The Economic Impact of Renewable Energy in Rural Texas

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Executive Summary

This analysis sought to assess the local tax and landowner payment implications as well as local sentiment of utility-scale renewable energy projects, particularly in rural Texas counties. We find that:

- Over their lifetime, the current fleet of utility-scale wind and solar projects in Texas will generate between $4.7 billion and $5.7 billion in new tax revenue to local communities.
- If all projects with interconnection agreements are built, *existing and planned* utility-scale wind and solar projects will pay between $8.1 billion and $10 billion in total tax revenue over their lifetimes.
- Existing utility-scale solar and wind projects in Texas will pay Texas landowners between $4.8 billion and $7.3 billion over the lifetime of the projects.
- If all of the projects with signed interconnection queues are built, Texas landowners will directly receive between $8 billion and $13.1 billion over the *existing and planned* project lifetimes.
- Of these taxes and landowner payments, over 70% are paid to rural counties.
- A county in Texas could expect to receive between $9.4 million and $13.1 million in lifetime taxes (including school taxes) for a 100 MW solar project located in its boundaries and between $16.8 million and $20.3 million for a 100 MW wind project.
- We estimate that a Texas landowner could expect to collect between $16.2 and $33 million in payments over the lifetime of a 100 MW wind farm, depending on length of contract and location in the state[a].
- We estimate that a Texas landowner could expect to collect between $5.2 and $27.7 million in payments over the lifetime of a 100 MW solar farm, depending on length of contract and location in the state.
- Residents and community leaders in rural areas indicated that counties with renewable energy projects tend to see them as good neighbors.
- Elected county leaders look favorably on renewable energy projects for the planning stability that comes with having confidence in consistent long-term revenue streams.
- Even residents that do not have wind turbines or solar panels benefit from their contribution to the local economy.

[a] This assumes that the 100 MW farm is wholly contained on that landowner's land. Thus, if a landowner had 25 MW of a wind or solar farm on their land, we estimate they would receive about 25% of the payments we quote for a 100 MW farm.

Introduction

By their very nature, rural counties tend to be more agriculturally based and have less people and industry per area than other regions. While this arrangement is a draw for some of a particular persuasion, smaller tax bases often put strains on the budgets of rural counties. This strain is compounded by the fact that rural counties are often large in land area and have many miles of roads to maintain to be able to provide essential services to their residents. In Texas, these areas have recently become the focus for renewable energy development given their abundant resources and available space. However, given a lack of data, it has been difficult to systematically assess the financial benefits that renewables bring to rural areas, a knowledge gap that this report seeks to fill.

The purpose of this report is two-fold, 1) to estimate the levelized (per MW) stream of tax and landowner payments that flow into, particularly rural, counties in Texas when utility-scale renewable (wind and solar) projects are built and 2) to provide some perspective from some of the residents of those rural counties. Funds flowing into counties from renewable energy projects typically consist of two major forms: increased tax revenue and direct landowner payments. However, renewable projects also provide other economic benefits to local communities via local jobs, community support, charitable contributions and spending on local services such as hotels, food, and supplies, etc. The tax revenue analysis consisted of analyzing dozens of Chapter 313[b] disclosures publicly available on the Texas Comptroller's website and developing a method to extend those estimated taxes beyond the 15-year window they provide. Estimating landowner payments is less data-driven as those contracts are not publicly available and thus, we relied on input from energy law firms and developers themselves.

This analysis and the methods developed therein indicate that the current fleet of wind and solar projects in Texas will provide between $4.7 billion and $5.7 billion in taxes over their lifetime and, if all projects with interconnection agreements are built, existing and planned wind and solar projects will pay between $8.1 billion and $10 billion in lifetime taxes. Of these taxes, over 70% are paid to more rural[c] counties. We also estimate that existing solar and wind projects in Texas will pay Texas landowners between $4.8 billion and $7.3 billion over the lifetime of the projects. Further, if all of the projects with signed interconnection queues are built, those projects will generate an additional $3.2 billion to $5.8 billion, for a total between $8 billion and $13.1 billion that is paid directly to Texas landowners.

Discussions with residents and community leaders in rural areas indicated that counties with renewable energy projects tend to see them as good neighbors and

[b] Tax abatements available to large commercial projects of many types in Texas.
[c] While there is no official definition of a rural county, this analysis defined counties with a population density less than the Texas median (about 22 persons per square mile) as rural.

look favorably on them for the planning stability that comes with having confidence in consistent long-term revenue streams. Landowners with renewables appear to be happy with the payments provided and the ability for projects to seamlessly fit in with the local economy. Even landowners that do not have wind turbines or solar panels benefit from either hosting supporting infrastructure such as transmission substations and all benefit from lower overall taxes.

Renewables in Texas

Texans often like to remind those around us that Texas has the unique distinction of being the only state in the union to have once been its own country. If that were still the case, Texas would rank 4th in the world for the amount of wind capacity installed[d,e], with over 30,000 MW inside her borders (as of Q2 2020[f]). The Electric Reliability Council of Texas (ERCOT), which serves about 90% of Texas' load, alone has enough planned wind projects inside its interconnection queue with signed interconnection agreements to push the total installed capacity of wind to almost 40,000 MW by Q4 of 2022. Wind alone generated about 20% of the electricity that Texans consumed (in ERCOT) in 2019 and will likely provide the second-most amount of electricity to the grid, behind natural gas, in 2020. Figure 1 shows a spatial view of the existing solar and wind farms, aggregated by county, in Texas.

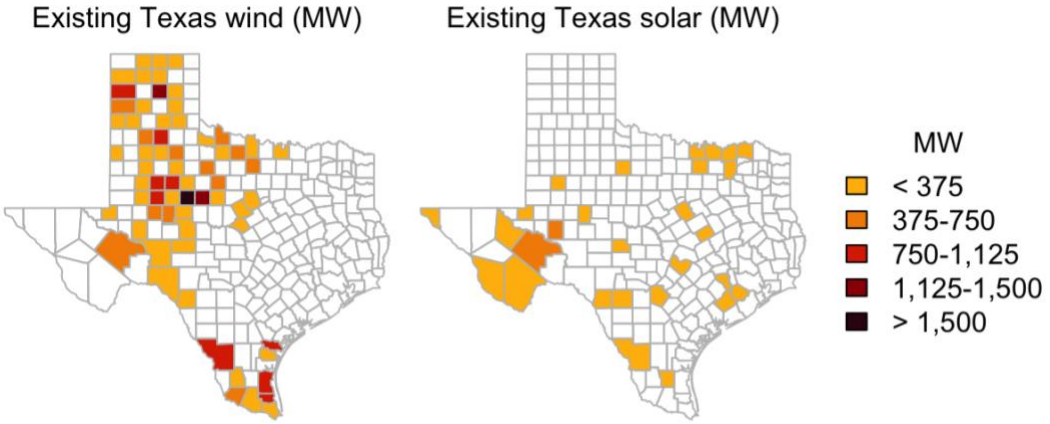


Figure 1: Figure showing the existing capacities of solar and wind, by county (Data from ERCOT Summer 2020 SARA report and EIA 860).

While later to the market than wind, solar is poised to grow fast over the next few years. While it took wind almost ten years to grow from 2,000 to 15,000 MW, solar projects in ERCOT's interconnection queue indicate that solar might make that jump in just four. If all of the solar PV plants with signed interconnection agreements are built, solar PV will likely be the third largest type of power plant in ERCOT (by capacity) behind natural gas and wind, by 2022. Figure 2 shows a

d https://www.irena.org/Statistics/View-Data-by-Topic/Capacity-and-Generation/Country-Rankings
e https://www.awea.org/Awea/media/Resources/StateFactSheets/Texas.pdf
f https://www.awea.org/resources/publications-and-reports/market-reports/2020-u-s-wind-industry-market-reports-(1)

spatial view of the existing and planned to be built[g] solar and wind farms, aggregated by county, in Texas.

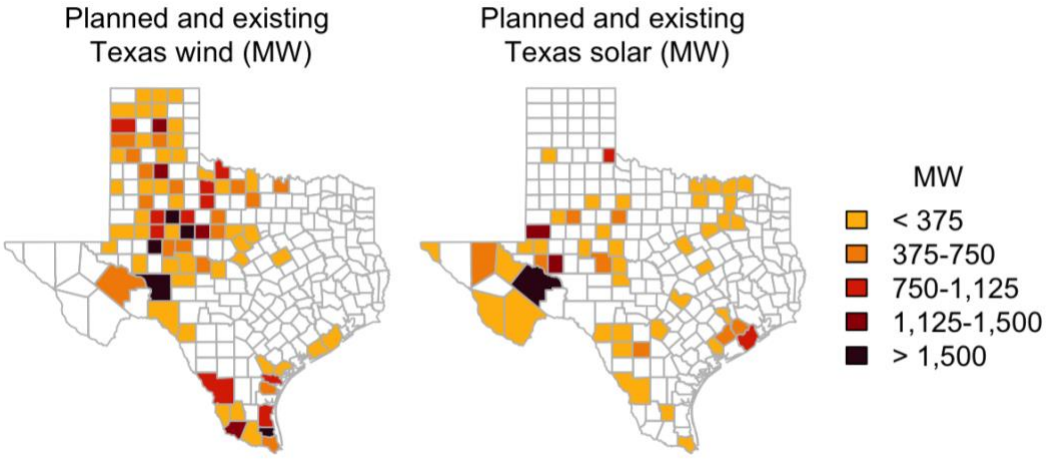


Figure 2: Figure showing the existing and planned capacities of solar and wind by county (Data from ERCOT Summer 2020 SARA report, ERCOT June 2020 GIS report[h], and EIA 860).

While Texas technically has a Renewable Portfolio Standard that requires the state to install 10,000 MW of renewables by 2025, the free-market Texas system met and exceeded that requirement in 2012 and is on-track to meet it five-fold by 2022. Texas has always been an energy state and renewables are just another source of energy that we can harvest.

County tax revenue

Renewable energy projects can be a major source of revenue for counties and schools, especially for rural counties that have less of an industrial base than others. This analysis sought to develop a systematic way to estimate the levelized (per 100 MW installed) tax revenue that a county might expect to receive for a project being built in it, including tax abatements. To do so, we used project Chapter 313 filings that are posted on the Texas Comptroller's website and the methodology can be found in Appendix A.

Using said methodology, we estimate that a county in Texas could expect to receive between $9.4 million and $13.1 million in lifetime taxes (including school taxes) for a 100 MW solar project located in its boundaries and between $16.8 million and $20.3 million for a 100 MW wind project[i]. Using the average of these estimates, Figure 3 shows our estimated amount of the lifetime taxes to be paid in each county for existing wind and solar farms (left) and if all wind and solar projects with interconnection agreements are built (right) in millions of dollars.

[g] Only projects with signed interconnection agreements included.
[h] Projects with signed interconnection agreements only.
[i] Note that these values do not include Payments in Lieu of Taxes (PILOT) payments that are sometimes also paid directly to local jurisdictions and thus could be an underestimation of the total payments that some projects make.

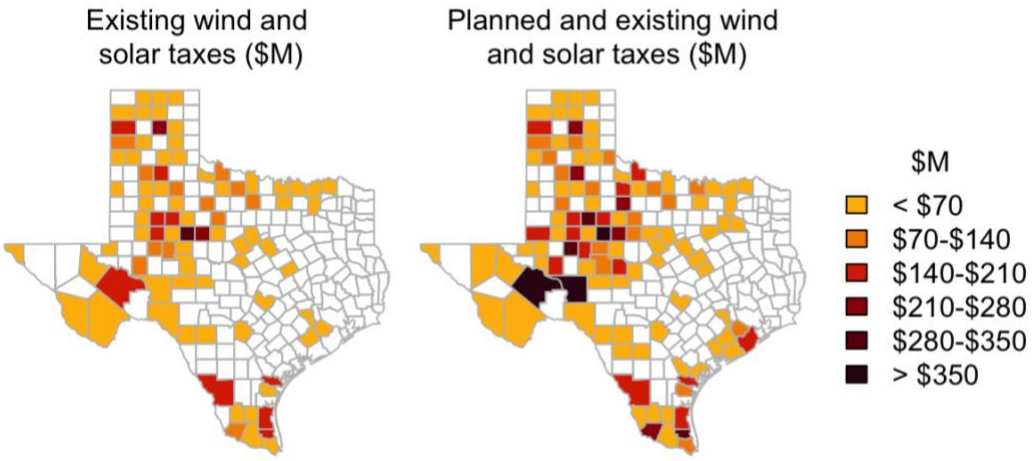


Figure 3: Figure showing our estimates of the amount of taxes to be paid in each county for existing wind and solar farms (left) and if all projects with interconnection agreements are built (right) in millions of dollars. Average between the low and high tax values were used to create the figures.

Summing up the values for each county indicates that existing solar and wind projects in Texas will pay between $4.7 billion and $5.7 billion in taxes over their lifetime and, if all projects with interconnection agreements are built, existing and planned wind and solar projects will pay between $8.1 billion and $10 billion in lifetime taxes. Of these taxes paid, the majority are paid/would be paid to more rural counties. Over 70% of existing and potential/planned taxes would go to counties with population densities less than the Texas median, or about 22 persons per square mile[j].

Landowner payments

A second, often less-mentioned stream of payments from renewables projects are those made directly to the landowner for the use of their land in hosting these projects. These payments can be hard to estimate because the contracts themselves are private and often do not allow for their terms to be disclosed. Values also often vary depending on location as some properties will have a higher opportunity cost than others, i.e. good farmland located close to population centers will often command a higher price than more marginal scrub land located far away. Landowner payments, particularly for wind, can also vary depending on the local production shapes. For example, wind farms in South and Coastal Texas often have higher landowner payments because they often produce more energy during times of higher grid electricity prices than those in North and West Texas.

Due to the availability of data, estimates for landowner payments were made using information received from developers and law firms that often represent landowners in renewable energy development contracts. Landowner payment contracts for solar PV farms are often simply based on the amount of acreage utilized and paid on a $/acre-year basis, similar to other forms of land-leasing,

[j] The average population density for Texas counties is about 114 persons per square mile.

such as cattle grazing fees. Landowner payment contracts for wind are often more complex as more of the land is available for other uses, such as farming and cattle, when the construction phase of the project is over. Thus, wind landowner payment contracts often are based on the amount of physical infrastructure left in the ground, such as the number of turbines, length of roads, and transmission right-of-way, etc. While it is possible that landowner payment contracts can include some amount of revenue sharing, conversations with industry indicated that that, while it was sometimes part of earlier contracts, it is less often used today, and most are based on fixed or escalating known values.

Wind landowner payments in Texas

Using the methodology outlined in Appendix A, we estimate that a landowner in West Texas could expect to collect between $16.2 million and $24 million[k] in lifetime landowner payments for a 100 MW wind farm located on their property, depending on the length of the contract. We estimate that the same wind farm located in the Southern and Coastal regions of Texas would provide the landowner with between $22.8 million and $33 million in payments over its lifetime.

Solar landowner payments in Texas

Using the methodology outlined in Appendix A, we estimate that a landowner in the West, Far West, North, and Panhandle regions of TX could expect to collect between $5.2 million and $15.8 million in lifetime landowner payments for a 100 MW solar farm located on their property, depending on the length of the contract. We estimate that the same solar farm located in the South, South Central, East, and North Central regions of TX could expect between $9 million and $23.8 million and landowners in the Coastal region of Texas could expect between $10.3 million and $27.7 million. Figure 4 shows our estimates of the amount of landowner payments to be made in each county for existing wind and solar farms (left) and if all projects with interconnection agreements are built (right), in millions of dollars[l].

[k] Based on a lease length of 25 to 35 years. Some leases are longer, up to 50 years. However, as those contracts are not public and older wind farms are often being repowered with newer technology, potentially introducing new contract terms, it was not possible to estimate the length of any particular landowner contract. Thus, a shorter range of times were chosen for the estimated range.

[l] An average of the low and high estimates in each region was used to create the figure.

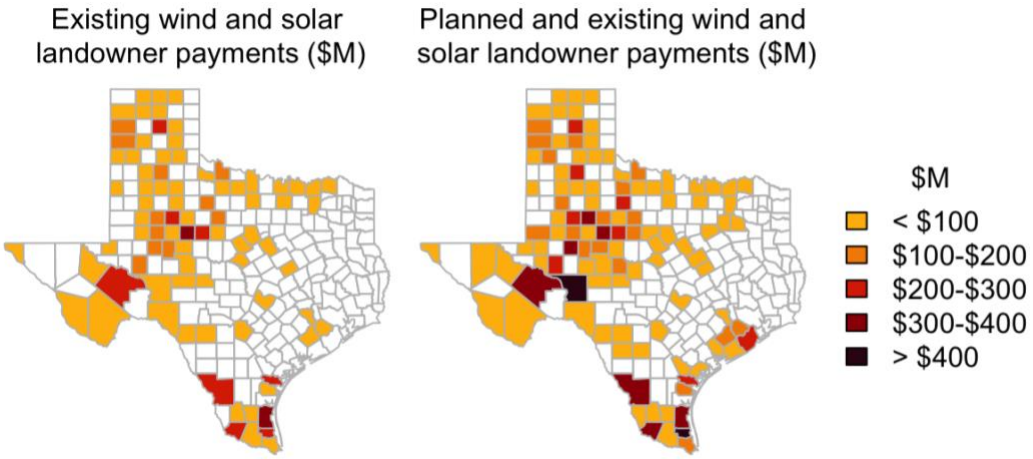


Figure 4: Figure showing our estimates of the amount of landowner payments to be made in each county for existing wind and solar farms (left) and if all projects with interconnection agreements are built (right), in millions of dollars. Average between the low and high landowner payment values were used to create the figures.

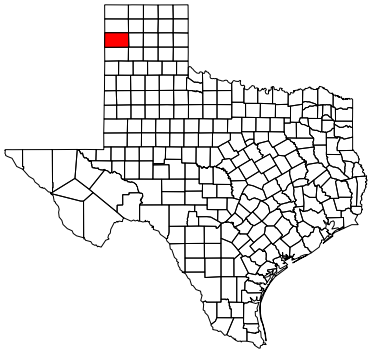
Given the methodology in Appendix A and the numbers in Figure 4, we estimate that existing solar and wind projects in Texas will pay Texas landowners between $4.8 billion and $7.3 billion over the lifetime of the projects. If all of the projects with signed interconnection queues are built, we estimate that those projects will generate an additional $3.2 billion to $5.8 billion in landowner payments, for a total between $8 billion and $13.1 billion.

Note that, while this section only focuses on the payments made to landowners for hosting solar PV panels and wind turbines, other landowners can benefit from payments for hosting the supporting infrastructure such as electric lines and substations, but that is beyond the scope of this work.

Selected Rural County Profiles

The second part of this work sought to focus in on a few rural counties in Texas and learn how renewable energy has impacted the people who live there as well as make a comparison to the other, less stable energy industries in the state.

Oldham County



Oldham county (population approx. 2,112) is a place that straddles many lines, it stands on the (slightly disputed[m]) border between Texas and New Mexico as well as on the border between two of the three major grids in the US, the Electric Reliability Council of Texas (ERCOT) and Eastern Interconnect via the Southern Power Pool (SPP). In fact, it appears to be the only location where two different grids (ERCOT and SPP) share the same transmission poles, but just the poles – Oldham's Spinning Spur 1 wind farm sends power to SPP on one side while the wires on the other side carry power from Spinning Spur 2 & 3 to ERCOT.

Oldham county, which at one point was almost wholly contained within the three million-acre XIT Ranch, is a very rural county where wind has had a big impact. The vast majority of Oldham county land carries an agricultural exemption, which limits the amount of revenue that the county and the four school districts can raise for road maintenance and retaining good schoolteachers. Before the wind industry arrived, Oldham's tax base was about $248 million and the tax rate was $.76 which equates to $1.9 million in total taxes to operate the county for one year.

As of 2019 the Oldham county tax base has increased to $342 million mainly due to a wind facility now fully on the tax roll. The other five facilities are still in abatement but provide $790,000 annually in PILOT (payments in lieu of taxes) payments to county as revenue for the abatement. The tax rate has been reduced by about 1/3 to $.50 which provided $1,710,000 and $790,000 PILOT money for a total of $2.5 million plus other revenues to provide services. While these figures may seem small in comparison to larger counties, this represents a tremendous increase for Oldham county that allows their elected leaders the opportunity to provide more services to their residents while cutting the tax rate.

In the best of times, oil and gas revenues make up about 20% of Oldham Counties' operating budget, but times are not always the best and those payments are hard to count on. According to Judge Allred, Oldham County has lost 80-90% of oil and gas revenues over the past 10 years. He notes that the sectors boom and bust cycle make it difficult to rely on them for making long-term plans.

"Wind has been a Godsend – it allows flexibility in budgeting by providing a constant source of revenues that you know will be there when you need them."
– Don Allred, Oldham County Judge.

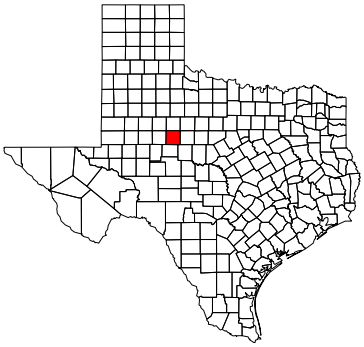
Today, about 50% of Oldham counties' revenues come from wind. And, because of the agreements that school districts are able to make with wind farms, three out of the four school districts in the county were able to hold bond elections and

[m] https://en.wikipedia.org/wiki/Oldham_County,_Texas#Border_Dispute_with_New_Mexico

build new facilities, something that would have never happened without the wind industry coming to town. Three-quarters of the cost of the new school facilities can be attributed directly to the wind industry.

The judge says that there have been no real complaints and the wind industry has been a good neighbor, which is what small communities look for when new industries come to town. Along with increased revenues, the industry has attracted new residents to the area to stay, while not putting a burden on the existing infrastructure like other industries tends to do[n].

Nolan County



Nolan County (population approx. 14,700) is in some ways the posterchild county for renewables in Texas. Nolan County currently has more wind than any other county in the state, with approx. 1,325 turbines (~2,000 MW), with current plans to add another ~200 MW of both wind and solar. Nolan received some of the first utility-scale wind farms in Texas due to their great wind resource and eagerness to embrace the industry. Their being an early-adopter paid off in that a significant number of wind-industry jobs, roughly 250, are now based out of Sweetwater, TX – Nolan's county seat.

Since 1998, taxable property values in Nolan County have increased from about $608 million to almost $2.2 billion in 2018, with market values increasing to over $3.2 billion. When asked what Nolan County would be like without the wind industry, Ken Becker, the Executive Director of the SEED Municipal Development District says: "It is hard to tell, we would probably be doing something else, but it would be tougher than it is today."

Many landowners have benefitted directly from having wind farms on their land as it has added an income stream that is compatible and complimentary with their existing operations.

"The cows love wind turbines, they walk around them all day and follow the shadows that they cast. We now have good roads on our land [because of the wind farm] that make it easier to take care of our cattle. It [my experience with the wind industry] has been super… It is not perfect, but I wish we had more of them [wind turbines] on our land…"
– Louis Brooks Jr., Louis Brooks Ranch, LTD.

Increased tax revenues can benefit all residents of any particular county through better services and/or reduced property taxes. However, landowners that don't

[n] Some other industries, in particular oil and gas extraction, while brining in a high level of temporary jobs, often put significant strain on the local infrastructure.

have wind turbines themselves can also benefit from the associated infrastructure, such as roads or electric infrastructure needed to support the industry. Miesha Adames is one such landowner that, while not having any wind turbines on her family ranch, has greatly benefited from the siting of a CREZ line substation.

"I wouldn't have been able to keep my land in the family if it were not for the landowner payments associated with the wind farms and their supporting infrastructure." - Miesha Adames (Sweetwater Economic Development Corp.)

Bee County

When people talk about renewables in Texas, most think of the vast ranches that span the western part of the state. While most projects have been built west of I-35, the southern and coastal regions of Texas are growing as well. Bee County (population approx. 34,000), which is named after a one time Republic of Texas ambassador to the United States, Barnard E. Bee Sr., is right in the coastal bend region of Texas that has excellent on-peak wind resources.

Former Bee County Judge Stephanie Moreno, who, during her term, was the youngest female county judge in Texas is an avid supporter of increasing economic development in Bee County, including playing a pivotal role in landing Bee County's first wind farm.

Local school districts have already been able to lower their tax rates by almost 10%[o] partly due to renewable investments and potential future projects could see those rates fall even further[p]. Some other school districts in the county that have had a few failed bond elections wish they had wind in their district Moreno said.

Moreno admits that there is resistance from some to real economic development of any type in rural areas like Bee County, but there is an active contingent of young couples that want to see the area grow.

"My husband works out of town Monday through Thursday because there aren't enough opportunities here just like my father when I was growing up. I want to live and raise my kids in Bee County. I want there to be good jobs in town so that more families can have dinner together and there are not so many missed t-ball games." – Former Bee County Judge Stephanie Moreno

[o] https://www.mysoutex.com/beeville_bee_picayune/news/s-tisd-drops-tax-rate-12-cents/article_91e0392e-d632-11e9-8ef9-5f5f031c989e.html

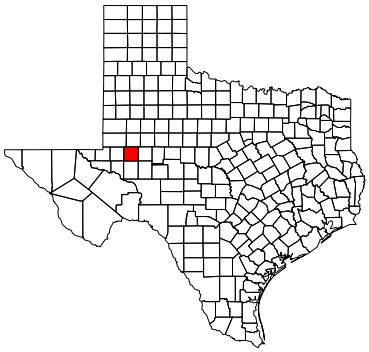
[p] https://www.mysoutex.com/beeville_bee_picayune/news/s-tisd-board-oks-tax-abatement-for-wind-farm/article_086ce40e-a0ed-11ea-9526-83730477254a.html

Local businesses have benefited from the under-construction 250 MW Helena Wind Farm and potential future projects, including local construction companies that have been able to hire locally those that used to have to drive across the state to work in the oil patch.

Local ranch owners also see the benefit to the way that renewables can integrate themselves into the existing rural economy.

"Wind energy sales produces a passive income that does not materially interfere with the AG operations or other uses of the property. In times of drought, electric power sales continue to create rainfall-independent financial stability like the oil and gas sector provided for so many other ranchers… The developer's infusion of fresh capital will give our economy the time it needs to recover [from losing the county's largest employer and COVID-19]." – Michael Manning, Bar T-Black Angus Ranch

Midland County



It seems to be impossible to talk about Midland, Texas without also talking about more traditional energy sources, such as oil and gas, oftentimes in the same sentence. Midland and the nearby City of Odessa sit at the heart of the modern Texas oil patch. These cities and the surrounding region have seen their share of boom and bust cycles that have come to define life in an oil and gas town. People often think of the booms as good times and the busts as bad, but it is not always the case.

"The boom times are frequently not pleasant either. They are so hectic that it is hard to keep the social fabric of the region in place. Many locals hate aspects of the booms because a lot of people come to town that have no real desire to invest in the community… You can feel it everywhere, it feels like a transient place."
– Carrie McKean, resident of Midland[q]

The oscillations of being closely tied to a global commodity market can make it hard for a region to plan for infrastructure and for the market to build housing[r]. There is always too little in the boom times and too much in the busts. Residents say it always seems like at the tail end of the boom, people start to invest, only to be half finished when the bust comes. The result is ending up with half-finished apartment complexes sitting vacant for years and promised Costcos that seem to never get built.

[q] https://www.nytimes.com/2020/04/30/opinion/coronavirus-oil-prices-texas.html
[r] https://www.chron.com/business/real-estate/article/Midland-housing-market-sizzles-alongside-Boston-12940762.php

“We have historically struggled to leverage our tax dollars well for roads and infrastructure because we may be fearful of the next bust cycle.”
– Lori Blong, Midland Councilwoman

Invested residents and community leaders in Midland are quick to point out that they love their town, the people, the wide-open spaces, and the world-class sunsets. They know that the region wouldn’t be what it is without the oil and gas industry driving the economy, they just wish that it were just more stable and less prone to extreme cycles.

Conclusions

Renewable energy development has had a positive economic impact in Texas, particularly in rural counties, which are likely to receive more than 70% of the potential tens of billions of dollars in tax revenue and landowner payments that come with existing and planned wind and solar development.

Renewable energy is set to grow by tens of thousands of megawatts in Texas and so with it will the tax revenue and landowner payments. The landowners and county officials consulted for this analysis tend to have a positive view of renewable energy development and the stability that the industry brings, a stability that is less found in all other energy industries.

Acknowledgements

This work was funded by the Conservative Texans for Energy Innovation (CTEI)[s] and Powering Texas[t].

CTEI is a non-profit clean energy education and advocacy organization launched to promote energy innovation and clean energy policies grounded in the conservative principle of common sense, market-based solutions that allow fair competition and provide greater access to clean, affordable and reliable energy.

Powering Texas an alliance of stakeholders bound by a mission to educate and advocate for innovative, sustainable electricity generation in Texas, including the expansion of renewable wind energy.

The authors would also like to thank the landowners, county judges, and other local leaders who graciously gave of their time to discuss how energy development of all types has impacted their lives and the places they call home. Lastly, we thank the energy consultants and project developers, including Caitlin Smith, Mark Stover, Jeff Clark and others who helped inform the process flow for this analysis. A special thanks to Jessie Rhodes for helping transcribe hundreds of PDF tables into actionable datasets.

About Us

IdeaSmiths LLC[u] was founded in 2013 to provide clients with access to professional analysis and development of energy systems and technologies. Our team focuses on energy system modeling and assessment of emerging innovations, and has provided support to investors, legal firms, and Fortune 500 companies trying to better understand opportunities in the energy marketplace.

[s] https://www.conservativetexansforenergyinnovation.org/
[t] https://poweringtexas.com
[u] https://www.ideasmiths.net/

Appendix A

County tax revenue methodology

This analysis utilized the Texas Chapter 313 tax abatement filings[v] with the Texas Comptroller's office to estimate a range of taxes that solar and wind projects will pay over their estimated lifetimes. Analyzing and projecting taxes, sometimes decades into the future, is a difficult problem as many things such as lifetimes, county tax rates, appraisal values, etc. can change over time. The goal was to develop a systematic methodology to produce a range of expected taxes paid that could be reasonably applied to all existing projects and not attempt to add up all values for posted projects[w].

This analysis took a data driven approach by first analyzing Chapter 313 tax abatement findings, specifically looking for projects with certification and economic impact packets posted online[xy]. In each of these certification and economic impact packets, Table 4 (example shown as Figure 5 below) produces a estimation of Ad Valorem taxes to be paid for the first 15 years of the project lifetime, including abatements given. The last column produces the estimated total property taxes to be paid for the first 15 years of the project's life. Because we assume that solar and wind projects will last longer than 15 years, we developed a data-driven methodology to estimate the additional taxes to be paid for 25- and 35-year lifetimes.

[v] https://comptroller.texas.gov/economy/local/ch313/agreement-docs.php
[w] IdeaSmiths LLC is not a professional tax firm, nor do we employ tax experts.
[x] Example: https://assets.comptroller.texas.gov/ch313/1091/gregory-1091-apex-cert.pdf
[y] We only considered projects that were wholly included within a single county and school district as developing a systematic method for keeping track of the taxes for different combinations of tax entities was beyond the scope of this analysis.

Table 4 examines the estimated direct impact on ad valorem taxes to the school district and Reagan County, with all property tax incentives sought being granted using estimated market value from the application. The project has applied for a value limitation under Chapter 313, Tax Code and tax abatement with Reagan County and Reagan County Hospital District.

The difference noted in the last line is the difference between the totals in Table 3 and Table 4.

Year	Estimated Taxable Value for I&S	Estimated Taxable Value for M&O		Reagan County ISD I&S Tax Levy	Reagan County ISD M&O Tax Levy	Reagan County ISD M&O and I&S Tax Levies	Reagan County Tax Levy	Reagan County Hospital Tax Levy	Reagan County Water District Tax Levy	Estimated Total Property Taxes
			Tax Rate[1]	0.1000	1.1000	1.2000	0.21	0.1984	0.11124	
2017	$226,200,000	$25,000,000		$226,200	$275,000	$501,200	$71,536	$66,945	$251,625	$891,306
2018	$210,366,000	$25,000,000		$210,366	$275,000	$485,366	$71,536	$66,945	$234,011	$857,858
2019	$195,640,380	$25,000,000		$195,640	$275,000	$470,640	$71,536	$66,945	$217,630	$826,752
2020	$181,945,553	$25,000,000		$181,946	$275,000	$456,946	$71,536	$66,945	$202,396	$797,823
2021	$169,209,365	$25,000,000		$169,209	$275,000	$444,209	$71,536	$66,945	$188,228	$770,919
2022	$157,364,709	$25,000,000		$157,365	$275,000	$432,365	$71,536	$66,945	$175,053	$745,898
2023	$146,349,179	$25,000,000		$146,349	$275,000	$421,349	$71,536	$66,945	$162,799	$722,629
2024	$136,104,737	$25,000,000		$136,105	$275,000	$411,105	$71,536	$66,945	$151,403	$700,989
2025	$126,577,405	$25,000,000		$126,577	$275,000	$401,577	$71,536	$66,945	$140,805	$680,863
2026	$117,716,987	$25,000,000		$117,717	$275,000	$392,717	$71,536	$66,945	$130,948	$662,146
2027	$111,831,138	$111,831,138		$111,831	$1,230,143	$1,341,974	$234,845	$221,873	$124,401	$1,923,093
2028	$106,239,581	$106,239,581		$106,240	$1,168,635	$1,274,875	$223,103	$210,779	$118,181	$1,826,938
2029	$100,927,602	$100,927,602		$100,928	$1,110,204	$1,211,131	$211,948	$200,240	$112,272	$1,735,591
2030	$95,881,222	$95,881,222		$95,881	$1,054,693	$1,150,575	$201,351	$190,228	$106,658	$1,648,812
2031	$91,087,161	$91,087,161		$91,087	$1,001,959	$1,093,046	$191,283	$180,717	$101,325	$1,566,371
					Total	$10,489,075	$1,777,890	$1,673,288	$2,417,736	$16,357,989
					Diff	$15,592,217	$2,786,336	$2,638,993	$0	$21,017,546

Source: CPA, Santa Rita Wind Energy LLC
[1]Tax Rate per $100 Valuation

Figure 5: Table 4 from the certification and economic impact document for the Santa Rita Wind Farm[z].

Figure 6 shows the taxes (to be) paid as taken from Table 4 of the certificate package (solid dots, #1-15) as well as our estimated future taxes to be paid beyond those listed in Table 4 of the certificate package (hollow dots, #16-35).

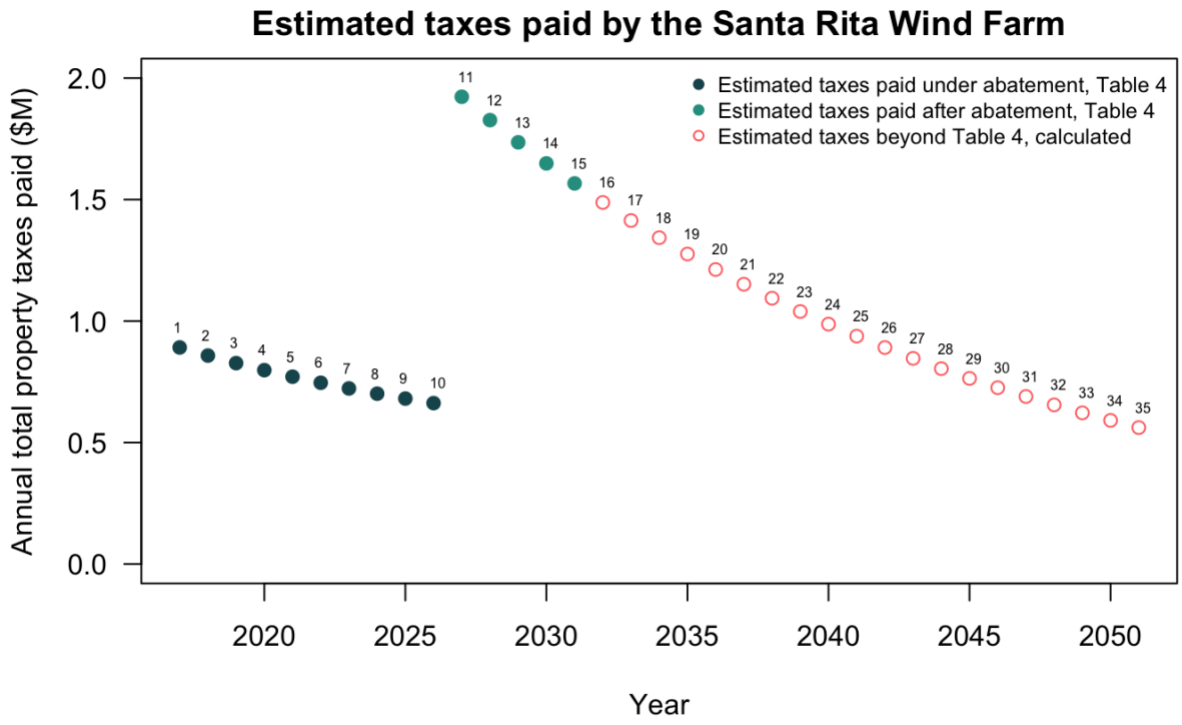


Figure 6: Ad valorem taxes paid as taken from Table 4 of the Santa Rita Wind Farm's Chapter 313 certificate package (solid dots #1-15) and our estimated future taxes paid (hollow dots #16-35).

[z] https://assets.comptroller.texas.gov/ch313/1103/reagan-1103-santarita-cert.pdf

The first ten (darker solid) dots of Figure 6 show the annual ad valorem taxes paid by the wind farm while under its tax abatement (first ten rows of the last column of the reproduced Table 4 in Figure 5). The next five (lighter solid, #11-15) dots of Figure 6 show the taxes paid after the abatement period ends (rows 11-15 of the last column of the reproduced Table 4 in Figure 5). To estimate the future taxes to be paid (#16-35 hollow dots in Figure 6), an exponential function was fit to these (lighter, solid dots #11-15) values and was used to extrapolate taxes to be paid for the next 20 years (dots #16-35).

A similar approach was taken for solar projects. However, solar farm's depreciation schedule is different than that of wind and an example of the tax schedule for a solar farm is shown in Figure 7.

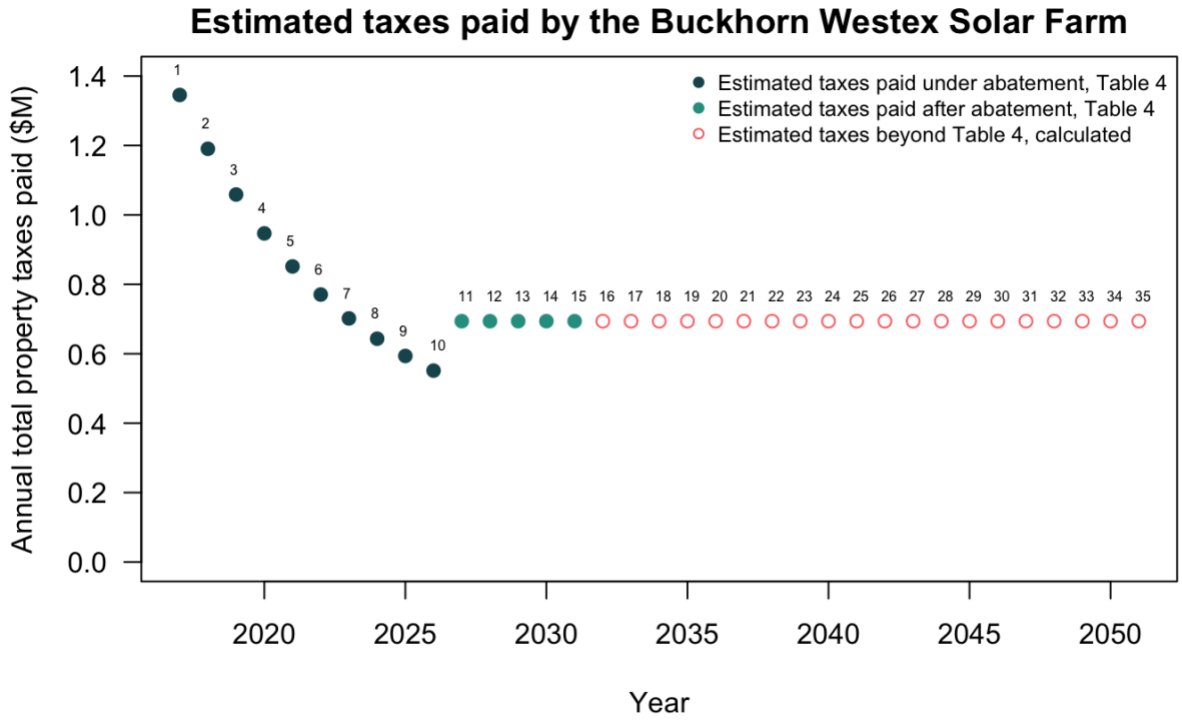


Figure 7: Ad valorem taxes paid as taken from Table 4 of the Buckhorn Westex Solar Farm's Chapter 313 certificate package (solid dots #1-15) and our estimated future taxes paid (hollow dots #16-35).

The first ten years of Figure 7 show a similar depreciation of the solar farm's taxable value during its abatement period. Years 11-15 show a constant amount of property taxes paid[aa]. To calculate the taxes to be paid in future years, this constant value was simply used for years 16-35.

A review of many of the solar and wind projects used in this analysis showed that each wind and solar project's tax schedule followed the same or a very similar pattern as the examples provided here.

[aa] Tax Code Section 23.26, requires: (1) use of cost method for valuation of commercial solar assets; (2) calculation of depreciated value of property assuming useful life of not more than 10 years; and (3) prohibits appraiser from determining depreciated value to be less than 20% of the total value adjusted for physical, functional or economic obsolescence.

Next, we developed a range of taxes paid by assuming that the project would last between 25 years for the low end and 35 years for the high end. So, for our low end estimate of lifetime taxes for a particular project, we added up the expected taxes to be paid from the last column of the project's Table 4 (example shown in Figure 5) in its certificate package and the first ten of our estimated tax payments (points/years 16-25 in Figure 6 and Figure 7). For the higher end estimate, we included all of our estimated future years' taxes. Then, we divided the low and high estimates of total taxes paid by the capacity of the plant to get a normalized value ($/MW) of expected taxes to be paid over the project's lifetime. Lastly, to remove any outliers due to missing or incorrect data, we took the first and third quantiles of the normalized values as our low and high estimates[bb]. We also attempted to assess if there were any noticeable trends in different taxes in different parts of the state but were unable to notice any recognizable patterns. Table 1 gives a summary of our estimated and levelized (per 100 MW) taxes paid over the lifetime of solar and wind projects to Texas counties[cc].

Table 1: Estimated levelized (per 100MW) taxes (millions) paid over the lifetime of solar and wind projects to Texas counties.

Project life	Years	25	30	35
Solar taxes	Lifetime $M/100MW	$ 9.4	$ 11.3	$ 13.1
Wind taxes	Lifetime $M/100MW	$ 16.8	$ 18.8	$ 20.3

One complicating factor for this type of approach is that it is possible to challenge the appraised value of any asset in future years. This is not unique to wind and solar projects but is often done for other large capital projects as well, including manufacturing facilities, oil refineries, and gas export terminals, all entities that receive the same types of tax abatements in Texas. Changing economic conditions and project size during construction can all impact future assessed values. Some of these changes are reflected in Biennial Progress and School District Cost Data Reports that are also filed on the Texas Comptroller's website[dd]. An analysis of a subset of these reports did not provide a clear impact of these future assessments as some were lower and some were higher. Thus, this analysis used the values given and calculated as mentioned above to calculate the taxes paid by the solar and wind projects.

Landowner payments methodology

Landowner payment contracts are not public documents and the landowners are often not allowed to discuss their terms. Thus, we relied on information from renewable project developers and law firms that often represent landowners to make these calculations.

[bb] We preformed this step because there were a few very high and very low outliers in the final dataset, and we didn't want them to skew the final average results. This resulted in a final sample size of 22 solar and 19 wind projects.
[cc] Code (R scripts) and data available on request.
[dd] These reports can be found on the same project page as the Certificate Packages used in this analysis to estimate taxes paid.

Wind landowner payments

Wind landowner payments are the more complicated of the two as they include many aspects of the wind farm in their calculation. The calculations relied heavily on information provided by Mr. Rod Wetsel, Attorney at Wetsel, Carmichael, and Allen, LLP., in Sweetwater, Texas. The document provided by Mr. Wetsel is attached to the end of this report as Appendix B.

Mr. Wetsel provided a breakdown of how landowners are compensated for the turbines that are on their property including their compensation for the development/scoping stage, one-time payments, and reoccurring payments over the lifetime of the system. This analysis sought to normalize these values per MW of wind installed, so values for the length of roads, number of turbines, size laydown yards, etc. in each stage of development were taken from a National Renewable Energy Lab analysis of the land use requirements for 172 proposed or existing wind farms[ee]. Lease payments over the lifetime of the farm were estimated to be based on capacity rather than on project revenues as conversations indicated that that is the direction that most modern contracts take, and the individual terms of any revenue sharing agreement are not public.

These requirements and the compensation levels of each were used to calculate a range of levelized (per MW) landowner payments that might be expected when a wind farm is built. A version of the spreadsheet used for these calculations can be found online[ff].

As noted in the information provided by Mr. Wetsel, there is a difference in the level of landowner payment compensation for a particular project depending on its location in the state. Typically, landowners located in South and Coastal Texas are typically compensated at higher levels than those in West Texas because these projects are physically located closer to load centers, their production profiles are more aligned with peak demand (and thus peak pricing), and the land itself typically has a higher opportunity cost.

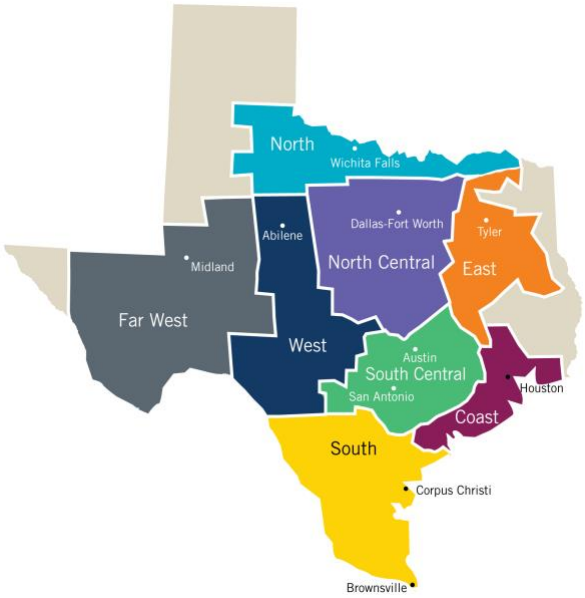


Figure 8: ERCOT weather zone map.

Absent the availability of actual data, we assigned a range of landowner payment estimates for a particular wind farm based on

[ee] https://www.nrel.gov/docs/fy09osti/45834.pdf
[ff] https://docs.google.com/spreadsheets/d/1_SYW_MyN2iAGI_inigx1jOjdxvguUjb2xB_PknlH-zE/edit?usp=sharing

ERCOT's weather zone map[gg] as shown in Figure 8. If a farm were located in the "South", "Coast", or "South Central" regions of ERCOT, we estimated that the landowner payments for that farm would fall in the higher range and all other farms would fall in the lower range.

Table 2: Table showing our estimated range of total lifetime landowner payments in millions of dollars per 100 MW wind plant in the various regions of Texas.

Lease length	(years)	25	30	35
West, Far West, North, North Central, East, and Panhandle[hh] regions of TX				
Lease value	($M)	$ 16.2	$ 20.0	$ 24.0
South, South Central, and Coast regions of TX				
Lease value	($M)	$ 22.8	$ 27.8	$ 33.0

Solar landowner payments

Landowner payments for solar projects are simpler to calculate as they are often a simple $/acre-year value. Because solar projects restrict dual use of the land surface more than wind projects, landowner payments are highly dependent on the opportunity cost of the land itself, i.e. productive arable land will command a premium over marginal scrub land. Landowner payments also vary based on location and tend to be higher closer to ERCOT load centers.

Based on conversations with developers and clean energy lawyers, we estimated landowners with solar projects in the "Coast" region would receive between $400-$700/acre-year, $350-$600/acre-year in the "South", "South Central", "East", and "North Central", and in all other areas, between $200-$400/acre-year in their first year, with a 1.75% annual escalator for future years. Table 3 shows our range of estimates for the total amount of landowner payments made for a 100 MW solar PV farm in different regions of Texas for various project/lease length estimates.

Table 3: Table showing our estimated range of total lifetime landowner payments in millions of dollars per 100 MW solar PV plant in the various regions of Texas. A version of the spreadsheet used for these calculations can be found online[ii].

Lease length	(years)	25	30	35
West, Far West, North, and Panhandle[jj] regions of TX				
Lease value	Low ($M)	$ 5.2	$ 6.5	$ 7.9
	High ($M)	$ 10.3	$13.0	$ 15.8

[gg] http://www.ercot.com/news/mediakit/maps
[hh] Not shown in Figure 8.
[ii] https://docs.google.com/spreadsheets/d/1_SYW_MyN2iAGI_inigx1jOjdxvguUjb2xB_PknlH-zE/edit?usp=sharing
[jj] Not shown in Figure 8.

South, South Central, East, and North Central regions of TX				
Lease value	Low ($M)	$ 9.0	$11.3	$ 13.9
	High ($M)	$ 15.5	$19.4	$ 23.8
Coast region of TX				
Lease value	Low ($M)	$ 10.3	$13.0	$ 15.8
	High ($M)	$ 18.0	$22.7	$ 27.7

Thus, we estimate that a landowner in the South Central region of Texas could expect between $11.3 million and $19.4 million for a 30-year lease of a 100 MW solar farm located on their property.

Appendix B

The information below is for wind leases in West Texas and the Texas Panhandle. Information is provided by Mr. Rod Wetsel, Attorney at Wetsel, Carmichael, and Allen, LLP., Sweetwater, Texas. http://www.wetsel-carmichael.com/

1) Development Fee to landowners before construction:
   a) $2.00 to $6.00* per acre each year (3-5 years) w/ an increase per acre annually

2) Landowner Royalty (greater of)
   a) 4 ½% to 5%** a year on gross revenues (increase .5% every 5 years)
   b) Minimum of $5,000.00** per MW (increasing $500.00 every 5 years)

3) Siting Fee
   a) $5,000.00*** per MW (one-time fee)

4) Road/Underground cable
   a) $15.00 to $25.00 per rod (16.5') (one-time fee)

5) Overhead lines
   a) $250.00**** per rod and uses a 150' easement (one-time fee)

6) Average Wind Lease term (50 years)
   a) May be a 30-year lease***** w/ 2 – 10-year extensions

7) Decommissioning (Removal Bond)
   a) Developer normally purchases the bond in the 10-15 year area. The value of the wind farm in the early years to too great to walk away from. Someone would take it over. Bond amount is cost of removal and restoration determined by an independent engineer selected by the district Judge of the County. Approx. cost to decommission is $100,000.00.

8) Termination Penalty
   a) Termination penalty if terminated in the first 10 years of the lease. Penalty would equal a minimum of 5 years royalty

9) Substation, O&M buildings, Laydown yard
   a) Up to 5 acres and flat one-time fee of $25,000.00 each plus $2,500.00 for each additional acre used. Laydown yards used during construction can be as high as $50,000.00 for 10-15 acres during construction only.

10) Hunting Compensation

a) Landowners are reimbursed $15 to $20 per acre or a flat fee for each hunting season which they cannot use during construction, maintenance, or repowering

11) Ad valorem taxes
    a) Wind Developer pays any increases over the landowners' ag exemptions as well as any rollbacks.

12) Wind Developer normally reimburses the landowner for attorney's fees up to a certain amount ($5,000.00 to $10,000.00 range). The wind developer may also pay the landowner a signing bonus.

* Up to $8.50 per acre in South Texas
** Up to 6% and $7,500.00 in South Texas
*** Up to $7,500.00 in South Texas
**** As high as $500.00 per rod in South Texas
***** As low as 30 years in South Texas

South Texas - royalty and fees can be 10% to 35% higher than West Texas/ Panhandle. Landowner wind compensation in South Texas is the highest in the United States due to its good afternoon winds and proximity to large population centers such as Austin and San Antonio.

About the Author

Joshua D. Rhodes, PhD

Dr. Joshua D. Rhodes is a Research Associate at The University of Texas at Austin, and a Founding partner of IdeaSmiths LLC. His current work is in the area of smart grid and the bulk electricity system, including spatial system-level applications and impacts of energy efficiency, resource planning, distributed generation, and storage. He is also interested in policy and the impacts that good policy can have on the efficiency of the micro and macro economy. He has carried out extensive research on the renewable energy industry in Texas.

He holds a double bachelors in Mathematics and Economics from Stephen F. Austin State University, a masters in Computational Mathematics from Texas A&M University, a masters in Architectural Engineering from The University of Texas at Austin and a Ph.D. in Civil Engineering from The University of Texas at Austin.