

Texas Wind Power Story: Part 1

How Subsidies Drive Texas Wind Power Development

by Lisa Linowes

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TEXAS PUBLIC POLICY FOUNDATION

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Executive Summary

In 1999, the state of Texas hosted 184 megawatts (MW) of installed wind energy representing 7.4 percent of the 2,473 MW of wind operating in the United States. At the time, California dominated the capacity race with 1,600 MW installed, followed by Minnesota with 274 MW, and Iowa a close third at 242 MW. By the end of 2006, wind capacity nationwide grew to over 11,000 MW and Texas assumed the lead with the most wind energy operating of any state (2,736 MW). Since that time, Texas experienced a sevenfold increase and now claims nearly 23,000 MW of wind representing 25 percent of the total installed in the U.S., with Oklahoma a distant second at 8 percent or 7,495 MW. Numerous factors influenced why Texas was able to achieve its rate of growth compared to other states. This report examines the Texas wind story, the reasons for its growth, and what to expect in the next 10 years.

KEY POINTS

- Federal subsidies, public-funded infrastructure expansion, and low barriers for wind power siting and construction, make Texas an attractive state for wind power development.
- Tax equity including the federal Production Tax Credit (PTC) and depreciation now accounts for over 50 percent of the capital needed to construct a typical wind facility.
- After committing nearly $7 billion to resolve Texas' transmission congestion and wind curtailment issues, the problem is returning as more wind is built.
- Around 50 percent of Chapter 313 agreements involve wind energy facilities with a lifetime total cost of $1.56 billion as of 2016.

Report Highlights

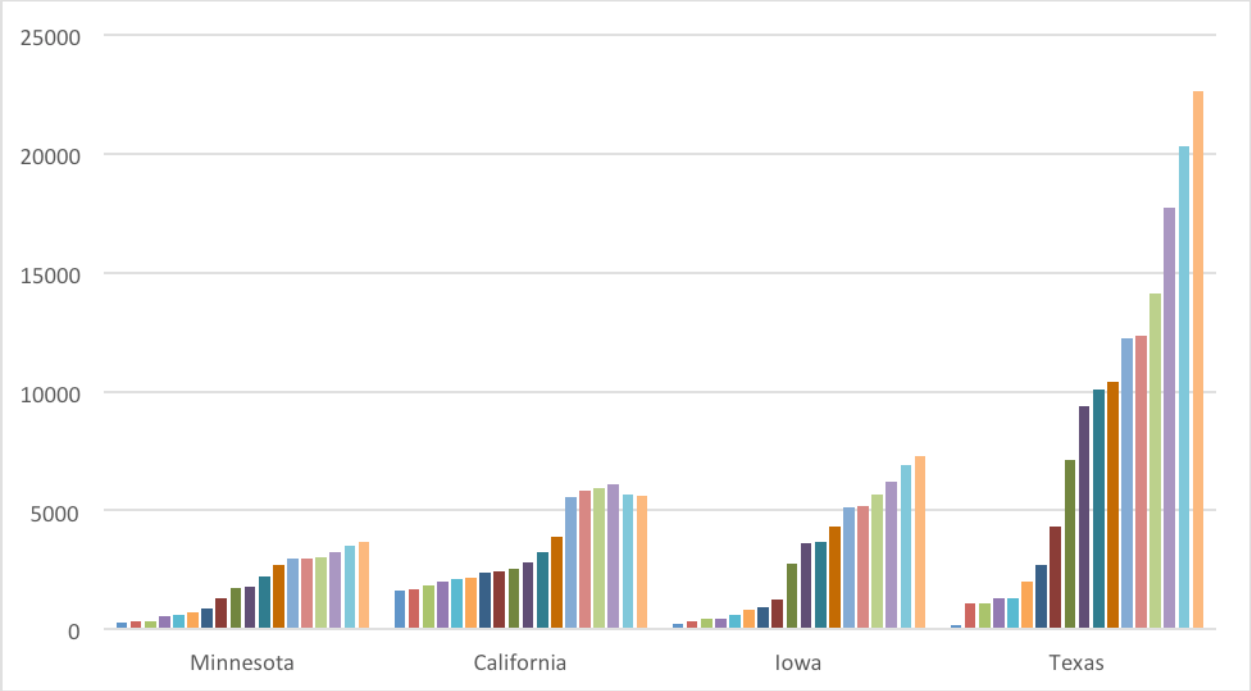
- The Texas renewable portfolio standard (RPS) was saturated nearly a decade ago resulting in a collapse in the value of renewable energy credits (RECs) and rendering the program more symbolic as a driver of renewable energy. Despite this, Texas remains an attractive state for wind energy development largely due to federal subsidies, public-funded infrastructure expansion, and low barriers for wind power siting and construction.

- U.S. wind energy development is heavily reliant on public subsidies and the Texas market is no different. Federal subsidies including the wind production tax credit (PTC) and depreciation combined represent over 50 percent of project capital cost. The pending expiration of the PTC after 2019 has fueled an aggressive race to erect as many turbines as possible. When the PTC expires, new project developers are likely to turn to the states to recoup the loss of the PTC, either through amendments to RPS policies or through other renewable energy programs. The alternative is to employ more conventional project finance strategies, which will significantly raise the price of their project output.

- Transmission congestion was relieved and wind curtailment dropped to 0.5 percent following CREZ (Competitive Renewable Energy Zones) transmission being energized. This is down from a peak of 17 percent in 2009 but the issue is starting to return. There are new requests to add 32,258 MW of wind to the Texas grid. Not all of the proposed wind will get built, but some will and Texas will again have to confront the transmission congestion problem.

- Fifty percent of the active Chapter 313 agreements involve wind energy facilities with a lifetime total cost of $1.56 billion as of 2016. Chapter 313 requires at least 10 new qualifying jobs be created for projects sited in rural counties. Waivers can be requested and are typically granted. More than half of the active agreements were

Figure 1. Wind states in megawatts, 2000-2017



Source: The U.S. Department of Energy WINDExchange.

approved with waivers and most pertained to wind applications. Actual wind-related job creation in Texas has not been independently verified. The source of the data is primarily the American Wind Energy Association.

- Subsidies, low natural gas prices, and competition from other renewable energy projects (including wind) have placed downward pressure on the price project owners can demand for their wind energy. These reduced prices are touted by the wind industry as a benefit to Texas ratepayers, but they are also used as a primary justification for Chapter 313 agreements. While Texas consumers might be enjoying low electricity prices, wind developers are asking taxpayers to pay more in order that their projects make financial sense.

Wind Energy and Public Funding

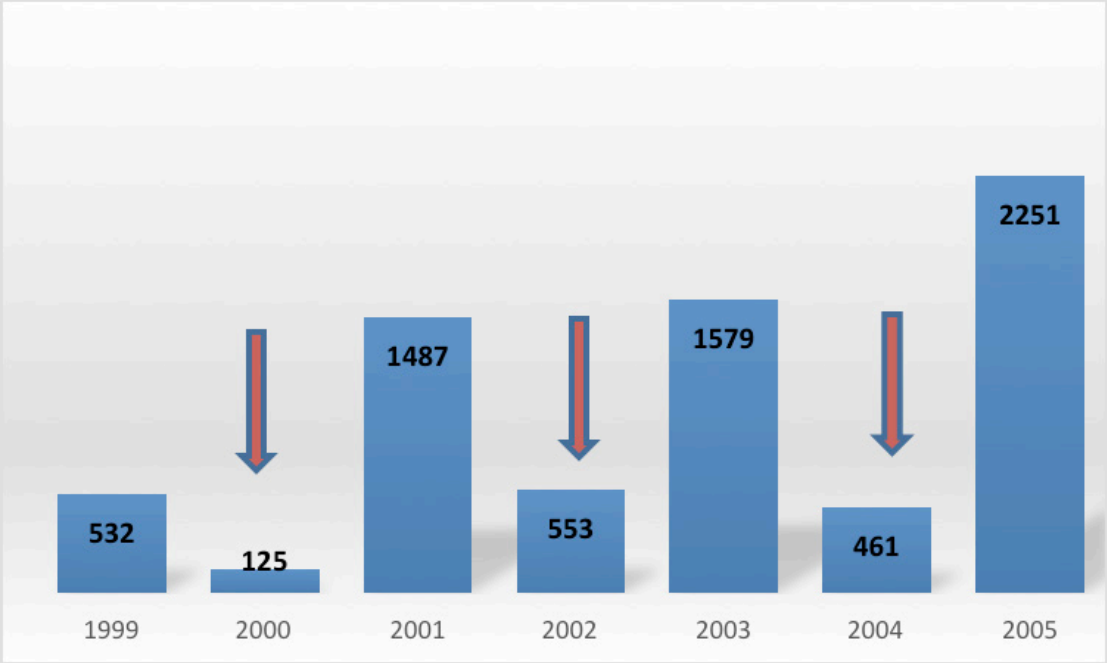
The federal Production Tax Credit (PTC), first adopted in 1992, is widely touted as the primary incentive behind wind energy development in the United States (Sherlock 2015, 4). The PTC marries tax-burdened investors with developers seeking construction financing for their projects. By selling the tax credits, developers secure a significant percentage of project capital costs, investors are able to lower their future tax debt, and the wind energy produced can be sold at a lower price than if tax equity were not involved.

Tax equity including the PTC and depreciation now account for over 50 percent of the capital needed to construct a typical wind facility. The pool of investors with enough passive income to qualify for wind PTCs is limited and includes the largest financial institutions such as JPMorgan, Bank of America, Citi, and high-tech giants such as Alphabet (Google) and Facebook. Since the PTC is used to reduce investor taxes, the true cost of the subsidy is borne by taxpayers at large. Combined with state renewable energy mandates and subsidies, the wind industry is assured a market for its energy at a reduced price (JCT 2005, 19).

Federal Subsidies and Mandates

The PTC was established under the Energy Policy Act of 1992 to stimulate renewable technologies by providing a production-based credit for the first 10 years of project operations. Initially set at 1.5¢ per kilowatt-hour (kWh), the credit was adjusted annually for inflation. By 2016, the PTC reached 2.4¢ per kWh which, pretax, equates to 3.5¢. At this value, the PTC equals or exceeds the wholesale price of electricity in many parts of the

Figure 2. Number of wind MW installed by year



Note: Wind power installations dropped following expiration of the production tax credit in the years 2000, 2002, and 2004. Data from U.S. Department of Energy WINDExchange.

country. Under the 21 percent corporate tax rate, the PTC still carries a high pretax value of 3.0¢/kWh.

When the PTC first expired in 1999 and again in 2002 and 2004, the American Wind Energy Association (AWEA) complained that its expiration caused wind power development to slow. But at the time, other market factors made wind power less attractive as an alternate energy source including low oil prices and a nationwide surplus in generation (Brown, 3). The value of the PTC as a percent of capital cost was also much lower than it is today.[1] After 2005, the PTC contributed to growth in the wind market, but so did state policies that mandated the purchase of certain renewables. Wind also benefited from rising natural gas prices (over $5 per million BTU) making wind power contracts a useful method of displacing higher-cost natural gas generation.

By the middle of 2008, the U.S. economy stumbled and energy prices dropped off quickly. With incomes falling, tax-based policy incentives including the PTC lost much of their effectiveness, and tax equity investors disappeared. The Section 1603 program created under the American Recovery and Reinvestment Act of 2009 aimed to fill the void by offering project owners the option to take direct payouts from the Treasury equal to 30 percent of their project's qualifying cost, in lieu of the tax credit. Unlike the PTC, the cash outlays were not production-based and their horizon was much shorter. Projects that started construction in 2009, 2010, or 2011 and operational by the end of 2012 received the funds within 60 days of going online.

The program was a boom for wind energy development. U.S. capacity more than doubled from 25,410 MW in 2008 to 60,000 MW when the program ended. Sixty-three percent of new wind megawatts installed in that period received cash grants totaling $13 billion. Many of those projects would not have moved forward otherwise. Texas wind capacity jumped 72 percent reaching 12,214 MW (Treasury 2018, 1).

Developers raced to meet the 2012 end date for the grant program, which flushed the industry's project pipeline. In 2013, only 1,100 MW of wind were installed in the U.S. including 141 MW in Texas.

[1] The PTC in 2005 was valued at 1.9¢/KWh and project capacity factors were hovering at or around 30 percent compared to current levels. *See Appendix A.*

Table 1. Top states with wind power capacity additions – MW (2014-2017)

	2014	2015	2016	2017	Total MW
Texas	1,811	3,615	2,611	2,305	10,345
Oklahoma	648	1,402	1,462	851	4,363
Iowa	511	524	707	397	2,139
Kansas	0	799	687	659	2,145
Total New MW	2,970	6,340	5,467	4,212	18,992
Total US New MW	4,854	8,598	8,203	7,017	28,672
% of US New	61%	74%	67%	60%	66%

Source: AWEA quarterly market reports

From 1992 to 2010, the aggregate cost of the PTC for wind power was approximately $6.8 billion (Sherlock 2012, 3). Advances in turbine technology that delivered higher electricity output and lowered overall project costs, dramatically raised the value of the PTC as a percent of project costs. Today, the PTC, discounted at 10 percent (conservatively), represents 34 percent of project capital costs. This compares to just 9 percent in 1992. Coupled with depreciation deductions, the total federal benefit for wind power is now over 50 percent of project costs[2] (Martin, 1; Appendix A).

No traditional source of electric generation receives a federal subsidy as open-ended and condition-free as the PTC. With more wind capacity in service, the cost of the PTC has soared to over $5 billion *per year* (JCT 2017, 31). The Department of the Treasury's itemized list of "tax expenditures" now shows the PTC as the most expensive energy subsidy with a forecasted price tag of $40.12 billion from 2017 to 2027. The energy investment tax credit (ITC), which largely applies to solar installations, is second at $18.36 billion (Treasury 2017, 1).

Recent development patterns in the United States show that the PTC alone is the leading driver of new wind development. Since 2014, 66 percent of the wind megawatts installed were located in Texas, Oklahoma, Kansas, and Iowa, four states in which the mandate had already been met or where no renewable energy mandates are in effect.[3]

In 2015, Congress passed the Protecting Americans from Tax Hikes Act of 2015 (PATH), which included a phase-down of the wind PTC. Under the law, facilities that began construction before January 1, 2017 are eligible to receive 100 percent of the PTC. Projects that start construction in 2017, 2018, and 2019 could receive 80 percent, 60 percent, and 40 percent of the wind PTC, respectively, after which the subsidy is eliminated. Since the credit is earned during the first 10 years of project life, costs accumulate to taxpayers well beyond the expiration date.

Since the phase-down was enacted, there has been a significant uptick in wind project starts in order to secure the full PTC benefit. Industry reports now estimate that turbines representing between 30,000 and 70,000 MW were purchased by the end of 2016. If placed in service before the end of 2020, they will be eligible for the full PTC, despite the phase-down.

RPS Mandates

Twenty-nine states and the District of Columbia have adopted mandatory renewable energy policies that require a certain percentage of electricity sold in a state (or district) be derived from renewable fuels. These policies, known as renewable portfolio standards (RPS), create demand for high-priced renewables by setting aside non-competitive segments of the power market for qualifying resources. Wind energy was seen by most as the dominant technology for meeting compliance. In the period from 1999 to 2013, 69 percent of the wind energy operating in the U.S. was situated in states with RPS policies (Wiser 2013, 65). As stated above, the opposite

[2] These values apply to wind projects prior to enactment of the 2017 tax bill. Under the new tax law, corporate tax rates were reduced from 35 percent to 21 percent, which mainly impacted the value of the depreciation. Industry investors report that for typical wind projects, the value of the subsidies dropped by roughly 8 percent under the new tax law.

[3] In Texas and Iowa, the mandates are still on the books but were met, and far exceeded, years ago. Kansas repealed its RPS mandate and replaced it with a voluntary target (Walton).

is true today signaling that state RPS policies are losing ground as state mandates are being met.

Most state RPS policies measure compliance in terms of the energy generated. Each megawatt-hour of electricity produced by a qualified resource, including wind turbines, creates a second commodity referred to as a renewable energy credit (REC). RECs represent the "environmental benefit" associated with renewable generation and can be sold separately from the energy. Generators may sell their RECs to electricity providers for RPS compliance, or into the voluntary market. Since wind farms generally operate less than 35 percent of the time based on the wind resource, they typically do not generate enough revenue from energy sales to be viable.[4] REC sales provide a necessary supplemental revenue stream.

Texas RPS

The Texas RPS is not energy-based. Rather, the Legislature adopted a capacity-based program[5] that measures compliance according to the number of megawatts of qualified resources operating in the state. The policy was first adopted in 1999 and later expanded to require 5,000 new megawatts of renewables be installed by January 1, 2015, with a final target of 10,000 megawatts operating by 2025[6] (SB 20). The mandate was met quickly with wind energy. By 2009, the state already surpassed its 2025 target with 10,367 MW of qualified renewables installed, including 10,030 MW of wind energy (ERCOT 2009, 2). By the end of 2016, total renewable energy capacity was 22,957 MW (21,377 MW of wind). The next highest REC provider by fuel type was solar at 987 MW (ERCOT 2016a, 2).

SB 20 required a renewable energy credit program be implemented as a means of tracking renewable production and ownership through RECs. Each year, the Electric Reliability Council of Texas (ERCOT), as administrator of the program, calculates the annual statewide mandate in megawatt-hours and allocates compliance quantities across all retail electricity suppliers[7] (ERCOT 2016b, 3-7).

Given the substantial surplus of RECs relative to the mandate, the Texas RPS no longer serves as a major revenue opportunity for project developers, nor has it for years. An April 2018 REC broker sheet[8] lists Texas compliance RECs at just 55¢ each. Wind RECs elsewhere range from a low of $5.25 in Pennsylvania to $17 in Connecticut. **Table 3** shows the difference in annual REC revenue earnings when comparing the different values for a 100 MW wind facility.

Texas RECs that are not retired for compliance purposes or reserved for future use can be sold into the voluntary REC market. Ultimately, the right to lay claim to a megawatt-hour of Texas wind solely belongs to the party who acquires the REC. Since RECs can be traded across state lines, the physical location of the wind turbine is not significant. The renewability claim travels with the REC. This is an important distinction when assessing how "renewable" the Texas grid actually is.

For example, in 2016, the number of wind energy RECs generated statewide was 57,796,161 (MWh) representing 15 percent of total electricity sales (EIA 2017, 127), yet the Texas RPS mandate was only 15,001,692 megawatt-hours or 4 percent of sales (ERCOT 2016a, 8-14). Surplus RECs may be banked forward up to three

[4] The U.S. average capacity factor for wind energy facilities has hovered at or below 33 percent. A project's capacity factor is the ratio of actual generation produced over a time period (generally a year) against the total amount of energy a project can produce at full nameplate. Different regions of the country produce capacity factors that are higher and lower than the U.S. average. In general, newer, taller turbines are operating with greater efficiencies.

[5] The Iowa RPS is also a capacity RPS. The Alternative Energy Production law (1983) required the state's two investor-owned utilities (MidAmerican Energy and Alliant Energy Interstate Power and Light) to own or contract a combined total of 105 MW of renewable generating capacity and the associated energy production. Once the mandate was met, it was never expanded, leaving MidAmerican and Alliant at liberty to sell their renewable energy (wind) to meet RPS compliance in neighboring states, which they do at above market prices (Iowa Code § 476.41 et seq.).

[6] The 10,000 megawatt target is a voluntary goal. The Texas RPS mandate is almost exclusively a wind energy mandate, with minimal recognition of other technologies, by creating a separate 500-megawatt target set aside for non-wind resources. Non-wind RECs are referred to as Compliance Premiums.

[7] The mandate in megawatt-hours (or RECs) is based on the 5,000 MW annual target and a capacity conversion factor (CCF) that is calculated in the fourth quarter of each odd year and applied to the following two-year compliance period. The CCF for 2015-16 was 33 percent; for 2017-18, it is 34.5 percent.

[8] On file with author.

Table 2. Texas RPS annual capacity targets

Annual Capacity Target (MW)	Existing Renewable Capacity (MW)	Total Renewable Capacity Target (MW)	Compliance Period (Years)
400	880	1,280	2002, 2003
850	880	1,730	2004, 2005
1,400	880	2,280	2006, 2007
2,392	880	3,272	2008, 2009
3,384	880	4,264	2010, 2011
4,376	880	5,256	2012, 2013
5,000	880	5,880	2014, and each year after 2014

Note: Existing capacity of 880 MW represents the remaining generation after resources that were in service before September 1, 1999 were retired or removed from the program.

Table 3. Annual REC revenues by state (34.5% capacity factor) [1]

MW	Texas ($0.55 REC)	Pennsylvania ($5.25 REC)	Connecticut ($17 REC)
100	$166,221	$1,586,655	$5,137,740

Calculation: REC Revenue = MW * 8760 hours/year * capacity factor * REC value
Source: Data on file with author.

years for future compliance before expiring, but the bulk of the RECs are likely sold into the voluntary market. *If sold out of state, Texas cannot lay claim to that generation as renewable.* Without verified wind RECs that are retired in Texas on behalf of Texas consumers, the wind energy that is placed on the grid is no 'greener' than fossil fuel.

In 2015, the Texas Senate voted 21 to 10 to end the RPS 10 years early. Sponsors of the bill argued the RPS had met its intended goal and served no meaningful purpose (SB 931). The bill would also have terminated any further public funding of wind-related transmission. RECs would still have been generated but the mandatory obligation to purchase and retire them would have been removed. At 55¢ per REC today, ending the RPS would have saved ratepayers at least $8.3 million annually (REC value * RPS mandate in megawatt-hours). The wind industry objected vigorously to the bill claiming that ending the RPS early would further depress REC prices which could jeopardize the economics of existing facilities, and potentially dissuade investment in future projects.[9] The debate divided the Legislature and the bill eventually died in committee (Trabish).

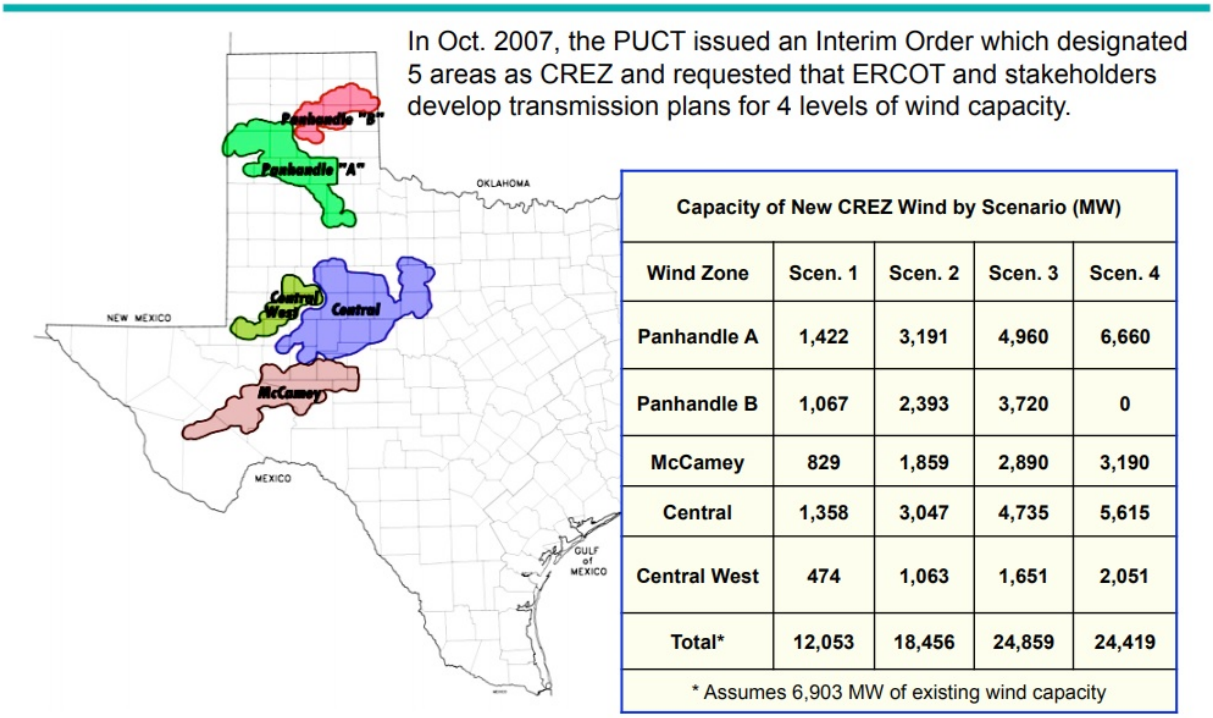
However, RPS costs are likely to become a hot button issue again in Texas and elsewhere as the PTC nears expiration after 2019 and new wind developers approach the states to recover the loss of federal funding. The difference in value between the production tax credit and a Texas REC is substantial. The PTC is worth $24 per MWh next to a Texas REC of just 55¢. Barring a sizable expansion of the RPS or adoption of other policies that match the PTC at the state level, the wind market in Texas is likely to slow after the current pipeline of projects is placed in service.

Texas Transmission (CREZ)

Competitive energy market rules generally discourage building power plants long distances from load centers, thus limiting the deployment of costly transmission. But in just a few short years, energy policies shifted in favor

[9] Despite low REC prices, the limited benefit has been incorporated into wind project finance negotiations. Any further drop in value might be noticed, however, existing projects have already absorbed reductions in REC prices due to market forces without complaint.

Figure 3. Designated zones and scenario wind levels



Capacity of New CREZ Wind by Scenario (MW)				
Wind Zone	Scen. 1	Scen. 2	Scen. 3	Scen. 4
Panhandle A	1,422	3,191	4,960	6,660
Panhandle B	1,067	2,393	3,720	0
McCamey	829	1,859	2,890	3,190
Central	1,358	3,047	4,735	5,615
Central West	474	1,063	1,651	2,051
Total*	12,053	18,456	24,859	24,419
* Assumes 6,903 MW of existing wind capacity				

Source: *The Competitive Renewable Energy Zones Process*, Warren Lasher, 4

of renewables, mainly wind, and rewarded energy on the grid regardless of where the project was sited or the time of day and year when the energy was produced. This has led to an explosion of variable generation operating largely off-peak, off-season, and located in rural and remote areas with limited transmission capacity.

Texas is a prime example of the issue. In 2005, nearly 2,000 megawatts of wind were operating in remote areas of the state and thousands more were planned or under construction. As wind capacity grew, so did the transmission bottleneck and risk of curtailment.

When the RPS mandate was expanded under SB 20, the law also required the Public Utility Commission of Texas (PUCT) address transmission deficiencies in order that the state could meet its renewable energy goals. Under the bill, the PUCT would oversee the designation of Competitive Renewable Energy Zones (CREZ) "in areas in which renewable energy resources and suitable land areas are sufficient to develop generating capacity from renewable energy technologies."

The PUCT opened Docket 33672 in January 2007. By October an interim order was issued identifying five CREZ areas and four transmission scenarios based on existing wind capacity and megawatts that were likely to be developed. A final order in October 2008 confirmed the state would proceed with Scenario 2 that would create 2,376 miles of new transmission rights-of-way at an estimated cost of $4.93 billion and allow for an incremental 11,553 MW of new wind generation, bringing the total to 18,456 MW. The cost would be borne by ratepayers (PUCT).

CREZ resolved the curtailment issue. In 2014, the first full year of availability, wind curtailment in ERCOT dropped to 0.5 percent, down from a peak of 17 percent in 2009 (Potomac, 75). But the price tag was much higher than forecasted, at $6.79 billion, and the issue is likely to return. ERCOT data show that as wind production increases, so do curtailments (Galbraith). More than 10,000 MW of wind capacity have been added since CREZ was completed and the latest data from 2016 estimate curtailment at 2 percent (Potomac, 75).

ERCOT is tracking 334 active requests for additional generation totaling 67,398 MW including 32,258 MW of new wind. Not all of the proposed wind will get built, but some will and Texas will again have to confront transmission congestion (ERCOT 2018, 3).

One option for addressing curtailment is through market price signals. Most grid regions in the country impose locational penalties on generation produced long distances from load, in order to discourage the remote siting of power plants. ERCOT market rules currently do not apply such penalties, but that could change. The PUCT is holding meetings with stakeholders to assess the effect of instituting locational pricing (Sechler). If implemented, wind projects operating in north and west Texas could see the market value of their energy drop, while the value of generation closer to population centers will increase. It is not clear how this change will impact existing wind resources, especially those with off-take contracts, but the rule could be enough to limit new wind from being built in transmission constrained areas.

Price Suppression and Negative Value

Proponents insist that the billions spent in wind subsidies will ultimately lead to lower electricity market pricing through a mechanism known as "price suppression," where resources with no fuel cost displace more expensive power. This claim is overly simplistic and the effect has been shown to be limited[10] (Elmer).

Consider a high-wind weather event where wind energy floods the system well in excess of demand. This surplus condition will cause wholesale price depression and, depending on the degree of surplus, pricing can go negative. Even under moderate wind conditions, if there is a high penetration of wind energy on the grid, prices could fall (Hirth). These lower prices are perceived as a benefit to consumers but they represent only part of the cost. As discussed above, wind energy also demands substantial revenue streams from sources outside of the energy market (i.e., RECs and PTCs) that are paid for by consumers and taxpayers.

The subsidies incent wind projects to continue operating even under negative price conditions since the subsidies are only earned when energy is placed on the grid. In this context, the lower prices represent a perverse outcome of overbuilding subsidized generation, especially in transmission-constrained areas.

If a long-term power purchase agreement (PPA) is involved, any benefit of lower cost energy is further elusive. Depending on the terms, these contracts could shield wind project owners entirely from market price fluctuations and shift market risk to consumers. With purchase agreements in hand, wind generators can operate independent of market signals, as long as they are assured the contract price. Since power purchase agreements are essentially "contracts for difference," consumers ultimately pay the delta between the contract price and the market value. If energy prices are negative, consumers would pay substantially above market for the wind-generated electricity.

Proponents insist that wind energy is a few short years away from no longer needing public support, but given the enormity of the PTC value, this claim may be more aspirational than real. Individual wind projects sited in areas with high/steady winds and in close proximity to existing transmission may survive without the PTC, but nationwide, such sites are increasingly rare. It is more likely that the wind industry, which grew as a result of the PTC, has made the subsidy a required component of project economics. *Rather than being weaned off public funding, the industry will seek alternative replacement policies in order to remain price competitive in energy markets.*

Texas Chapter 313 Agreements

As the result of the "Dillon's Rule," rural governing authorities in Texas cannot regulate wind project siting (CAPCOG, 2), but they are free to exercise power over taxation under Chapters 312 and 313 of the Texas Tax Code. The Chapter 312 and 313 programs were enacted to incentivize large capital-intensive projects to locate in Texas, as a means of expanding the tax base and creating good-paying jobs.

The Property Redevelopment and Tax Abatement Act empowers the governing body of municipalities and counties' commissioners courts to designate reinvestment zones within which new facilities and structures can benefit from tax abatement agreements. Abatements range between 1 percent and 100 percent of total property tax due and can apply to new development

[10] This discussion does not include the effect of day-ahead pricing that further lessens wind energy's ability to lower market pricing (Linowes).

or expansions and modernizations of existing facilities (Chapter 312).

The more controversial Texas Economic Development Act[11] grants independent school districts the power to limit the appraised value of projects for 10 years as a means of lowering the local property tax burden. In exchange, developers must agree to (a) site their projects in the district, (b) meet minimum job requirements, and (c) demonstrate that without the agreement they can and might relocate outside of Texas (Chapter 313).

Tax breaks granted under Chapter 313 are paid back to the school districts by Texans at large, ensuring the school districts are kept whole. There is no limit on the number of Chapter 313 agreements executed nor is there a cap on total state dollars funneled into the program. Through 2016, the lifetime cost of the program to the state was $7.1 billion of which 22 percent was allocated to wind projects and 75 percent for manufacturing (Comp, 3).

Completed applications for 313 agreements are submitted to the district board of trustees along with a processing fee. If deemed complete, the Texas Comptroller of Public Accounts must perform an economic assessment to determine if the project will deliver on the reduced tax burden, provide a net benefit to the state long term, and advance the state's economic development goals (Section 313.004(4)).

Projects that do not receive a certificate from the Comptroller can still proceed, but do so without a property tax limitation. Prior to 2014 and passage of HB 3390, certificates were not issued by the state. Rather, the Comptroller could only issue non-binding recommendations, which the districts could follow or choose to ignore.

The process is limited to 150 days, but extensions are allowed as needed, and there is no obligation to notify the public of the proposal. The statute only requires a public hearing be held after the application is vetted by the district and the state. By then, the agreement is largely ready for signature and the public's ability to influence the outcome is limited.

Chapter 313 requires at least ten new qualifying jobs[12] be created for projects sited in rural counties (populations under 50,000) but the requirement can be waived under HB 3390 if shown that the limit "exceeds the industry standard for the number of employees reasonably necessary for the operation of the facility." More than half of the 313 active agreements were approved with waivers and, most pertained to wind applications[13] (Garza and Nalukwago). See Appendix B for a discussion on wind industry jobs.

Before a project can be certificated, the Comptroller must find that securing the value limitation is "a determining factor" in whether the project stays in Texas (HB 3390).

But how likely is it for a wind project to relocate out of state if denied an agreement? A quick survey of several wind projects with active agreements suggests the standard exercised for satisfying the requirement is very low to a point where the statute is not being enforced. Many of the wind projects would proceed in the district (or state) regardless of a negative finding. Four examples out of many reviewed by the author are described in **Table 4**.

Proponents of Chapter 313 agreements have asserted that large capital projects constructed in the state ultimately do not cost the state. But they also agree the state loses money on Chapter 313 projects that would locate in Texas irrespective of the value limitation (TTARA, 14).

Texas is the most attractive state for wind energy development despite its saturated RPS. Federal subsidies coupled with available land, no permitting requirements, and a public willingness to commit billions for wind-related grid upgrades have kept the project pipeline active. Other states perceived as wind-friendly do not come close to the wind capacity currently existing and proposed to be built in Texas. Low natural gas prices and competition from other renewable energy

[11] Chapter 313 was first enacted in 2002 and slated to expire after five years in 2007. Instead of expiring, the program was extended three times and now ends in 2022. In 2014, the Legislature enacted a number of amendments to the program that added uniformity to the application process and took steps to ensure the state as a whole benefited from the agreement since the taxpayers at large assume the cost (Garza and Nalukwago).

[12] HB 3390 added the requirement that new jobs be 'qualifying' jobs. Qualifying jobs are jobs offering 1,600+ hour work weeks, minimum health care benefits, and pay levels that are at least 110 percent of the average manufacturing wage for the county where the district is located.

[13] Wind energy applications filed since 2014 typically cite an industry standard based on the number of turbines proposed. Generally, this has worked out to one employee per 15 turbines.

Table 4. Survey of projects	
App ID	1128
Applicant	Lincoln Clean Energy
ISD	Snyder Independent School District
Project	Dermott Wind Farm, 253 MW
Comments	Lincoln claims to be a "national wind developer with the ability to locate projects of this type" to other states and other regions of Texas, but Lincoln's project portfolio shows no evidence the applicant has built wind farms outside of Texas (Lincoln). Lincoln also states the project can relocate elsewhere in Texas. If true, this should not be a determining factor for the Comptroller since the statute specifically seeks to reward in-state projects without bias as to where within the state. The applicant admits that project construction already began at the site. If a wind facility has started construction, there is little likelihood it will relocate elsewhere. The applicant complains that since he is competing with other energy projects also seeking Chapter 313 applications, it was necessary to offer an electricity price that was below a level that would make the project economically viable. In other words, the taxpayers of Texas were asked to invest in making this project viable against other proposals that might be better situated and more economically viable.

App ID	373
Applicant	Duke Energy Renewables
ISD	Rio Grande City Consolidated Independent School District
Project	Los Vientos Wind Farm III, IV, V (510 MW)
Comments	Duke Energy states the land for project phases III, IV, and V is already under lease and the proposal expands the already existing Los Vientos I and II projects. Duke writes "the wind turbines and supporting infrastructure are long-lived assets engineered and designed specifically for this project location." While Duke Energy has project sites in other states, it is apparent Duke's commitment to this project and its location were established years ago and it is unlikely to relocate out of Texas or elsewhere in Texas.

App ID	337
Applicant	Invenergy
ISD	Mullin Independent School District
Project	Logan's Gap Wind Farm (200 MW)
Comments	On the question of whether the project can be relocated, Invenergy claims generically that projects are being developed in numerous states around the U.S. and lists Alabama, Arizona, California, Connecticut, Maryland, Nevada, New Hampshire, and Pennsylvania. In fact, since the Invenergy application was filed in August 2013, net wind capacity in the eight states cited *dropped* by 72 MW. Securing wind energy permits in other states is not easy and the claimed ease with which projects can relocate out of state appears exaggerated. Invenergy also suggests the project could move to other Texas counties where "at least 20 other counties have wind farms proposed, under construction, or operating."

App ID	1203
Applicant	National Renewable Solutions, LLC
ISD	Canyon Independent School District
Project	Buffalo Wind Prime LLC (150 MW)
Comments	The Buffalo Wind Prime project, according to its developer, NRS, has been in the planning stages since 2010 but has not moved forward until recently. NRS cites four reasons for why a property value limitation is necessary in order for the project to proceed: low regional power pricing in ERCOT, regional competition with other renewable energy projects for an off-take contract, limited transmission infrastructure, and delivery and congestion issues that could lead to curtailment. NRS is knowingly planning to site a project in a transmission-constrained area where improvements are not anticipated for another 2-4 years (or much longer). The congestion will result in lower market prices and project curtailment. These constraints would generally signal a poor site for a wind project. In this case, NRS is requesting tax relief to correct for poor site conditions. Building the project will only exacerbate the transmission problem and put added pressure on the state to build more infrastructure. Certifying this project, in effect, could introduce higher costs for the state.

Source: Comptroller's Office.

projects have put downward pressure on the value of Texas wind power, which benefits electricity consumers. But these lower electricity prices are causing wind power producers to underbid their energy to a point where new project financials do not make sense without a Chapter 313 agreement. In many cases, applicants are citing these low prices as a primary reason for needing a value limitation. *At a time when Texans are being told wind energy is lowering energy prices, in fact, taxpayers are being asked to pay more.*

There is evidence that viable wind projects can proceed without value limitations. At least two wind projects that were denied 313 agreements were constructed in 2017 and a third is scheduled to begin construction by 2019.[14]

Conclusion

Texas has witnessed a boom in wind energy development over the past 15 years that put the state on the map as leader in renewable energy. The state remains attractive for further development due to the federal subsidies, public-funded infrastructure expansion, and the low barriers for wind power siting and construction. But the expansion of wind power has placed a strain on the state's delivery system that resulted in large quantities of wind generation not making it to market. Texas ratepayers committed nearly $7 billion to resolve the issue but wind expansion is reaching a point where transmission congestion is returning. With ERCOT reporting that an additional 32,258 MW of new wind is proposed, state policymakers need to be more proactive in deciding how the next decade will unfold.

[14] The Chapman Ranch I project (250 MW) in Nueces County, and Rock Springs Wind (149 MW) now operating in Val Verde County were placed online in October 2017. The third project is Patriot Wind (180 MW) slated to be online in Nueces County September 2019.

Appendix A – PTC and Project Costs

Since the PTC was enacted in 1992 at 1.5¢/kWh, the subsidy has been subject to cost of living adjustments. In 2016, it was valued at 2.4¢/kWh. Since 1992, wind energy costs have dropped and capacity factors have increased dramatically. As such, the effect of the adjusted PTC on project capital costs has grown substantially.

Table A.1 demonstrates how the PTC has grown in value for a 1,000 kW project sited in 1992 and 2017. In 1992, a 1,000 kW project at an assumed installed cost of $2,000 per kW and 22 percent capacity factor[15] would produce 19,272,000 kWh of electricity and receive PTCs valued at $289,080. Spread over 10 years, the undiscounted value of the PTC represented 14 percent of project costs. The same 1,000 kW facility in 2017 would have a project cost of $1,600 per kW and an average capacity factor of 42.5 percent, earning $893,520 in tax credits on 37,230,000 kWhs produced. In this scenario, the 2017 PTC represents an undiscounted 56 percent of project costs. Even if the PTC had been held flat at 1.5¢/kWh since 1992, it would still represent 35 percent of project costs. On a discounted basis, the PTC together with the accelerated depreciation program represents over 50 percent of the capital cost of a typical wind facility.

Table A1. Comparison of PTC value as percent of project cost: 1992 and 2017

Year	1992		
PTC	$ 0.015†		
CF	22.0%		
Year	KW	KWh	PTC
1	1000	1,927,200	$ 28,908
2	1000	1,927,200	28,908
3	1000	1,927,200	28,908
4	1000	1,927,200	28,908
5	1000	1,927,200	28,908
6	1000	1,927,200	28,908
7	1000	1,927,200	28,908
8	1000	1,927,200	28,908
9	1000	1,927,200	28,908
10	1000	1,927,200	28,908
Total		19,272,000	289,080
NPV 10%			177,627
Proj. Cost	$2,000,000		14%
	w/Discount		9%

Year	2017		
PTC	$0.024†		
CF	42.5%		
Year	KW	KWh	PTC
1	1000	3,723,000	$89,352
2	1000	3,723,000	89,352
3	1000	3,723,000	89,352
4	1000	3,723,000	89,352
5	1000	3,723,000	89,352
6	1000	3,723,000	89,352
7	1000	3,723,000	89,352
8	1000	3,723,000	89,352
9	1000	3,723,000	89,352
10	1000	3,723,000	89,352
Total		37,230,000	893,520
NPV 10%			549,029
Proj. Cost	$1,600,000		56%
	w/Discount		34%

†The above figures are very conservative and based on the post-tax value of the PTC. At a 35 percent tax rate, the pretax value of the PTC is 3.5¢/kWh. At 21 percent, the pretax value of the PTC is 3.0¢/kWh.

Source: *Annual Report on U.S. Wind Power Installation, Cost, and Performance Trends: 2006* (May 2007) and *2016 Wind Technologies Market Report* (Aug. 2017).

[15] 1992 and 2017 capacity factors and project costs are taken from the *Annual Report on U.S. Wind Power Installation, Cost, and Performance Trends: 2006* (May 2007) and *2016 Wind Technologies Market Report* (Aug. 2017), respectively. Project costs of $2,000/kW in 1992 is conservative with $/kW in some cases reported up to $4,500/kW; weighted average capacity factor for wind projects in 1992 was roughly 22 percent.

Appendix B – Wind Energy Jobs

The wind industry reported 102,500 jobs in 2016 including over 25,000 manufacturing positions. Thirty-eight percent of the jobs were construction-, development-, and transportation-related that will vary from year to year (LBNL 2016).

Table B.1. Change in wind jobs by category†

	2014	2015	2016	2017‡
Manufacturing and Supply Chain	19,200	21,000	29,500	25,000
Construction, Development, Transport	26,700	38,000	38,000	87,000
Plant Operations	17,000	19,000	22,100	
Total Jobs Reported	73,000	88,000	102,500	112,000

†*Source:* LBNL and AWEA annual wind market reports.

‡2017 figures represent modeled output prepared by Navigant Consulting Inc. Construction and plant operation jobs combined.

Validating this information is difficult since the American Wind Energy Association (AWEA) remains the primary source of wind-related employment statistics. Where other source data are available, the numbers do not match. For example, the Bureau of Labor Statistics, which recently started tracking wind turbine service technician jobs, reported 4,580 technicians working nationwide in 2016 including 1,440 located in Texas (BLS). AWEA's figure for the same job put the nationwide count at 9,800.

Regarding manufacturing, AWEA identifies over 500 U.S. companies involved in the engineering and production of industrial products used in the wind industry ranging from turbine components (blades, towers, nacelles), to electrical switchboxes, HVAC, piping, and climbing gear and safety harnesses. Many of these companies have been operating for decades and their sole business is not wind-specific. No information is available showing the percentage of each company's gross revenues tied to the wind industry, whether these companies are selling custom products for the wind market or off-the-shelf components, so verifying job counts is not possible.

Debate also surrounds the method of determining job counts, which typically relies on modeling tools like JEDI ("Jobs and Economic Development Impacts"), developed by the U.S. Department of Energy to estimate economic benefits expected through the construction of large wind projects. A 2012 report by the House Subcommittee on Oversight and Investigations found that jobs produced under the Section 1603 grant program using the JEDI model overstated actual jobs created.

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