Oklahoma Depends on Wind

November 2016

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Sponsored by PACE - The Partnership for Affordable Clean Energy

"Electricity customers deserve a strong voice in discussions of our shared energy future."

Lance Brown
Executive Director

About PACE

The Partnership for Affordable Clean Energy (PACE) is a national not-for-profit organization that advocates for fair and sensible energy policies. Founded in January 2009, PACE brings together a wide variety of groups such as businesses, labor groups, trade organizations, agricultural groups, and consumer advocates who have common concerns about the future of American electricity.

Through our public education efforts, the organization has helped to shape national and state energy conversations. This has included intervening in matters before public service commissions and other regulators, offering testimony to the Environmental Protection Agency in public hearings, submitting comments to state and federal policy makers on various energy proposals, and presenting at national and regional conferences about the importance of energy policy that works for customers. We believe strongly that electricity customers deserve a strong voice in discussions of our shared energy future.

To this end, PACE maintains an aggressive schedule of communication, sending out twice-weekly emails on current topics and being regularly featured and quoted in publications such as The Wall Street Journal, USA Today, and The National Journal. In 2011, the organization launched a mini-documentary, entitled Unplugged: Reconnecting American Energy Policy with Reality, through a series of town hall meetings with members of the U.S. Congress. Currently, PACE's Executive Director, Lance Brown, serves as Alabama's appointee to TVA's Regional Energy Resource Council, helping to shape the future of one of the nation's largest electricity utilities.

Our vision is clear. PACE believes in an energy future that preserves access to reliable, low-cost electric power while continuing the significant environmental progress that has been made in past decades. In the end, it is America's working families and businesses that must live with the energy future we create today. That future must be affordable.

Learn more at www.EnergyFairness.org.

Foreword

As the United States moves into an energy future that requires greater supplies of electricity, but reduced emissions of carbon dioxide, it will be critical that new sources of energy are available that make sense for both customers and the grid. This includes the continued pursuit of fossil technologies that provide around-the-clock electricity with an ever-smaller emissions footprint. It means committing to the next generation of nuclear reactors that are capable of providing uninterrupted power supplies with no carbon dioxide emissions. It also means deploying renewable technologies where they work best and where they offer maximum value to customers and the utilities that serve them.

In that context, Oklahoma's wind industry serves a critical role. Located in one of the most productive wind corridors in the nation, Oklahoma wind has already provided incredible benefit not only to the grid, but also to communities, local governments, and schools in the state. It is capable of providing even more.

That is why, in the spring of 2015, PACE decided to publicly enter the debate in Oklahoma over the future of the state's wind tax credit. In general, our organization is opposed to the public subsidy of energy sources that compete poorly with traditional sources of electricity. However, not all public policy cases are alike.

As we explained in an opinion piece published in Tulsa World on April 15, 2016, "Subsidies for renewable energy aren't always all they are cracked up to be. The Partnership for Affordable Clean Energy has written in recent years of failed promises and bad policies that hurt taxpayers. On the other hand, we back a simple strategy about renewables: Build them where they work best. Subsidies, too, should be targeted to create real, measurable results."[1]

At the time, Oklahoma faced a budget shortfall of a staggering $1.3 billion. Lawmakers, in the search for solutions, considered eliminating the wind tax credit that has helped support the wind industry in Oklahoma. We opposed this move for a variety of reasons and advocated for a path forward that maintained this important public support. The reason was simple: Oklahoma's wind industry produces far more benefits than costs. The wind credit is a good and sound investment for the people of the state and produces benefits for the regional grid that extend beyond Oklahoma's borders.

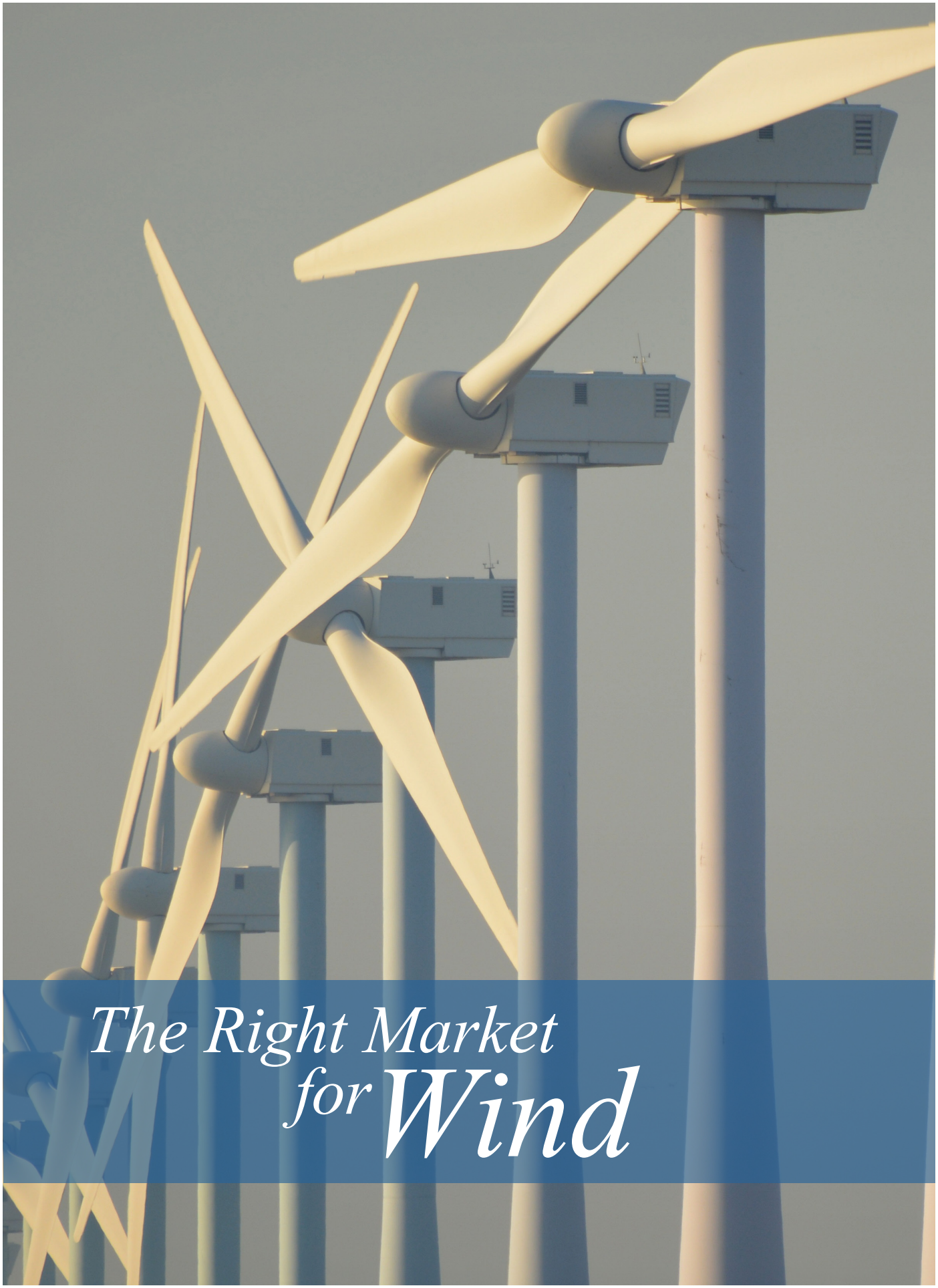
The best information at the time placed the cost of the state wind credit at around $88 million for Fiscal Year 2016. Data also showed that the wind industry would return more than a billion dollars in property taxes that help support local governments and schools. Wind generation would also save Oklahoma electricity customers about $2 billion in fuel costs. Those are serious benefits that policy makers carefully considered, ultimately deciding to keep the wind credit in place. We believe, along with many others, that the state's policy makers made the right call.

A November 2015 study from the State Chamber of Oklahoma, authored by an economist at Oklahoma State University, is a primary source of information about current and future benefits that will derive from Oklahoma's investment in its wind industry. The report, entitled "Wind Energy Industry Impacts in Oklahoma", is a rich source of unprecedented data that compels readers to think twice about endangering the progress of the state's wind resources. The lead author, Dr. Shannon Ferrell, should be commended for his meticulous work in revealing just how deeply the impacts of wind are felt in Oklahoma. Those impacts are truly numerous.

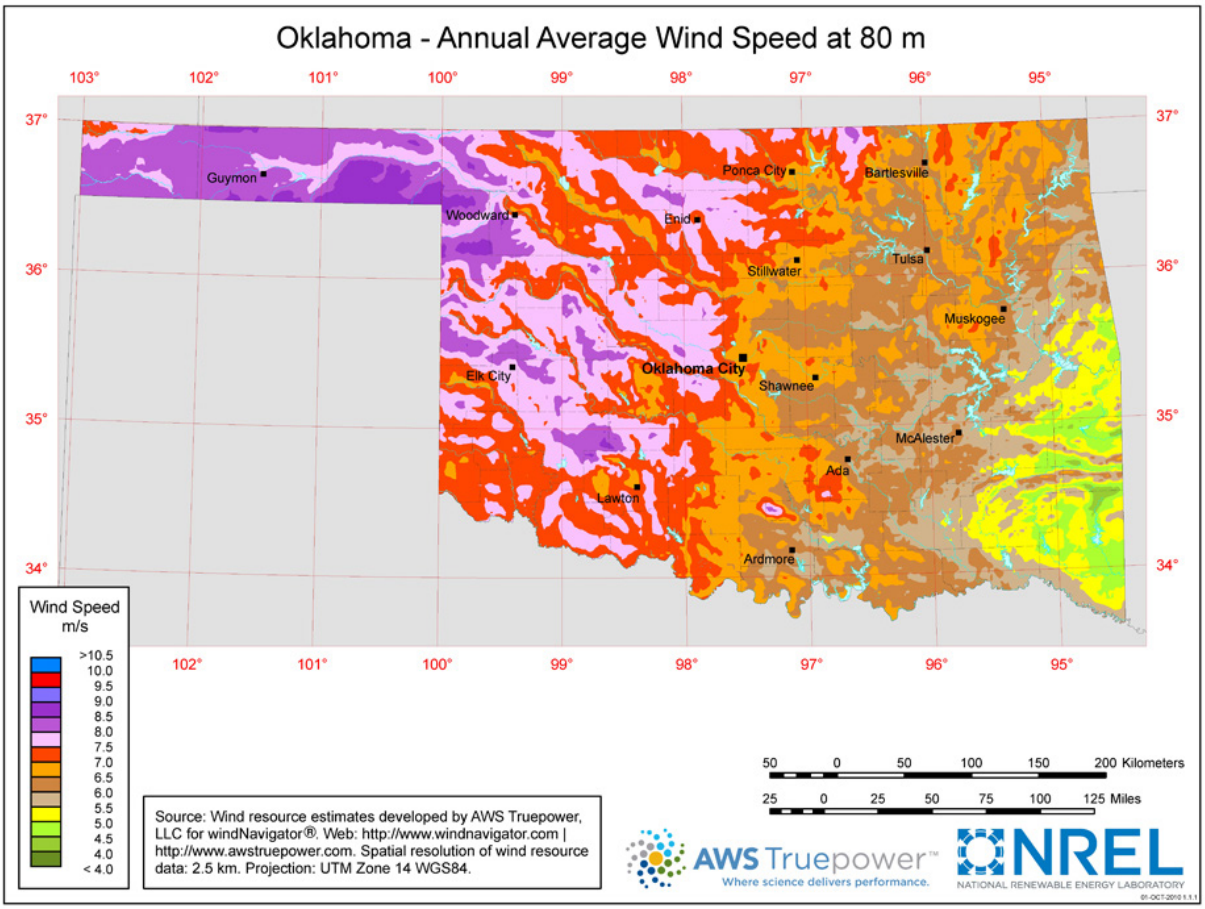
"Wind power, spurred on by incentives, is coming up aces for Oklahoma," we wrote in Tulsa World this past April. "That's worth holding on to for now."

We believe that the past is prologue for Oklahoma's wind industry and that the future of wind production in the state will provide increasing benefits not just for the state, but for the region. That is why this white paper focuses on placing the Oklahoma wind industry in its proper context and enumerates the various benefits that the public, as well as local governments and schools, has seen and will see from the state's wise investment in wind power.

Wind makes sense for Oklahoma and for the energy customers who call Oklahoma home. It makes sense for local governments and schools. And it continues to make sense for utilities charged with looking into the future and deciding today on the resources that will power homes and businesses in Oklahoma, and beyond, tomorrow. It is a resource worth protecting and supporting.



The Right Market for Wind

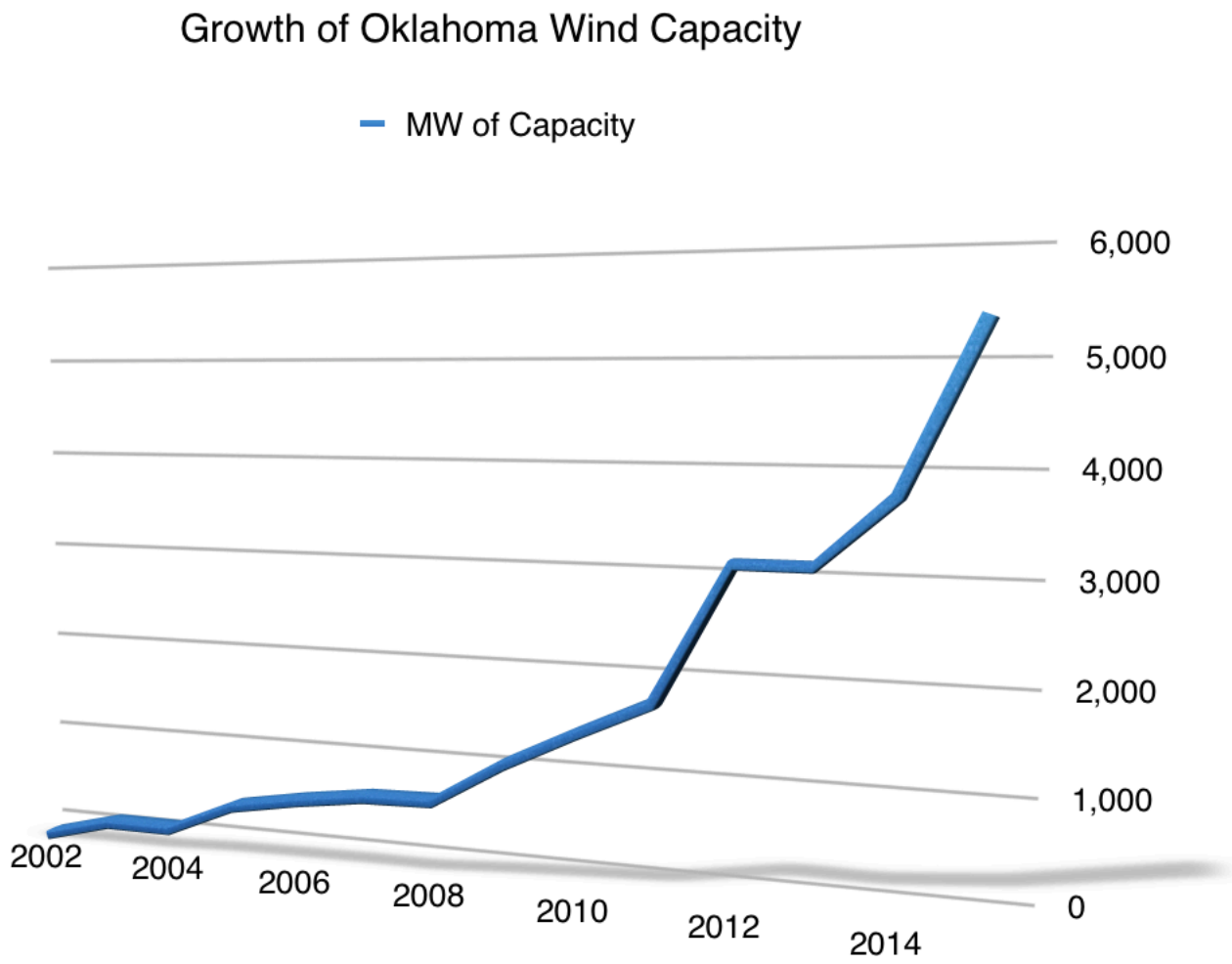


Oklahoma possesses great potential for wind energy, particularly in the western part of the state.

Some locations are ideal fits for wind energy technology. Much of Oklahoma fits that category, particularly in the parts of the state west of Oklahoma City. The panhandle especially has wind resources that rival any site nationally for commercial wind production. Despite these robust wind resources, however, much of the potential for electricity generation from wind went untapped for decades. Even as recent as 2002, Oklahoma had zero commercial wind operations.

All of that began to change in the early years of the last decade. Records show 176 megawatts of wind capacity came online in Oklahoma in 2003, with nearly additional 300 megawatts coming online by 2005. Since that time, wind production in Oklahoma has grown substantially, surpassing the 1,000 megawatt mark in 2009 and growing to an estimated 5,346 megawatts of installed capacity last year.

The panhandle especially has wind resources that rival any site nationally for commercial wind production.



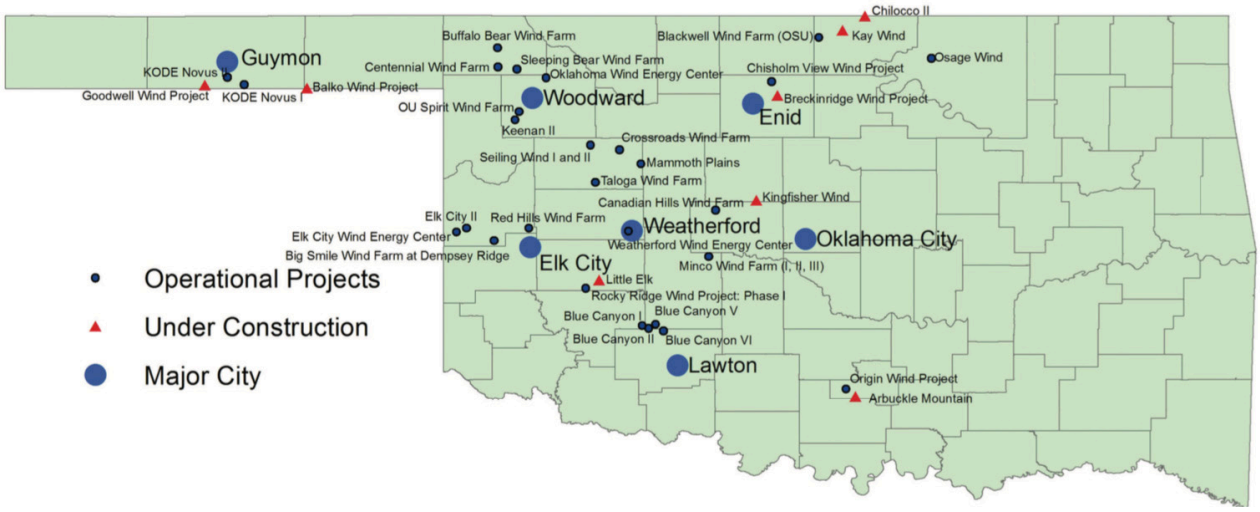
Starting with almost no wind generation capacity in 2002, Oklahoma has expanded its wind industry to more than 2000 turbines, producing more than 12 million megawatt-hours of electricty.

The cumulative results are staggering. Oklahoma started with zero wind generation capacity in 2002. Today, it is the fourth-largest wind energy state in the nation.

According to recent data, Oklahoma has thirty existing wind energy projects in nineteen counties, mostly in the western half of the state, that use more than 2,000 wind turbines to add electricity to the power grid. According to the U.S. Energy Information Administration, Oklahoma turbines produced over fourteen million megawatt-hours of electricity for homes and businesses across the region in 2015.[2] That means Oklahoma's wind projects produce about as much annual electricity production as a nuclear power plant with two reactors.

"Today, Oklahoma is the fourth-largest wind energy state in the nation."

Sites of Oklahoma Wind Operations



Oklahoma's western half is extremely productive for wind power

The effect on Oklahoma's energy mix has been equally impactful. As of August 2016, utilities in the state now produce about a sixth of their total electricity from wind turbines.[3] That's about two and a half times the national average. And with a transmission grid that has been updated in recent years to accommodate the growing amount of electricity derived from wind power, the state is poised to be an even bigger leader in wind.

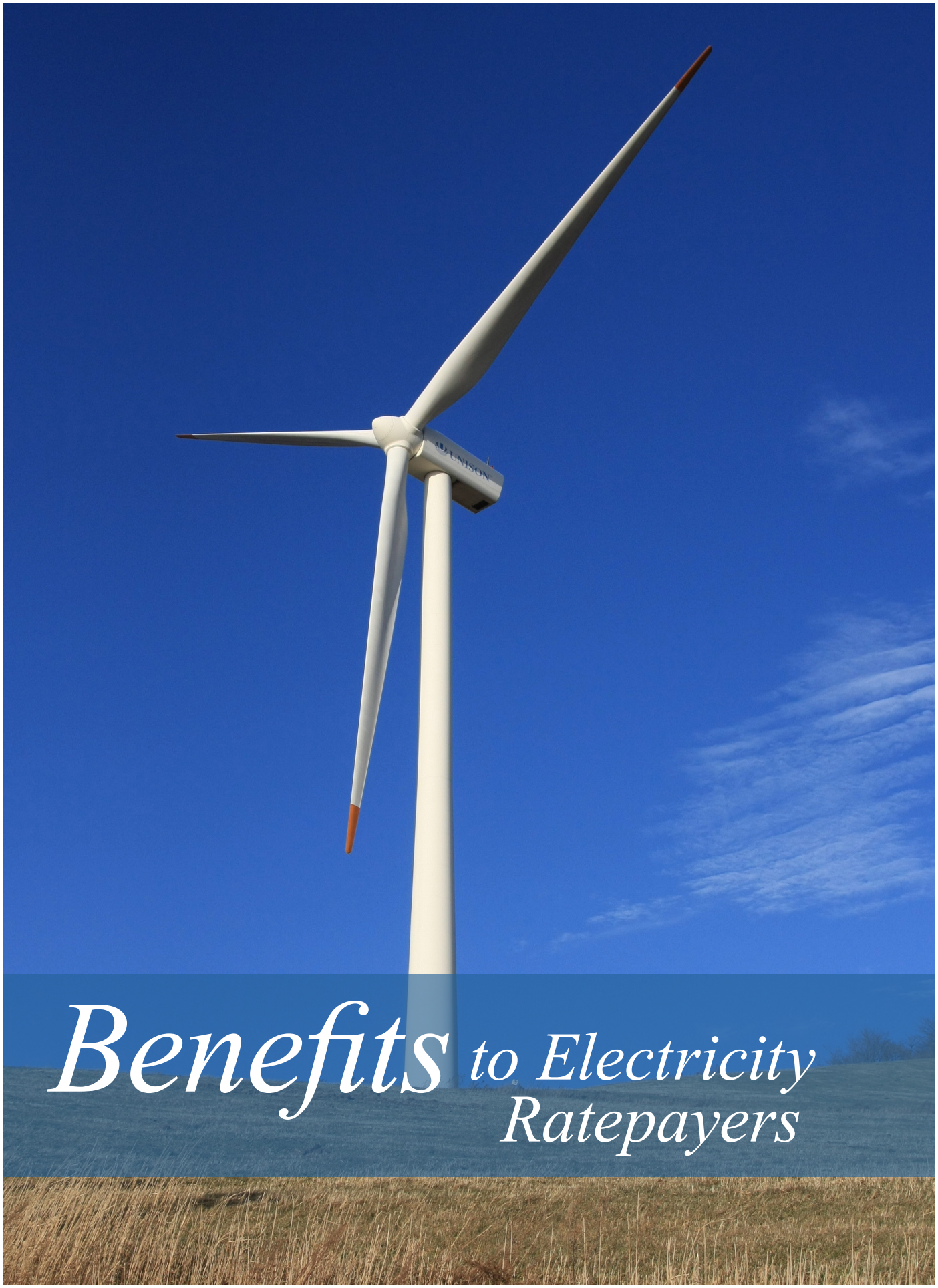
Despite the high level of production from Oklahoma's wind fleet, it might be surprising to know that these projects require a remarkably small allocation of land resources. Research shows that all of the wind energy projects currently operating in the state only use 1,350 acres of land. That is a small footprint compared to the high amount of productivity from Oklahoma wind projects.

These wind projects are mostly in highly rural areas, away from populations centers. In fact, mapping data shows that among existing turbines, only two hospitals, airports, or schools were located within a mile and a half of the nearest utility-scale wind turbine.

All told, the land use requirement for wind projects is less than half an acre per megawatt, or about a megawatt for each wind turbine. This includes the land required for the turbines, the associated roads, and the substations necessary to make the project viable. Researchers at Oklahoma State University, in fact, found that previous data overestimated the amount of land required for wind generation in Oklahoma.

Not only do these wind projects benefit the power grid by adding low-cost, carbon-free electricity, they also provide real financial gains for landowners. The same research from Oklahoma State University found that the average landowner would net nearly ten thousand dollars per turbine annually after taking into account the lost opportunity to use the required land for traditional agriculture. Research shows, too, that wind energy development in Oklahoma has virtually no negative impact on oil and gas development across the state. Both wind energy and oil and gas exploration and production can coexist without barriers.

Clearly, Oklahoma is a strong market for wind power, with production continuing to grow. With the right support, the state can continue to be a leader nationally in wind energy production, providing real revenue for landowners, adding carbon-free electricity to the grid from home-grown resources, and staying out of the way of industries such as agriculture and fossil fuel development that have been staples of the Oklahoma economy.



Benefits to Electricity Ratepayers

Oklahoma is an energy state.With an array of natural resources, the state has spent the last century helping to fuel the nation's raw fuel needs while also meeting the electricity demands for Oklahoma ratepayers at some of the lowest prices in the industry.[4] Adding to the contributions of fossil fuels, wind generation has established itself as a compelling complement to Oklahoma's energy portfolio.

The evidence for wind's benefit to ratepayers is both clear and abundant. In his November 2015 study, cited extensively in this report, Dr. Shannon Ferrell of Oklahoma State University states that both of Oklahoma's investor owned utilities have estimated that ratepayers in the state will save approximately $2 billion directly because of the contributions of current wind projects. As a specific

example, Ferrell cites that Oklahoma Gas & Electric "has estimated its wind energy fleet will save ratepayers a total of more than $1 billion over the lifespan of its wind energy facilities."[5] Those are real dollars that help Oklahoma businesses and families.

How exactly does wind lead to lower power bills for electricity ratepayers? In the simplest terms, wind generation creates a viable alternative for electricity providers, establishing a critical hedge against the price fluctuations of essential fuels such as natural gas. By utilizing a stable resource with no fuel cost, wind serves as a safety net for potential spikes in the price of traditional electricity fuels such as natural gas. Being another competitive option for state electricity providers, wind power helps drive down overall cost.

As federal regulation continues to reduce the use of coal for power generation, Oklahoma's ample stores of natural gas will take center stage as the primary source for low-priced, on-demand generation.[6] With this transition, ratepayers become more exposed to the short-term fluctuations and inherent long-term uncertainty of natural gas prices. While natural gas prices are low at the moment, and probably will continue to remain low for several years, power generation infrastructure must be strategically built to serve well into the future. In a location such as Oklahoma, where wind power is so productive, building wind power capacity simply makes sense as both a hedge and a safety net.

The evidence for wind's benefit to ratepayers is both clear and abundant.

The daily price level in dollars per Million Btu for the U.S. Natural Gas futures under the Nymex contract market rules and regulations; settlement Jan-2017 (NGF 17). Assessed 11/2/16.

"Where natural gas is the workhorse, wind is the great stabilizer."

Consider the best available data on natural gas pricing. Examining natural gas futures prices from 2015 to today shows a clear downward trend, bottoming out in February 2016. And while there has been an upward trend over the past eight months, prices have yet to reach the highs of 2014. It is true that natural gas prices have remained low relative to historical marks. However, there remains a good deal of volatility in the price of the resource. A simple glance at the recent movement in natural gas prices shows the ups and downs are becoming more frequent and more pronounced. History has shown that forecasting the price of natural gas into the future has been an exercise fraught with uncertainty; that level of uncertainty can quickly lead to higher costs for power customers, meaning higher power bills.

Unlike a number of other states whose electricity generation portfolio is heavily leveraged on natural gas, Oklahoma is well positioned to counter fluctuations in natural gas prices because of the state's wind assets. Through power-purchase agreements with commercial customers, such as Google or with other utilities, wind generation provides a useful, practical complement to natural gas. Where natural gas is the workhorse, wind is the great stabilizer.[7]

The truth is that Oklahoma wind is already bearing fruit for ratepayers, as explained earlier, by generating an estimated $2 billion in eventual savings for power customers. Policy makers should recognize that there is a strong probability that the increase in the volatility of natural gas prices will continue into the near future. Wind helps combat that risk. By continuing to support wind generation through the state tax incentive, policy makers can help ensure savings and stability for Oklahoma's businesses and families in the years to come.

Impacts on Communities and Schools

Commercial wind production in Oklahoma easily clears the primary hurdle facing any industry that is incentivized, in part, by taxpayer dollars: its benefits are much greater than its costs. And while PACE has mostly focused its public arguments on the benefits of commercial wind production to Oklahoma power customers, there are other benefits of wind power to the state and its communities that go well beyond the bottom line of power prices.

When considering the role that commercial wind power plays in Oklahoma, policy makers must recognize the contributions of wind to three areas: job creation and economic growth, benefits to landowners, and tax revenue impacts on schools and communities.

Fast Facts on Wind's Economic Impact

- **Each $1** of state reimbursement for ad valorem exemption **leads to $1.69 of wind project owner-paid tax revenues** to local governments and schools.[12]
- **$1 billion in cumulative ad valorem taxes** will be paid by the wind industry.[13]
- **$1.2 billion of education funding** is projected to accumulate through wind industry tax revenue and corresponding OTC payments.[14]
- **Corporations Want Wind!** - Non-Utility power purchasers signed a record 52% of power purchase agreements in the U.S. in 2015. The range of companies wanting wind energy span all industries, including power purchasers such as Google, Procter & Gamble, and General Motors.[15]
- **$22 million in royalty payments** are paid annually to local landowners.[16]
- **More than 7,000 direct jobs** have been created in the wind industry.[17]
- **Nearly $10 billion invested** by wind farm developers for construction and development as of the end of 2015.[18]

Creating Jobs and Investment

The 2014 economic impact study by Kyle Dean, PhD, and Russell Evans, PhD, shows that the wind industry is responsible for the creation of 1,600 direct full time jobs for Oklahoma.[8] More recently, the latest annual report from the American Wind Energy Association places the number of full time Oklahoma jobs from wind projects to be as high as 7,000.[9]

Dean and Evans also found that direct income received from wind-related jobs has already exceeded $340 million annually. Annual wages paid to wind industry workers is already at $15 million. Clearly, wind power puts Oklahomans to work in a high-tech, skilled industry.

More than just job creation, though, the viability of Oklahoma's wind industry also sends an important signal to potential economic development prospects. For example, major corporations such as Google, Procter & Gamble, and General Motors have all stated that obtaining power generated from wind is an important part of their energy sourcing strategy. Helping to satisfy this growing trend of corporations toward renewable energy sources can pay dividends for Oklahoma.[10]

The capital investment of the commercial wind industry is also impressive. As of the end of 2015, wind farm developers will have invested nearly $10 billion in the construction of wind assets in Oklahoma.[11] These projects also generate another $1 billion in goods and services within the state.

Providing Dollars for Landowners

Commercial wind production also requires land use. Because most of the best wind resources in Oklahoma are located in the western half of the state, this means that turbines are often sited on productive farmland. This land use creates valuable revenue opportunity for landowners.

As this report discussed earlier, research from Oklahoma State University found that the average landowner would net nearly ten thousand dollars per turbine annually after taking into account the lost opportunity to use the required land for traditional agriculture. In other words, the siting of turbines on farmland offers a profitable trade for landowners. Using a small footprint, wind energy projects can put tens of thousands of dollars into the hands of a landowner each year.

Royalty payments to Oklahoma landowners from wind farms are estimated to total more than $22 million per year. These projects can coexist with livestock and crop operations, giving landowners additional opportunities for revenue with minimal interference to their livelihood.

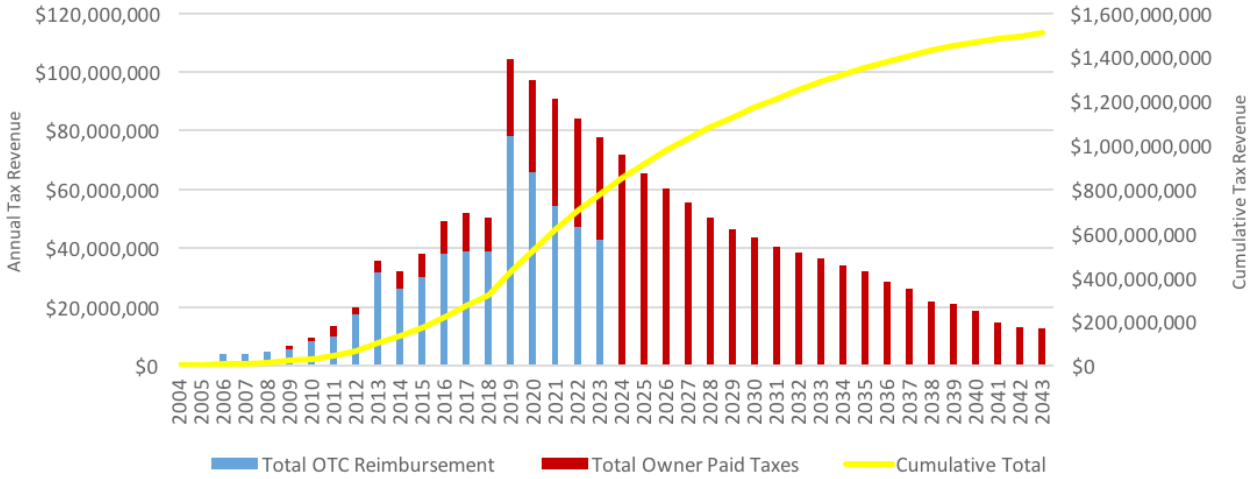
Critical Revenue for Schools and Communities

Perhaps the most compelling benefit for Oklahoma policy makers to consider is the impact of the wind industry on the state's local schools and communities. In nineteen Oklahoma counties, wind projects now represent a significant part of the tax base. In fact, research shows that installed wind equipment has added $3.3 billion to the tax base for those counties.

basis.[19] Once that cap is met, the surplus tax revenue above the cap becomes available to support all Oklahoma schools.

That means that while nineteen of the state's counties might be the home of Oklahoma's wind turbines, all seventy-seven Oklahoma counties benefit in some way from the state's wind industry.

Local Tax Revenue from Oklahoma Wind Projects



Total Historic and Forecast Ad Valorem Revenues. Source: These forecasted values were calculated in Ferrell and Conway (2015) using a Cost Approach method for depreciating capital—refer to "Appendix: Research Methodology," pp.37-39 for a detailed overview of the authors' model methodology.

Districts with wind farms have seen combined ad valorem tax revenue increase more than $28 million, growing from $19 million to more than $47 million.

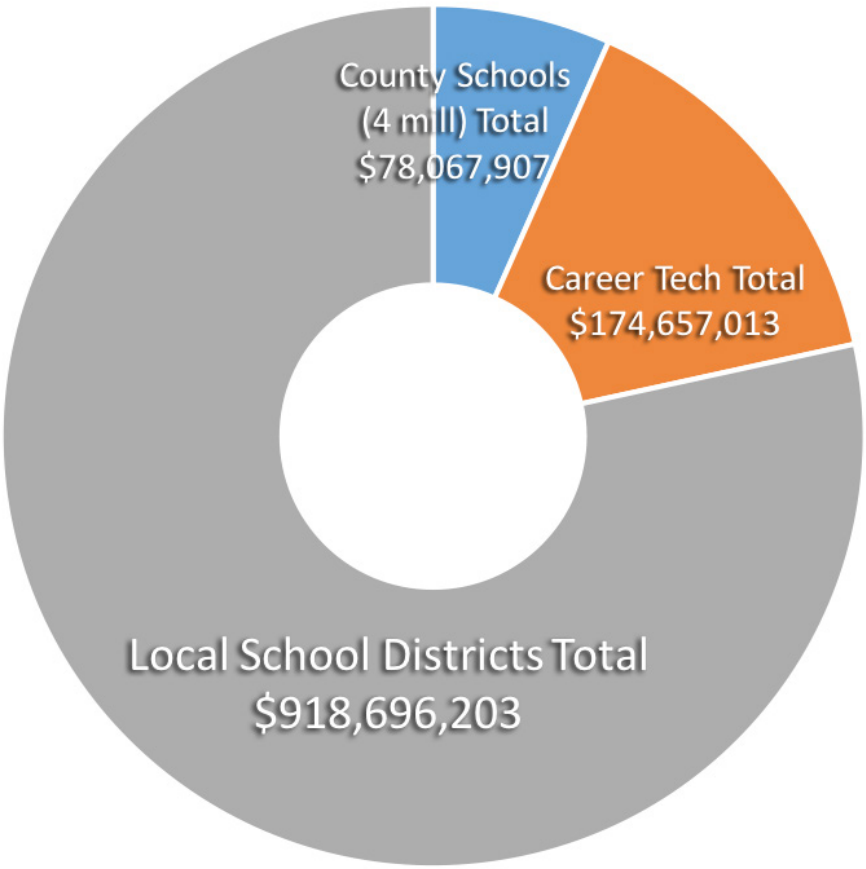
It is important, too, to acknowledge that all Oklahoma counties - not just counties with wind projects - benefit from this tax boon.

Let's consider for a moment how the ad valorem tax system works relative to wind projects and their treatment by state policy. Under the current system, the wind energy industry is projected to pay approximately $1 billion in ad valorem taxes. As the following appendix shows, much of these tax revenues go directly to the nineteen counties in Oklahoma that house wind projects. However, state policy caps the amount of ad valorem revenue that each school district can receive on a per-pupil

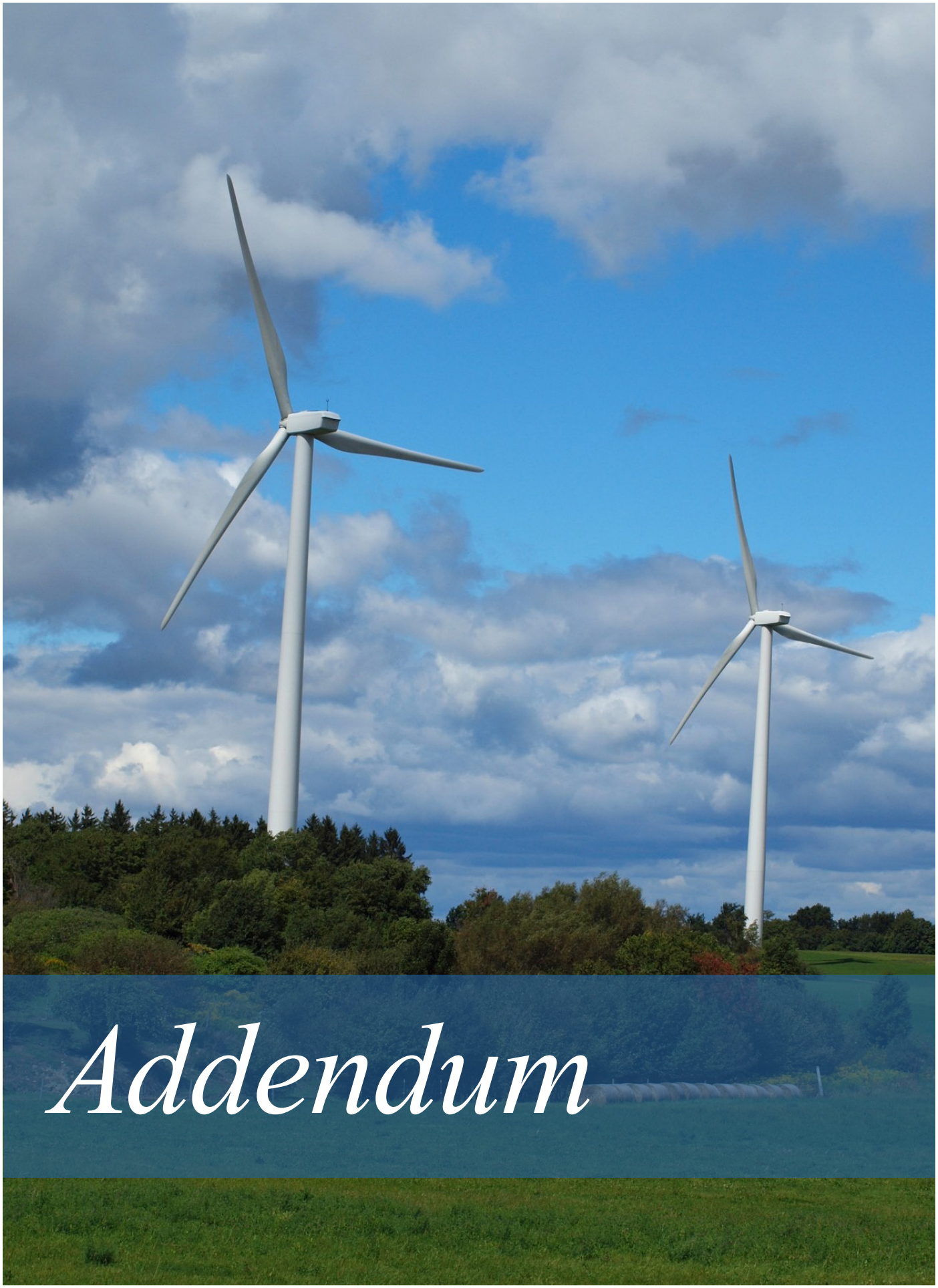
The Oklahoma Public School Resource Center agrees. They explain that the long-term nature of power purchase contracts for wind power means that wind projects can provide relatively stable sources of school revenue for significant periods of time. This not only provides real dollars for local schools, but also enhances the ability of local school districts to issue bonds. In the process, Oklahoma's wind energy industry helps school districts in the nineteen counties with wind projects become less dependent on state aid to fund basic education.[20]

"The value of the wind energy systems to local ad valorem is indisputable."[22]

Distribution of Tax Revenue for Schools

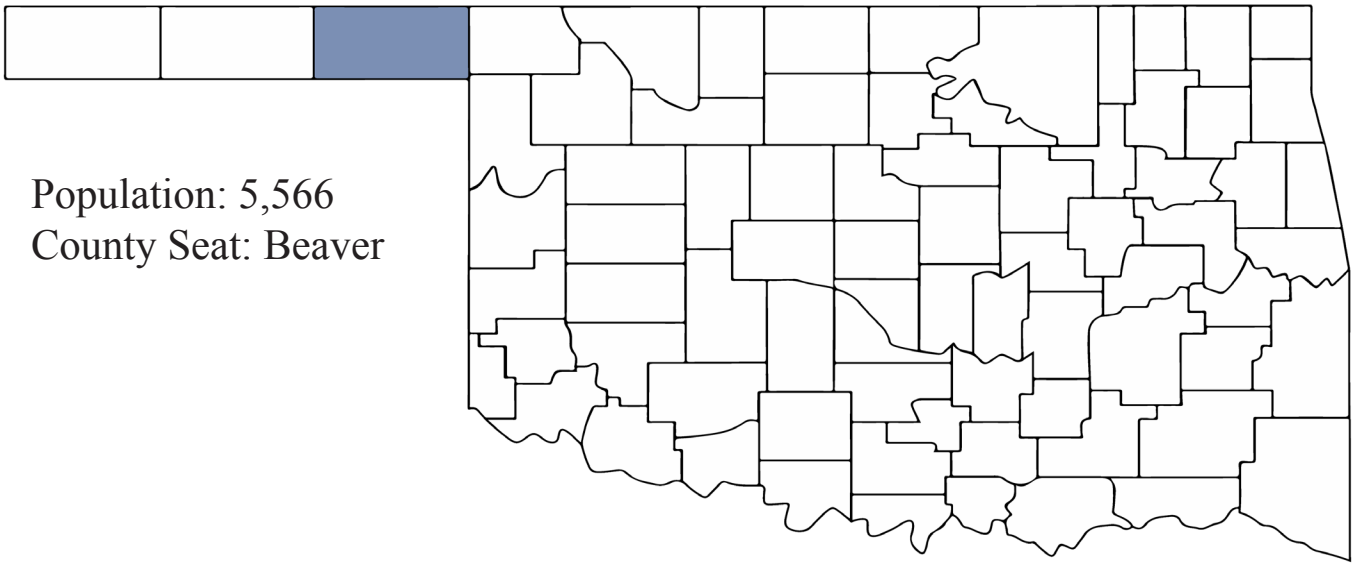


In total, including all funds generated by wind projects, the commercial wind industry in Oklahoma is expected to pay nearly $1.2 billion to education funds, including local and county school funds and the Oklahoma Career Tech system. Of this revenue, more than $918 million will be paid in millages to local school districts, more than $78 million will be paid in the form of 4-mill levies to counties (which are redistributed to local school districts in proportion to their average daily attendance), and more than $174 million will be paid in millages attributable to Career Tech schools.[21]



Addendum

Beaver County



Population: 5,566
County Seat: Beaver

Total Tax Revenues from Wind
$131,543,513

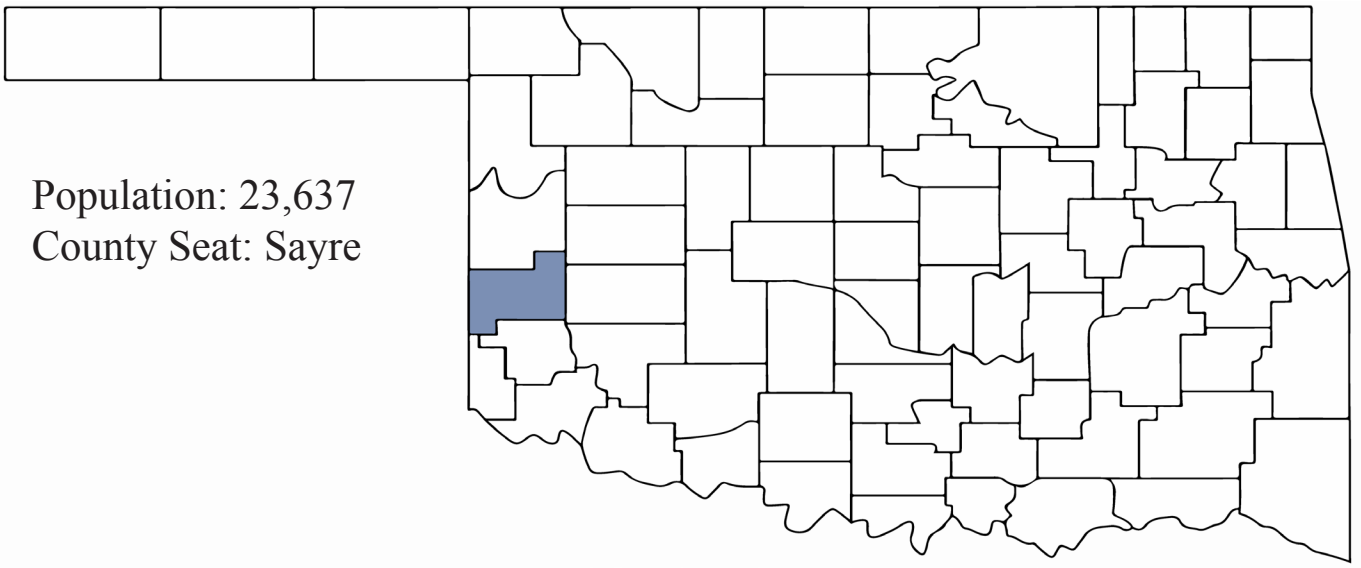
Historical Revenues

OTC Reimbursements	Owner-Paid Taxes
$0	$0

Forecast Revenues

OTC Reimbursements	Owner-Paid Taxes
$47,131,923	$84,411,590

Beckham County



Population: 23,637
County Seat: Sayre

Total Tax Revenues from Wind
$46,702,512

Historical Revenues

OTC Reimbursements
$657,435

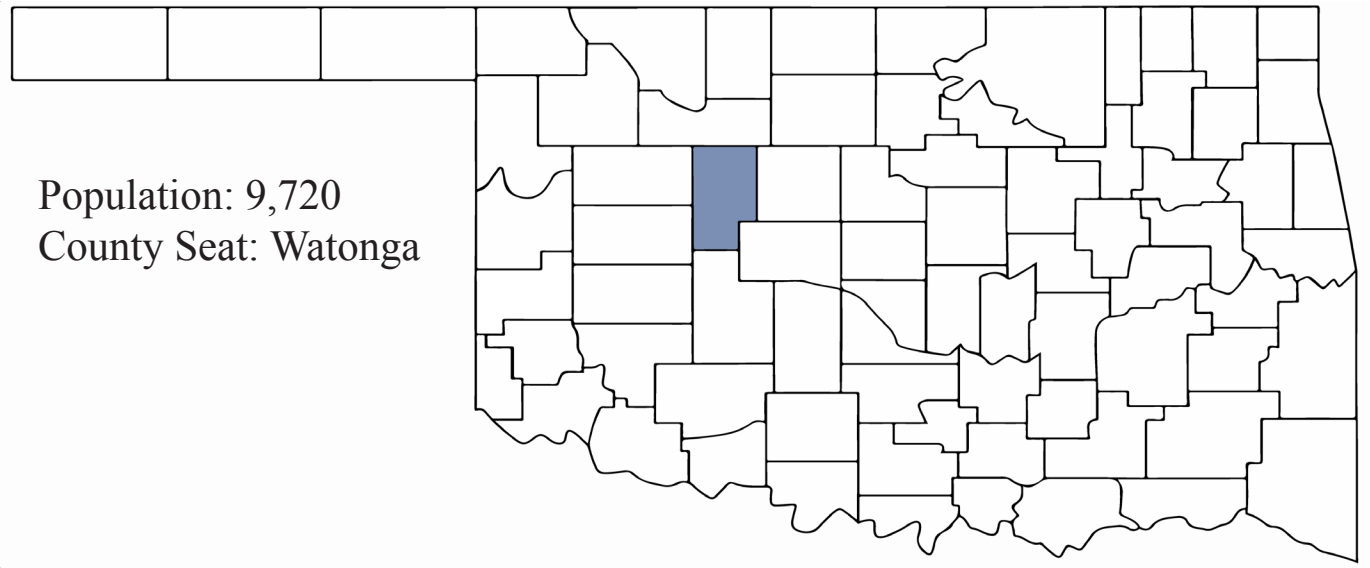
Owner-Paid Taxes
$0

Forecast Revenues

OTC Reimbursements
$16,697,373

Owner-Paid Taxes
$29,347,704

Blaine County



Population: 9,720
County Seat: Watonga

Total Tax Revenues from Wind
$3,324,354

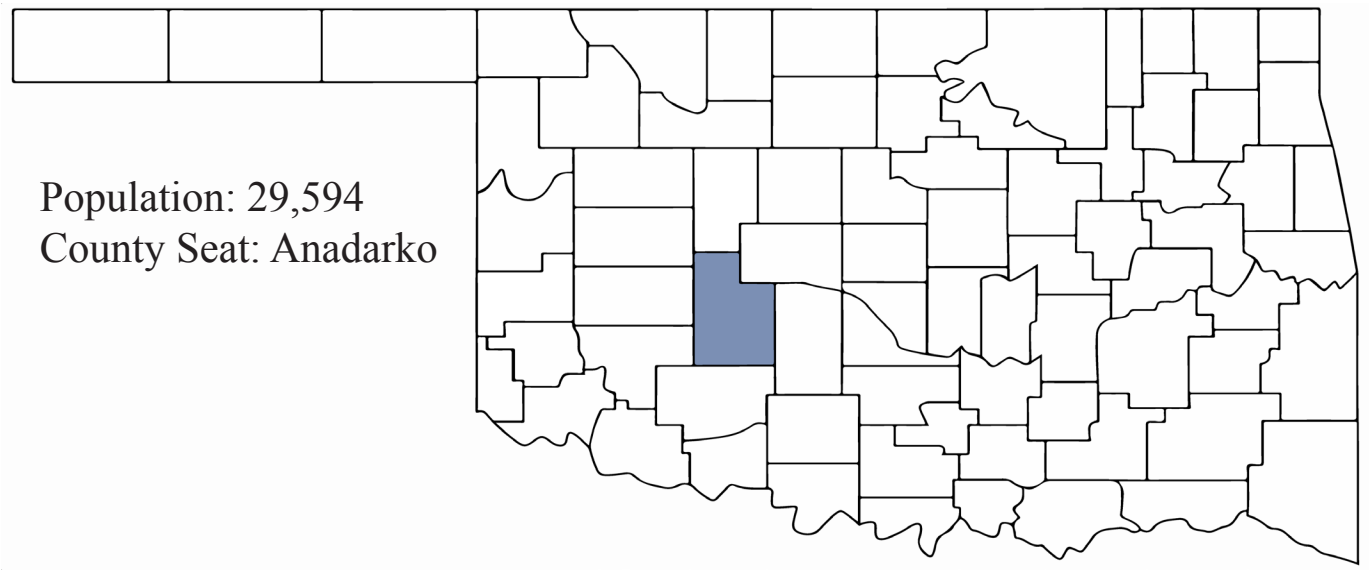
Historical Revenues

OTC Reimbursements	Owner-Paid Taxes
$0	$0

Forecast Revenues

OTC Reimbursements	Owner-Paid Taxes
$1,239,274	$2,085,081

Caddo County



Population: 29,594
County Seat: Anadarko

Total Tax Revenues from Wind
$34,403,590

Historical Revenues

OTC Reimbursements
$8,734,758

Owner-Paid Taxes
$1,975,834

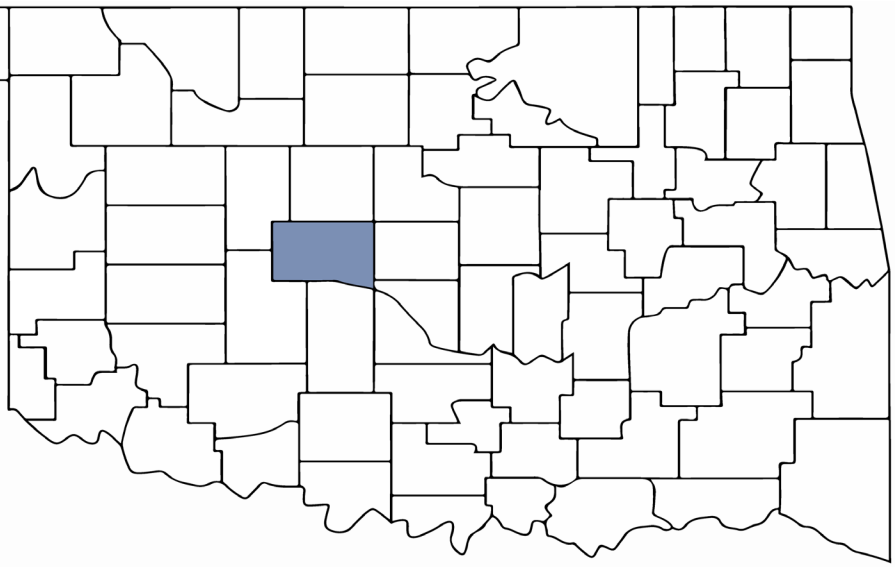
Forecast Revenues

OTC Reimbursements
$4,568,671

Owner-Paid Taxes
$19,124,327

Canadian County

Population: 126,123
County Seat: El Reno



Total Tax Revenues from Wind
$190,822,944

Historical Revenues

OTC Reimbursements
$9,093,267

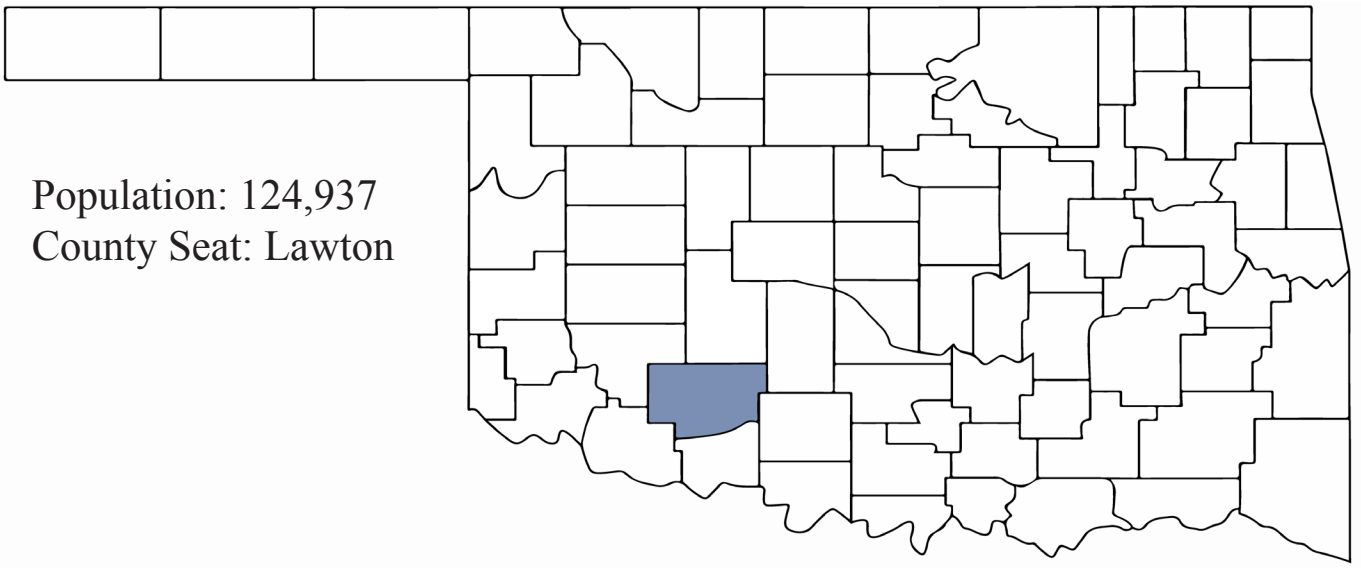
Owner-Paid Taxes
$0

Forecast Revenues

OTC Reimbursements
$62,404,126

Owner-Paid Taxes
$119,325,551

Comanche County



Population: 124,937
County Seat: Lawton

Total Tax Revenues from Wind
$23,310,996

Historical Revenues

OTC Reimbursements
$8,786,986

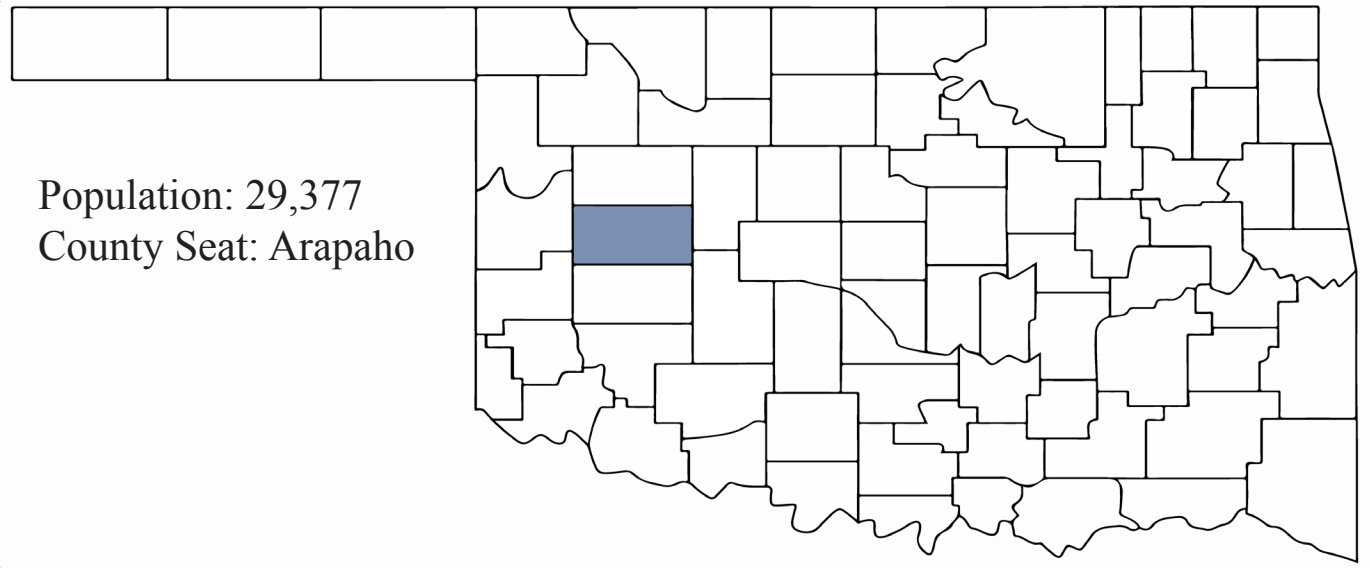
Owner-Paid Taxes
$1,877,660

Forecast Revenues

OTC Reimbursements
$0

Owner-Paid Taxes
$12,646,350

Custer County



Population: 29,377
County Seat: Arapaho

Total Tax Revenues from Wind
$49,508,314

Historical Revenues

OTC Reimbursements
$8,530,650

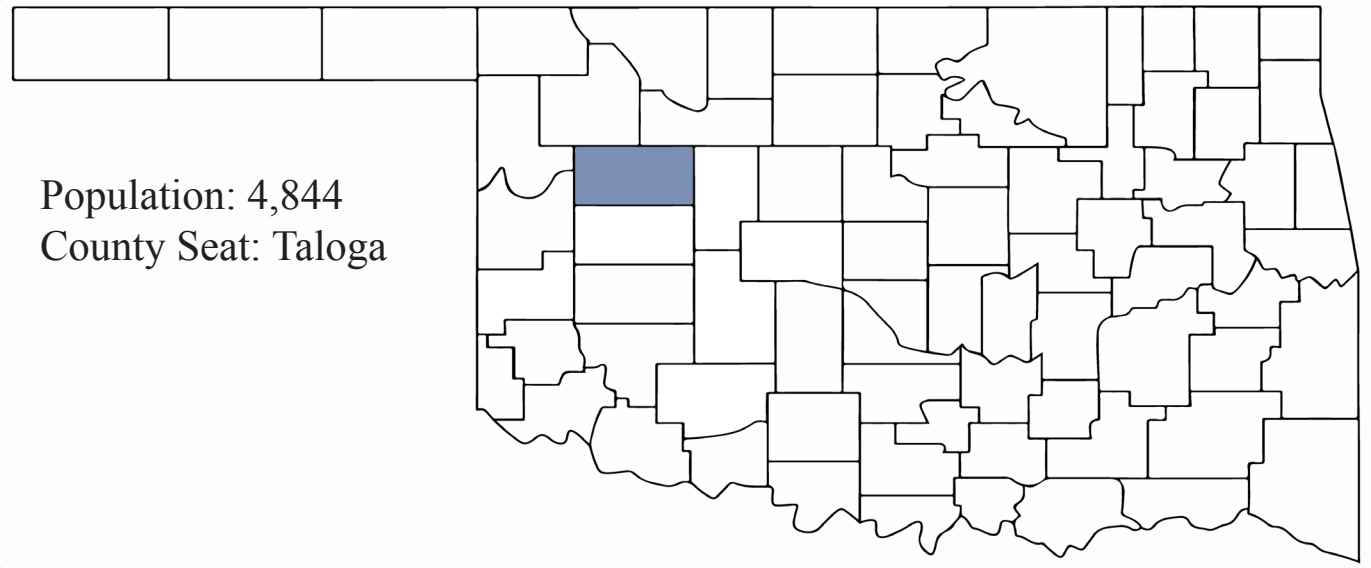
Owner-Paid Taxes
$4,008,487

Forecast Revenues

OTC Reimbursements
$10,210,987

Owner-Paid Taxes
$26,758,191

Dewey County



Total Tax Revenues from Wind
$94,973,076

Historical Revenues

OTC Reimbursements
$4,709,009

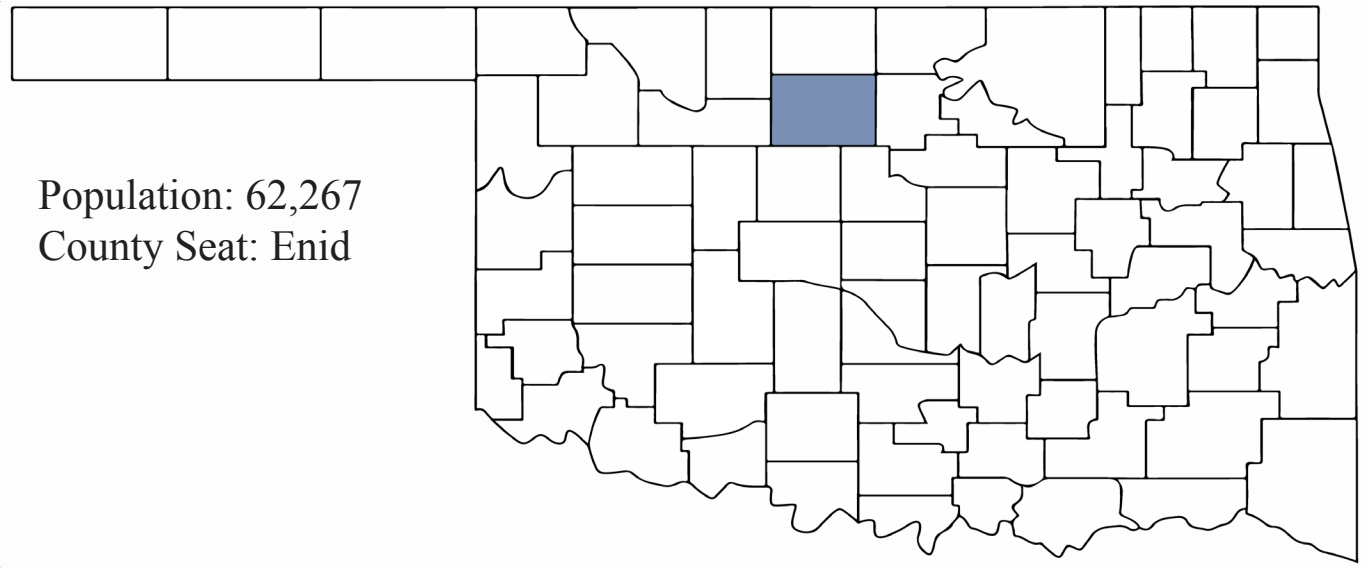
Owner-Paid Taxes
$26,490

Forecast Revenues

OTC Reimbursements
$30,718,549

Owner-Paid Taxes
$59,519,028

Garfield County



Population: 62,267
County Seat: Enid

Total Tax Revenues from Wind
$69,148,008

Historical Revenues

OTC Reimbursements
$6,902,905

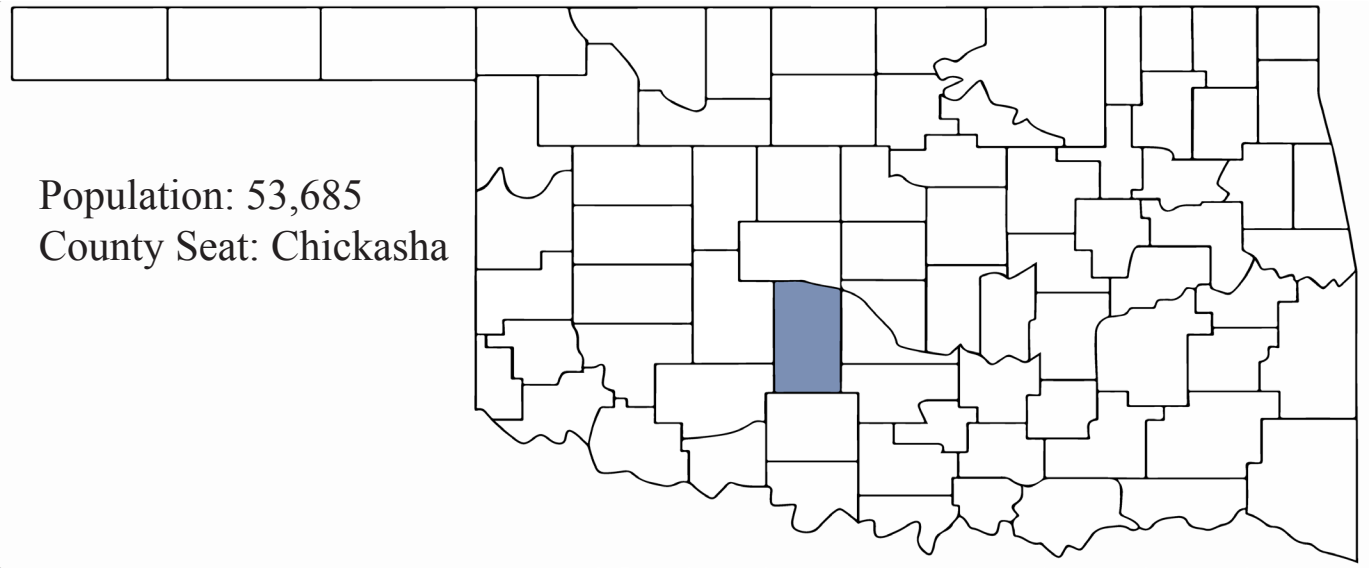
Owner-Paid Taxes
$0

Forecast Revenues

OTC Reimbursements
$18,975,133

Owner-Paid Taxes
$43,269,971

Grady County



Total Tax Revenues from Wind
$51,246,124

Historical Revenues

OTC Reimbursements
$7,816,137

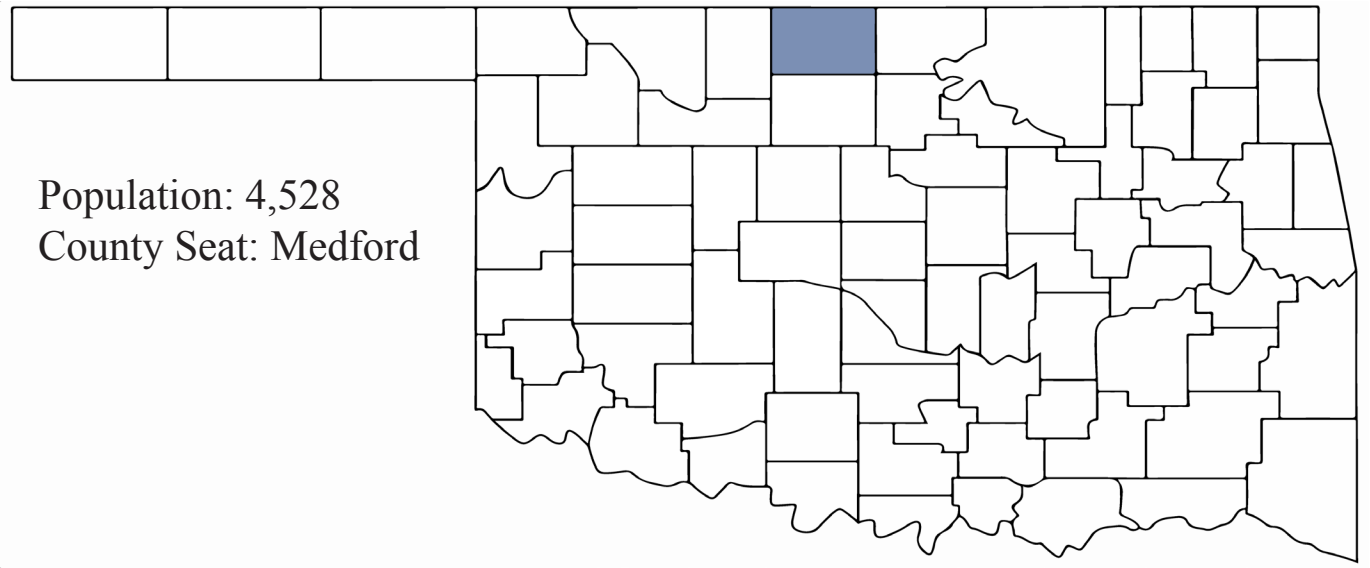
Owner-Paid Taxes
$0

Forecast Revenues

OTC Reimbursements
$11,463,635

Owner-Paid Taxes
$31,966,352

Grant County



Population: 4,528
County Seat: Medford

Total Tax Revenues from Wind
$28,903,421

Historical Revenues

OTC Reimbursements
$1,101,623

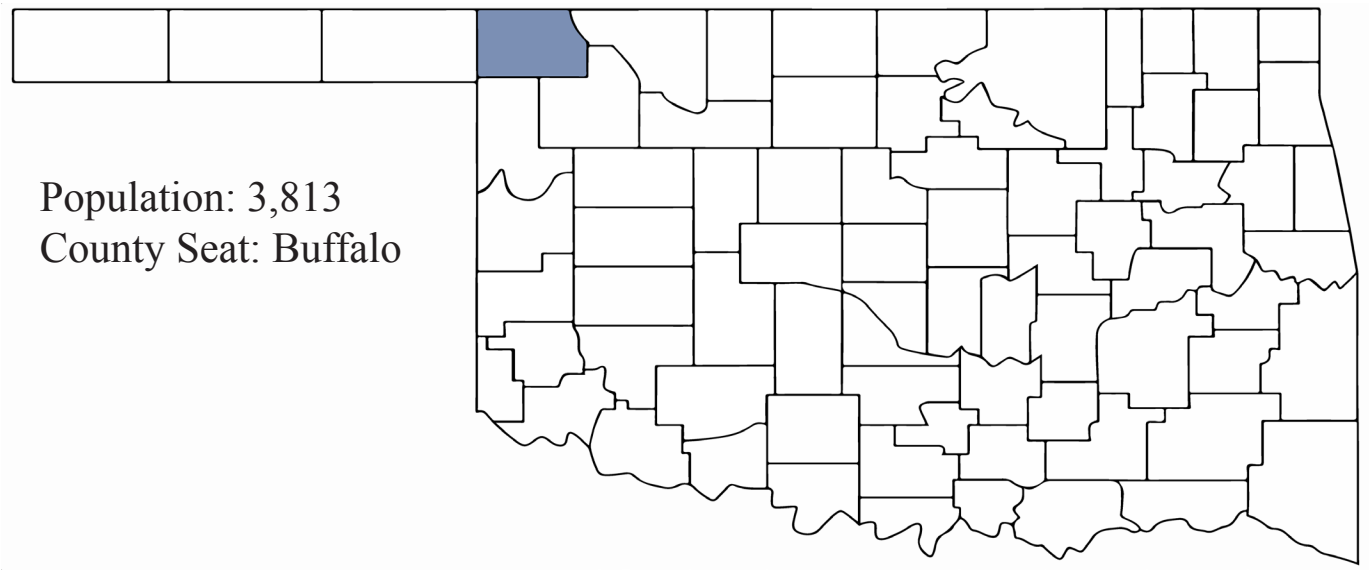
Owner-Paid Taxes
$0

Forecast Revenues

OTC Reimbursements
$9,688,630

Owner-Paid Taxes
$18,113,169

Harper County



Population: 3,813
County Seat: Buffalo

Total Tax Revenues from Wind
$160,230,086

Historical Revenues

OTC Reimbursements
$7,677,653

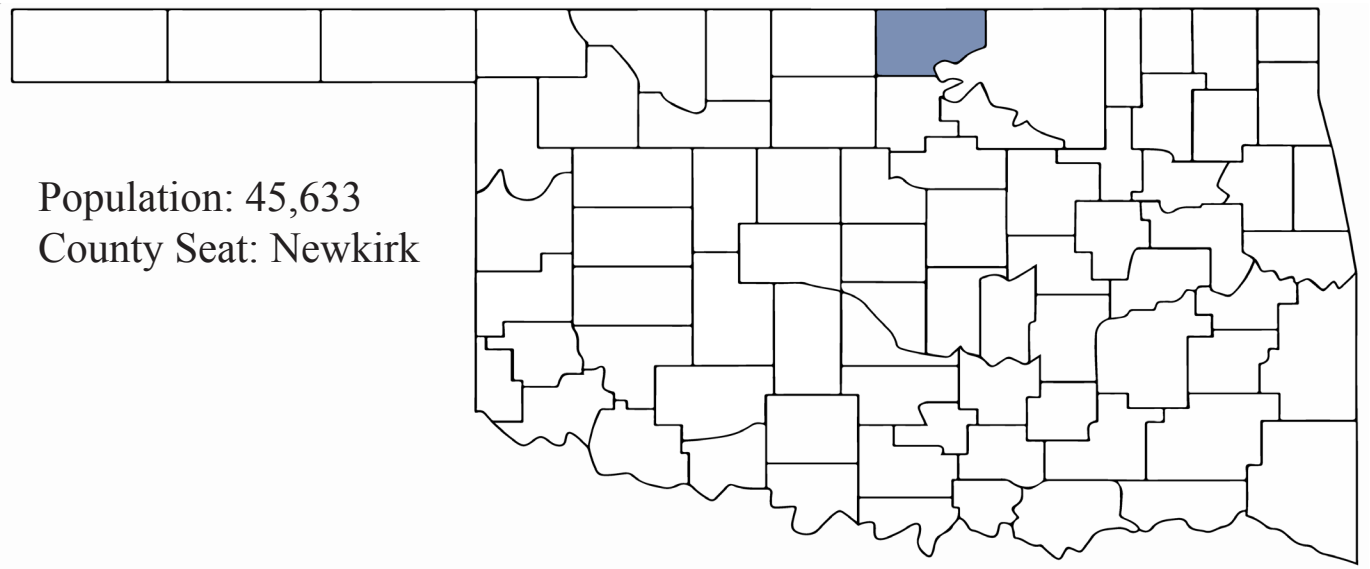
Owner-Paid Taxes
$2,897,916

Forecast Revenues

OTC Reimbursements
$52,218,626

Owner-Paid Taxes
$97,435,891

Kay County



Population: 45,633
County Seat: Newkirk

Total Tax Revenues from Wind
$106,834,028

Historical Revenues

OTC Reimbursements
$2,392,035

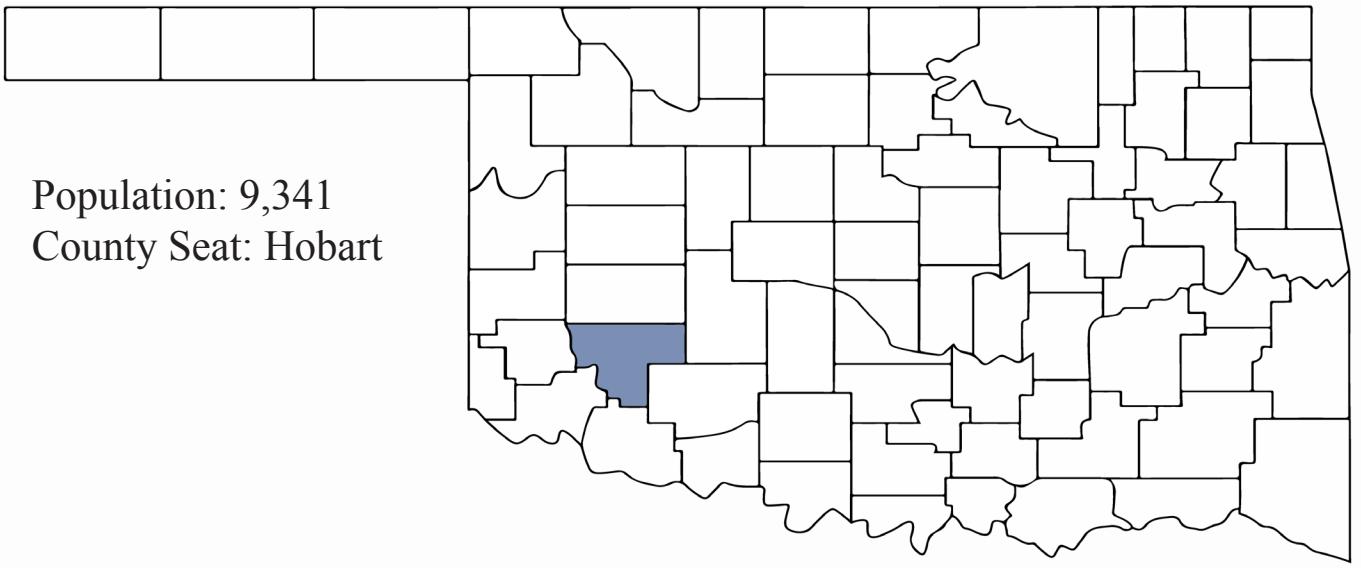
Owner-Paid Taxes
$12,571

Forecast Revenues

OTC Reimbursements
$37,454,864

Owner-Paid Taxes
$66,974,558

Kiowa County



Population: 9,341
County Seat: Hobart

Total Tax Revenues from Wind
$38,423,793

Historical Revenues

OTC Reimbursements
$6,464,434

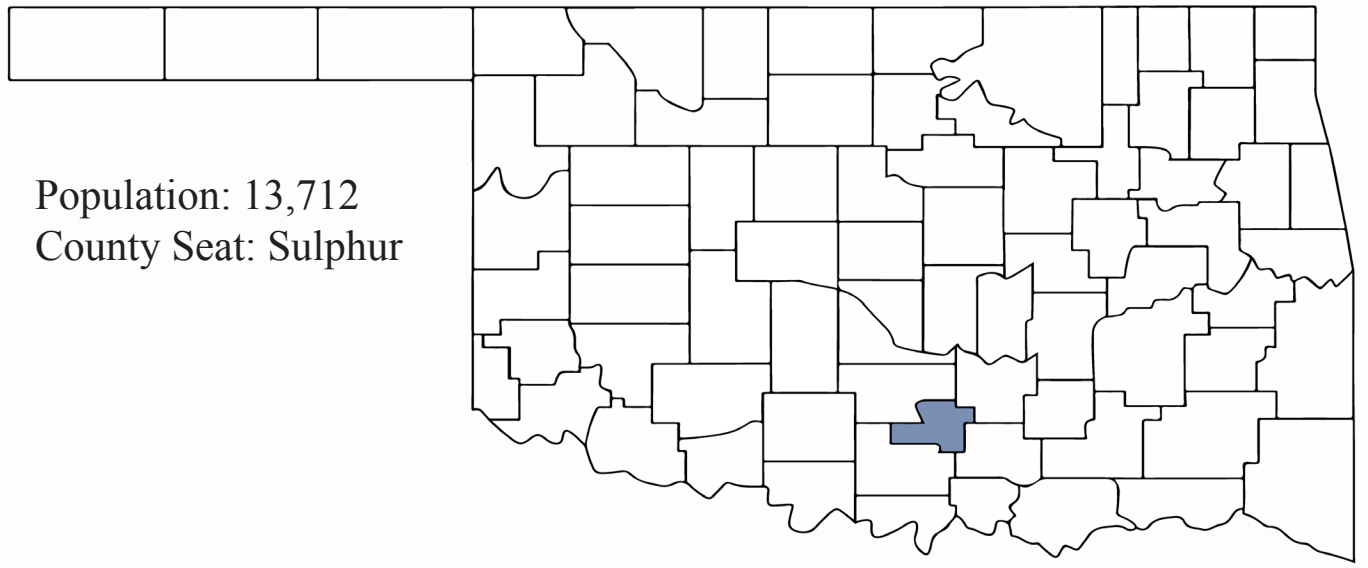
Owner-Paid Taxes
$2,662,906

Forecast Revenues

OTC Reimbursements
$7,864,869

Owner-Paid Taxes
$21,431,584

Murray County



Population: 13,712
County Seat: Sulphur

Total Tax Revenues from Wind
$51,528,031

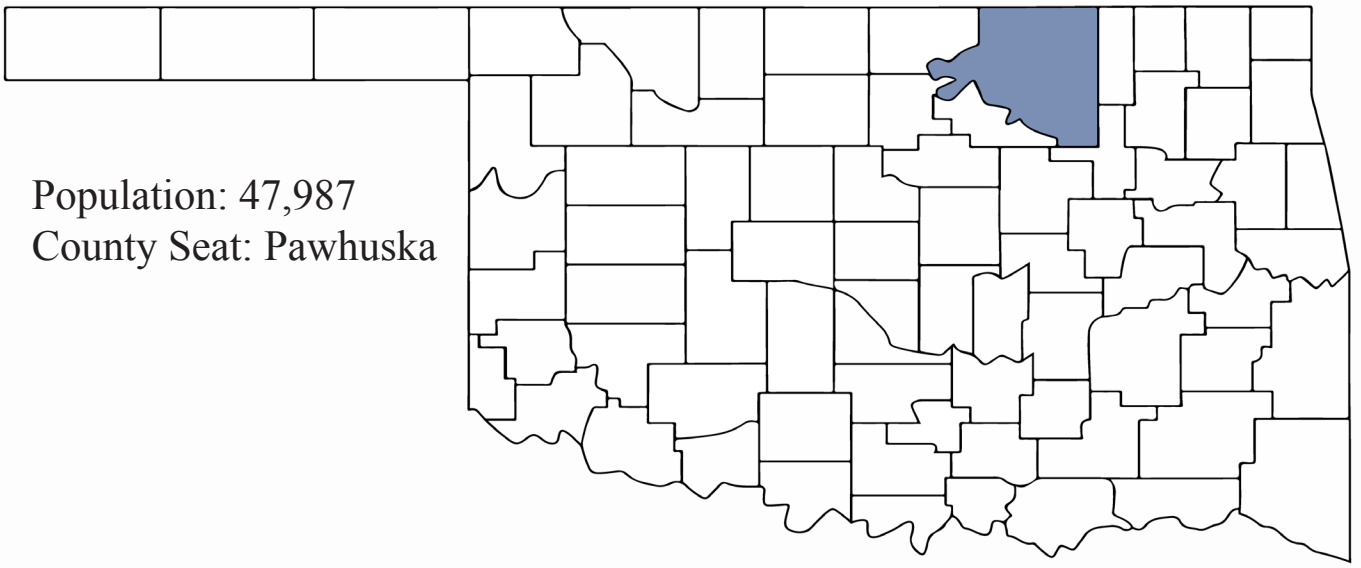
Historical Revenues

OTC Reimbursements	Owner-Paid Taxes
$0	$0

Forecast Revenues

OTC Reimbursements	Owner-Paid Taxes
$19,208,942	$32,319,089

Osage County



Population: 47,987
County Seat: Pawhuska

Total Tax Revenues from Wind
$62,273,498

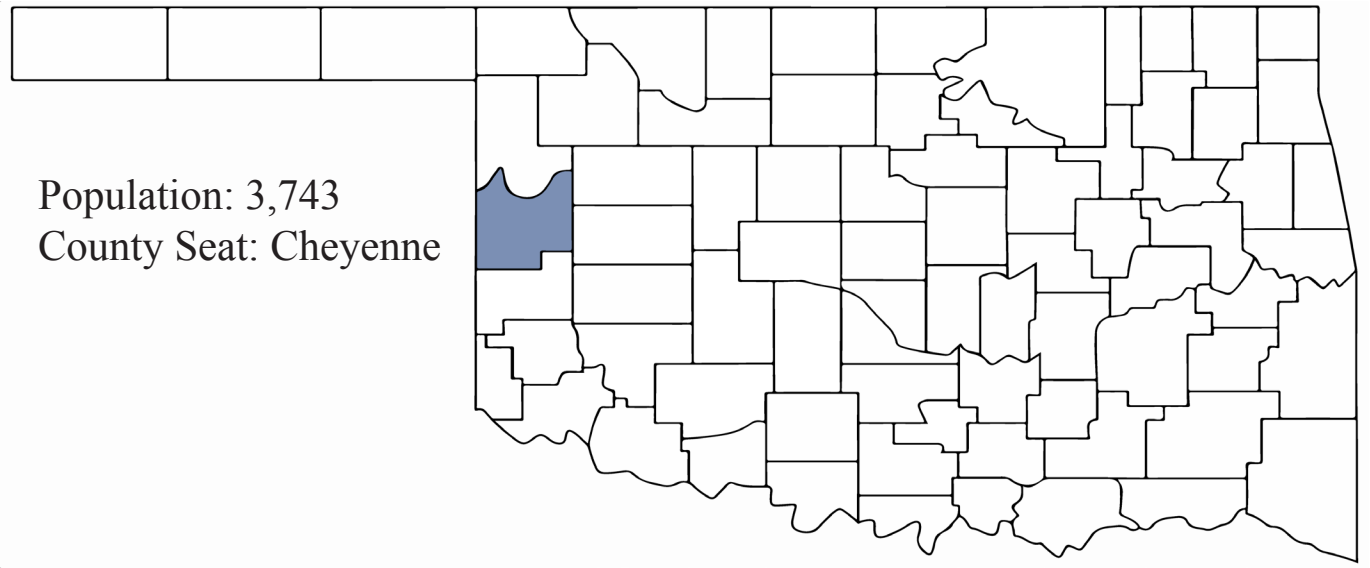
Historical Revenues

OTC Reimbursements	Owner-Paid Taxes
$0	$0

Forecast Revenues

OTC Reimbursements	Owner-Paid Taxes
$23,326,560	$38,946,939

Roger Mills County



Population: 3,743
County Seat: Cheyenne

Total Tax Revenues from Wind
$79,596,871

Historical Revenues

OTC Reimbursements
$24,298,729

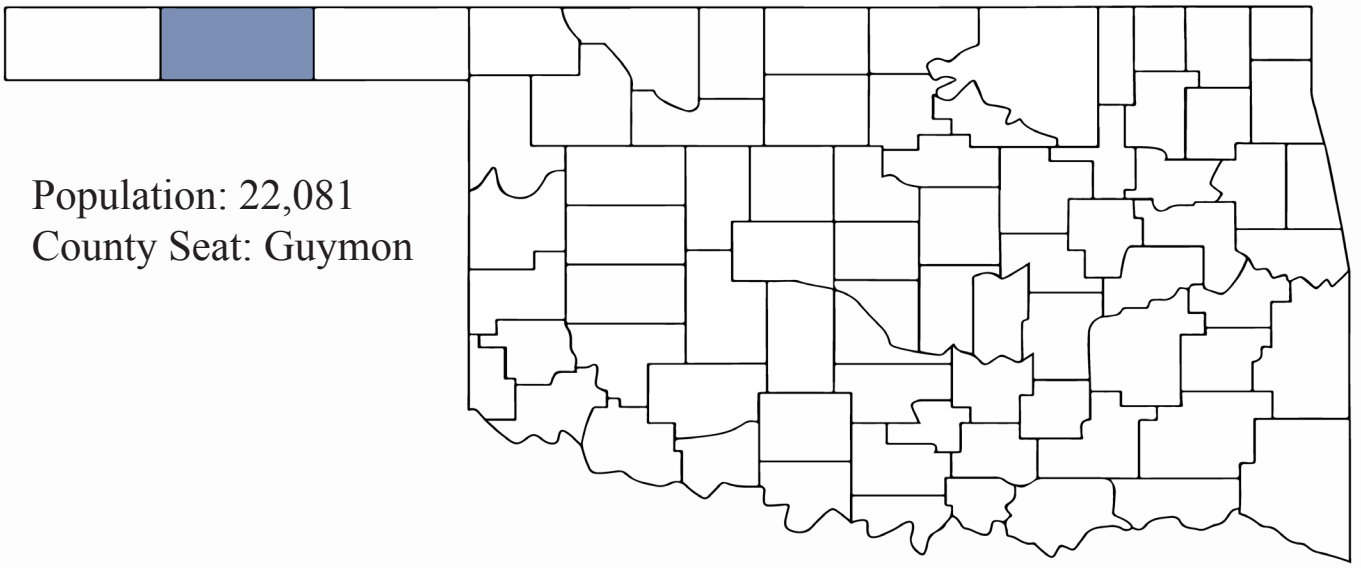
Owner-Paid Taxes
$1,554,291

Forecast Revenues

OTC Reimbursements
$4,626,871

Owner-Paid Taxes
$49,116,980

Texas County



Population: 22,081
County Seat: Guymon

Total Tax Revenues from Wind
$100,296,821

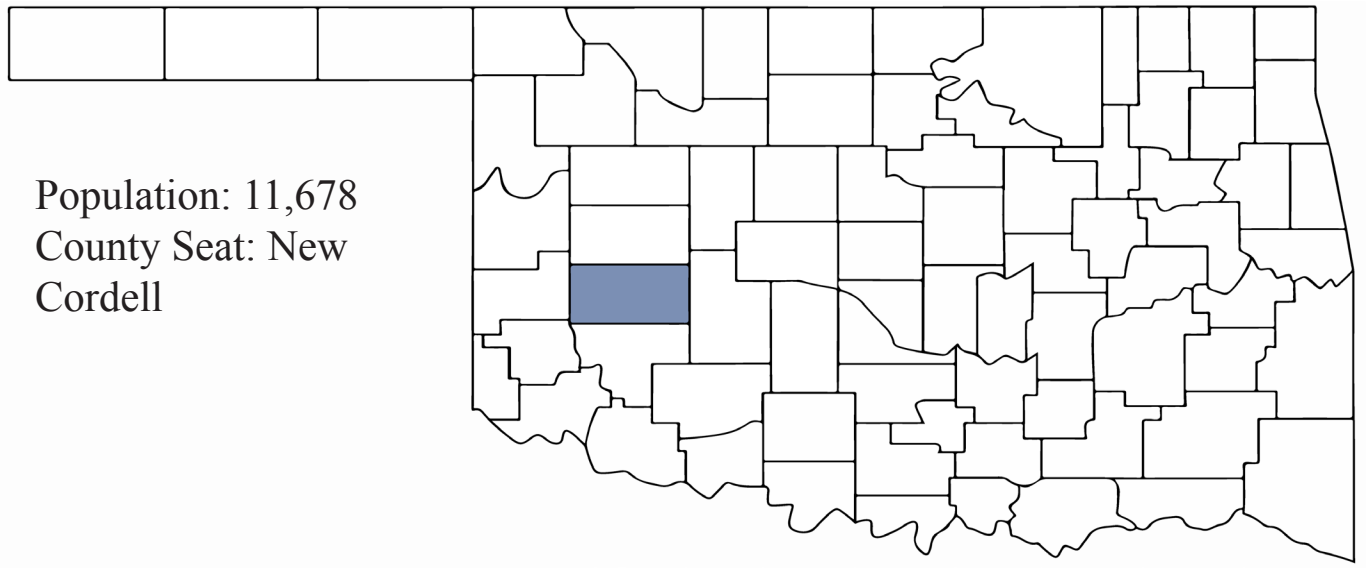
Historical Revenues

OTC Reimbursements	Owner-Paid Taxes
$3,546,316	$0

Forecast Revenues

OTC Reimbursements	Owner-Paid Taxes
$33,881,100	$62,869,405

Washita County



Population: 11,678
County Seat: New Cordell

Total Tax Revenues from Wind
$19,346,771

Historical Revenues

OTC Reimbursements
$3,613,591

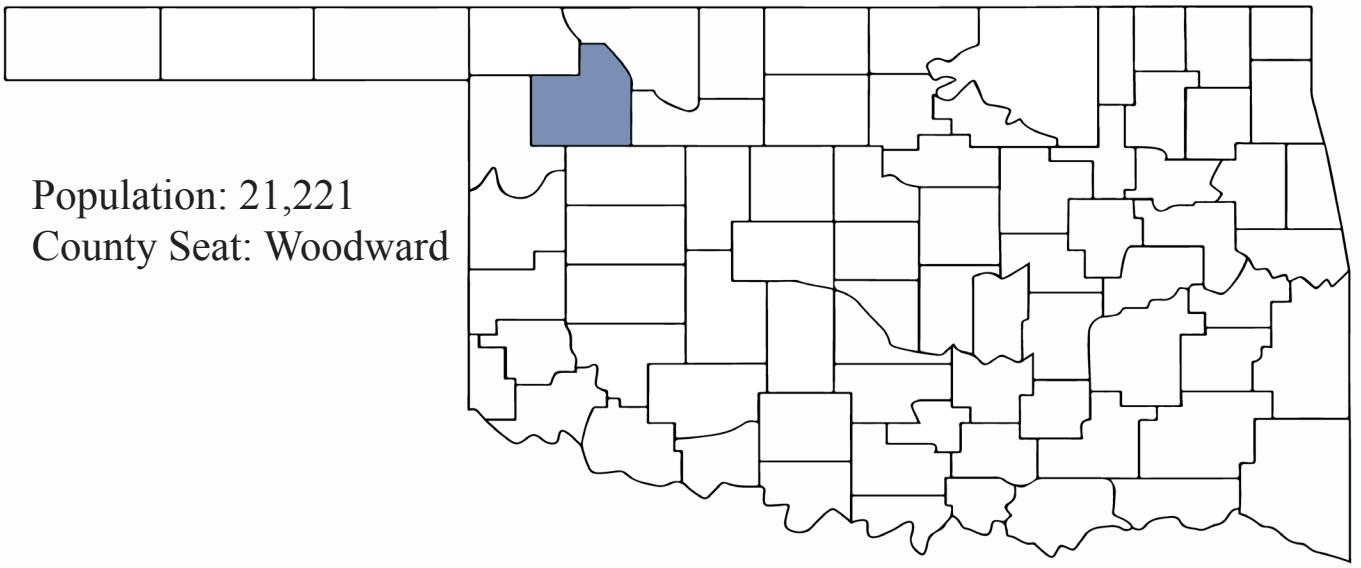
Owner-Paid Taxes
$415,493

Forecast Revenues

OTC Reimbursements
$3,626,334

Owner-Paid Taxes
$11,691,353

Woodward County



Population: 21,221
County Seat: Woodward

Total Tax Revenues from Wind
$166,774,444

Historical Revenues

OTC Reimbursements
$11,796,210

Owner-Paid Taxes
$1,352,869

Forecast Revenues

OTC Reimbursements
$49,279,498

Owner-Paid Taxes
$104,345,867

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End-Notes

[1] *"Lance Brown: Wind energy tax credits are working for Oklahoma", Tulsa World - April 15, 2016. See http://www.tulsaworld.com/opinion/readersforum/lance-brown-wind-energy-tax-credits-are-working-for-oklahoma/article_ceffb61b-35f9-57f8-a762-2c6c531e7253.html*

[2] *From the latest EIA figures, Wind's net electricity generation for Oklahoma was 14,018,000 MWh's for 2015. See http://www.eia.gov/electricity/data/browser*

[3] *Latest figures are from the EIA Oklahoma energy profile. See http://www.eia.gov/electricity/data/browser*

[4] *Latest numbers from the Energy Information Administration show that both residential and commercial electricity prices are more than 20% lower than the U.S. national averages for each.*

[5] *See Ferrell and Conaway (2015), p. 35*

[6] *As of 2014, Oklahoma is a top natural gas producer, accounting for 7.4% of U.S. gross production according to the U.S. Energy Information Administration (assessed 11/1/16—See https://www.eia.gov/state/print.cfm?sid=OK)*

[7] *In his 2013 study, Mark Bolinger digs deep into the complementary relationship between wind generation and natural gas, finding key benefits despite the recent low cost of natural gas.*

[8] *See "The Statewide Economic Impact of Wind Energy Development in Oklahoma: An Input-Output Analysis by Parts Examination"— by Kyle Dean, PhD, and Russell Evans, PhD (2014)*

[9] *AWEA 2015 annual market update reports OK having between 7,001-8,000 FTE equivalent jobs directly associated with wind energy project planning, siting, development, construction, manufacturing and supply chain, and operations.*

[10] *See AWEA Wind Industry Top Facts 2015*

[11] *According to the 2015 annual market report by the AWEA (American Wind Energy Association) there has been $9.6 billion of cumulative investment in wind energy projects.*

[12] *See p. 23 "Wind Energy Industry Impacts in Oklahoma" (November 2015), Ferrell and Conaway*

[13] *See "Wind Energy Industry Impacts in Oklahoma" (November 2015), Ferrell and Conaway*

[14] *"Of these funds, more than $918 million will be paid in millages to local school districts, more than $78 million will be paid in the form of counties' 4-mill levies (which are redistributed to local school districts in proportion to their average daily attendance), and more than $174 million will be paid in millages attributable to Career Tech schools."— See p. 19 "Wind Energy Industry Impacts in Oklahoma" (November 2015), Ferrell and Conaway*

[15] *See AWEA Wind Industry Top Facts 2015*

[16] *See p. 17 - "The Statewide Economic Impact of Wind Energy Development in Oklahoma: An Input-Output Analysis by Parts Examination" by Economic Impact Group LLC, March 2014*

[17] *AWEA 2015 annual market update reports OK having between 7,001-8,000 FTE equivalent jobs directly associated with wind energy project planning, siting, development, construction, manufacturing and supply chain, and operations.*

[18] *According to the 2015 annual market report by the AWEA (American Wind Energy Association) there has been $9.6 billion of cumulative investment in wind energy projects.*

[19] *See: 70 Okla. Stat. § 18-201.1(B)(3)(c).*

[20] *See: "Wind Energy and Oklahoma Education - OPSRC Data Study" by Andy Evans, Tom Curran, and Seth Hill (2016).*

[21] *See: Ferrell and Conaway (2015) p.19*

[22] *See: Evans, Curran, and Hill (2016) p.9*