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Axel Gerdau
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**The Unlikely Success of Green Power in America's Reddest State,
and Its Uncertain Future**

**APPROVED BY
SUPERVISING COMMITTEE:**

Supervisor:

Tracy Dahlby

Rosental Alves

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and Its Uncertain Future**

by

Axel Gerdau, B.A.

Report

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Abstract

The Unlikely Success of Green Power in America's Reddest State, and Its Uncertain Future

Axel Gerdau, MA; MPAff

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Supervisor: Tracy Dahlby

This narrative chronicles the development of the utility scale wind industry in Texas from the perspective of the people who made it possible. It also looks ahead at the challenges facing the most mature green power sector in the United States.

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The Wind Energy Capital of the World

Scenically challenged. That's how some locals describe the area. Others say that in order to appreciate the place, you must first wear out a pair of shoes there. Either way, Nolan County does not look like much. It's a barren stretch of land with hard blue skies and desert-clear air 200 miles west of the Dallas. And until recently, it had even less going for it. Ten years ago Sweetwater, the county seat, had two claims to fame. It played host to the world's largest rattlesnake roundup, and it had become the fastest shrinking city in Texas.

The local economy started to decline in the 1980s. Droughts hit ranching and farming businesses hard, and government programs, which paid farmers to conserve land instead of cultivating it, reduced the local workforce further. Manufacturing jobs that left did not return. The community's slow death amid cotton fields that would bloom but once a year seemed as certain as economic development seemed elusive.

"Our only hope to create new jobs," said Greg Wortham, "was a prison." Wortham is the town's mayor and a graduate of Sweetwater High, class of 1979.

"We'd have to go to the legislature, convince them that crime was very bad, and we need a new prison in the state," Wortham said. "Everyone would compete for the prison, and one town—Snyder or Colorado City or Childress—would get it. Then we'd have to wait two years, go back to the legislature and tell them, 'There is more crime than ever. We need another prison.' Then we'd compete, and the next town would win."

Wortham paused to see if his visitor has understood. Outside of his office, located across from the county courthouse, a fleet of white pick up trucks passed. A broad smile began to shine through his carefully trimmed gray beard. He knew that times had changed. Now legislators and economists studying rural development the world over come to Wortham for help. Or they invite him to come to them. "I get to give speeches in Montreal, Chihuahua and Berlin," Wortham said matter-of-factly.

His opinions and experiences are in demand because Sweetwater and Nolan County, though located in the middle of nowhere, are situated at the heart of one of the

most important developments in the world of energy: the dramatic success of green power in America's reddest state.

In just over 10 years, Texas, which produces more oil and gas than any other state and emits more carbon dioxide than all but a handful of nations, became the six largest producer of wind power in the world behind countries like China and Germany. Today, Texas has more installed wind energy capacity than the next closest states (Iowa and California) combined. In fact, Nolan County produces almost as much wind power as all of California, a region nearly 200 times its size. The economic windfall for Sweetwater and the surrounding communities has been enormous.

According to Wortham's calculations, the tax base in Nolan County was \$500 million before wind. Now it is \$2.8 billion. In 2008 alone, 1,124 direct wind jobs spread out over 40 companies in the area paid salaries in excess of \$45,000,000. Naturally, the entire local economy is benefitting. "We have five new hotels," Wortham explained. "The whole south side of town has grown, and it's 24 hours. Twenty-four-hour Wal-Mart, a fitness center. There's a lot of new restaurants. So the whole buzz of the town is different." Recently, Sweetwater dubbed itself the "Wind Energy Capital of the World." The slogan was Wortham's idea.

Wind energy from West Texas has also helped to reduce electricity rates across the state and improved air quality as power plant emissions have been lowered. What's more, in the process of generating electricity the new power source did not, unlike its competitors, tap into Texas' most precious natural resource: water.

As a result, policy makers are aiming to expand the state's wind resources aggressively with the largest renewable energy infrastructure project in North America. Construction has begun on 2,300 miles of high-powered transmission lines. Their purpose: Bring electricity generated by wind turbines from the far-flung regions of the state to the population centers in Central Texas and, it is hoped, create more Sweetwaters in the process. Companies from around the world, including petroleum giants like BP and Shell, have deepened their investments in Texas wind.

The sustained growth of wind power in the Lone Star State could well change the way America sees renewable energy—and Texas. Yet critics are adamant in their opposition, and their voices seem to be growing. Author Robert Bryce, possibly America’s most prolific critic of green energy and a resident of Austin, refers to the state’s bullishness on wind in general and the transmission build-out in particular as “the Lone Star wind boondoggle.” In his opinion, “Texas ratepayers are being forced to pay billions for wind-generation and transmission capacity that is proving to be ultra-expensive.” Along with others, Bryce also points to drawbacks of the technology such as its intermittency and variability.

Two big factors influencing wind power lie outside of Texas’s control anyway. Not only could the federal government allow the wind energy industry’s production tax credit to expire this year. But an abundance of cheap natural gas on the world market, produced via a new process known as hydraulic fracturing (“fracking”), continues to cut into wind’s bottom line. As a result, the momentum behind America’s most impressive and most surprising success story in renewable power is waning. How the wind will blow in Texas going forward remains to be seen.

“We Used to Cuss the Wind”

In the beginning, the wind was a problem. No doubt about it. Dust storms caused the most damage, and they looked the part too. Sitting in his family home just outside Roscoe, a 10-minute drive from Sweetwater, Cliff Etheredge, 69, described them as “big brown clouds that move on the ground and are 1,000 feet high.” Coming from the West, the storms dwarfed farmhouses and grain elevators as they rolled across the plains of Nolan County, eventually eclipsing the sunlight and engulfing everything.

“Back in the day, before we had cabins on the tractors, you would be caked in dirt, if you couldn’t get away before one of these things hit,” said Etheredge, who grew up farming cotton in Roscoe. “Clods of mud would hang from your eye lids, and often, if the storm was real bad, we would have to replant all of our crops.” After 50 years of labor in the fields of West Texas, Etheredge’s face is tan and thick. His right arm is gone, lost in a harvest accident decades ago. He thinks for a moment before adding, “We cussed the wind here all my life and all my parents’ lives. The truth is, it was a liability for West Texas.”

Etheredge explains that, in an area already ill suited for agriculture due to high evaporation rates and little rainfall, the wind made farming risky (even when it wasn’t destroying an entire crop), because it took all the moisture out of the soil. Not that he and his neighbors had much of a choice. “Cotton is a difficult crop to grow, but it’s our only cash crop here, really,” Etheredge said.

Today that has changed, and in no small part due to Etheredge’s work. In 2004, right around the time he turned the operation of the family farm over to his son Scott, Etheredge became fascinated with the white towers that appeared in surrounding counties. His interest grew as much out of his life-long relationship with the wind as “a farmer’s infatuation with machinery—the bigger, the better.”

He started reading about wind power. He talked to relatives and acquaintances about the subject, and he even spent \$5,000 of his own money to install a system to

collect wind data on his property. What started as an interest became an education, and a passion.

Etheredge spent months in the living rooms and kitchens of his neighbors, convincing the farmers that wind power could be a lucrative business for them. He used his own money (again) to travel to a renewable energy conference in New York City, though that trip seemed like a failure at first. “I took business cards. I met everybody I could and shook hands, and I didn’t understand a single presentation,” he said. “That was a different world.”

Success eluded Etheredge. Meanwhile, family and friends thought little of his obsession. “They considered it ‘a serious long shot,’” Etheredge said. “Some of them questioned my intelligence.” But with the same persistence that allowed him to eek out a living on cotton fields for 50 years, he pushed ahead.

Etheredge started looking through business cards he had collected and began calling people. A banker in Philadelphia referred him to a company that was headquartered in Dublin, Ireland, and had just opened an office in Chicago: Airtricity. And after dispatching a consultant from Dallas to visit Nolan County, Airtricity realized that Etheredge was on to something.

The area around Roscoe had great wind, which means constant wind and high speeds. Yet the small town, home to just over 1,000 people, had something else to offer that was nearly as important: transmission lines. Built decades earlier to move power generated by a natural gas plant to Forth Worth, the existing wires had been unused, or underused, for years. As a result, wind power could begin flowing to one of the nation’s biggest markets for electricity right away. “It was a natural fit,” says Etheredge. “Plus all the farm roads around here allowed easy access to the land, which reduced the cost of development dramatically.”

Ultimately, the project that started with Etheredge taking wind measurements outside his family’s home became the largest wind energy installation in the world: the Roscoe Wind Farm. Operated by the German utility E.On, its more than 600 turbines

equal a total installed capacity of 781.5 megawatts, enough to power 250,000 Texas homes.

For his efforts Etheredge received the Texas Environmental Excellence Award in 2009. But the humble grandfather, who upon his initial success briefly ran a business organizing and educating land owners on wind energy developments, is not interested in recognition. Etheredge loves the thought that the wind, of all things, is making farming easier in the area, because it provides families with additional income, even if he and most of his neighbors collect less than \$10,000 per year in royalties. “Nobody is getting rich. But it’s the only opportunity I have heard of where the landowner can sell something he does not own,” he said with a smile. The biggest benefit of wind power, Etheredge explains, is that it allows the community to survive by providing jobs and opportunities for young families.

Like Craig Guelker’s.

Together with his wife Melissa and their three sons, Guelker moved to Roscoe from the town of Blackwell (population 360), located 30 minutes south by car.

While his childhood friends and high school classmates left Nolan County upon graduation to find jobs, Guelker, 28, is putting down new roots. He started working for wind power companies almost immediately after finishing high school. Today Guelker is the site supervisor at the Roscoe Wind Farm, which surrounds Cliff Etheredge’s home. And he is hopeful that his sons will be able to find jobs similar to his.

“There’s so many opportunities in this area for working in wind,” Guelker said. “The normal going rate for an entry level technician is anywhere from \$35,000 to \$45,000. But you can go all the way to the \$75,000 to \$80,000 mark just as a technician.” Is it the best job in the area? “Definitely.” Guelker nods.

The local schools may best symbolize the new opportunities that exist in the area thanks to wind development. Blackwell’s, which Guelker’s sons still attend, was remodeled with tax money from the wind industry and became the crown jewel of the community. Today 180 students receive their k-12 education in the science and computer labs, libraries and classrooms of a state-of-the-art educational complex that cost

Blackwell ISD \$15 million to build. The brand new stadium (with Astro Turf) for Blackwell's six-man football team cost \$3 million. But these investments were only the beginning.

"We have been able to provide all of our students, grades 7 through 12, iPads, and we established an education foundation," Principal Abe Gott said. "So for every year you have gone to school in Blackwell, you get a scholarship to further your education, be it in trade school, university or beauty school. Anything that will get you job-ready or college-ready, it will go towards that."

Since 2009 the school's official motto is "you can get there from here." Directly behind the building a wind turbine is turning. It generates as much as 40 percent of Blackwell ISD's electricity needs.

The possibilities available to the youngest generation here are "awesome," said Craig Guelker. Behind the wheel of his pick-up truck he navigates the grid of farm roads that lead through wind turbines near Roscoe. Guelker admits that some of his neighbors miss the scenery they grew up in: open fields under a big sky. Now three-armed metal giants are reaching to the heavens all across this desert-like landscape, in every direction.

But Guelker says the area's new look fills him with pride, because it reminds him how he contributes to the revitalization of his home region. The jobs, the schools, the tax revenues. The majority of his neighbors feel the same way, Guelker reckons. He pushes the accelerator and as the white towers fly by his truck, he said, "We used to grow cotton. Now it looks like we are growing wind turbines."

The Business Model

Texas has always had some of the best wind in the country. The state's geographic and meteorological conditions are nearly ideal for this endeavor. Hot air rises above its landmass, and cool breezes blow inland from the Gulf of Mexico. Much of the massive region is flat. When the sun rises over the horizon on the High Plains of the Texas Panhandle, the stunned observer could fancy himself at sea were it not for isolated farmhouses on the horizon poking into the endless sky.

Alongside these settlements metal windmills turn and turn, like they have for generations. Used to pull water from the ground, the iconic structures helped settle the West in the mid- to late 1800s. They provided groundwater for livestock and steam for the railroad. By the early 20th century, farmers bought "wind chargers" to supply electricity to their homes, but once rural electrification extended electric wires into the country side, the importance of wind energy declined. Thus the job of figuring out how to power the Lone Star State using the wind fell to tinkerers and hobbyists. Fortunately, one of their earliest attempts is caught on tape.

In 1981 Michael Osborne, now an executive with the municipal utility Austin Energy, produced a short documentary film in Pampa called "Lease the Wind." Osborne's hometown is located in the Texas Panhandle close to the Oklahoma border. "I used it as part of my speech at a renewable energy conference in Houston," explained Osborne, sitting in front of a TV and VCR in his Austin home, the tape cued up. "I talked about the nation's first wind park and used this little 16-minute documentary to bring people into [the topic] in a real way." Three decades after the fact the footage encapsulates the infancy of utility scale wind power in America.

There is Carl Kennedy, a local judge wearing short sleeves and a baseball hat, who puts the local effort in bigger context. With his arms crossed, standing sideways to the camera, Kennedy says, "We have the wind, and we plan to capitalize on it. If there is any truth to the energy shortage, and the federal government is encouraging people to develop secondary sources of energy, here is a first step to getting it done."

In subsequent shots electricians connect power meters while others drill holes into concrete slabs and screw down bolts that will hold up the towers. All by hand. Jay Carter, who manufactured the turbines, talks about the state of the technology: “We have had some adverse publicity. Anybody who thinks you are not going to have problems with a new technology is really kind of naive.” At the end of the video, Father Joe James explains why he erected wind turbines around St. John Neumann Catholic Church in Lubbock. “We are fast depleting the great bounty of resources our country had. And instead of saying, ‘What can I do to make life easier for myself?’ I think we are going to have to start saying, ‘What can I do to make this world a better place to pass on?’”

Watching the video today, Osborne cannot help but smile. On screen he leads through the entire piece wearing what he calls “my little wind outfit”: khaki pants, khaki shirt and a Stetson. “I had that same outfit on when I was at the podium in Houston,” he said.

Osborne moved to Austin to study at the University of Texas 1967, then worked as an adman. Impressed by the cultural upheaval of the time, he decided to reorient himself professionally. “I made commitment at the time that I would not to contribute to consumer society but do something more meaningful, which was the development of a ‘post-carbon society,’” he said. “We didn’t use the term then, but the development of sun, solar, wind and biomass is what I was thinking about.”

Wind seemed especially promising to Osborne. In 1981, then 32 years old, he drove back to Pampa. He wanted to see whether or not wind power could pay for itself—and he was hopeful because of an initiative pushed by the Carter administration. “The Public Utility Regulatory Policies Act passed in 1978. This amazing law allowed folks of any stripe to produce energy and sell that energy back into the utility grid,” explained Osborne. “That’s what I did. We had five wind turbines, and we connected them up to the grid and sold the energy. I was pretty much the first person to ever have done that.” Alas, the time was not right, also because the technology was not anywhere close.

The turbines of 1981 looked like spindly sticks in comparison to today’s massive towers. They were much shorter (60 feet to 250 feet in height) and yet needed a set of

four metal wires for stability. Even the newer models included only two blades, not three, and they were not much taller than the front door of a house. Today's blades can be as long as a football field is wide. While the arrival of wind power in a major way seemed imminent, it was anything but.

However, Osborne did take wind development in Texas a big step farther. He figured out the business model that would become the foundation of today's wind energy sector. Instead of selling the turbines to the landowners for their personal use (like the manufacturers of wind mills for irrigation had done), wind power entrepreneurs would lease land, sell electricity into the grid and pay the landowner a royalty. It was the same model used by the oil-and-gas industry, and it would not be the last time that the wind business benefitted from Texas' oil and gas legacy.

Wind Power Politics

In 1996 plans were underway to increase the competitiveness of the electricity sector in Texas, and Pat Wood's star was rising. Soon he would become the highest-ranking national energy regulator at the Federal Energy Regulatory Commission, an independent agency that directs the interstate transmission of electricity, natural gas and oil. But he was already considered by many to be one of the smartest people in the business and, as the Chair of the Public Utility Commission of Texas, charged with regulating electric utilities in one of the biggest power markets in the country.

In this role Wood met with Governor George W. Bush every two or three weeks. He remembers the future President of the United States as a good counselor on energy matters. "I could never talk to him, of course, about a pending rate case or some litigation or something," Wood said. "That would be inappropriate. But on policy issues he was a lot of fun to talk to, because he would just kind of cut through it all."

"So I went in one day, and we talked, probably about transmission. When I was walking out of his office, his boots were on the desk, and I think he was chewing on a cigar or something, and he said, 'Oh! By the way, we like wind.'"

Wood stops his narrative. Sitting in his Houston living room, he squints through one eye and tilts his head, feigning surprise. A red glow radiates from his cheeks. It's clear that Wood loves this story.

"I said, 'We like what?' He said, 'You heard me. Go get smart on it, Pat.'"

Wood laughs.

"I just walked out of the door and thought, 'What a line to end a meeting with!' I mean, 'We like wind? That's what Birkenstock wearin', tree huggin' Californians are all about. That's not us.' And then I thought, 'OK. I couldn't care a damn about it, but let's figure it out.'"

Wood and his colleagues did get smart on wind energy. They helped create a regulatory framework that achieved results few people predicted and Governor Bush in all likelihood did not expect.

By all accounts, Bush was not a visionary of renewable energy. In Wood's opinion, Bush "knew intuitively" that wind would be a great resource, because he grew up in Midland, regarded as one of the windiest places in the state, and worked in the oil and gas business there before turning to politics. "He knew energy," says Wood. But Wood also explained that in the mid-90's "there were definitely people that were starting to try and do some business [with West Texas wind], and I'm sure had been by to see him."

The opportunity to do something for wind on the political front came in 1999. The state legislature was trying to pass a law to break up monopoly utilities across Texas and introduce a competitive wholesale and retail market for power. A similar proposal had failed to pass in the previous legislative session. The new initiative saw bipartisan support and was pushed by companies like Enron.

Critics worried that deregulation of the electricity sector would not benefit Texans, because three companies (one generating, another transmitting and a third selling electricity) would now try to squeeze profits out of the same dollar that one regulated company had earned previously by providing all three services. Ultimately, the opposition could not stem the bill's momentum. Yet they did get something else they were interested in from the legislative leadership: a renewable portfolio standard, or simply RPS, and a provision that required utilities to clean up their most polluting power plants.

"Really, the power plant clean up was a much bigger deal back then," says Pat Wood. "The RPS was almost a throw-away item that nobody thought anything off, but it had a huge impact."

An RPS is a policy, now adopted by more than 20 states, stipulating that a certain amount of electricity generated in a region has to come from renewable sources. In order to implement the change, Pat Wood and his colleagues, in consultation with Governor Bush, devised a market-based trading system for renewable energy credits. These certificates are tradable, non-tangible energy commodities that represent proof that one megawatt-hour of electricity was generated from an eligible renewable resource—and

they provided the producers of green power with extra cash. The system would become a game changer for Texas wind.

Success in Oil Country

When Andy Bowman first traveled to West Texas to lease land on which to develop a wind farm, he had doubts. Big ones. “I remember getting on that plane and wondering what I had gotten myself into,” he says. The year was 1998, and Bowman had just left a well-paying job at the University of Texas. He was excited by the idea of working for a start-up company in clean energy. But more than once he asked himself whether or not his timing was right. “My wife had just had our first child, and the utility scale wind industry didn’t really exist,” Bowman says. “It wasn’t clear to either one of us that we were making the right decision.” And now he was traveling to the town of Kermit, located less than an hour’s drive from the place that had once been synonymous with Texas oil.

The City of Midland could well have remained a desolate farming community. But in 1923, an oil well named after the patron saint of the impossible, Santa Rita, erupted on land owned by the University of Texas some 60 miles away. During the late 70s, when the price of oil rose to more than \$95 in today’s dollars, Midland became one of the richest cities per capita in the United States, writes Skip Hollandsworth in *Texas Monthly*. “Oilmen bought jets to fly themselves and their friends to San Francisco or New York for dinner. They hired designers in Dallas to decorate their second, or third, vacation homes. There was so much money in town that Rolls-Royce went so far as to open a dealership near the airport. In 1982, eight Midland oilmen were included in the first Forbes 400 list of richest Americans, an amazing statistic considering the city’s population was only 70,000.”

But the good years did not last. Midland’s First National Bank closed its doors in late 1983 as did many oil companies, including one run by George W. Bush. Later, when the price of oil rose again, Midland got its groove back somewhat. But when Andy Bowman arrived in Midland in 1998 to lease land for wind development, the community’s economic outlook was dim. Of course, that did not mean the former center of the oil and gas economy would welcome the wind industry with open arms.

“People’s first reaction was definitely that it would be a waste of time to explore the possibility of a wind farm out there,” Bowman said. At the same time, it was very obvious to people that wind was a very powerful resource, and the idea that money could be made from it had a natural appeal. “The most difficult thing to get over was, ‘Is this something that’s not actually likely to happen or is it something that can be achieved now?’” said Bowman.

He was asking himself some of the same questions. “[That’s why] the first project of scale at 75 megawatts was such an important thing,” Bowman said. “Once that project was finished and people were actually receiving checks and income, people who in some cases were having a hard time making a living off that land... Once their neighbors started seeing that this actually works, it got a lot easier.”

Convincing landowners to lease their land to wind energy developers got even easier thanks to the work of policy makers in Austin—and the system devised by Pat Wood to support renewable power companies. “Once the RPS was passed in Texas, we were able to demonstrate to landowners how projects could happen and succeed,” said Bowman.

Soon after the RPS became law, wind energy production in Texas skyrocketed. From a mere 180 Kilowatt in 1999, the total installed capacity within the grid managed by the Electric Reliability Council of Texas (ERCOT) grew to approximately 10,000 Megawatt (8 percent of all installed electric capacity in the state) in just over ten years, and much of the early development was located in oil country. The initial goal for power production from renewables set by legislators (2000 megawatt by 2009) got surpassed in 2005, and their readjusted goal of 5880 megawatt was passed in 2008, seven years ahead of schedule. In the end, wind turned out to be a good investment.

Environmentally conscious costumers, who wanted to support renewable technologies, were willing to pay more for electricity from wind farms. At the same time, energy companies realized that wind power could provide them with an important business advantage. Building wind farms was expensive up front, yes. But once the turbine blades were turning, the maintenance costs for power plants were negligible and

the fuel that created the electricity, the wind, was free. This not only reduced the overall investment, but it allowed companies to forecast their expenses for years. Thus wind energy provided a hedge against spikes in fuel costs and thus electricity costs.

Finally, the creation of a competitive wholesale spot market in Texas increased wind's competitive advantage. When power is sold in real-time on the open market, suppliers of electricity can bid into the market at marginal cost. In other words, the price a company asks for one unit of electricity is determined by how much it costs the company to generate that one additional unit of power. The cost of one extra unit of electricity from coal and gas generators is, by and large, determined by the cost of the one extra unit of fuel required to run the power plant. But wind power did not incur those costs, because the wind was free. As a result, wind power was able to compete with conventional energy sources from the start.

In light of all these advantages, investors were so bullish on wind energy that they poured billions into the market, and over-built. The consequence: On windy days and nights turbines in Nolan County had to be turned off, because the transmission lines, which like water pipes or highways have a maximum capacity, were full. If the state of Texas wanted the wind industry to grow further, it needed to build out the existing transmission infrastructure.

Transmission, and Other Tradeoffs

When the build-out Texas' system of transmission lines was first announced in 2005, it was widely heralded as a success and a new term got introduced into the state's extensive energy dictionary: CREZ. The acronym stands for Competitive Renewable Energy Zones, and it refers to the plan created by the Texas Public Utility Commission to connect five wind (and solar) energy rich regions across state to the densely populated cities in Central and East Texas. Based on a proposal by ERCOT, the state's grid operator, the PUC contracted with 13 companies to build 2,300 miles of transmission lines by December 2013.

Not everybody was happy, of course. Notably, landowners in the Texas Hill Country mounted some resistance, because they would have to deal with the wires crossing their land. But Republicans and Democrats were able to celebrate a rare bi-partisan effort in politically polarized times. On the right, policy makers cheered on the pending economic development in rural (conservative) districts. On the left, legislators considered the project a victory for climate and environmental protection. Robert Bryce, meanwhile, wasn't having any of it.

An author based in Austin, Bryce is a frequent guest on nationally televised broadcasts on energy issues, and his articles appear in *The Wall Street Journal*, *The New York Times* and other publications. In fact, he has been devoted to the topic of energy since his high school days. "One of the first stories I published was on nuclear power," Bryce said.

But to this day few things get him as worked up as wind power in general and CREZ in particular. What is effectively America's largest renewable energy infrastructure projected, Bryce calls a "boondoggle." In part, Bryce is referring to the increased cost of the CREZ project. The original proposal for the construction process estimated total costs at \$4.93 billion, which the transmission companies expected to recoup from residential ratepayers by adding between \$3 and \$5 a month to utility bills

for about a decade. Now the cost estimate has risen to \$6.79 billion, a 38 percent increase, according to a report published in July 2011.

But fundamentally Bryce is concerned about wind power's ability to make a meaningful contribution to America's electricity needs. His two recent books point out, directly and indirectly, the limits of renewable power. "Gusher of Lies: The Dangerous Illusion of Energy Independence" explains why the U.S. must (and should) continue to buy foreign energy. Meanwhile, "Power Hungry: The Myths of 'Green' Energy and the Real Fuels of the Future" is devoted to debunking the myths of, among other technologies, wind and solar. He has built a career on these arguments as America's most prolific critic of renewable power.

"I am all for wind and solar," Bryce said. "But the fact is that they cannot and will not make a significant addition to our overall energy and power needs at any time in the foreseeable future, because of their intermittency, their high cost and their variability."

By intermittency Bryce is referring to the fact that the wind does not blow all the time. In fact, it often blows little or not at all when the demand for electricity in Texas peaks: during the middle of the afternoon in the summer. To illustrate his point, Bryce cites numbers from ERCOT from 2010, one of the hottest years in Texas history. "In August Texas set four records for power demand, four different days of peak power demand over 65,000 Megawatts each time. On those four days between 4 and 5 p.m., wind energy provided 1 percent, 1 percent, 2 percent and 1 percent of the needed power."

The investment in wind power and wind energy infrastructure pushed by politicians and financed by ratepayers, has little value in Bryce's opinion. "Why are we spending so much money building infrastructure that we cannot use when electricity prices are the highest and demand is the greatest?"

Variability, wind power's second major drawback, ties into this first point and refers to the energy source's varying output of power over time. When the wind blows strongly and the turbines' blades turn quickly, more electricity is generated than when they rotate more slowly. This point is important, because electric grids need to be in

balance at all times (supply must meet demand) in order to function. A misallocation can lead to a regional loss of power and cost millions, even billions of dollars in economic activity. “Other power generators, they say we will deliver 1000 megawatts tomorrow at three o’clock,” Bryce said. “They have to deliver. Wind guys don’t. It’s not fair.”

Finally, there are the subsidies, one of Bryce’s favorite topics. In 2010 Bryce calculated that wind power is subsidized at roughly \$6.44 per million BTU (a unit of energy used to compare different energy sources), mainly through a production tax credit doled out by the federal government. By his calculations, the oil and gas industry receives only about 3 cents per million BTU in subsidies.

The author also cites arguments that lie outside of the mainstream conversation about the merits and drawbacks of wind power, at least in Texas. He quotes anecdotal reports about low-frequency noise the turbines generate. “Infrasound,” Bryce calls it, has been reported to cause headaches, ringing in ears and nausea. This does not happen much in Texas where most wind generation is situated in rural areas, but Bryce says he has heard about such problems from people in Missouri, New York, New Zealand and other places.

Similarly, arguments about the low power density of wind—a term referring to the amount of energy flow to be captured from a given volume, area or mass—do not get much traction, though Bryce describes it as “basic physics.” “It’s something that everyone wants to dismiss on the pro-wind side,” he said.

Of course, some on the pro-wind side are eager to dismiss Robert Bryce altogether. Wind industry representatives point to articles he publishes in print or on his blog, which carry emotionally charged titles like “Why the Wind Energy Industry Is Full of Hot Air And Costing You Big Bucks,” “Texas Wind Energy Fails, Again” and “The Party Is Over For Big Wind.” In addition, Bryce is an easy villain, because the Manhattan Institute, where he is a senior fellow, has received funding from ExxonMobile and foundations associated with Koch Industries, an oil, gas and chemicals company, according to the website SourceWatch.org. (In October 2011, The New York Times reported that funding from traditional energy companies amounted to 2.5 percent of the

Manhattan Institute's budget over the past 10 years.) And Bryce freely admits that he is bullish on natural gas. But it is dangerous to dismiss outright the concerns he and others, who may be less adamant, are raising.

Notional v. Real Turbines

The wind turbine has become a symbol for sustainability and smart ways of creating a better future. Marketers use the image to communicate such values in the same way they use the color green or the term “eco,” even if the promoted product has nothing to do with electricity. During the national broadcast of this year’s Grammy Awards, the fast food company Chipotle ran an ad that ended with the slogan “cultivate a better world” and featured animated wind turbines. Turbines also appear in commercials promoting the services of real-estate agents with the company Remax.

Today these notional wind turbines find their way into living rooms, kitchens and offices across the U.S. on a daily basis. But few people have ever seen a wind turbine up close or can explain wind energy’s role in the electric system. And that, in turn, obscures a fundamental characteristic wind shares with all energy technologies: they are imperfect. Or as Michael Webber likes to say, “There are trade-offs to all energy technologies.”

Webber is a professor for Mechanical Engineering at the University of Texas at Austin and the Associate Director of the Center for International Energy and Environmental Policy. A course he teaches to engineering, business, policy and law students at the Graduate School of the University of Texas focuses on this very issue and sends a clear message: "There is no single solution that meets all of our needs."

Sitting in his office on the sixth floor of a building that belongs to the Cockrell School of Engineering, Webber ticks off a list of pros and cons for each one of the technologies competing with wind. Coal: Abundant and cheap as long as the environmental pollution is not factored in along with the power plants’ water consumption. Gas: Abundant and cheap though historically volatile in price with an unclear environmental downside due to a new technology used in the production process ("fracking"). Nuclear: Steady supply of power and relatively cheap over time but expensive to built and water intensive with a lack of public support and a waste disposal problem. Solar: Complimentary to wind but still pricy and requiring a lot of land at utility scale. When asked about wind power, Webber says, "It does have its limits and in these

limits will become more acute as we develop more wind. But my sense is that wind will grow dramatically."

At the basis of Webber's opinion is the understanding that the ways electricity is generated and managed in Texas (and America) are changing. When he lived in the Bay Area in the 90s, earning a Ph.D. in engineering at Stanford, Webber witnessed the IT revolution first hand. His friends worked for companies like Yahoo, the founder of Netscape lived across the street. "I saw the writing on the wall that we were about to do another revolution like this in energy," he said.

Today the scenario that he anticipated a decade ago is playing out, and wind is playing an important role in it. "Wind has lowered the price of electricity," says Webber. "Wind has also been good for air quality. When the wind turbines are spinning and generating electricity usually power plants are turned off that cause air pollution." In addition, wind has helped to conserve water in Texas, which constitute a significant benefit in a state that has struggled with record drought conditions for years but requires a lot of power. According to a 2009 report by the University of Texas, enough water for over three million people (each using 140 gallons per person per day) is consumed every year for cooling the state's power plants.

Meanwhile, the debate over subsidies is not always useful, according to Webber. He explains that there are many subsidies in the energy industry, and they show up in different forms. Wind gets a direct subsidy (called a production tax credit or PTC) of 2.2 cents per kilowatt-hour from the federal government. Other industries are supported in other ways. "The U.S. government pays for a lot of research in natural gas, but they have not paid for wind. Is that a subsidy? There have been government efforts to help pipelines at various times for natural gas. Is that a subsidy?" says Webber. "We should also remember that coal, oil and gas have received direct or indirect subsidies for 100 years."

Then there are the hidden costs of carbon fuels. Webber explains that the National Academy of Sciences, a non-partisan research group created by President Lincoln in 1863, evaluated the negative public health impacts of the power sector's air and wastewater emissions in 2009. Without taking into consideration the costs associated

with factors like climate change, national security and others, the researchers estimated that damages to the U.S. economy from pollution created in the power sector add up to more than \$120 billion in health problems, including deaths. A main culprit was coal. “[Electricity from] coal is worth about three or four cents per kilowatt-hour and in the process does about three cents worth of damage that it doesn’t pay for,” calculates Webber. “Critics would say that’s a subsidy.”

The debate should be less about who needs what subsidy, because all energy technologies are subsidized in some form, according to Webber. Instead the conversation concerning our collective energy future should be about “what energy system and fuel mix meets our needs best and what can we do to get there.”

Unquestionably, the debate over America’s energy future will continue, and because the stakes are high, it likely will be neither calm nor nuanced. Competing energy industries are fighting over more than \$350 billion in U.S. electricity retail revenue each year. A loss of market share of even 1 percent costs an energy industry, for example coal, more than \$3 billion. That’s why utilities and mining companies spend more than \$200 million annually to buy political influence, according to the Center of Responsive Politics. By comparison, the \$53,200 the American Wind Energy Association spent on lobbying between 2011 and 2012 seem rather measly.

An Uncertain Future

Ultimately, the fortunes of U.S. wind power—and most other sources of electricity for that matter—will be impacted by the price of natural gas. Negatively, one is inclined to add. After all, the price of natural gas continues to hover under \$3 per million BTU, which allows gas-fired power plants to outcompete other sources of electricity. The reason: A new extraction technique called hydraulic fracturing (“fracking”) has produced an abundance of cheap fuel. The development of what is also known as “shale gas” may well transform the global energy landscape, according to a 2011 report by the International Energy Agency titled “Are We Entering A Golden Age of Gas?”

The wind industry is watching this development with some concern. “Essentially, the way things are now, we have little chance of competing until the price of natural gas goes above \$4 per million BTU,” said an analyst off-the-record, who works for Houston-based wind developer and did not want to compromise his company’s competitive market position. Some experts, including former FERC Chairman Wood, believe that natural gas will stay at or below the \$4 threshold for much of the decade.

Meanwhile, politicians in Washington, concerned with government overspending, are increasingly skeptical when it comes to giving tax breaks to businesses. The case of Solyndra, a maker of solar modules that filed for bankruptcy and defaulted on a federal loan worth more than half a billion dollars, has damaged the image of renewable power in particular. Neither development bodes well for the extension of the federal production tax credit this year. The American Wind Energy Association is alarmed. “Half of the U.S. wind industry’s workforce is at stake,” according to a call-to-action statement on the organization’s website.

In light of these events the future of American wind energy seems to have turned increasingly bleak. Will America’s green energy future, which started with the development of utility scale wind power in Texas, be put on hold?

Texas wind supporters caution pessimists. “I am hopeful but not exuberant,” said Pat Wood. “The dramatic growth of wind we have seen here over the past ten years was unsustainable. It had to come to an end.” Outside of Texas wind will fair well in states that have passed a renewable portfolio standard, he thinks, because the technology is still the most cost-effective source of green power.

Michael Osborne says it is “quite likely” that President Obama, who has been a proponent of renewable energy all along, could win support for the production tax credit by using it as a bargaining chip with congressional Republicans in the debate over the Keystone Pipeline.

In the long term, both are confident that wind will continue to grow, and other experts, including Michael Webber and Andy Bowman, agree. Wood predicts that wind will constitute as much as a quarter of all new capacity installed in the U.S. and in Texas over the next ten years. In the Lone Star State, new transmission lines will tap into additional (and even better) wind resources in the Texas Panhandle. Turbines built along the coastline will supply electricity during the heat of the afternoon, complementing wind resources in West Texas that blow mainly at night. As technology continues to improve, turbines also will be able to generate more output with less input, which will enable them to compete at lower power and gas prices.

“Ultimately, the existence of all of this cheap gas will actually help wind,” said Osborne. He explains that the technologies are “complementary,” because gas plants can come online quickly when the wind dies down unexpectedly.

Sweetwater Mayor Greg Wortham also expects wind to grow. He knows that the technology is “not a silver bullet” but predicts it will be part of America’s larger energy solution. Wortham also believes wind power can do more than simply supply electricity: prevent the slow death of rural America along the Great Plains, America’s wind corridor.

“It happened in Sweetwater,” he said. “People started fixing up houses, because people are going to want houses for a long time. Communities voted for new schools, because of course we’ll be around another 100 years. All kinds of things happened that couldn’t be conceived three or four years earlier.”

He explains that the Bush administration set a goal for America to get 20 percent of its electricity from wind power by 2030, which, according to Wortham, would mean a total installed capacity of 300,000 megawatts of wind. “Well, there’s roughly 3,000 megawatts operating here today. Which means 100 Sweetwater’s, 100 revitalized communities.”

“There were the railroads in the 19th century, rural electrification in the 20th century, and now you have wind energy in the 21st century,” Wortham said. “Each have revitalized the Great Plains. And it’s time for the rest of this region to get the revitalizations that we’ve seen.”

Outside of Wortham’s office crickets are chirping. The county courthouse across the way has already closed for the evening, but a few cars remain. One of them is Wortham’s. He has got more work to do, he says, and is headed to the high school. The girls’ volleyball team is playing tonight. Wortham needs to catch up with a couple of the parents who are not only constituents but entrepreneurs in, what else, the wind industry.

“The high school bleachers is where most business is done here,” Wortham said. As he heads out the door, night is falling over his West Texas town of 11,000, the self-proclaimed wind energy capital of the world.

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