The Economic Impact of Renewable Energy and Energy Storage in Rural Texas

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Contents

Executive Summary

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

- Renewables are a large, and growing, source of tax payments and revenue for landowners across Texas, particularly in rural Texas.
- Over their lifetime, the current fleet of utility-scale wind, solar, and energy storage projects in Texas are estimated to generate $7.2–$8.8 billion in new tax revenue to local communities.[1]
- If all projects with interconnection agreements are built, *existing and planned* utility-scale wind, solar, and energy storage projects will pay between $12.5 billion and $15.9 billion in total tax revenue over their lifetimes.
- Existing utility-scale wind, solar, and energy storage projects in Texas are estimated to pay Texas landowners $7.1–$11.3 billion over the lifetime of the projects.
- If all projects with signed interconnection queues are built, Texas landowners will directly receive $11.8–$21.7 billion over the *existing and planned* project lifetimes.
- Over 60% of the taxes and landowner payments are paid in rural counties.
- A county in Texas could expect to receive $9.4–$13.1 million in lifetime taxes (including school taxes) for a 100 MW solar project located in its boundaries, $16.8–$20.3 million for a 100 MW wind project, and $3.8–$4.7 million for a 100 MW energy storage project.
- A 100 MW wind farm, over its lifetime, could expect to pay $16.2–$33 million in payments to the landowner, depending on length of contract and location in the state[2].
- A 100 MW solar farm, over its lifetime, could expect to pay $5.2–$27.7 million in payments to the landowner, depending on length of contract and location in the state.
- A 100 MW energy storage project, over its lifetime, could expect to pay $260,000–$1.2 million in payments to the landowner, but much less land is used than for a 100 MW wind or solar farm.
- Residents and community leaders indicated that counties with renewable energy and storage 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.
- The growth of renewables has been a significant source of revenue for local jurisdictions and landowners across Texas, but any policy changes that reduce renewable or storage deployment in Texas will reduce these benefits, which are a lifeline to many rural communities across the state.

1 For aggregate values in this report, wind and solar projects were estimated to have a 30-year lifetime and current energy storage projects were estimated to have a 15-year lifetime.

2 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

This report is an update to a previous version[3] that assessed the taxes and landowner payments paid by wind and solar farms. This report builds on the previous analysis by including estimates of the local taxes and landowner payments that energy storage will make over their lifetimes[4].

By their very nature, rural counties tend to be more agriculturally based and have fewer people and less industry per area than other regions. This arrangement is desirable for many Texans, but 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 and energy storage development given their abundant resources and available space. This report seeks to assess the financial benefits that renewables have and are expected to bring to these rural areas.

The purpose of this report is two-fold, 1) to estimate the levelized (per MW) stream of tax and landowner payments that flow into counties in Texas (with a particular focus on rural counties) when utility-scale wind, solar, and energy storage projects are built and 2) to provide some perspective from some of the residents of those areas. Funds flowing into counties from renewable energy projects typically consist of two major forms: increased tax revenue and direct landowner payments. However, renewable and energy storage projects also provide other economic benefits to local communities via local jobs, community support, charitable contributions, and additional spending on local services such as hotels, food, and supplies, etc.

The wind and solar tax revenue estimates are based on the analysis of dozens of Chapter 313[5] disclosures publicly available on the Texas Comptroller's website and a methodology to extend those estimated taxes beyond the 15-year window they provide. Estimations of local taxes from energy storage projects used private data provided by multiple companies that have and are building energy storage projects in the state because those types of projects never qualified for Chapter 313 tax abatements and thus their data are not public like wind and solar projects. Models are used to estimate landowner payments as those contracts are not publicly available and thus, we relied on input from energy law firms and developers themselves.

This analysis and the underlying methods (see Appendix A) indicate that the current fleet of wind, solar, and energy storage projects in Texas will provide $7.2–$8.8 billion in taxes over their lifetime and, if all projects with interconnection agreements are built, existing and planned wind, solar, and energy storage projects will pay $12.5–$15.9 billion in lifetime taxes. Of these taxes, over 60% are paid to rural[6] counties. We also estimate that existing solar, wind, and energy storage projects in Texas will pay Texas landowners $8–$13.1 billion over the lifetime of the projects. Further, if all projects with signed interconnection queues are built, those projects will generate an additional $4.7–$10.4 billion, for a total of $11.8–$21.7 billion that is paid directly to Texas landowners.

Discussions with residents and community leaders in rural areas indicated that inhabitants of counties with renewable energy projects tend to see them as good neighbors and look favorably on them for the planning stability that comes with having confidence in consistent long-term revenue streams. Landowners with renewables and energy storage systems 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, solar panels, or batteries benefit from either hosting supporting infrastructure such as transmission substations and all benefit from the additional local tax revenues.

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3 https://www.ideasmiths.net/wp-content/uploads/2020/08/CTEI_PT_TX_renewable_county_analysis_FINAL_20200805.pdf

4 For aggregate values in this report, wind and solar projects were estimated to have a 30-year lifetime and current energy storage projects were estimated to have a 15-year lifetime.

5 Tax abatements available to large commercial projects of many types in Texas.

6 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.

Renewables and energy storage in Texas

Texans often like to remind others that the state has the unique distinction of being the only one in the continental US to have once been its own country. If that were still the case, Texas would rank 5th in the world for wind capacity installed[7], with almost 36,000 MW inside the state's borders[8] by the end of 2021. Further, wind is expected to increase to over 47,000 MW by 2025. At the same time, Texas was 15th in the world[9] for solar power capacity at 8,837 MW[10], with plans to grow to over 42,000 MW by 2025. Texas added over 1,000 MW of energy storage in the first half of 2022 and is expected to have well over 10,000 MW of energy storage connected to the grid in the next few years[11]. These numbers don't include distributed energy resources, such as rooftop PV, of which ERCOT estimates there are over 115,000[12,13] in its service territory, or home battery systems.

As of the second quarter of 2022, Texas had almost as much wind, solar, and storage under construction (12,204 MW) as the next five states combined and over three times as much as the next closest state of California (3,757 MW)[14].

The Electric Reliability Council of Texas (ERCOT), which serves about 90% of Texas' load, generated about 24% of the electricity that Texans consumed (in ERCOT) in 2021 from wind, second only to natural gas for the second year in a row. Solar provided about 4% of total ERCOT energy in 2021, but that share is expected to grow quickly in the next few years. Figure 1 shows a spatial view of the existing solar, wind, and energy storage facilities, aggregated by county, in Texas.

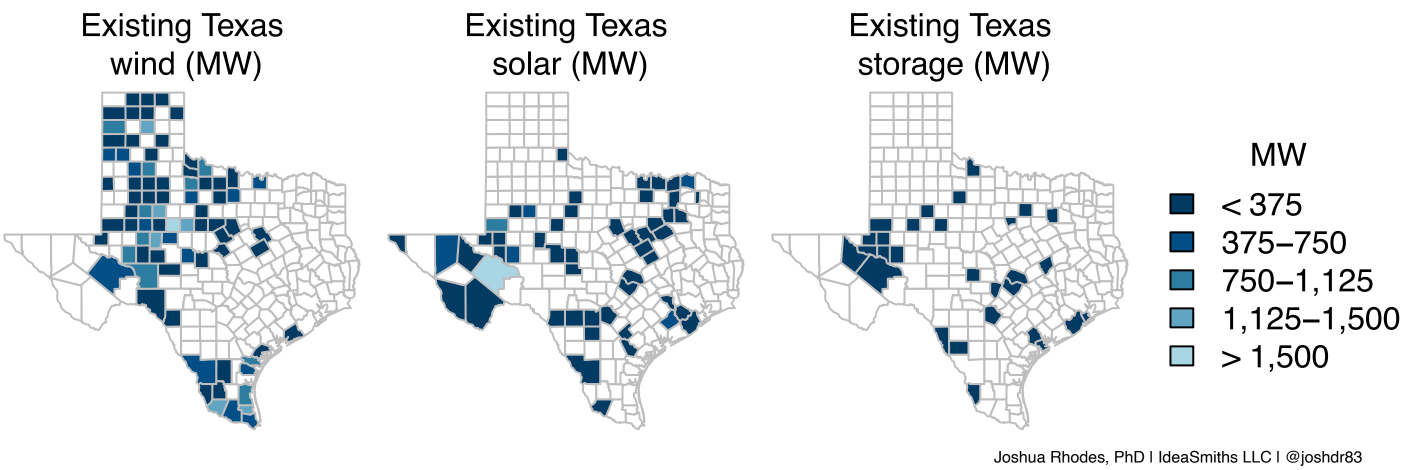


Figure 1: Figure showing the existing capacities of solar, wind, and energy storage, by county (Data from ERCOT Fall 2022 SARA report and EIA 860).

Wind and solar projects have constituted most new power plant builds in Texas for some time and are expected to continue to grow. However, in early 2021, energy storage projects surpassed wind to take the second spot behind solar in the ERCOT interconnection queue. As of the last quarter of 2022, there were over 75,000 MW of energy storage projects looking to connect to the ERCOT grid. Not all projects in interconnection queues get built, but Figure 2 shows a spatial view of the already existing and queued (with signed interconnection agreements) wind, solar, and energy storage projects, aggregated by county, in Texas.

7 https://en.wikipedia.org/wiki/Wind_power_by_country

8 https://www.energy.gov/sites/default/files/2022-08/land_based_wind_market_report_2202.pdf

9 https://en.wikipedia.org/wiki/Solar_power_by_country

10 https://www.eia.gov/electricity/data/eia860/

11 http://mis.ercot.com/misapp/GetReports.do?reportTypeId=15933&reportTitle=GIS+Report&showHTMLView&mimicKey

12 https://www.ercot.com/mktinfo/loadprofile (Profile Type Counts)

13 Wind and solar facilities designed to provide power to mainly on-site locations are exempt from property taxes. https://comptroller.texas.gov/taxes/property-tax/docs/96-1569.pdf

14 https://cleanpower.org/resources/clean-power-quarterly-market-report-q2-2022/

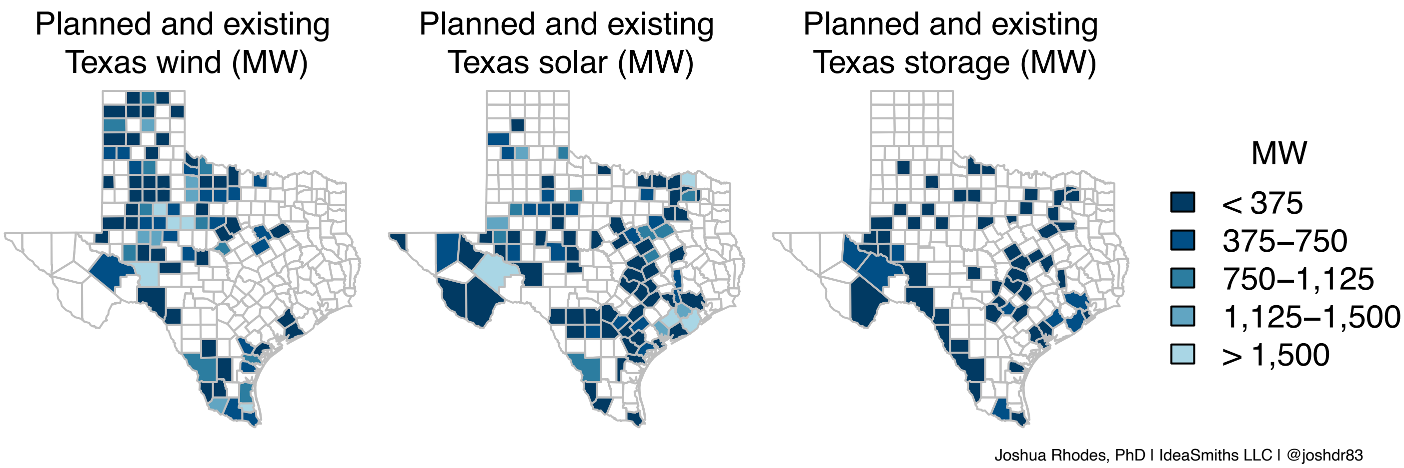


Figure 2: Figure showing the existing and planned capacities of solar, wind, and energy storage by county (Data from ERCOT Fall 2022 SARA report, ERCOT August 2022 GIS report[15], and EIA 860).

While Texas technically has a Renewable Portfolio Standard that requires power companies in the state to install 10,000 MW of renewables by 2025, the requirement was exceeded in 2012 and is on-track to meet it five-fold by the end of 2022. Texas has been a leading energy state for over a century, and the rapid growth of renewables and energy storage continue that legacy.

County tax revenue

Renewable and energy storage projects can be a major source of revenue for counties and schools, especially for rural counties that generally have a smaller industrial base than others. This analysis sought to develop a systematic way to estimate the levelized (per 100 MW installed) tax revenue (including tax abatements) that a county might expect to receive for a project within its borders. For wind and solar projects, we utilized publicly available Chapter 313 filings from the Texas Comptroller's website, which layout tax schedules for projects seeking the abatement. For energy storage projects we asked for the annual project financials from companies that have or are building projects in the state. The methodology for each can be found in Appendix A.

Using the methodology refined for this analysis, we estimate that a county in Texas could expect to receive \$9.4–\$13.1 million in lifetime taxes (including school taxes) for a 100 MW solar project located in its boundaries, \$16.8–\$20.3 million for a 100 MW wind project, and \$3.8–\$4.7 million for a 100 MW energy storage project[16]. 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, solar, and energy storage projects (left) and if all wind, solar, and energy storage projects with interconnection agreements[17] are built (right) in millions of dollars.

15 Projects with signed interconnection agreements only.

16 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.

17 An Interconnection Agreement; can include either of the following, 1) the Standard Generation Interconnection Agreement (SGIA), 2) a Public financially binding agreement, or 3) an official letter from a Municipally Owned Utility (MOU) or Electric Cooperative (EC) signifying developer intent to build and operate generation facilities and interconnect with the MOU or EC .

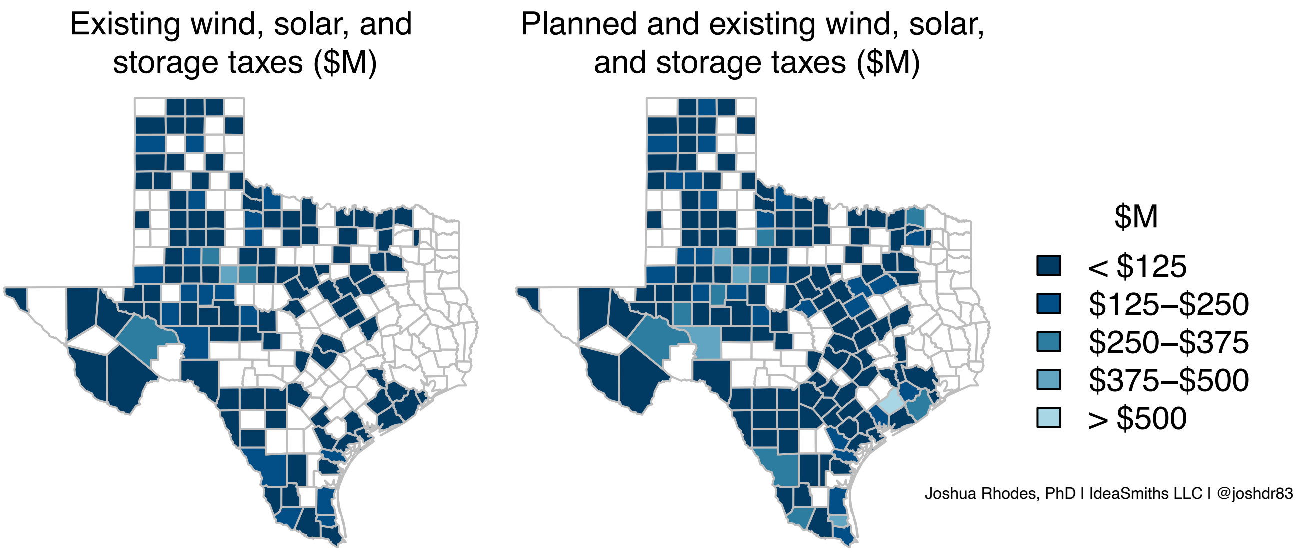


Figure 3: Figure showing our estimates of the amount of taxes to be paid in each county for existing wind, solar, and energy storage projects (left) and if all projects with interconnection agreements are built (right) in millions of dollars. Average between the low and high tax values were used to create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

Summing the values for each county indicates that existing solar, wind, and energy storage projects in Texas will pay $7.2–$8.8 billion in taxes over their lifetime and, if all projects with interconnection agreements are built, existing and planned wind, solar, and energy storage projects will pay $12.5–$15.9 billion in lifetime taxes. Of these taxes paid, over 60% would go to rural counties with population densities less than the Texas median or about 22 persons per square mile[18].

Landowner payments

A second, less understood stream of payments from renewables projects are those made directly to the landowner for leasing their land to project developers. These payments can be difficult to estimate because the contracts themselves are not public. Values 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 production profiles of the wind farm output. 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 data availability, estimates for landowner payments were made using information received from developers and energy 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, such as cattle grazing fees. Energy storage projects follow a similar pattern.

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.

It is possible that landowner payment contracts can include some amount of revenue sharing. However, conversations with industry indicated that that, while it was sometimes part of earlier contracts, it is less typical today, and most agreements use fixed or escalating values that are based on installed capacity or acreage leased. More detail is available in Appendix A.

Wind landowner payments in Texas

Using the methodology developed for this analysis, we estimate that a landowner in West Texas could expect to

18 The average population density for Texas counties is about 114 persons per square mile.

collect $16.2–$24 million[19] 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 $22.8–$33 million in payments over its lifetime.

Solar landowner payments in Texas

Further, we estimate that a landowner in the West, Far West, North, and Panhandle regions of TX could expect to collect $5.2–$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 $9–$23.8 million and landowners in the Coastal region of Texas could expect $10.3–$27.7 million.

Energy storage landowner payments in Texas

Finally, we estimate that a landowner leasing their land for energy storage projects could expect to receive about $500,000 (per 100MW) of lifetime landowner payments, with a range of $260,000–$1.2M (per 100MW). While this number might seem smaller relative to that of wind and solar projects, it is important to remember that energy storage projects take up much less land per MW of capacity and these projects are generally expected to have shorter lifetimes, although they could be repowered for extended lifetimes like wind and solar projects.

Figure 4 shows our estimates of the amount of landowner payments to be made in each county for existing wind, solar, and energy storage projects (left) and if all projects with interconnection agreements are built (right), in millions of dollars[20].

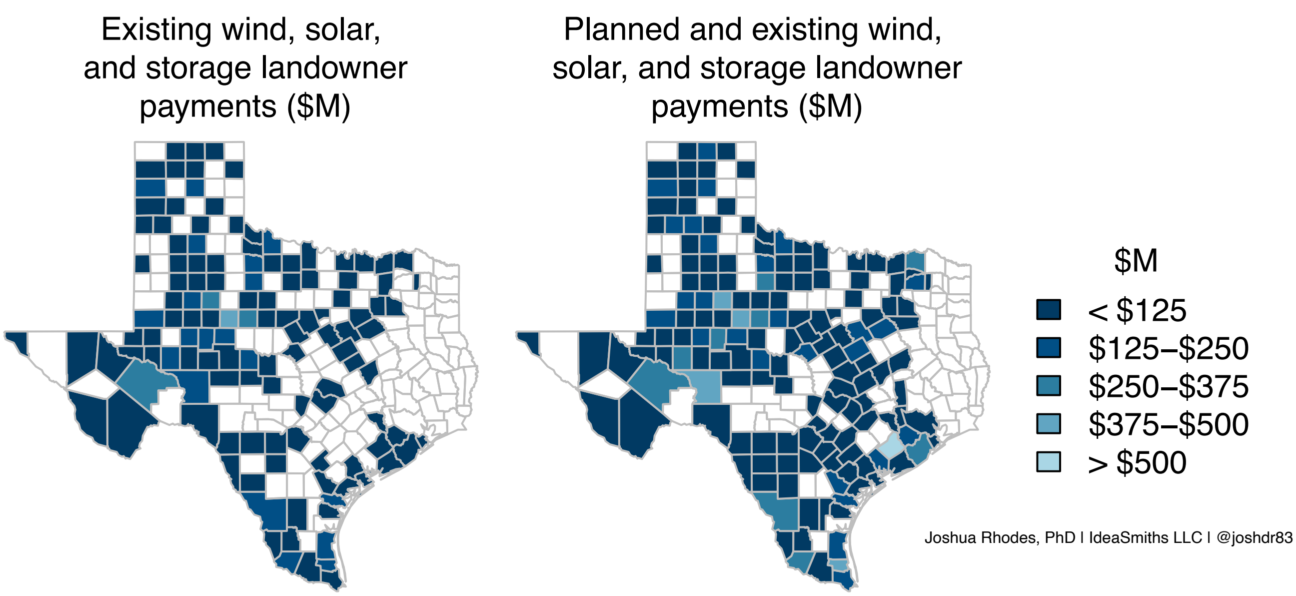


Figure 4: Figure showing our estimates of the amount of landowner payments to be made in each county for existing wind, solar, and energy storage projects (left) and if all projects with interconnection agreements are built (right), in millions of dollars. Average between the low and high landowner payment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

All together, we estimate that existing solar, wind, and energy storage projects in Texas will pay Texas landowners $7.1–$11.3 billion over the lifetime of the projects. If all projects with signed interconnection agreements are built, we estimate that those projects will generate an additional $4.7–$10.4 billion in lifetime landowner payments, for a total of $11.8–$21.7 billion.

Projects with interconnection agreements only constitute a view out for the next few years – the most distant project in that category is expected to come online in 2025. However, longer-term projections see even more renewable energy capacity being built in the state so it is expected that future values of taxes and landowner payments will be higher than those outlined in this report.

19 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 landowner contract. Thus, a shorter range of times were chosen for the estimated range.

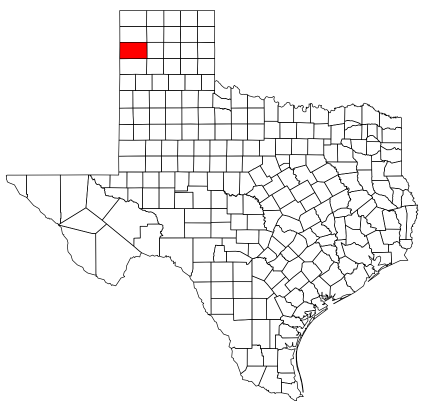
20 An average of the low and high estimates in each region was used to create the figure.

Note that, while this section only focuses on the payments made to landowners for hosting solar PV panels, wind turbines, and batteries 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

This section of the report focuses on a handful of rural counties in Texas to assess how renewable energy has impacted local residents[21] and to benchmark against other, less stable energy industries in the state.

Oldham County



Oldham county (population approx. 2,112) straddles many lines: it stands on the (slightly disputed[22]) border between Texas and New Mexico and 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 $0.76 per $100 of assessed value 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, which 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 have made up about 20% of Oldham Counties' operating budget, but times are not always the best and because of global commodity price cycles those payments are hard to count on. In 2020, according to Judge Allred, Oldham County had lost 80-90% of oil and gas revenues over the prior 10 years. He notes that the sector's 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 can make with wind farms, three out of the four school districts in the county were able to hold bond elections and build new facilities. Three-quarters of the cost of the new school facilities can be attributed directly to the wind industry.

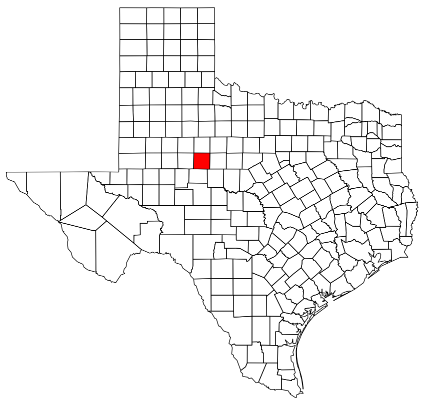
Judge Allred says that there have been no real complaints and the wind industry has been a good neighbor, which is what small communities look for when new industries come to town. Along with increased revenues, the industry has attracted new residents to the area to stay, while not putting a burden on the existing infrastructure like other industries tends to do[23].

21 All of the following direct quotes are from personal communication with the quoted.

22 https://en.wikipedia.org/wiki/Oldham_County,_Texas#Border_Dispute_with_New_Mexico

23 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.

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 capacity installed than any other county in the state, with approx. 1,400 turbines (~2,125 MW) and plans to add another ~200 MW. Nolan received some of the first utility-scale wind farms in Texas due to their great wind resource and eager embrace for the industry. 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 county through better services and/or reduced property taxes. However, landowners that don't 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 in the coastal bend region of Texas that has excellent on-peak wind resources. This analysis expects to see over $130 million in additional tax revenue to come from renewables and energy storage in the county.

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. She played 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%[24] partly due to renewable investments and potential future projects could see those

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

rates fall even further[25]. 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.

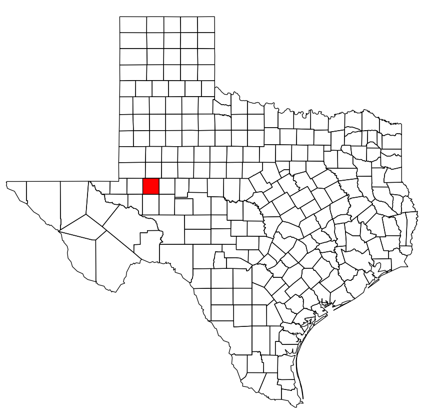
> "My husband works out of town Monday through Thursday because there aren't enough opportunities here just like my father when I was growing up. I want to live and raise my kids in Bee County. I want there to be good jobs in town so that more families can have dinner together and there are not so many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

Local businesses have benefited from the under-con struction 250 MW Helena Wind Farm and potential future projects, including local construction companies who can hire locals who often drive west across the state to work in the Permian.

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



Midland, Texas is closely linked with oil and gas. Midland and the nearby City of Odessa sit at the heart of the Permian Basin's epic oilfields. These cities and the surrounding region have seen multiple boom-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

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[26]. There is always too little housing 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 shopping outlets that never appear.

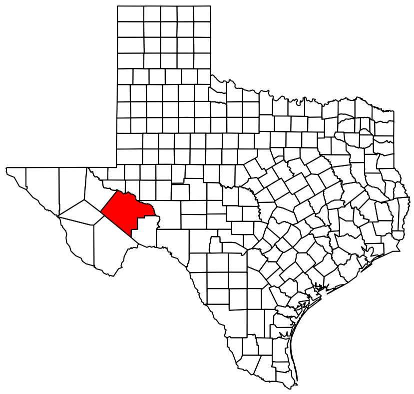
> "We have historically struggled to leverage our tax dollars well for roads and infrastructure because we may be fearful of the next bust cycle."
>
> — Lori Blong, Midland Councilwoman

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 have come to exist in its current form without the legacy of the oil and gas industry, but they wish that it were more stable and less prone to extreme cycles.

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

26 https://www.chron.com/business/real-estate/article/Midland-housing-market-sizzles-alongside-Boston-12940762.php

Pecos County



Pecos County is the first of the big counties in West Texas. Pecos County's eastern border is defined by the Pecos River, similar to how many East Texas counties are defined by rivers. At over 4,700 square miles, Pecos County is the second largest county in Texas, second only to Brewster County to its south.

Pecos County has some of the best sun in Texas and so it is not surprising that it has been an early leader in the Texas solar rush: the county currently has the most installed solar of any Texas county with over 1,550MW of capacity. Given its Far West location and ample solar resources, it is also not a surprise that the county is also a large destination for energy storage.

While renewable energy projects have been providing residents with new diversified income streams for years, landowners, such as Former County Commissioner George Riggs are also starting to see the same from energy storage projects, which can help keep family ranches together.

> "My family has a lot of heritage in this land, but my kids don't want to ranch, so other ways of earning income from the land are important to keeping it in the family."
>
> — George Riggs, former Pecos County Commissioner)

Mr. Riggs also noted that, as County Commissioner, he would see county tax revenues rise and fall with the global price of oil because oil and gas make up about 90% of the tax base in the county. However, the newer renewable energy and storage projects offer more stable sources of tax revenue which can serve to act as a hedge against higher taxes for county residents. This analysis expects renewable and energy storage to pay over $350 million in taxes in Pecos County.

Conclusions

Renewable energy and energy storage development have had a positive economic impact in Texas, particularly in rural counties, which are likely to receive more than 60% of the estimated tens of billions of dollars in tax revenue and landowner payments that come with existing and planned wind, solar, and energy storage development.

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

Interactive website with project data

The data presented in this analysis are also available on an online interactive website[27] that allows the user to see and download project size, tax, and landowner payment data for multiple jurisdictions beyond counties, including state and federal legislative districts.

The Chapter 313 program

While this analysis leaned heavily on the data available from the Chapter 313 program, its future is uncertain. The Texas Economic Development Act (Chapter 313) was implemented in 2001 to help Texas attract capital intensive projects to the state by providing a local-option, ad valorem (property tax) value limitation for a temporary period. In 2021, the Texas Legislature did not renew the Chapter 313 program and it is scheduled to expire on December 31, 2022. Because projects that applied for and are granted Chapter 313 value limitations prior to the program's expiration are eligible to access those benefits even after the expiration date, the economic impacts forecast in this study contemplate the use of Chapter 313 program, but readers should not assume that the programs benefits will be realized in future years. Without the Chapter 313 exemptions,

27 https://txrenewables.net/

the tax revenues would even higher for a 100 MW project that what this analysis concludes.

While at the time of this report's writing there are discussions about possibly renewing some version of the program,[28] doing so will require direct action during the 2023 Texas Legislative session. If the program is not renewed, capital-intensive projects, such as wind and solar farms, but also including other sectors such as LNG export terminals and manufacturing plants would pay more in taxes, it might also mean that fewer projects locate in the state. Because of its reliance on higher ad valorem taxes for a large portion of its tax revenue, without some type of limitation program Texas has a competitive disadvantage when compared with neighboring states which often have lower ad valorem tax rates. Many other states also offer tax reductions, exemptions, and incentives to attract capital investments.

Acknowledgements

This work was funded by the Conservative Texans for Energy Innovation (CTEI)[29], Texas Association of Business[30] and the Advanced Power Alliance[31].

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.

The Texas Association of Business (TAB) is the Texas State Chamber, representing companies of every size and industry. TAB works in a bipartisan manner to vigorously protect Texas' pro-business climate, delivering solutions to the challenges affecting Texas employers.

The Advanced Power Alliance is the industry trade association created to promote the development of wind, solar and energy storage as resources that can deliver clean, reliable, affordable power for American consumers.

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 who provided data and helped inform the process flow for this analysis.

About Us

IdeaSmiths LLC[32] 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.

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28 https://www.texastribune.org/2022/08/05/texas-dade-phelan-chapter-313/

29 https://www.conservativetexansforenergyinnovation.org/

30 https://www.txbiz.org/

31 https://poweringtexas.com

32 https://www.ideasmiths.net/

Appendix A

County tax revenue methodology

Wind and solar local taxes

This analysis utilized the Texas Chapter 313 tax abatement filings[33] 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[34].

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[35,36]. In each of these certification and economic impact packets, Table 4 (example shown as Figure 5 below) produces an 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.

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[37].

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).

33 https://comptroller.texas.gov/economy/local/ch313/agreement-docs.php

34 IdeaSmiths LLC is not a professional tax firm, nor do we employ tax experts.

35 Example: https://assets.comptroller.texas.gov/ch313/1091/gregory-1091-apex-cert.pdf

36 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.

37 https://assets.comptroller.texas.gov/ch313/1103/reagan-1103-santarita-cert.pdf

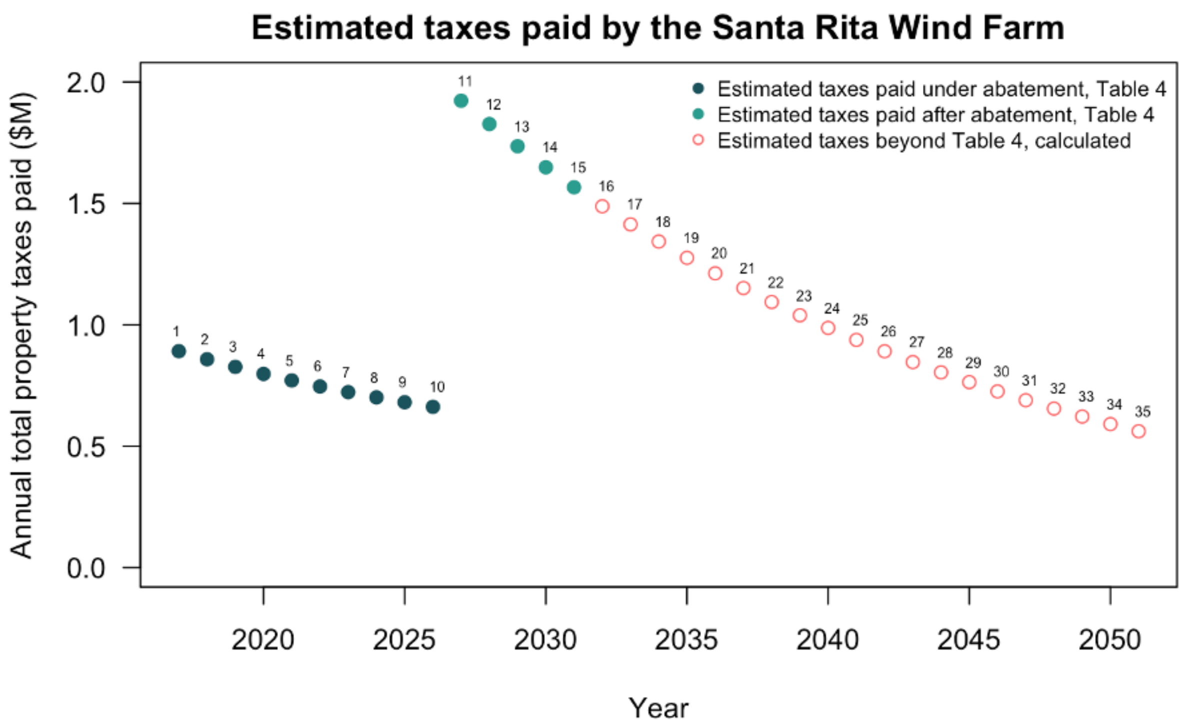

Figure 6: Ad valorem taxes paid as taken from Table 4 of the Santa Rita Wind Farm's Chapter 313 certificate package (solid dots #1-15) and our estimated future taxes paid (hollow dots #16-35).

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.

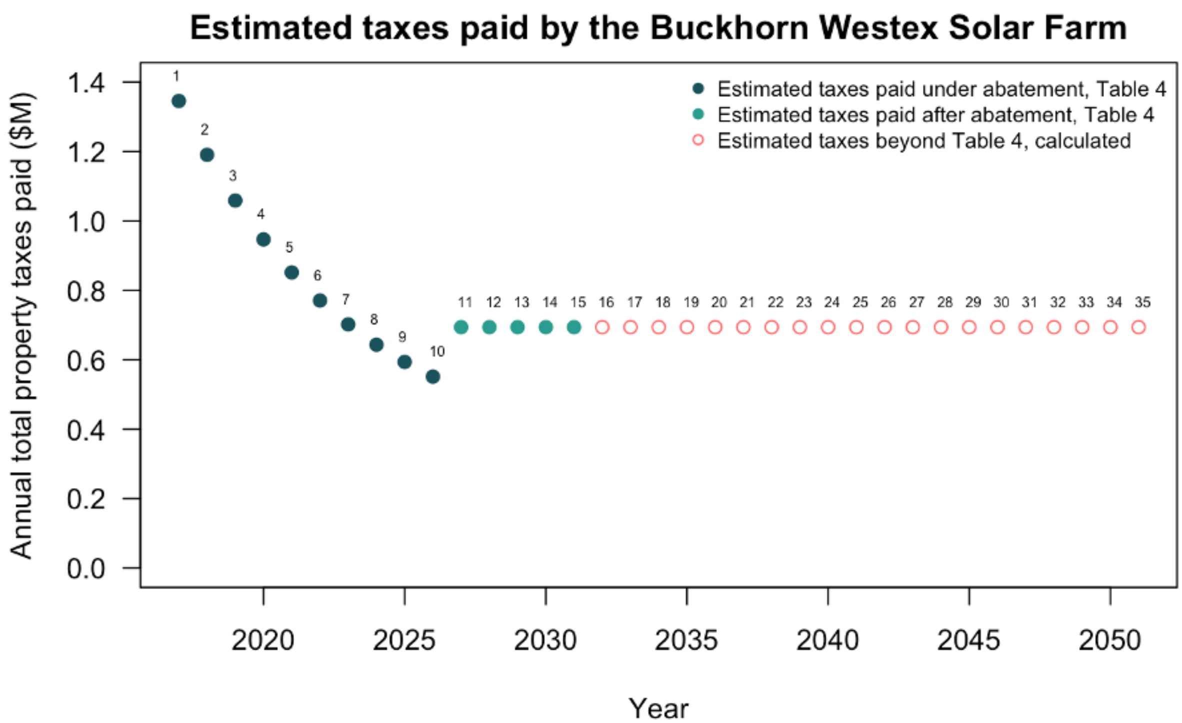

Figure 7: Ad valorem taxes paid as taken from Table 4 of the Buckhorn Westex Solar Farm's Chapter 313 certificate package (solid dots #1-15) and our estimated future taxes paid (hollow dots #16-35).

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[38]. 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.

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[39]. 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[40].

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

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

38 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.

39 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.

40 Code (R scripts) and data available on request.

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. 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.

Energy storage taxes

Taxes paid for energy storage projects were calculated differently than for wind and solar projects. Energy storage projects differ in that they never qualified for the Chapter 313 abatements and thus their projected tax schedules are not public. Thus, we asked multiple companies that have and are planning on developing energy storage projects in Texas to provide us with the data needed to develop similar estimates.

Multiple companies responded and we were able to review data for about 30 projects located across the state of various sizes. Using these data
, we estimate that energy storage projects will pay about $4.5M (per 100 MW) of installed capacity over their lifetime, with an estimated range of $3.8M–$4.7M (per 100 MW) in lifetime taxes.

Generally, energy storage projects have a shorter lifetime, about half as much, than what is expected for wind and solar projects and while technology upgrades are likely possible in the future, we did not consider their impact on taxes here. Thus, we estimate that tax values for energy storage projects are generally comparable to those of renewable energy projects when the differences in project lifetimes are considered.

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.

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. 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.

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 ERCOT's weather zone map[41] 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.

Lease length	(years)	25	30	35
West, Far West, North, North Central, East, and Panhandle[42] 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

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.

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 $400–$700/acre-year, $350–$600/acre-year in the "South", "South Central", "East", and "North Central", and in all other areas, $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[43].

41 http://www.ercot.com/news/mediakit/maps

42 Not shown in Figure 8.

43 https://docs.google.com/spreadsheets/d/1_SYW_MyN2iAGI_inigx1jOjdxvguUjb2xB_PknlH-zE/edit?usp=sharing

Lease length	(years)	25	30	35
West, Far West, North, and Panhandle[44] regions of TX				
Lease value	Low ($M)	$ 5.2	$ 6.5	$ 7.9
	High ($M)	$ 10.3	$13.0	$ 15.8
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 $11.3–$19.4 million for a 30-year lease of a 100 MW solar farm located on their property.

Energy storage landowner payments

Landowner payments for energy storage projects can vary depending on the structure of the deal. Given the smaller footprint of energy storage projects relative to wind and solar, some developers prefer to purchase the land and thus provide the former owner will the full value upfront, while others enter into a multi-year or multi-decade lease.

Data received from energy storage companies indicated that landowner payments for energy storage projects generated about $500,000 (per 100MW) of lifetime landowner payments, with a range of $260,000–$1.2M. Because of the smaller sample size, we assumed that the same landowner payment values were similar across the state, although it might be possible to update them in the future with more data.

While this number might seem smaller relative to that of wind and solar projects, it is important to remember that energy storage projects take up much less land per MW of capacity. Assuming an average of 13.7 MW/acre and a 15 year lifetime, these estimates yields an average lease value of about $4,750/acre-year, with an observed range of $2,400–$11,000 per acre-year for projects in lower or higher-value areas, which is about seven times higher, per acre, than a solar lease[45].

44 Not shown in Figure 8.

45 Assuming a solar lease of $500/acre-year with a 1.75% annual escalator for 30 years.

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, Ph.D. is a Research Scientist at The University of Texas at Austin, a non-Resident Fellow at Columbia University, and a Founding partner and the CTO of IdeaSmiths LLC. His current work is in 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. Dr. Rhodes is a regular contributor to popular media outlets, including to Forbes and he sits on the board of Catalyst Cooperative. 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.