

## Background

### *Wind Energy*

Wind energy is a renewable energy source, because there is not a finite amount of wind that could be used up. Renewable energy, like wind, is known to have environmental benefits. For example, unlike more traditional fuel sources, wind energy produces nominal air or water pollution when generating electricity.

Industrial wind generating facilities are commonly called “wind farms”. They consist of a number of individual towers with multi-bladed turbines mounted on top that turn in the wind, generating electricity. The electrical energy produced from a wind farm or any other generating facility is measured in kilowatt hours (kwh). That is the number of kilowatts of electricity generated over a one-hour period. Each wind farm has a rated capacity for electrical generation consisting of the total of rated capacity of all turbines to be installed in a project. The electricity is conveyed from the site of the turbine to a substation and then transferred to the regional power grid consisting of high voltage transmission lines used to transmit the electricity to the end user.<sup>1</sup>

After the initial capital investment for the generating facilities and the infrastructure to transmit the electricity from remote locales have been amortized, wind is one of the lowest cost renewable energy sources available for electricity generation.<sup>2</sup> The operating costs consist of repair, replacement and management costs since there are no fuel costs for electricity generated from wind. According to Wisser and Bolinger “turbine scaling and other

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<sup>1</sup> <http://plainswindeis.anl.gov/guide/transmission/index.cfm>, 04/18/2016

<sup>2</sup> <http://energy.gov/eere/wind/advantages-and-challenges-wind-energy>, 04/18/2016

improvements to turbine efficiency” have helped drive down the price of generating electricity from wind energy in recent years.<sup>3</sup>

The real challenge for renewables is not electricity generation, but getting the energy to the places that need to be supplied with power in the form of electricity. The best sources of wind are located in rural areas which means generators are “located far from existing load centers and will thus necessitate expansion of the transmission system, often via unusually long transmission lines.”<sup>4</sup> The primary job of grid managers is to make sure there is balance on the grid. Whatever power is going in must also equal the power going out. If the power in does not equal the power out the system becomes unstable and power failures may occur. Wind produces electrical output “that is variable over time and imperfectly predictable, making it harder for system operators to match generation and load at every instance.”<sup>5</sup> It is tricky to balance the grid when the wind changes unexpectedly and grid managers must compensate to keep the balance. Grid managers must compensate by pulling electricity from more reliable energy sources such as gas fired generating plants to respond to the changes in demand. In order to pay for wind energy one must also pay for the generating capacity to be held in reserve to balance the grid when the wind stops blowing. Lack of sufficient transmission capacity may result in congestion causing all or some of the power generated from a wind turbine to be unusable. Utility scale wind generators produced on average at 32.5% of their

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<sup>3</sup> <http://energy.gov/sites/prod/files/2015/08/f25/2014-Wind-Technologies-Market-Report-8.7.pdf> pg 56, April 12, 2016

<sup>4</sup> [https://mitei.mit.edu/system/files/Electric\\_Grid\\_Full\\_Report.pdf](https://mitei.mit.edu/system/files/Electric_Grid_Full_Report.pdf), April 17, 2016

<sup>5</sup> [https://mitei.mit.edu/system/files/Electric\\_Grid\\_Full\\_Report.pdf](https://mitei.mit.edu/system/files/Electric_Grid_Full_Report.pdf), April 17, 2016

rated capacity in the United States during 2015.<sup>6</sup> This was partly due to the fact that the wind does not always blow leaving the turbines motionless and partly because the electricity was being generated at times or in amounts that were not needed. That same year geothermal produced at 74%, nuclear at 91.7%, and coal at 61% of their respective capacities.<sup>7</sup>

Germany is currently generating more than 25% of its electricity from renewable sources and is struggling with maintaining stability of its grid to prevent blackouts. Clements Triebel, of the German energy management company Younicos, explains that as the percentage of energy generated from renewables on the European grid reaches ten percent there are “two systems fighting against each other” and Germany has had to sometimes shut down wind turbines because the grid cannot handle the electricity produced. Eventually, “Germany and the world will need to develop a massive storage infrastructure for intermittent wind and solar electricity.” (Thomson). That kind of infrastructure would be very costly. Transmission lines are very expensive and take around five to seven years to build. Wind farms are popping up in less than a year’s time. (Profita)

### *Growth of the Wind Industry*

Over the last decade there has been a massive boom in wind industry installations nationally and in Oklahoma. Net generation from wind in the United States grew 1,184% in ten years between 2004 and 2014.<sup>8</sup> In 2015 the US installed 8,598 MW of wind generating capacity,

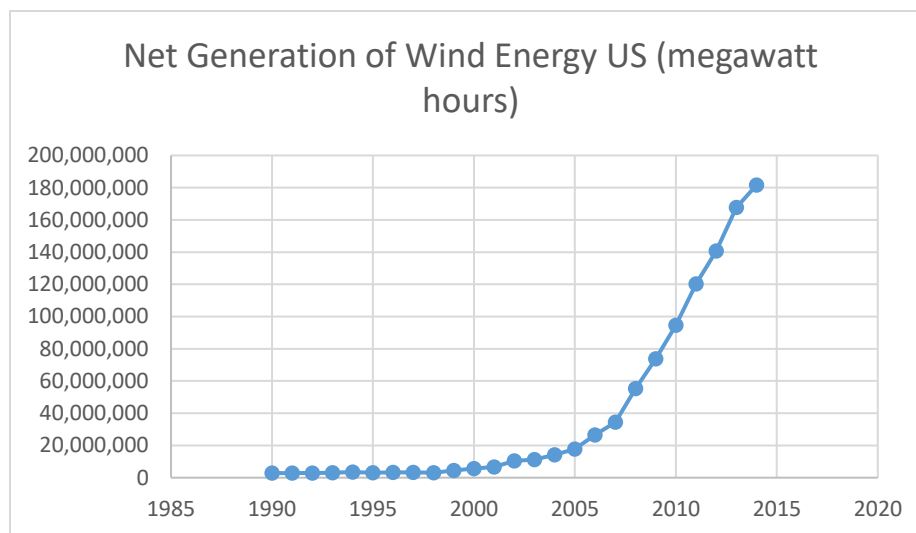
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<sup>6</sup> [http://www.eia.gov/electricity/monthly/epm\\_table\\_grapher.cfm?t=epmt\\_6\\_07\\_b](http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_6_07_b), April 17, 2016

<sup>7</sup> [http://www.eia.gov/electricity/monthly/epm\\_table\\_grapher.cfm?t=epmt\\_6\\_07\\_b](http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_6_07_b), April 17, 2016

<sup>8</sup> <https://www.eia.gov/electricity/data/state/>, 04/14/2016

a 77% increase from the year before.<sup>9</sup> More rated megawatt capacity was installed during the fourth quarter of 2015 than in all of 2014. Oklahoma has seen a rapid expansion of the number and size of industrial wind turbine facilities in the last fifteen years. The state had 1,128 megawatts of wind generating capacity installed prior to 2010. Currently, Oklahoma is home to 5,184 megawatts of capacity.<sup>10</sup> This represents over a 400% increase in capacity in five years. Oklahoma finished second among the states in capacity installed in 2015 and is currently ranked fourth in installed total wind capacity and number of turbines, ranked among Texas and California despite having approximately one-quarter of their land area.

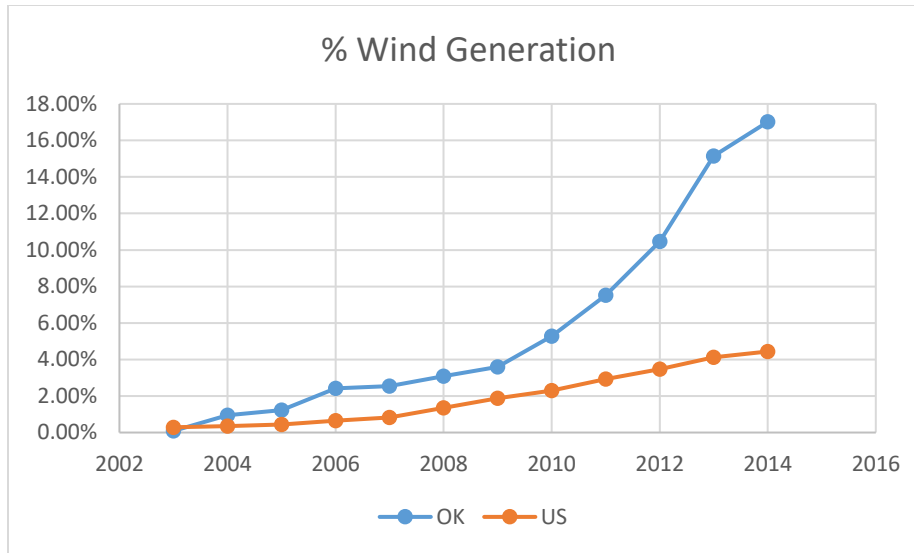


Source: <https://www.eia.gov/electricity/data/state/>

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<sup>9</sup> <http://awea.files.cms-plus.com/FileDownloads/pdfs/4Q2015%20AWEA%20Market%20Report%20Public%20Version.pdf>, 04/14/2016

<sup>10</sup> <http://awea.files.cms-plus.com/FileDownloads/pdfs/4Q2015%20AWEA%20Market%20Report%20Public%20Version.pdf>, 04/14/2016



Source: <https://www.eia.gov/electricity/data/state/>

### *Government Renewable Policy*

To date twenty-nine US states have adopted Renewable Portfolio Standards and eight states have established renewable energy goals. Oklahoma is among the eight that have set a renewable energy goal. (Durkay) Oklahoma’s venture into the politics of renewable energy began in earnest in May 2010 when the Oklahoma Legislature enacted the Oklahoma Energy Security Act. The Act established a renewable energy goal for electric utilities of 15% of the total installed generation capacity in Oklahoma to be derived from renewable resources by 2015. This goal was met in 2013 and surpassed in 2014 and 2015. In their 2014 Report on the Oklahoma Energy Security Act, The Oklahoma Corporation Commission calculated the total amount of electricity generated in Oklahoma from renewable energy for 2013 as 18.42% and 2014 as 20.85%.<sup>11</sup> In the same report, the Corporation Commission expressed that the increase from year to year was due to new wind farms coming online. Wind projects totaling 1402

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<sup>11</sup> [http://www.okstatechamber.com/sites/www.okstatechamber.com/files/ADV\\_Web.pdf](http://www.okstatechamber.com/sites/www.okstatechamber.com/files/ADV_Web.pdf), 04/16/2016

Megawatts of capacity came on-line in 2015 and an additional 695 megawatts of capacity are to be completed before the end of 2016.<sup>12,13</sup>

### *Oklahoma Tax Credits*

The State of Oklahoma currently has two major tax subsidies that apply to the wind industry. The first is a Zero Emission Facility Tax Credit (68 OSA 2357.32A).<sup>14</sup> This is a ten-year credit at \$0.005 per kilowatt hour (kWh) generated from a Wind Power Facility. This credit expires for Wind Generation facilities coming on line after January 1, 2021. The Zero Emission Tax credit is an unusual credit for Oklahoma due to its refundable nature. Unused tax credits earned after January 1, 2014 may be presented to the State Treasurer for reimbursement in cash at 85% of the face value. The zero emission credits are expected to amount to \$88 million in fiscal year 2016 and grow to \$123 million in the following fiscal year. (Monies)

The second Oklahoma tax subsidy is an Ad Valorem Exemption (68 OSA 2902).<sup>15</sup> Oklahoma offers a five-year ad valorem property tax exemption for industrial wind power generators. To qualify for this exemption in a county with a population of 75,000 people or less there must be an initial investment of at least \$250,000 and an additional of \$250,000 in annual payroll in the company. Companies in larger counties are required to have an additional \$1,000,000 in annualized payroll to file for the exemption. Wind power generators are exempt from the payroll requirement if there is an increase of \$2,000,000 or more in capital improvements while maintaining or increasing payroll. These limitations are not large enough

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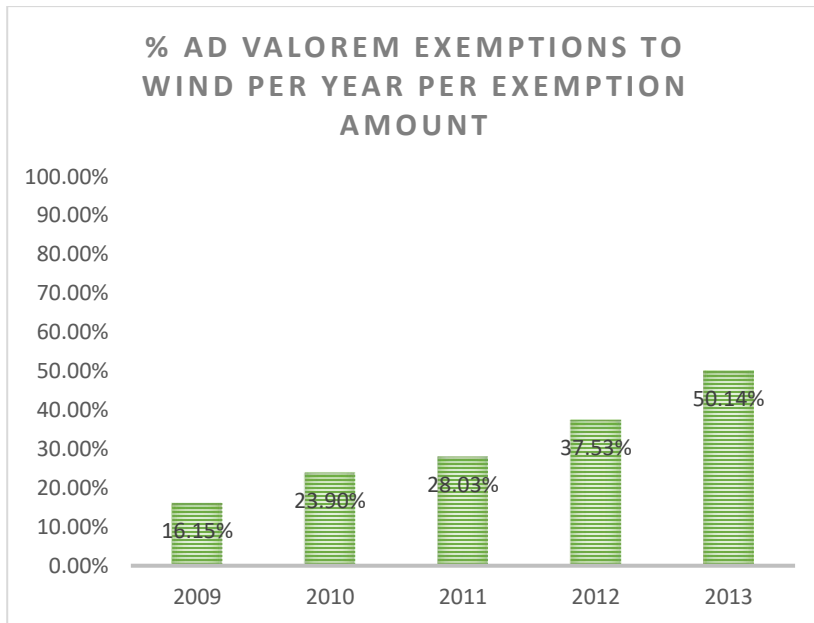
<sup>12</sup> <http://newsok.com/article/5475177>, April 12, 2016

<sup>13</sup> [https://www.ok.gov/treasurer/documents/OER\\_3-31-16.pdf](https://www.ok.gov/treasurer/documents/OER_3-31-16.pdf), April 12, 2016

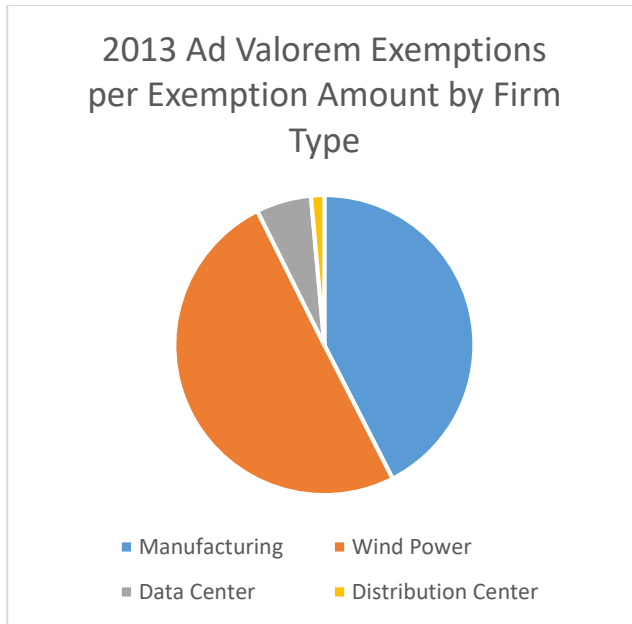
<sup>14</sup> <http://law.justia.com/codes/oklahoma/2006/os68.html>, 04/19/2016

<sup>15</sup> <http://law.justia.com/codes/oklahoma/2006/os68.html>, 04/19/2016

to limit commercial wind projects when companies make investments in the hundreds of millions for a project. This exemption will expire for wind facilities put in operation after January 1, 2017. Facilities currently in operation or put in operation during 2016 will still receive the exemption for the full five years. The amount of exemptions given to the wind industry now represents over 50% of ad valorem tax exemptions granted by the State. The State Chamber of Oklahoma’s Economic Assessment of the Oklahoma Manufacturer’s Ad Valorem Tax Exemption in 2013 reports \$32,270,226 in property tax exemptions to “Wind Power.” It is now estimated by State Auditor Gary Jones that “Oklahoma is paying for \$44.9 million of wind’s property taxes to schools.” (Jones)



Source: [http://www.okstatechamber.com/sites/www.okstatechamber.com/files/ADV\\_Web.pdf](http://www.okstatechamber.com/sites/www.okstatechamber.com/files/ADV_Web.pdf)



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### *Federal Incentives*

Arguably the most important federal incentive is the Federal Production Tax Credit (PTC). The PTC is a corporate tax credit applicable to the following technologies: geothermal electric, biomass, hydroelectric, municipal solid waste, landfill gas, tidal, wave, ocean thermal, and wind. For wind, geothermal and closed-loop biomass this is a \$0.023/kwh tax credit adjusted for inflation. Although originally enacted in 1992 the PTC has been renewed and expanded many times since then. This credit lasts ten years after the date the facility is in operation. The most recent extension of the PTC set up a phase-down beginning for wind projects starting construction in 2017. For wind facilities that begins construction in 2017 the PTC amount is reduced to 80%, 60% for facilities beginning construction 2018, and 40% to projects beginning construction 2019. The Consolidations Appropriations Act that set the phase-down extended the expiration date from January 1, 2015 to January 1, 2020.

(Consolidated Appropriations Act, 2016 Division P Title 3 Sec 301). Wisner and Bolinger point out



the importance of the PTC and the weight it carries “is illustrated by the pronounced lulls in wind additions in the four years in which the PTC lapsed as well as the increased development activity often seen during the year in which the PTC is otherwise scheduled to expire.” (2014 Wind Technologies Market Report 62)

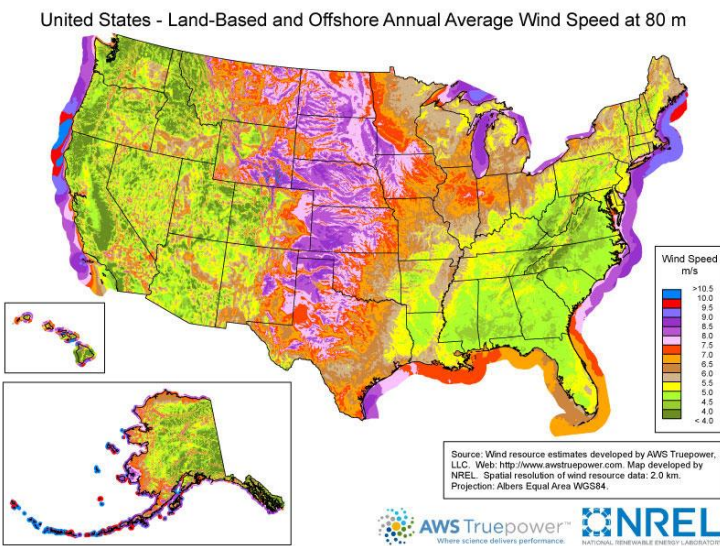
### **Are the Oklahoma Tax Incentives Worth it?**

Wind companies have held that the tax incentives are necessary for Oklahoma to “compete” with surrounding states for the construction of industrial wind farms. Our neighboring State of Kansas has adopted a renewable portfolio standard (RPS) that required the state's investor-owned utilities and electric cooperatives to generate or purchase 20% of the affected utility's peak demand from eligible renewable resources for each calendar year beginning in 2020. According to the American Wind Energy Association, Kansas generated 21.7% of its electricity from wind energy in 2014, exceeding their goal. In May 2015 S.B. 91 was enacted changing the RPS from a standard to a voluntary goal. Kansas only has one tax incentive aimed at drawing wind companies to the State. Kansas Statutes 79-201 exempts renewable energy equipment from property taxes forever if an application is filed before Dec 31, 2016. Starting in 2017 a property tax exemption is limited to the 10 taxable years immediately following the taxable year in which construction or installation of such property is completed.

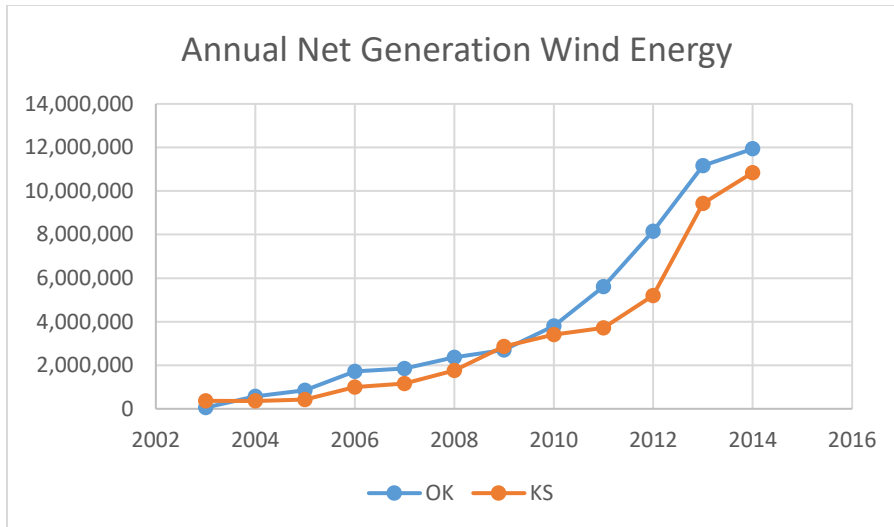
### ***Growth of wind energy in Kansas vs. Oklahoma***

Just as seen on a national level and in Oklahoma, Kansas has experienced a massive boom in wind energy throughout the past decade. Kansas has 16% more land area than

Oklahoma (over 13,000 more square miles), similar geographic features to Oklahoma, and better wind resources (see NREL map) than Oklahoma. However, Oklahoma has 14% more megawatts online and has 42.5% more megawatts under construction. When considering wind and land resources, logic says Kansas should be producing more wind energy. Even after both states met their renewable goals and standards, Oklahoma continues to push past Kansas in generation of wind energy and construction of new farms. Concerned with profitability, corporations are going to be more attracted to the most frugal investment. The tax incentives offered in Oklahoma make the state an appealing area for corporations to invest in wind projects.



Source: <http://www.nrel.gov/gis/wind.html>



Source: <https://www.eia.gov/electricity/data/state/>

## Case Studies

In order to better understand the costs and benefits of Oklahoma’s wind energy tax credits, below I present two case studies. In each case study I will discuss specific facts, costs and benefits of two wind farms in Oklahoma.

### *Drift Sand Project*

The Drift Sand Project is a subsidiary of Enel Kansas, LLC, part of the Italian multinational corporation Enel Green Power, and is anticipated to be in operation by the end of 2016. Drift Sand Wind Project, LLC is investing \$180 million in the construction and development of the project located in Grady County, Oklahoma. This wind farm has a total installed capacity of 108 megawatts and is expected to produce 480 gigawatts of electricity annually.<sup>16</sup> The average size of a commercial wind operation in Oklahoma is 137.15 megawatts. From the state of Oklahoma, Drift Wind will receive over \$4 million in tax exemptions annually from this wind

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<sup>16</sup> <http://www.researchviews.com/energy/power/Wind/DealReport.aspx?DealID=1060333>, 04/19/2016

farm. \$2,400,000 per year in Oklahoma zero emission credits. Based on the investment, an estimated \$1,902,780 in property taxes per year will also be exempt and paid by the taxpayers of Oklahoma out of the general fund budget.<sup>17</sup> Drift Wind will also receive over \$11 million federal dollars in tax exemptions per year from the PTC. The project costs are estimated by Enel to be \$180 million. The federal and state tax subsidies will repay over 75% of that cost over the first 10 years of the project. In June 2015, a long term agreement was reached that sold all production and tax credits from this project to the Arkansas Electric Cooperative Corporation (AECC).<sup>18</sup>

#### *Kay Wind Farm*

Virginia based company Apex Clean Energy began work in March 2015 on Kay Wind, a wind farm located north of Ponca City in Kay County, Oklahoma. Apex articulates the project will “create jobs and generate an entirely new source of long-term revenue for local schools, government services, and property owners.”<sup>19</sup> Completed in the same year and beginning commercial operation in December 2015, this wind farm has one hundred thirty turbines and three hundred megawatts in rated capacity.<sup>20</sup> Based on rated capacity Kay Wind ties with the Canadian Hills Wind Farm as the largest wind farms in Oklahoma per rated capacity. Kay Wind, the largest wind farm in Oklahoma, will generate twelve permanent jobs. Once a wind farm is operational generally the project creates one permanent job per 10-20 megawatts of capacity. 66.67% of megawatts generated from the Kay County wind farm have been sold to WestStar to

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<sup>17</sup> <http://grady.okcountyassessors.org/other/estimator.aspx>, 04/19/2016

<sup>18</sup> <http://tradewindenergy.com/drift-sand/>, 04/09/2016

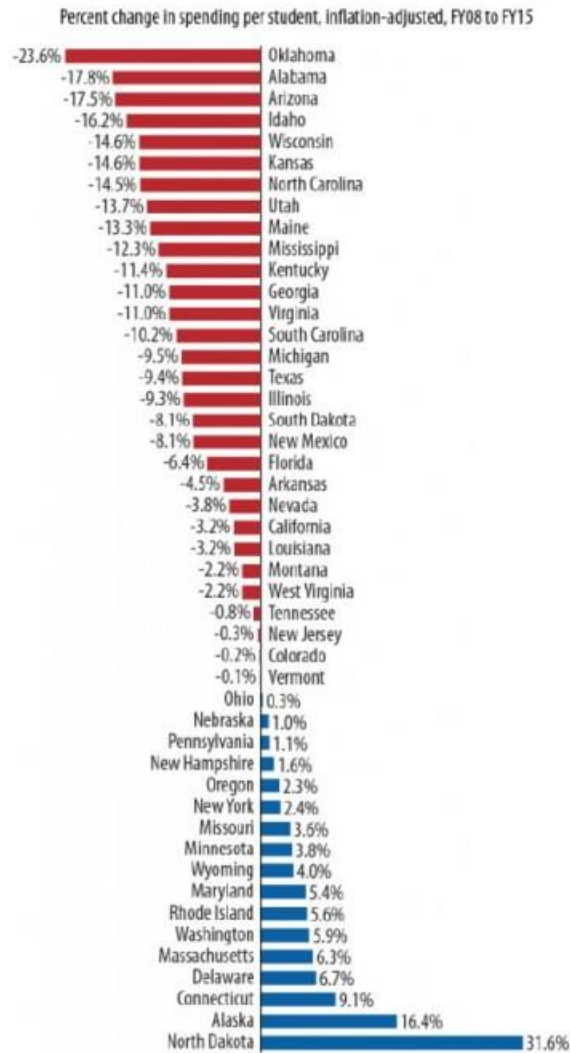
<sup>19</sup> <http://www.kaywind.com>, 04/19/2016

<sup>20</sup> <http://www.kaywind.com>, 04/19/2016

be used exclusively in Kansas. That leaves 33.33% sold to GRDA for use in Oklahoma. (Kay Wind.)

**Discussion: Opportunity Cost of Wind**

**Oklahoma education cuts still worst in the nation**



Note: Hawaii, Indiana, and Iowa are excluded because the necessary data to make a valid comparison are not available. Sources: CBPP budget analysis and National Center for Education Statistics enrollment estimates.

Source: <http://okpolicy.org/oklahoma-continues-lead-u-s-deepest-cuts-education/>

Some have found that policy efforts will likely be needed to continue to expand renewable energy on a large scale. (Wiser) Others contend that booms and busts surrounding PTC expansions and extensions suggest the level of energy investment that would be economically viable without the PTC. (Barradale) Either stance you take “Policymakers must consider both the potential costs and benefits of these policies, as well as the alternative uses of the funds required to support them.” (Wiser, 2016) Just as Oklahoma’s Budget Shortfall has expanded to \$1.3 billion and funding for public education has been cut by nearly \$110 million for the fiscal year ending in June, Oklahoma is giving the wind industry over \$200 million in tax exemptions and credits each year from zero-emission tax credits, property tax exemptions, and sales tax exemptions. (Jones,

2016) (KFOR) Is that what Oklahoma desires? The cost to Oklahoma tax payers of the states wind energy policies have contributed greatly to the funding crisis for education. Each two megawatt wind turbine built in Oklahoma is capable of producing sufficient electricity to claim a zero emission tax credit in excess of \$40,000 while an entry level public school teacher is paid a salary of \$34,000. Is Oklahoma's utility for one wind turbine greater than a public school teacher? Hungerford and Wassmer found a decline in the public confidence in K-12 education which suggests that Americans are concerned. Additionally, in each of 6 studies ranging from 1975 and 2002 the majority of Americans believed that too little money is being spent on K-12 education. In 2002 74% of the public believed we are spending too little on education. (K-12 14) Oklahoma is ranked fourth in terms of wind energy capacity, but has been ranked first in terms of deepest cuts to education each year since 2008. (Perry) Formula funding for public schools are anticipated to be more than \$200 million below 2008 levels even though enrollment continually increases.<sup>21</sup> There are many positive externalities to an educated population. Externalities related to a higher quality primary and secondary education can include the individual's payment of higher taxes, a smoother operation of the democratic process through a more informed electorate, and the lower likelihood of educated individuals being involved in criminal activities. Additionally, there are some nonmarket spillover effects of education like economic growth, quality of life, decision-making and choice, and social capital. Hungerford and Wassmer found that K-12 expenditures increase personal income, manufacturing investments and employment, number of small business starts, and the residential labor force available in a metropolitan area. (Hungerford, pg 30) These credits and exemptions were fine, and maybe

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<sup>21</sup> <http://okpolicy.org/wp-content/uploads/budget-trends-3-16.pdf?997616>, 04/19/2016

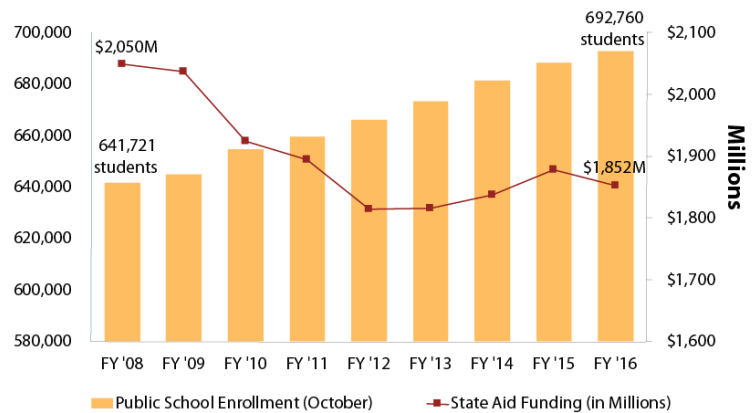
even beneficial, for the industry in its infancy. Now that the wind industry has surpassed the Oklahoma renewable energy goal for electric utilities, represents 50% of property tax exemptions, and is ranked number four in the nation for wind power generation, it is reasonable that the industry can be considered mature. Wisner illustrates the maturity of the industry by pointing to the involvement of major international firms like GE and Siemens or companies like Goldman Sachs and BP that have entered into the development side of the the industry. \$8.3 billion was invested in wind power additions in 2014. (Wisner and Bollinger)

Mature industries, like the wind industry in Oklahoma, should be able to stand on their own without special support from the government. Oklahoma is in a budget crisis where the state

cannot afford to give hundreds of millions of dollars to an industry with no restrictions upon the amounts we may be obligated for in the future.

Elimination of wind tax incentives are one possible solution to Oklahoma’s budget woes.

**State Aid Funding for Schools Has Not Kept Up With Enrollment**



Note: State Funding excludes money allocated for textbooks

Oklahoma Policy Institute | www.okpolicy.org

Source: <http://okpolicy.org/wp-content/uploads/budget-trends-3-16.pdf?997616>

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