

THE ECONOMIC BENEFITS OF KANSAS WIND ENERGY

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I. EXECUTIVE SUMMARY

A. OVERVIEW

In the last decade, numerous wind energy generation projects spanning the state of Kansas have come online. While it is clear that the nineteen wind energy projects currently in operation and under construction in Kansas have significantly impacted the Kansas economy at the local, county and state levels, specific data about the actual economic impacts generated by these projects is not readily available. This report provides empirical, factual data based upon reports and actual experiences of Kansas citizens, utilities, and project developers. The report then seeks to compare that empirical data against non-partisan academic studies of the potential economic impacts of wind generation for state and local economies.

B. KEY FINDINGS

The key findings of this report are as follows:

1. New Kansas wind generation is cost-effective when compared to other sources of new intermittent or peaking electricity generation.

Dockets filed for recently built utility energy projects indicate that wind projects are providing Kansas utilities with cheaper power per megawatt-hour (“MWh”) than other forms of intermittent or peaking electricity generation, including natural gas. As a result, the impact on electricity rates for retail customers for new wind generation is roughly equivalent to, or often less than, the rate impact that would be caused by other forms of new generation.

Actual Costs Per MWh of New Non-Baseload Generation in Kansas

Natural Gas (Emporia Energy Center)	Wind: Utility-Owned (Central Plains, Flat Ridge)	Wind: Power Purchase Agreements (Ironwood, Post Rock)
\$45.63	\$44.87	\$35.00

2. Wind generation is an important part of a well-designed electricity generation portfolio, and provides a hedge against future cost volatility of fossil fuels.

Wind generation is not intended to be a substitute for coal or natural gas generation, but instead plays an important role in balancing a utility’s load demands and offsetting volatile fuel costs. Because the bulk of wind generation costs are paid upfront (or set at a predetermined rate for the life of the project in the case of wind power purchased through a power purchase agreement), utilities use wind generation to introduce known costs into their long-term portfolios to hedge against the future cost volatility of fossil fuels.

3. Wind generation has created a substantial number of jobs for Kansas citizens.

Based upon empirical data from each of the Kansas wind farms and economic studies conducted by third-party sources, Kansas wind generation has created a significant number of jobs for Kansas citizens:

Jobs Created by Kansas Wind Generation

	Total Impact	Per MW	Per Avg. Project (150 MW)
Job Creation			
Total Jobs Created	12,316	4.65	697.02
Jobs (Construction Phase)	3,484	1.39	208.50
Jobs (Operation Phase)	263	0.10	14.52
Jobs (Indirect & Induced)	8,569	3.16	474.00

4. Wind generation has created significant positive impact for Kansas landowners and local economies.

Empirical data from each of the Kansas wind farms and economic studies conducted by non-partisan sources indicate that Kansas wind generation has created the following additional economic impacts for the state:

Additional Economic Benefits of Kansas Wind Generation

	Total Impact	Per MW	Per Avg. Project (150 MW)
Landowner Lease Payments			
Annually	\$13,673,302	\$4,639	\$695,850
Over 20-Year Project Life	\$273,466,040	\$100,761.25	\$15,114,187.91
Donation Agreements and Community Contributions			
Annually	\$10,414,609	\$3,837.37	\$575,604.77
Over 20-Year Project Life	\$208,292,180	\$76,747.40	\$11,512,095.40

5. The Kansas Renewable Portfolio Standard is an important economic development tool for attracting new businesses to the state.

Sustainability is an increasingly important factor to companies looking to locate new facilities and the RPS is the most visible symbol to companies evaluating a state’s commitment to sustainability. Should the RPS be eliminated, or reduced to a non-material level, a similarly clear negative message would be sent to those companies that include sustainability as a factor in site selection.

II. INTRODUCTION

In May of 2009, Kansas Governor Mark Parkinson signed into law a piece of comprehensive energy legislation, Senate Bill 108, the *Economic Revitalization and Reinvestment Act*. One of the provisions in that legislation enacted a Renewable Portfolio Standard (“RPS”) for the state of Kansas, stating “the nation’s energy challenge provides the opportunities for a ‘made in America’ energy program, and Kansas is ready to be a leader in that effort. I look forward to the new jobs, more wind power, and the stronger economy that will be a result of this legislation.”¹

Now, three years into the RPS program, Kansas has capitalized on its access to one of the best energy resources in the country to develop an important wind industry in the state. The nineteen wind projects currently in operation or under construction and the direct and indirect manufacturing jobs that have come to Kansas have created thousands of jobs for Kansans, and encouraged investments of hundreds of millions of dollars in local economies.

Unfortunately, very few studies have been conducted that provide an accurate, empirical analysis of the true economic impacts of the wind industry on the Kansas local, county and state economies. This report endeavors to answer some of the fundamental questions that will be raised as Kansas maps out its future energy goals:

- 1.) What is the actual cost of new wind generation as compared to similar new generation from other resources?
- 2.) How many jobs does the Kansas wind industry create?
- 3.) What are the economic impacts for landowners that site wind projects on their property?
- 4.) What are the economic impacts for local and county governments that host wind projects?
- 5.) What is the value of the Renewable Portfolio Standard for Kansas beyond the power generated for Kansas utilities?

In order to help facilitate thoughtful policy discussions about these issues, this report analyzes the ample data that has been provided by the wind energy projects across the state, as well as various academic and economic analyses of the impacts that wind generation can provide for state and local economies, in order to determine the actual benefits that Kansas wind generation has brought to the Kansas economy.

III. PRIMER ON KANSAS' WIND RESOURCE

In order to understand the current status of the wind industry in Kansas and its impact on the state economy, it is necessary to first understand why Kansas is uniquely positioned to reap its extraordinary wind resource.

A. KANSAS' ABUNDANT WIND RESOURCE

Kansas enjoys one of the best wind resources in the world, ranking between first and third among the states in terms of total wind capacity.² To quantify this resource, wind speed measurements are taken at several heights that reflect typical wind tower hub heights: 50 meters, 80 meters, and 100 meters. As Figure 1 below illustrates, at 50 meters most of western Kansas has access to "Class 4" winds, with wind speeds ranging from 7.5 to 8.1 meters per second, with a number of additional locations reaching "Class 5" status, with wind speeds ranging from 8.1 to 8.6 meters per second.³

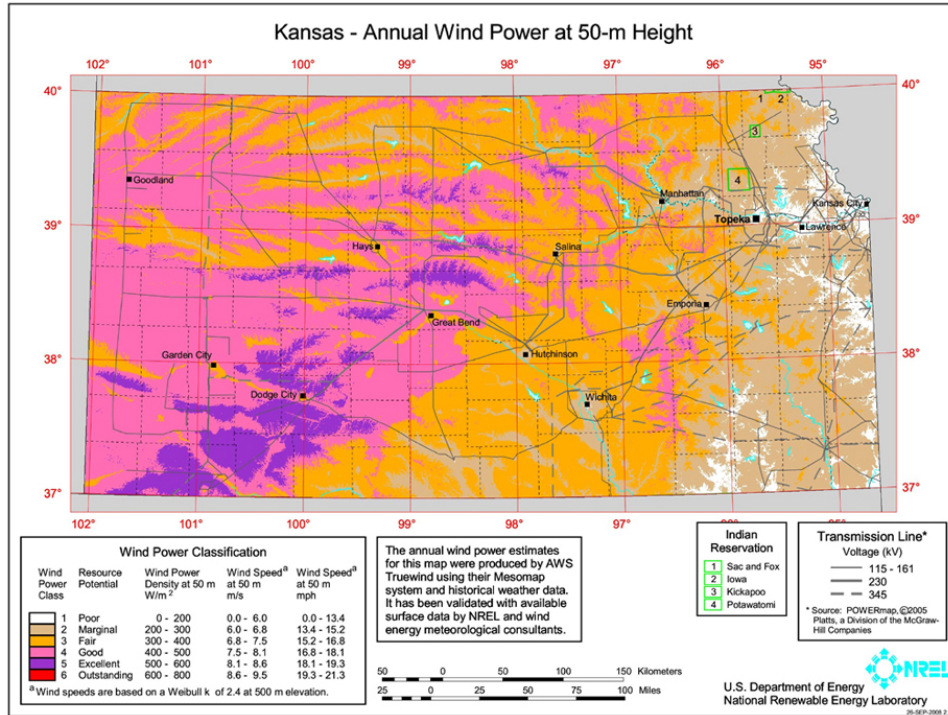


Figure 1: Kansas Annual Wind Speeds at 50 meters

To understand how Kansas’ access to wind compares to other states across the country, it is necessary to consult Figure 2 below, which illustrates the wind speeds at a height of 50 meters for the entire United States.⁴

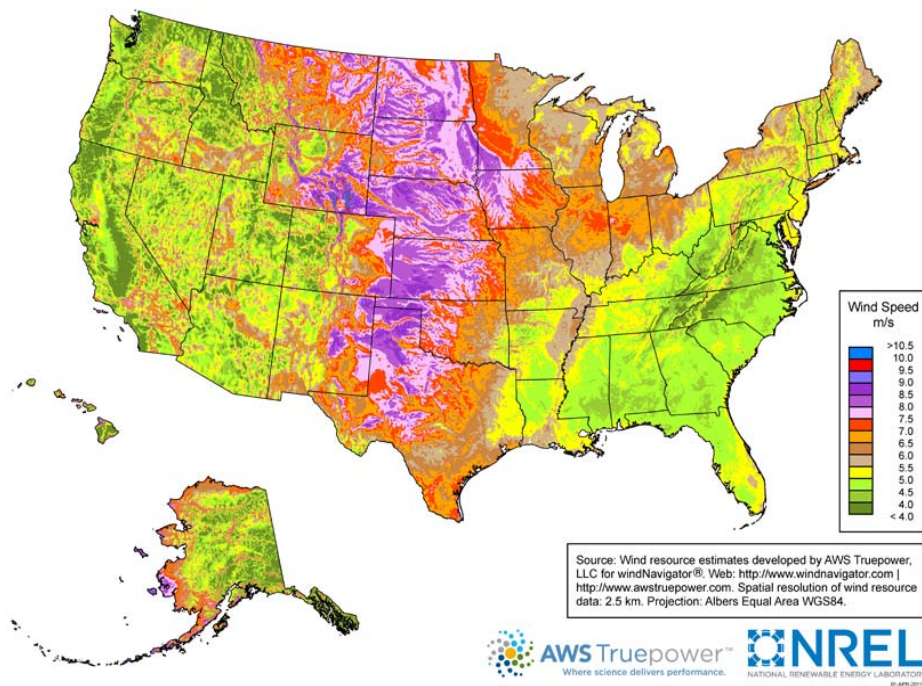


Figure 2: U.S. Wind Resource Map at 50 Meters (U.S. Department of Energy, National Renewable Energy Laboratory)

As Figure 2 shows, Kansas is well positioned in America’s “Wind Belt.” This geographic advantage means that Kansas has access to a robust renewable energy source that few other states share. Kansas and its neighboring Plains states have access to one of the best wind resources in the United States. As Figure 3 below shows, the electrical transmission grid in the U.S. is broken into three distinct electrical interconnections: ERCOT, which serves most of Texas, the Western Interconnect, which serves all states west of the Colorado-Kansas state-line, and the Eastern Interconnect. With new transmission projects in the works to alleviate bottlenecks in the grid (See Section C.1 below), Kansas is in a prime position to export power from its excellent wind resource.

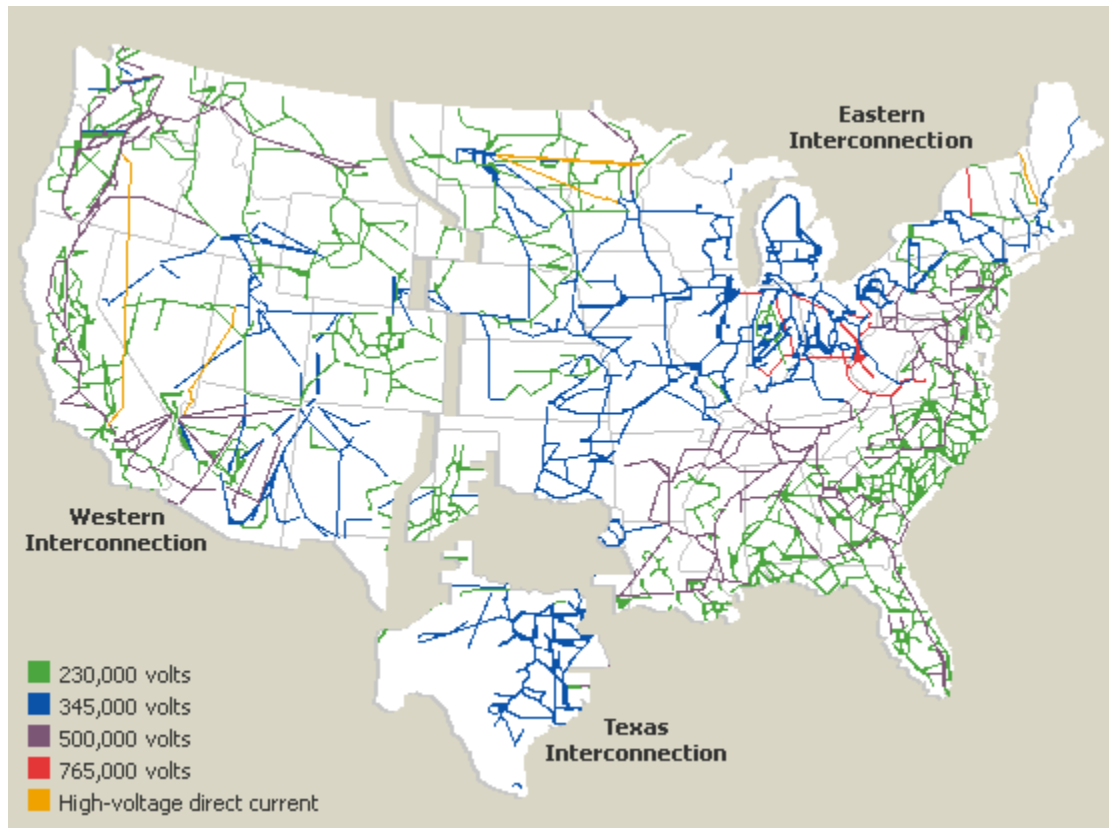


Figure 3: The United States Transmission Grid.⁵

Prior to 2012, Kansas ranked ninth among states in terms of operational wind energy.⁶ Building on this success, Kansas has led the nation in new wind energy construction in 2012, with an anticipated operational wind energy capacity of approximately 2,714 MW by the end of 2012.⁷

B. HISTORY

The substantial growth in Kansas’ wind energy capacity in 2012 has been the culmination of more than a decade of hard work by Kansas’ citizens, utilities and electrical cooperatives, local, county and state officials, and third-party participants.

Although Kansas has long been known for the winds sweeping across its prairielands, it was not until 1999 that Westar Energy (then Western Resources) took the first steps into utility-scale

wind power with the installation of two 600 kW Vestas wind turbines near the Jeffrey Energy Center in Pottawatomie County, north of St. Marys, Kansas. In 2001, Westar's Jeffrey Energy Center project was followed by the state's first large scale wind farm, the Gray County Wind Project built near the town of Montezuma by NextEra Energy Resources (then FPL Energy). Containing 170 Vestas 600 kW turbines with a total installed capacity of 112 MW, the Gray County Wind Project is still operating today.

Since those early successes, at least one project has come online in Kansas every year since 2008, (*see* Table 1), and the period from 2011-2012 has seen a boom that will nearly double the state's installed wind capacity (*see* Table 2).

Table 1: Operating Kansas Wind Farms as of November, 2012

Name	County	Size (MW)	Began Operation	Developer	Power Off-taker (Owner)
Gray County	Gray	112	2001	NextEra Energy Resources	MKEC (NextEra)
Elk River	Butler	150	2005	Iberdrola	Empire District (Iberdrola)
Spearville	Ford	100.5	2006	EDF Renewable Energy	KCP&L (KCP&L)
Smoky Hills, Phase I	Lincoln/ Ellsworth	100.8	2008	TradeWind Energy	Sunflower, Midwest Energy, KCBPU (Enel Green Power North America ("Enel"))
Smoky Hills, Phase II	Lincoln	150	2008	TradeWind Energy	Sunflower Electric, Midwest Energy, Springfield, Independence P&L (Enel)
Meridian Way	Cloud	201	2008	EDP Renewables	Westar, Empire District (EDP Renewables)
Flat Ridge Ia	Barber	50	2009	BP Wind	Westar (BP Wind)
Flat Ridge Ib	Barber	50	2009	BP Wind	Westar (Westar)
Central Plains	Wichita	99	2009	RES Americas	Westar (Westar)
Spearville II	Ford	48	2010	EDF Renewable Energy	KCP&L (KCP&L)
Greensburg	Kiowa	12.5	2010	John Deere	Kansas Power Pool, City of Greensburg (Exelon)
Caney River	Elk	200	2011	TradeWind Energy	TVA (Enel Green Power North America)
Post Rock	Ellsworth	201	2012	Hilliard / Wind Capital Group	Westar (Wind Capital Group)
Cimarron II	Gray	131	2012	CPV Renewable Energy	KCP&L (Duke Energy / Sumitomo Corp. of America)
Ironwood	Ford/Hodgeman	168	2012	Infinity	Westar (Duke Energy / Sumitomo Corp. of America)
Flat Ridge 2	Barber, Kingman, Sumner, Harper	470.4	2012	BP Wind	Associated Electric Cooperative, SWEPCO (BP Wind)
Spearville 3	Ford	100.8	2012	EDF Renewable Energy	KCP&L (KCP&L)
Total		2,345.6			

Table 2: Kansas Wind Farms Under Construction As of November, 2012

Name	County	Size (MW)	Began Operation	Developer	Power Off-taker (Owner)
Shooting Star	Kiowa	105	2012	Clipper	Sunflower Electric (Exelon)
Cimarron I	Gray	165	2012	CPV Renewable Energy	TVA (CPV Renewable Energy)
Ensign	Gray	99	2012	NextEra Energy Resources	KCP&L (NextEra)
Total		369			

Though there were a number of early wind projects in Kansas, Table 1 above illustrates that there was a significant increase in project development beginning in 2008 and 2009. A lot of this growth is the result of steady improvements in wind generation technology and increasing access to new areas of the state due to the expansion of transmission infrastructure (as discussed in Section III.C.1, below). This is also the period when the Kansas state legislature adopted the state's Renewable Portfolio Standard ("RPS"), a policy implemented to diversify the state's electricity generation mix by adding more renewable generation.

Prior to 2009, demand for wind energy in Kansas was driven by voluntary measures. Some utilities, like Empire District Electric ("Empire"), began purchasing wind energy due, in part, to high natural gas prices and a high percentage of natural gas baseload generation, which wind-powered generation could offset. Empire believed that the addition of wind power to their system was a way to "decrease exposure to natural gas, provide a hedge against any future global warming legislation" and to help them provide their customers "lower, more stable prices."⁸ Empire noted that the energy purchased from wind farms allowed them to decrease the amount and percentage of electricity generated by natural gas, and thus decrease their exposure to fuel price volatility.⁹ Similarly, the Kansas City Board of Public utilities saw wind power as "a hedge against high market purchase prices" and estimated their 20-year power purchase agreement for wind power would save the utility \$3 million during the first decade.¹⁰ Ultimately, some utilities decided to participate in the voluntary RPS that then-Governor Kathleen Sebelius had proposed, while others foresaw the potential for a future, mandatory, RPS.

Since 2009, demand for renewable energy in Kansas by public utilities has been driven by the RPS, as passed by the Kansas Legislature in May 2009 through Senate Substitute bill for H. 2369 and incorporated by Kansas Statutes Annotated (K.S.A.) 66-1256 through 66-1262.¹¹ Under the RPS, every regulated public utility in the state is required to own or purchase renewable generation, such that the nameplate capacity of the renewable generation owned or purchased by the utility satisfies the following minimum threshold percentages of the utility's average three-year annual peak retail sales:

- 10 percent for 2011 through 2015
- 15 percent for 2016 through 2019
- 20 percent for 2020 and beyond

Importantly, for renewable capacity generated in Kansas, utilities are awarded an additional 10 percent credit toward their requirements, thus incentivizing utilities to keep the renewable projects, and the economic benefits that they create, within the state. Additionally, a key provision of the RPS language was a one percent cap on the rate impact of compliance.¹² Under this guideline, the Kansas Corporation Commission (“KCC”) is permitted to exempt any utility that can demonstrate that compliance with the RPS would cause retail rates to increase by one percent or more. This effectively ensures that, to the extent that there is a cost associated with developing renewable generation opportunities as compared to traditional fuel sources, the rate impact for retail customers will be minimal.

Since 2010, the KCC has prepared and submitted an annual report to the Legislature that details each utility’s progress toward fulfilling its RPS requirements, including forecasts for its renewable energy generation over the next 20 years. The most recent data for each of the six affected utilities are summarized in the following Table 3.¹³

		Kansas Utilities					
		Empire	KCP&L	Westar	KEPCo	Midwest	Sunflower
2012 (Actual)	Renewable Capacity (MW)	297	178.8	737	114	57	141
	RES Requirement - 10% (MW)	5.1	163.6	456.2	41.6	30.2	67.9
	Surplus / Deficit	291.9	15.2	280.8	72.4	26.8	73.1
2016 (Projected)	Renewable Capacity (MW)	297	281.8	737	114	57	255
	RES Requirement - 15% (MW)	8.1	284.2	742.3	67.4	53.4	112.8
	Surplus / Deficit	288.9	-2.4	-5.3	46.6	3.6	142.2
2020 (Projected)	Renewable Capacity (MW)	297	375.7	737	114	57	200
	RES Requirement - 20% (MW)	11.3	398.7	1023.7	94.2	75.2	156.5
	Surplus / Deficit	285.7	-23	-286.7	19.8	-18.2	43.5

	RES Requirement Met		Res Requirement Not Met
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Table 3: Kansas Utilities' Progress towards meeting Kansas Renewable Portfolio Standard

As the chart above illustrates, all Kansas utilities currently have enough renewable generation in their portfolios to satisfy the RPS through 2015, with most possessing far more renewable generation than is required. Additionally, most Kansas utilities currently have more than enough renewable generation in their portfolios to satisfy the 15 percent threshold that will take effect from 2016 through 2019, with only a small amount of additional renewable generation required for Westar and Midwest.

C. FUTURE PROJECT DEVELOPMENT

Despite the significant growth the Kansas wind industry has experienced over the past few years, the vast majority of the state's wind resource remains untapped. This growth potential is attributable to many factors, including the fact that the wind resource in Kansas is still significantly underutilized, with a large number of potential projects sites ready to be developed. While some of these sites simply await a buyer, some of them merely require access to sufficient transmission to move the electricity, while others require incremental improvements in wind generation technology.

1. Expansion of the Transmission Grid

Wind energy projects are viable only if they have access to a transmission grid that can transport the power to customers. Historically, this has been an important factor for wind project developers looking for suitable project locations in Kansas, because the bulk of the state's best wind resource is located in areas with limited access to transmission lines. This issue is currently being addressed by a number of public and private entities.

The Kansas "V-Plan," the northern portion of the Southwest Power Pool's ("SPP") "Y-Plan," is particularly noteworthy. The "V-Plan" consists of high-voltage transmission that connects eastern and western Kansas with the dual purpose of improving electric reliability and carrying more electricity from various sources, including wind, and thus further establishing a competitive energy market in the state. Two companies, ITC Great Plains and Prairie Wind Transmission, LLC, a joint venture between Westar Energy and Electric Transmission America, are participating in the construction of this 180-mile transmission line which is expected to be completed in 2014. The "Y-Plan" will help support the addition of 2,500 MW of new wind generation in Kansas, Oklahoma, and the Texas panhandle.¹⁴

In addition to the "V-Plan," ITC is also developing a 210-mile high-voltage transmission line between Spearville, Kansas and Axtell, Nebraska. Construction of this line, known as the "KETA Project" began in 2009 and is expected to be completed by the end of 2012.¹⁵ Once completed, the KETA Project, which was encouraged by the Kansas Electric Transmission Authority ("KETA"), will support renewable generation development by providing more potential interconnection locations and transmission capacity for renewable energy generators.¹⁶

Finally, Clean Line Energy, a private company based in Houston, Texas, is in the process of developing a significant transmission project across the state known as the "Grain Belt Express Clean Line." Once constructed, this privately-owned project will provide a 700-mile, 600 kV extra high voltage direct current ("HVDC") transmission line starting in Kansas and running east through Missouri, enabling Kansas wind to be exported to serve utility customers in Missouri, Illinois, Indiana, and points farther east. Clean Line anticipates that this project will enable approximately \$7 billion of new, renewable energy projects to be built.¹⁷ Clean Line Energy has set 2018 as the goal for commercial operation of this new transmission line.¹⁸

As Figure 4 below illustrates, these new transmission lines are located in the heart of Kansas' most productive wind areas and provide valuable paths to market for future wind projects in those areas.

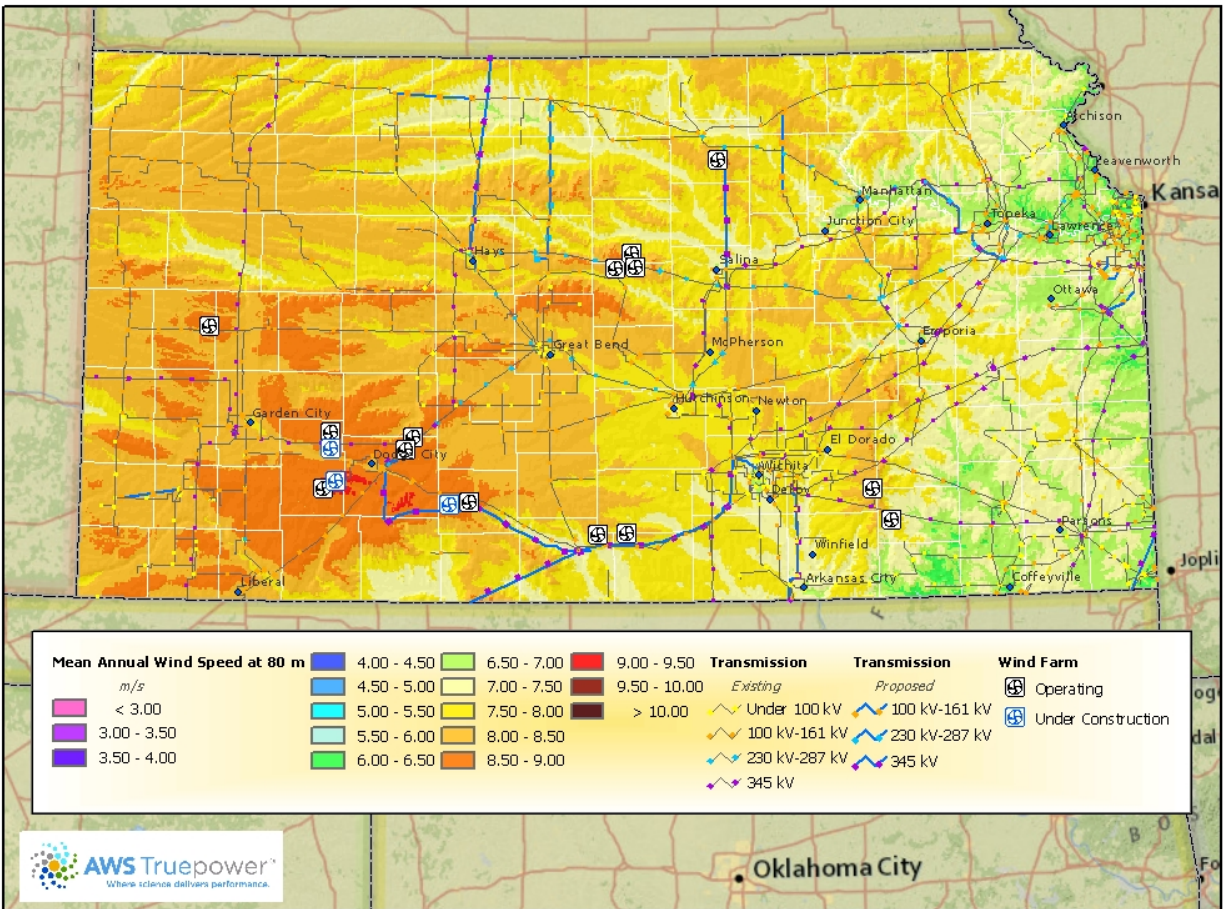


Figure 4: New Kansas Transmission Projects (Wind speeds at 80 meters)

2. Improvements in Wind Generation Technology

Generally speaking, wind speeds increase as turbine heights (referred to as “hub heights”) increase. Since wind speed is the single most important factor in creating electricity out of the wind, tapping into high winds is key to a successful wind project. For this reason, the most noticeable wind turbine technology improvements have focused on taller hub heights and larger rotor diameters. The combination of these improvements have led to significant increases in efficiency, which have resulted in wind farms with higher capacity factors or similar capacity factors in areas with lesser winds or lower elevations.

Wind speeds have historically been measured at 50 meters for wind farm development and subsequent wind maps (such as that shown in Figure 1) reflected this. However, utility-scale wind turbine hub heights have been significantly higher than 50 meters for many years (as an example, the Gray County wind farm, built in 2001, has a hub height of 65 meters).

On average, Kansas possesses a robust wind resource at a height of 50 meters. However, as Figure 5 below illustrates, at a height of 80 meters, roughly half the state experiences average

wind speeds between 8 and 9 meters per second,¹⁹ which is well above the 7 to 8 meters per second commonly found at a height of 50 meters.

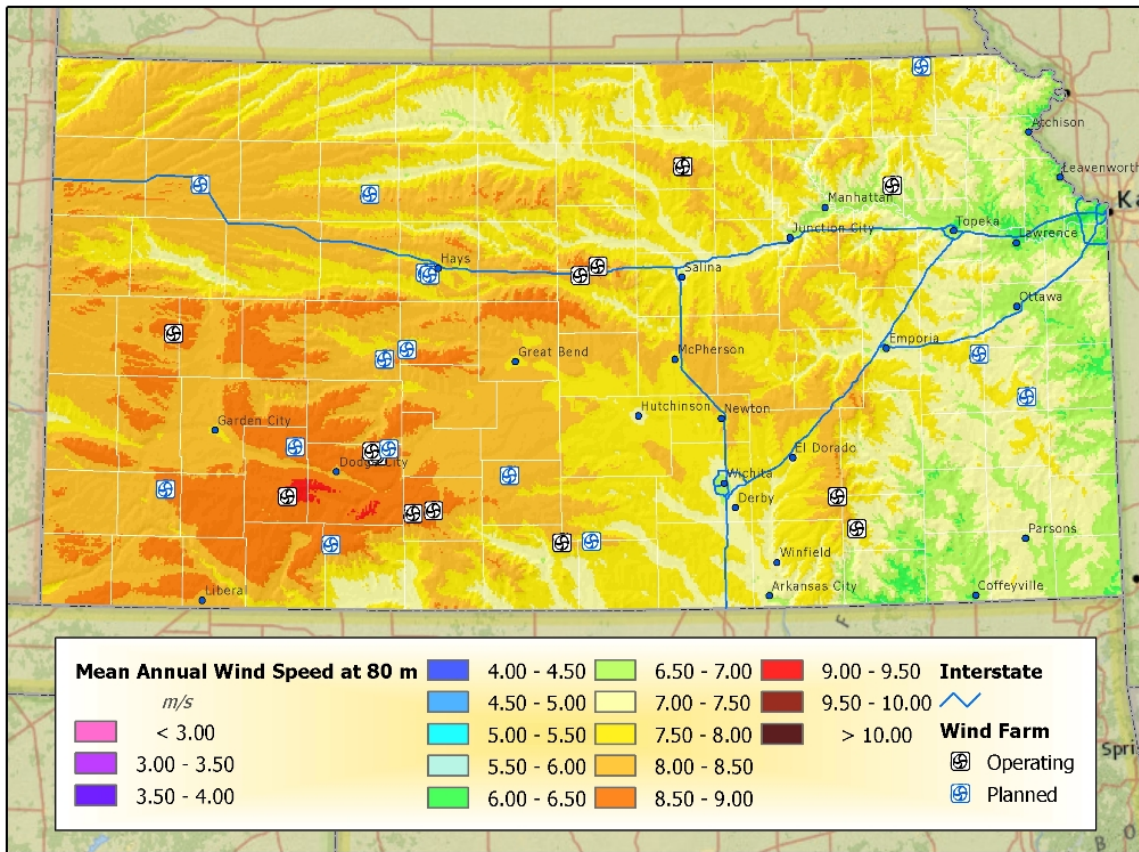


Figure 5: Kansas Annual Wind Speeds at 80 meters

Given that wind speed increases with an increase in altitude, there has been a trend across the wind industry to erect turbines with taller hub heights. As seen in Figure 6 below, over the last decade, hub heights across the country have steadily increased from an *average* of approximately 60 meters in 2001 to 81 meters in 2011.

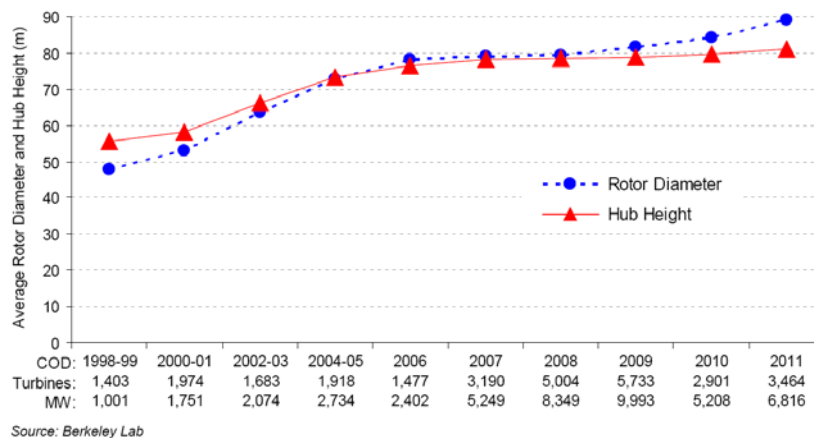


Figure 6: Increases in Hub Heights and Rotor Diameters (1998-2011)²⁰

As technology continues to improve, and construction costs for these towers decrease, it is probable that 100 meter hub heights will become common for wind projects in Kansas. This trend towards taller hub heights is evidenced by the fact that, in 2011, 128 turbines were installed in the United States with hub heights of 100 meters, a sharp increase over the 17 turbines of that size installed in 2010.²¹ The following Figure 7 provides some context to the significant technological advances that have occurred over the last decade.

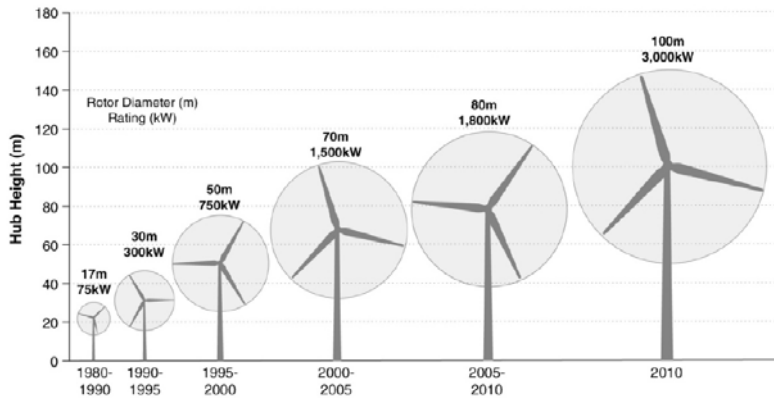


Figure 7: Representation of Wind Turbine Hub Height and Rotor Diameter Increases.²²

As the average hub heights for Kansas projects increase from the current average of 80 meters, access to high-quality wind resources will increase and more locations in Kansas will be economically viable. As shown in Figure 8, the wind speeds available at 100 meters are predominantly in the range of 8.5 to 9.5 meters per second.

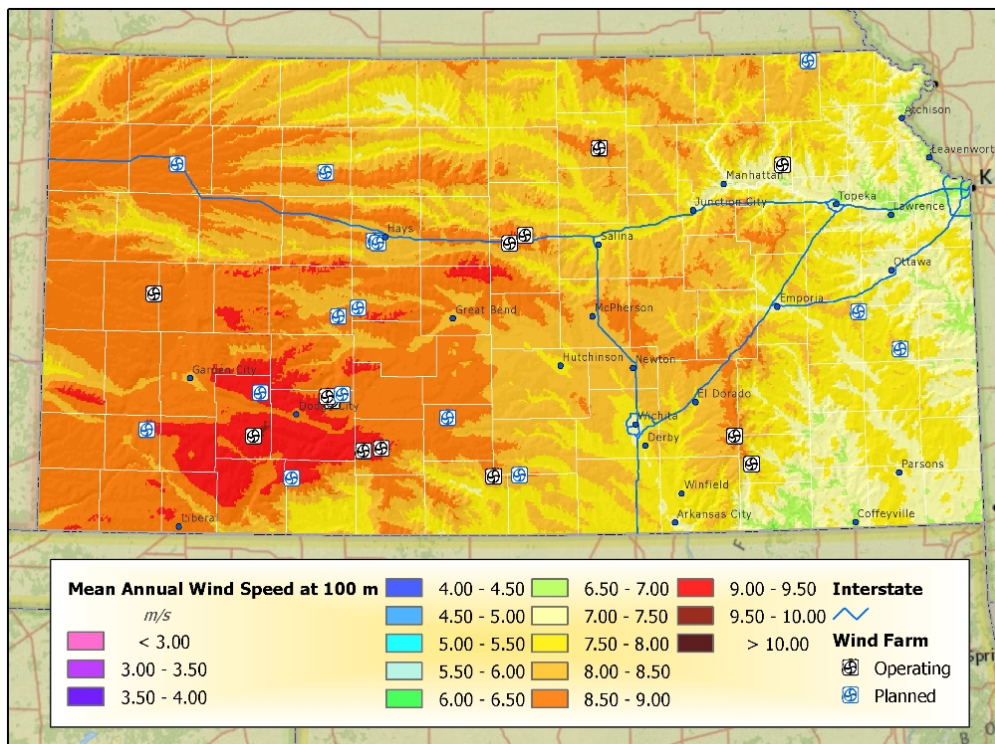


Figure 8: Kansas Annual Average Wind Speeds at 100 meters.

Ultimately, the combination of an expanding transmission infrastructure and technological advancements will significantly expand the areas of the state that can support viable wind development.

IV. ECONOMIC BENEFITS OF KANSAS WIND

With nineteen wind projects currently in operation or under construction in the state of Kansas, an important question for Kansas citizens and policymakers is what impact those projects have had on the state economy. Numerous studies have been conducted across the country by the U.S. Department of Energy's national laboratories, state and local governments, industry groups, and non-profit organizations; however, there is a lack of information specific to Kansas based on empirical data from the projects that have been installed. In an effort to quantify the actual economic impact of Kansas' portfolio of wind projects, empirical data from publicly-released sources was compiled for this study that provide the following information:

- 1.) the number of jobs created in the construction and operation phases of each Kansas wind farm;
- 2.) annual landowner payments made by each Kansas wind farm; and
- 3.) annual contributions to city, county and state governments, including school district contributions by each Kansas wind farm.

Fortunately, most Kansas wind developers have been willing to disclose information about the economic benefits of their projects. As a result, for each of these categories, empirical data was compiled for the majority of the projects in Kansas. Based upon that empirical data, an average impact per megawatt of generation was calculated, which was then utilized to estimate data points for projects where information was not readily available.

The results of this analysis, discussed in the following sections, are summarized in Table 4.

Table 4: Economic Benefits of Kansas Wind Generation²³

	Total Impact	Per MW	Per Avg. Project (150 MW)
Job Creation			
Total Jobs Created	12,316	4.65	679.74
Jobs (Construction Phase)	3,484	1.39	192.25
Jobs (Operation Phase)	263	0.10	14.52
Jobs (Indirect & Induced)	8,569	3.16	472.97
Landowner Lease Payments			
Annually	\$13,673,156	\$5,031.34	\$754,700.25
Over 20-Year Project Life	\$273,463,120	\$100,626.80	\$15,094,005
Donation Agreements and Community Contributions			
Annually	\$10,414,609	\$4,406	\$574,783.26
Over 20-Year Project Life	\$208,270,800	\$76,637.80	\$11,495,665.20

A. JOB CREATION

With numerous multi-million dollar construction projects occurring simultaneously across Kansas, often in rural or economically-depressed areas, job creation is perhaps the most direct benefit that wind generation provides to Kansas citizens. Over the last decade, our analysis indicates that the nineteen wind farms in operation or under construction in Kansas have created approximately **3,747 jobs** relating directly to the construction and operation of the projects. Of those jobs, approximately 3,484 positions relate to project construction, while approximately 263 positions are on-going operation and maintenance of the projects.

Additional jurisdictional-specific studies by the National Renewable Energy Laboratory in neighboring markets support this analysis. For example, the first 1,000 MW of installed wind energy capacity in Colorado was estimated to create approximately 1,700 full-time equivalent construction jobs and 300 permanent operation and maintenance jobs.²⁴ In Texas, 1,000 MW of installed wind energy capacity was estimated to create 2,100 full-time construction jobs, and 240 permanent operation and maintenance jobs.²⁵

This influx of new labor creates a ripple effect that benefits other areas of the economy as well. For example, taking into account “indirect jobs” (employees of banks financing the project, component suppliers, manufacturers of equipment, etc.) and “induced jobs” (employees of restaurants, lodging providers, retail establishments, child care providers, and others serving the new workers), the U.S. Department of Energy estimates that the 2,714 MW of new wind generation in Kansas creates an additional 8,569 jobs during the construction phase of projects, and an additional 1,168 jobs during the operation phase of the projects.²⁶ Adding these indirect and induced jobs to those directly created by the wind projects, it is estimated that wind generation is responsible for the creation of approximately **12,316 jobs** for Kansas citizens.

B. LANDOWNER LEASE PAYMENTS

In addition to job growth, hundreds of Kansas landowners have directly benefited from substantial land lease payments and royalties. Specifically, our analysis indicates that wind developers pay a total of approximately **\$13,673,000 annually** to the landowners who host wind projects on their property. This equates to annual payments of approximately **\$4,635 per megawatt** of wind generation in the state.

This estimate is supported by a recent study by the National Renewable Energy Laboratory (“NREL”), which found that land lease payments to landowners range from \$1,300 per MW to \$5,000 per MW across the Midwest.²⁷ Applying this rather broad range of numbers to Kansas, the report determined that, per 1,000 MW of installed capacity, Kansas landowners receive between roughly \$2 million and \$8 million per year from wind project developers. Scaling this estimate up to the roughly 2,600 MW of wind capacity that will be installed in Kansas by the end of 2012, this equates to estimated payments totaling between **\$5.3 million** and **\$21.2 million per year** to Kansas landowners.²⁸

C. COMMUNITY, COUNTY, AND STATE REVENUE

Kansas exempts coal, natural-gas-fired and renewable generation from property taxes for either a defined or indefinite time period. In place of property taxes, wind power producers make voluntary contributions at the county level, and often make additional contributions directly to local community organizations and school districts. While the exact terms of these donations and community contributions vary between projects and jurisdictions, our analysis indicates that, as a whole, Kansas wind projects are responsible for contributions of approximately **\$10,414,600 per year** to Kansas state, county and local jurisdictions. Extrapolated out over 20 years, which is a common term for these types of agreements, these payments equal approximately **\$208,292,000** of new revenue for Kansas communities.

V. THE COST OF WIND COMPARED TO OTHER GENERATION SOURCES

Any time that a public utility purchases power at wholesale or installs new generation assets, the costs of that energy are passed through to customers through their electricity rates. This is true for coal, natural gas and nuclear plants, and it is no different for wind generation. In order to measure the prudence of the utility's decision to purchase or generate energy from a particular resource and ensure that ratepayers are receiving high quality service at low-cost, it is necessary to evaluate the price that the utility pays for the new generation against the price that it would have paid for a similar amount of new generation from other types of resources. In order to perform such an analysis, the authors of this report have taken the following two approaches:

- 1.) Compare actual cost data filed with the KCC for natural gas and wind projects in the state of Kansas; and
- 2.) Compare models of the "Levelized Cost of Energy" for various types of generation.

Ultimately, as is described in more detail below, both the actual data filed by public utilities in the state of Kansas and the economic modeling conducted by numerous national organizations support the conclusion that the cost of wind generation is equivalent to, and often much lower than, the costs of generation from fossil-fuels.

A. ACTUAL COSTS OF KANSAS WIND TO DATE

Given the fact that the public utilities in Kansas have already satisfied the 10 percent threshold in the RPS, and largely have satisfied the 15 percent threshold as well, it is possible to evaluate the actual economic impacts of the projects that have been placed into service so far.

The KCC has recently evaluated utilities' decisions to invest in several different types of non-baseload generation, including a natural gas combustion turbine (the Emporia Energy Center), utility-owned wind projects (Central Plains and Flat Ridge), and utility purchases of power through Power Purchase Agreements (Ironwood and Post Rock).

Because public utilities are regulated entities, they are required to file a docket with the KCC to detail the justifications for any requested increases in the rates charged to their customers. As a

result, there is detailed, publicly-available documentation of the amount of capital investments utilities have made developing various types of generation resources in their portfolios.

Table 5 summarizes key data points from various utility and Commission filings related to the development of new generation assets that utilize a variety of fuel resources.

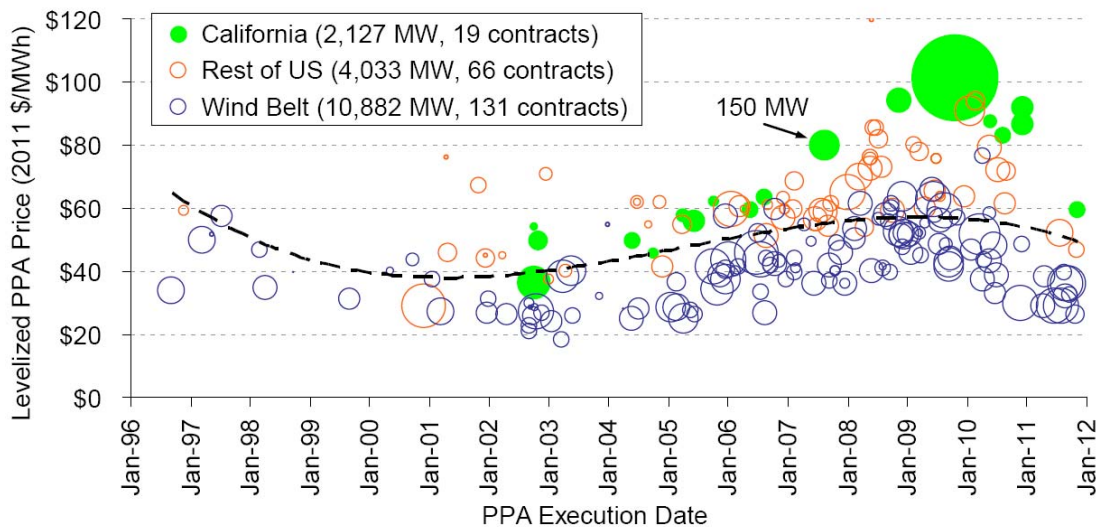
Table 5: Actual Costs of New Non-Baseload Generation in Kansas						
	Natural Gas (Emporia Energy Center)		Wind: Utility-Owned (Central Plains, Flat Ridge)		Wind: Power Purchase Agreements (Ironwood, Post Rock)	
Upfront Costs Paid by Ratepayers						
Fuel Type	Natural Gas		Wind		Wind	
Generation Capacity (MW)	665 ²⁹		149 ³⁰		369 ³¹	
Annual Net MWhs Generated	438,191 ³²		441,121 ³³		1,292,976 ³⁴	
Installation Costs Paid by Ratepayers	\$304,589,316 ³⁵		\$272,993,736 ³⁶		\$0	
Initial Monthly Rate Impact (Avg. Residential Customer)	\$2.47 ³⁷		\$2.96 ³⁸		\$1.15 ³⁹	
Ongoing Costs Paid by Ratepayers						
	Annual	Over 20 Years	Annual	Over 20 Years	Annual	Over 20 Years
Operation and Maintenance Cost (Annual)	\$2,457,268 ⁴⁰	\$49,145,360	\$6,142,070 ⁴¹	\$122,841,400	\$0	\$0
Fuel Cost (Annual)	\$2,309,267 ⁴²	\$46,185,331	\$0	\$0	\$0	\$0
Power Purchase Cost (Annual)	\$0	\$0	\$0	\$0	\$45,254,160 ⁴³	\$905,083,200
Total Costs Paid by Ratepayers Over 20 Years						
Total Cost / MWh	\$399,920,007 / 438,191		\$395,835,136 / 441,121		\$905,083,200 / 1,292,976	
Cost Per MWh	\$45.63		\$44.87		\$35.00	

A comparison of the actual costs reported by Kansas utilities relating to the Emporia Energy Center natural gas combustion turbine facility, Westar's owned wind facilities, and Westar's wind Power Purchase Agreements indicates that, over a 20-year period, the evaluated wind projects provided the lowest cost option for ratepayers per MWh of electricity generated.

Specifically, natural gas and utility-developed wind projects fall roughly in the range of \$45 per MWh, with utility-developed wind projects coming in slightly below the cost of the traditional fuels. Wind generation purchased through PPAs, however, presents a much more economically appealing option for ratepayers because the initial rate impact for the average residential

customer is considerably lower than other new generation sources (\$1.15 per month for wind PPAs versus the low-end estimate of \$2.47 per month for natural gas). Additionally, the long-term cost per MWh of wind PPAs is better than the next lowest alternative by nearly \$10, or 22 percent.

While a PPA price of \$35 per MWh may seem low, recent trends across the Midwest indicate that this price is representative of the current market, and perhaps even a bit higher than can be expected for future projects. To illustrate this point, Figure 9 below depicts data collected by the Lawrence Berkeley National Laboratory on actual prices from 216 PPAs entered into in 2010 and 2011. As this chart demonstrates, over the last few years PPAs from the “Wind Belt” have regularly been in the \$20 to \$40 range.⁴⁴



Note: Size of “bubble” is proportional to project nameplate capacity.

Figure 9: PPA Prices for Wind Projects, 1996-2012, Lawrence Berkeley Laboratory.

Although cost comparisons provide interesting context in the discussion of wind generation’s economic impacts, it is important to note that these cost comparisons should not be interpreted as an argument that wind should or could take the place of coal or natural gas generation in a well-balanced utility portfolio. Instead, they merely illustrate the fact that wind energy is often at least as economically viable, if not more so, than other types of generation.

B. MODELING THE COST OF WIND COMPARED TO OTHER RESOURCES

The empirical evidence of projects actually installed in Kansas shows that wind generation is at least equivalent to, and often cheaper than, generation from traditional fuel sources, and these results can be confirmed by analyzing academic studies of the cost of various types of generation. The best standard for this type of analysis is known as a “Levelized Cost of Energy” (“LCOE”) comparison, which takes into account the following five cost components for each type of generation source: (1) Investment and Installation Costs; (2) Operation and Maintenance Costs; (3) Fuel Cost; (4) Life of the Generating Unit; and (5) Energy Generated by the Unit.

Over the past few years, there have been a number of LCOE studies performed by a variety of different governmental and non-governmental entities.⁴⁵ In particular, by averaging the results

of three detailed studies that forecast the LCOE of wind generation, it is possible to find a quality average cost, as shown in Figure 10.

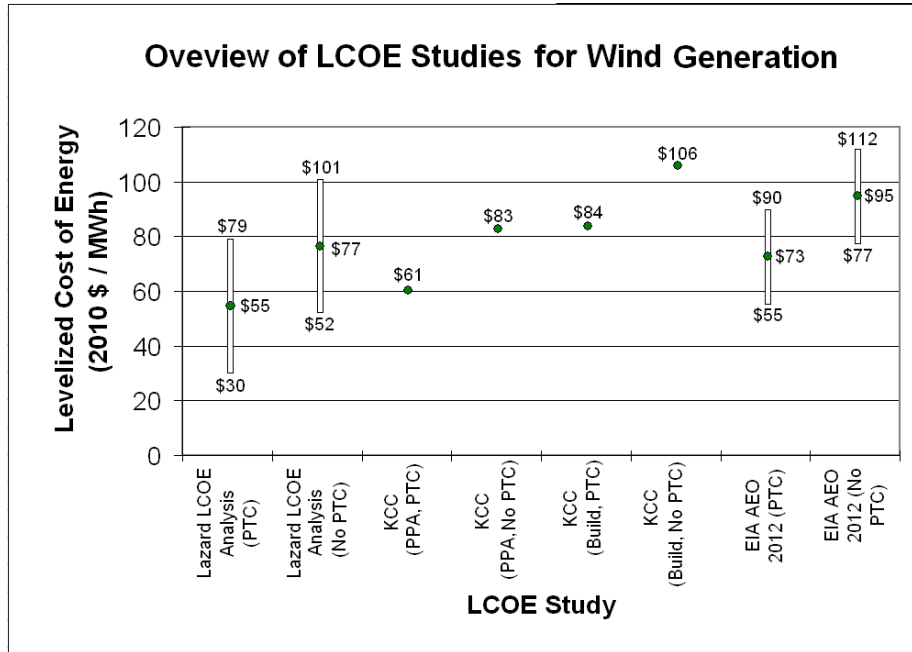


Figure 10: Overview of LCOE Studies for Wind Generation.⁴⁶

By averaging the results of these studies, the average LCOE for wind generation is \$68.25 per MWh if the federal Production Tax Credit (“PTC”) is taken into consideration or \$90.25 per MWh if the Production Tax Credit is not included, as shown in Figure 11. This compares very favorably to the average LCOE for Combined-Cycle Natural Gas at \$74.55 per MWh, Conventional Coal at \$104.35 per MWh, and Natural Gas Peaking facilities at \$177.20 per MWh.

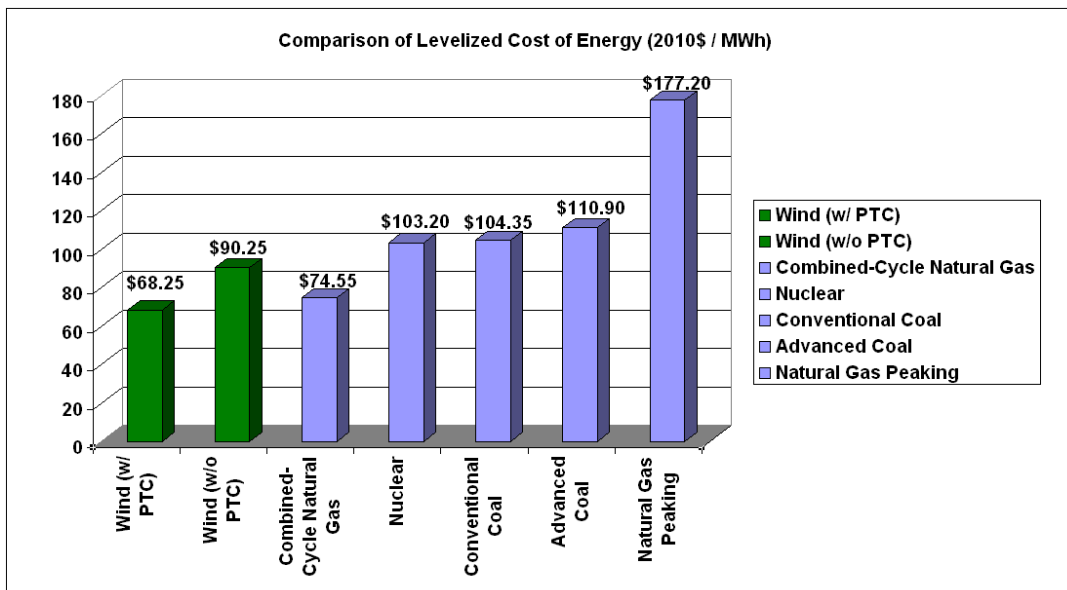


Figure 11: Comparison of LCOE for Different Technologies (2010\$/MWh).⁴⁷

Given that the empirical costs for wind projects in Kansas indicate a range between \$35.00 and \$44.87 per MWh, this comparison highlights the fact that Kansas is able to generate electricity from wind at very low rates. One of the main reasons that wind costs in Kansas are so low is that the state has an excellent wind resource. A wind project that is located in a high wind area will be able to generate electricity more consistently throughout the year. This is measured by the generator's "capacity factor," which is the ratio of the actual energy produced by a generator in a period of time as compared to the amount of energy that it is capable of producing under ideal conditions (known as its "nameplate capacity").

Due to an excellent wind resource, wind projects in Kansas have capacity factors that far exceed the national averages. Table 5 shows that wind projects in Kansas have a high capacity factor when compared to other states with substantial wind development.

State	MW	MWh (Monthly Average)	Capacity Factor	Number of Facilities in Sample
Oklahoma	1,491.7	5,410,442	41.41%	13
Nebraska	294.7	1,046,899	40.55%	7
South Dakota	632.5	2,183,219	39.40%	8
Kansas	1,061.5	3,553,669	38.22%	10
North Dakota	1,488.5	4,883,694	37.45%	19
Colorado	1,719.4	5,127,139	34.04%	12
Minnesota	2,003.4	5,814,338	33.13%	45
Texas	8,939.2	25,706,538	32.83%	62
Iowa	3,505.6	9,728,235	31.68%	30
Illinois	2,081.0	5,568,100	30.54%	14
Washington	1,863.1	4,838,230	29.64%	13
Oregon	1,631.2	4,105,680	28.73%	17
Wisconsin	449.1	1,103,084	28.04%	9
Missouri	452.0	1,109,282	28.02%	5
California	3,344.7	7,679,871	26.21%	77
New York	1,328.0	2,683,826	23.07%	15
Total	32,447.2	90,600,230		356
Average			32.01%	

This table lists average capacity factors for the top 12 states for installed wind capacity, as well as a few other nearby states. It is important to note that states whose wind energy facilities were built more recently enjoy higher average capacity factors due to the technological advancements described in Section C(2). As Figure 12 below illustrates, projects with high capacity factors see

a marked decline in their total levelized costs. Thus, Kansas' excellent wind resource leads to markedly lower wind generation prices than can be found in other areas across the country.

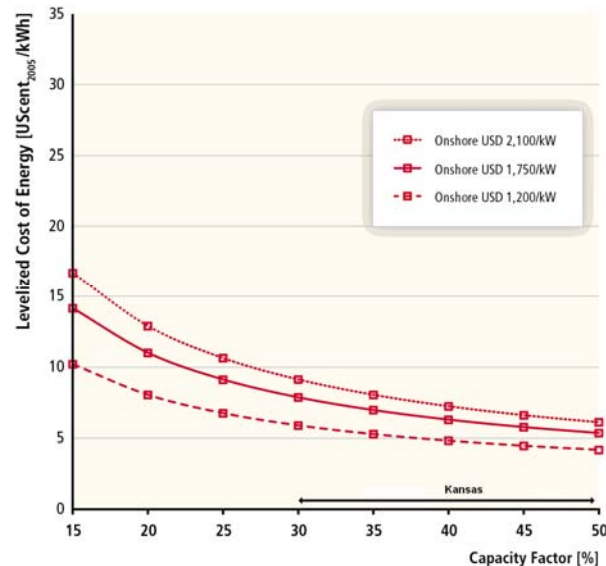


Figure 12: LCOE for Wind Projects Decreases with Increased Capacity Factor.⁴⁹

VI. WIND'S ROLE AS A HEDGE AGAINST FUEL COST VOLATILITY

A significant benefit that renewable energy sources, such as wind and solar, provide for public utilities and customers is price certainty. When utilities add renewable generation sources to their energy mix, they can lock in power supply at a known price for up to twenty years. Two years after Empire District Electric started receiving wind-generated power from the Elk River Wind Farm in Butler County, they wrote to their shareholders that the wind PPAs “decrease our exposure to natural gas, provide a hedge against any future global warming legislation, and help us give our customers lower, more stable prices.”⁵⁰

For wind power, 80 percent of the overall cost is incurred upfront due to the procurement of the turbines and the construction of the generation facility, with only approximately 10 percent of the levelized cost incurred during operations and maintenance. For projects developed by third parties where the energy is purchased by a public utility, the utility is able to lock in a price for the electricity for the term of the agreement, regardless of any fluctuations to the ongoing project costs. The benefit of having the bulk of wind facility costs incurred upfront is that, because the costs are accrued early in the project's development, it becomes easier to accurately estimate the extent of those costs. Additionally, because the majority of these costs are related to equipment and construction services, the total costs for these projects are likely to decrease over time as technology becomes more widely utilized. To illustrate this point, in a May 2012 study conducted by the NREL for the International Energy Agency, researchers collected LCOE estimates for onshore wind generation from 13 recent analyses, and found a rough consensus estimate of a 20 to 30 percent reduction in the LCOE of wind generation by the year 2030.⁵¹ And of course, the “fuel” of wind generation is free, so there is no exposure to volatile fuel prices or fluctuating fuel transportation costs.

While the costs of wind are relatively predictable, the costs of coal and natural gas generation facilities can fluctuate significantly over time due to the costs associated with fuel prices as well as increasingly stringent environmental regulations. With respect to fuel costs, forecasting the future cost of any commodity is an imperfect science. For fossil fuels, it is even more difficult because there are a number of variables affecting price, including transportation options, changes to regulations, market factors, and changes to resource access.

The EIA reports that coal exports are on a record pace in 2012. This means new demands will compete for current supplies, which will likely drive prices upward.⁵² This volatility is not new. As Figure 13 illustrates, the real price of coal has gone up sharply in the U.S. since 2000.

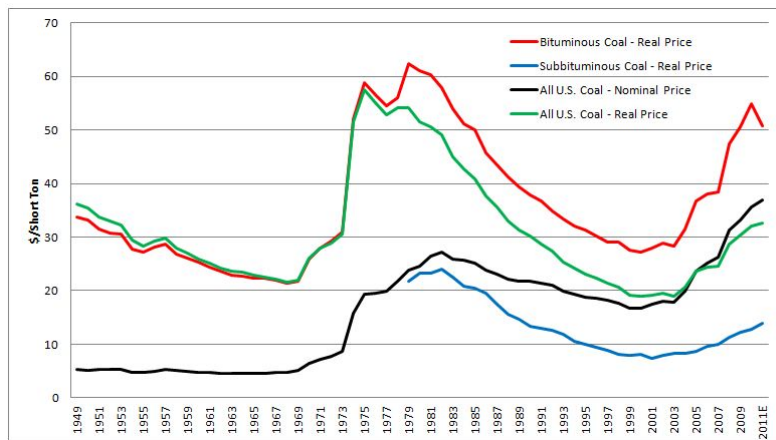
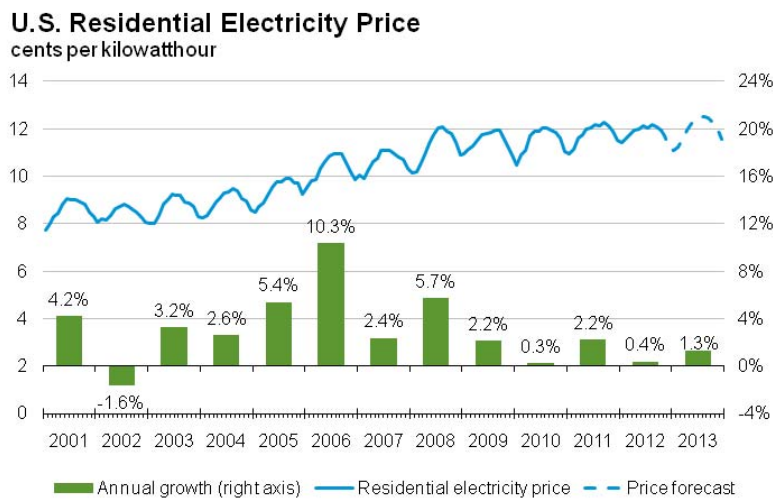


Figure 13: Coal Prices, 1930-2011, EIA, Sept. 2012.⁵³

To put these increases into perspective for Kansas, between 2006 and 2011, Westar reported that the weighted average price of coal utilized in its facilities increased 39 percent.⁵⁴ These increases in coal prices cause significant increases in residential electricity rates. In Kansas, like elsewhere in the U.S., the price of electricity has been steadily increasing (see Figure 14).



Source: Short-Term Energy Outlook, October 2012



Figure 14: Residential Electricity Prices, 2001-2013, EIA, Oct. 2012.⁵⁵

Such price volatility is not limited to coal. As illustrated in Figure 15, despite recent developments in hydraulic fracturing and horizontal drilling, natural gas prices remain subject to significant fluctuations in price.

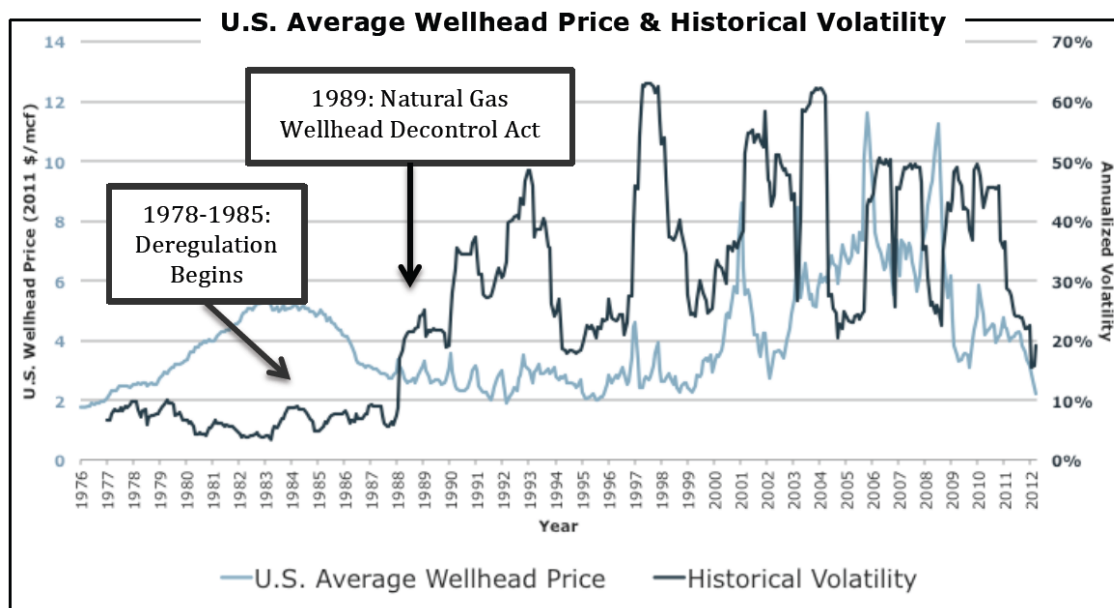


Figure 15: U.S. Average Wellhead Natural Gas Price and Historical Volatility.⁵⁶

The KCC has recognized the problems caused by volatile fossil fuel prices, and found that the inclusion of wind energy into a public utility's portfolio can provide valuable protection against that price volatility and can serve an important role in a well-designed electricity portfolio. The KCC has stated, "Natural gas, coal, and wholesale power prices have all experienced significant volatility and upward trending costs. Wind generation provides value as insurance for customers from some of the effects of unexpectedly high and volatile fuel and wholesale energy prices."⁵⁷

VII. BENEFITS OF A STATE RENEWABLE PORTFOLIO STANDARD

There are benefits to the Renewable Portfolio Standard beyond earning revenue for local communities, generating low-cost, domestic electricity, and creating jobs and work for Kansas residents and companies. The RPS also is one of the clearest and most visible messages to the outside world that the state either values, or does not value, sustainability. Many companies value sustainability as part of their business practices and in the selection of the location of their manufacturing and production facilities. The RPS is a visible symbol to companies evaluating state energy policies among their sustainability criteria, and the Kansas RPS allows the state to be part of the twenty-nine states that have RPS policies in place. Of course, should the RPS be eliminated, or reduced to non-material level, a similarly clear negative message would be sent to those companies that include sustainability as a factor in site selection. In the highly competitive effort to attract companies, jobs, and payroll to the state of Kansas, numerous factors come into play, and it is valuable for Kansas economic development professionals to have as many positive factors as possible on their side. Mark Sweeney, Senior Principal of McCallum Sweeney Consulting, a top site consulting firm had this to say about the RPS;

Many of the companies that are expanding have a commitment to sustainability and renewable energy. If a state takes the unprecedented step of repealing its Renewable Portfolio Standard, that state will send a clear message to the marketplace that those companies interested in sustainability should look elsewhere. The competition for company and job location is too tough for a state to place itself at a self-inflicted disadvantage.⁵⁸

For example, wind manufacturing companies locate their factories in states with strong policies for wind energy. Both Iowa and Colorado, which have policies that indicate the states are friendly to renewable energy, each host multiple manufacturing facilities. Similarly, when Spanish wind-turbine manufacturer Gamesa Corp. decided to build their headquarters and several manufacturing facilities in Pennsylvania, they cited “a state energy policy that is promoting clean or renewable forms of energy” as one of the reasons they selected that state.⁵⁹

Kansas has already reaped benefits from this positive message, as Siemens announced their intention to build a nacelle manufacturing plant in Hutchinson, Kansas only after then-Governor Parkinson worked out a deal with Kansas legislatures to adopt a Renewable Portfolio Standard.⁶⁰ Ed McCallum, a Senior Principal of McCallum Sweeney Consulting was recently quoted in *Trade and Industry Development Magazine*;

Having been involved in several site searches for renewable energy companies, wind in particular, the question always arises about the finalist state’s position regarding Renewable Portfolio Standards (RPS) or the voting record of the federal house and senate representatives regarding Production Tax Credits (PTC). Many times it makes a difference between winning and losing the project.⁶¹

Of course, the appeal of states that value renewable energy and sustainability is not unique to renewable energy companies. When the Mars Corporation was looking for a site to build its new \$250 million chocolate plant, one of their requirements was that the location could provide a certain percentage of its power from renewable sources. Due to the RPS and the proximity to possible locations to install wind turbines, state officials were able to demonstrate that Kansas could help the company reach its own internal goals.⁶² The Mars plant in Topeka will initially employ 200 people and could eventually lead to 1,000 direct and indirect jobs in the area.⁶³ As a state competing for jobs and payroll, the benefits of the RPS should not be understated.

VIII. CONCLUSION

Kansas is fortunate to be in a position to truly be a leader in an “all- the- above” energy strategy and, while there have been some attempts to guess at the impact of what wind energy development has done and will continue to do for the Kansas economy, there had not been a good study evaluating the data as to what has actually happened. Fortunately, because the Kansas utilities have embraced wind energy generation as a valuable component of their energy portfolios and made significant strides towards accomplishing the state’s RPS goal of twenty percent renewable energy by the year 2020, the data that is required to do this economic analysis is now publicly available.

Based upon empirical data from the wind energy projects currently operating and under construction in the state, we can make the following conclusions:

- 1.) New Kansas wind generation is cost-effective when compared to other sources of new electricity generation, as substantiated by the public reports filed by the utilities with the KCC.
- 2.) Wind generation is an important part of a well-designed electricity generation portfolio, and provides a hedge against future cost volatility of fossil fuels.
- 3.) Wind energy generation has provided a substantial number of jobs for Kansas citizens, and provides important economic benefits for landowners and local economies.
- 4.) The Kansas Renewable Portfolio Standard (RPS) is an important economic development tool for attracting new businesses to the state.

It is the authors' objective to facilitate thoughtful policy discussions about these issues, as they will remain important to Kansas now and in the years to come.

¹ Newsletter, 10th Anniversary Kansas Wind & Renewable Energy Conference, 2009, *available at* http://www.kcc.state.ks.us/energy/kwrec_09/09newsletter.pdf.

² Kansas is tied for 2nd with Montana behind Oklahoma in Lu, Xi, M.B. McElroy, and J. Kiviluoma, "Global potential for wind-generated electricity," *PNAS*, Vol. 106, No. 27, July 27, 2009, 10933-10938. <http://www.pnas.org/content/106/27/10933.full.pdf>.

³ Kansas Wind map at 50-m Height, Wind Powering America, U.S. Department of Energy, September 2008. http://www.windpoweringamerica.gov/maps_template.asp?stateab=ks.

⁴ United States Wind map at 50-m Height, Wind Powering America, U.S. Department of Energy, September 2008, *available at* <http://www.nrel.gov/gis/pdfs/windsmodel4pub1-1-9base200904enh.pdf>.

⁵ Global Energy Network Institute, http://www.geni.org/globalenergy/library/national_energy_grid/united-states-of-america/americanationalelectricitygrid.shtml.

⁶ American Wind Energy Association, "AWEA U.S. Wind Industry Third Quarter 2012 Market Report (Public Version)," October 17, 2012, http://www.awea.org/learnabout/publications/reports/upload/3Q2012-Market-Report_Public-Version.pdf, accessed Oct. 24, 2012.

⁷ Kansas Energy Information Network, Kansas Wind Projects, http://www.kansasenergy.org/wind_projects.htm, accessed Oct. 25, 2012.

⁸ Annual Report 2007, Empire District Electric Company, p. 2, *available at* <https://www.empiredistrict.com/DocHandler.ashx?id=2623>.

⁹ Annual Report 2006, Empire District Electric Company, p. 10, *available at* <https://www.empiredistrict.com/DocHandler.ashx?id=1875>.

¹⁰ Quote by KC BPU senior electric supply planner, Blake Elliott. Carpenter, Tim, "Energy farms are increasingly dotting Kansas' landscape", *The Topeka Capital-Journal*, October 7, 2007, http://cjonline.com/stories/100707/loc_206025299.shtml.

¹¹ See the following link for the first part of the law and click on next to progress to see it all: http://www.kslegislature.org/li/b2011_12/statute/066_000_0000_chapter/066_012_0000_article/066_012_0056_section/066_012_0056_k/.

¹² K.A.R. 82-16-2(c).

¹³ Kansas Corporation Commission, "2011 Kansas Generation Planning Survey," *available at* http://www.kcc.state.ks.us/electric/2011_kansas_generation_planning_survey.pdf.

- ¹⁴ Edison Electric Institute, ITC Holdings, Corp. Company Overview, *available at* http://www.eei.org/ourissues/electricitytransmission/documents/transprojrenew_e-m.pdf.
- ¹⁵ ITC Great Plains Kansas Spearville-Axtell project profile, http://www.itc-holdings.com/images/itc-greatplains/projects/ITCGP_Profile_KETA_Gen_52311.pdf
- ¹⁶ Edison Electric Institute, ITC Holdings, Corp. Company Overview, *available at* http://www.eei.org/ourissues/electricitytransmission/documents/transprojrenew_e-m.pdf.
- ¹⁷ Clean Line Energy Partners Website, Grain Belt Express Clean Line Project Description, *available at* http://www.grainbeltexpresscleanline.com/site/page/project_description.
- ¹⁸ Clean Line Energy Partners Website, Grain Belt Express Clean Line Schedule, *available at* <http://www.grainbeltexpresscleanline.com/site/page/schedule>.
- ¹⁹ Kansas Wind map at 80-m Height, Wind Powering America, U.S. Department of Energy, September 2008, *available at* http://www.windpoweringamerica.gov/pdfs/wind_maps/ks_80m.pdf.
- ²⁰ U.S. Department of Energy, 2011 Wind Technologies Market Report, August 2012, *available at* http://www1.eere.energy.gov/wind/pdfs/2011_wind_technologies_market_report.pdf.
- ²¹ *Id.*
- ²² Lantz, E.; Wiser, R.; Hand, M. (2012). IEA Wind Task 26: The Past and Future Cost of Wind Energy, Work Package 2, *available at* <http://www.nrel.gov/docs/fy12osti/53510.pdf>.
- ²³ See e.g. Voorhis, Dan, “Wind farms a cash crop for rural Kansas counties,” *Wichita Eagle*, July 12, 2012, *available at* <http://www.mcclatchydc.com/2012/07/12/v-print/155923/wind-farms-a-cash-crop-for-rural.html>; Iberdrola Renewables, Fact Sheet, “Elk River Wind Power Project,” *available at* http://www.iberdrolarenewables.us/pdf/Elk_River_fact_sheet.pdf; Wind Power America, Wind Energy Update, January 2012, *available at* http://www.windpoweringamerica.gov/pdfs/wpa/wpa_update.pdf; Vandernack, Tim, “Wind Farm, Company to Energize County with \$9.73M”, *The Hutchinson News*, December 9, 2006, *available at* <http://www.ecogen-energy.com/news/article16.html>; Swanson, Eric, “Windfall”, *Dodge City Daily Globe*, September 21, 2010, *available at* <http://www.morningsun.net/news/kansas/x995831004/Windfall>; TradeWind Energy, Press Release, “TradeWind Energy Dedicated 250MW Smoky Hills Wind Farm in Central Kansas”, October 2, 2008, *available at* <http://www.tradewindenergy.com/WorkArea/showcontent.aspx?id=1010>; Rothschild, Scott, “New fortunes in the wind: Economics advance state’s new energy resource”, *Knight Ridder Tribune*, Dec. 26, 2007, *available at* <http://www.tradewindenergy.com/WorkArea/showcontent.aspx?id=700>; Heartland Rural Electric Cooperative, Inc., Newsletter, “Wind interest grows”, August, 2008, *available at* <http://www.heartland-rec.com/documents/HB29.pdf>; Mayworm, Mark, Westar Presentation to KCC, “Central Plains”, http://kcc.ks.gov/energy/kwrec_09/presentations/D1_Mayworm.pdf; RES Americas, Press Release, “Sunflower Electric Wind to be Built in Western Kansas”, February 4, 2003, *available at* <http://www.res-americas.com/en/news-events/press-releases/archive/2003/2003/sunflower-electric-wind-farm-to-be-built-in-western-kansas.aspx>; Tennessee Valley Authority, Environmental Assessment for the Caney River Wind Project Power Purchase Agreement, Appendix B, *available at* http://www.tva.gov/environment/reports/caney/appendix_b.pdf; Tennessee Valley Authority, Environmental Assessment for the Caney River Wind Project Power Purchase Agreement, *available at* <http://www.tva.gov/environment/reports/caney/fea.pdf>; TradeWind Energy, Press Release, “TradeWind Energy and Enel North America’s Caney River Wind Project Will Bring Jobs and Economic Development to Elk County”, October 8, 2010, *available at* <http://www.tradewindenergy.com/WorkArea/showcontent.aspx?id=2018>; Corn, Mike, “Wind farm dots landscape”, *Hays Daily News*, January 19, 2012, *available at* <http://www.hdnews.net/Story/wilson011912>; Payment in Lieu of Taxes Agreement, Ford County Kansas, Ironwood Project, *available at* <http://www.fordcounty.net/comm/agenda/10172011/PILOT.pdf>; Bussert, Joah, “New Wind Farm in the Works for Kiowa County”, *Greensburg Greentown*, September 15, 2011, *available at* <http://www.greensburggreentown.org/home/2011/9/15/new-wind-farm-in-the-works-for-kiowa-county.html>; Voorhis, Dan and Siebenmark, Jerry, “BP wind farm to span four Kansas counties”, *The Wichita Eagle*, October 4, 2011, *available at* <http://www.wind-watch.org/news/2011/10/05/bp-wind-farm-to-span-four-kansas-counties/>; Eagleston, Todd, Testimony before House Energy and Utilities Committee, March 15, 2012, *available at*

http://www.kslegislature.org/li/b2011_12/committees/misc/ctte_h_engy_utls_1_20120315_08_other.pdf; Tennessee Valley Authority, Environmental Assessment for the Cimmaron Wind Energy Project – Phase 1, November 2011, available at http://www.tva.gov/environment/reports/cimmaron_wind/final_environmental_assessment.pdf; Unified School District #381, Board of Education, Unofficial Minutes of Regular Meeting, March 6, 2012, available at <http://www.usd381.org/vnews/display.v/ART/4f86e4830c6c4>; Swanson, Eric, “Ford County Commission OKs PILOT agreement with enXco”, *Dodge City Daily Globe*, March 1, 2012, available at <http://www.wind-watch.org/news/2012/03/02/ford-county-commission-oks-pilot-agreement-with-enxco/>.

²⁴ Reategui, S.; Tegen, S., *Economic Development Impacts of Colorado’s First 1000 Megawatts of Wind Energy* (2008), available at <http://www.nrel.gov/docs/fy08osti/43505.pdf>.

²⁵ Reategui, S.; Hendrickson, S., *Economic Development Impact of 1,000 MW of Wind Energy in Texas* (2011), available at <http://www.nrel.gov/docs/fy11osti/50400.pdf>.

²⁶ U.S. Department of Energy, “Economic Benefits, Carbon Dioxide (CO₂) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Kansas,” June 2008, available at http://www.windpoweringamerica.gov/pdfs/economic_development/2008/ks_wind_benefits_factsheet.pdf.

²⁷ Lantz, E & Tegen, S., “Variables Affecting Economic Development of Wind Energy,” National Renewable Energy Laboratory, CP-500-43506 (July 2008) (Figure 11).

²⁸ U.S. Department of Energy, June 2008, (relying upon the National Renewable Energy Laboratory’s (NREL’s) Jobs and Economic Development Impacts (JEDI) model).

²⁹ Application, Docket 09-WSEE-925-RTS (June 2, 2009).

³⁰ Application, Docket 09-WSEE-925-RTS (June 2, 2009).

³¹ Westar Energy, Presentation, “Meeting the State Renewable Energy Portfolio Standard,” available at [http://www.westarenergy.com/wcm.nsf/resources/Westar%20Wind%20PPA/\\$file/Westar%20Wind%20PPA.pdf?op=element](http://www.westarenergy.com/wcm.nsf/resources/Westar%20Wind%20PPA/$file/Westar%20Wind%20PPA.pdf?op=element).

³² Direct Testimony of Bryan L. Taggart, KCC Docket No. 12-WSEE-696-ACA (March 20, 2012).

³³ Direct Testimony of Bryan L. Taggart, KCC Docket No. 12-WSEE-696-ACA (March 20, 2012)

³⁴ Estimated amount based on 369 MW x 8,760 hours x 40% capacity factor.

³⁵ Application, Docket 09-WSEE-925-RTS (June 2, 2009).

³⁶ Application, Docket 09-WSEE-925-RTS (June 2, 2009).

³⁷ \$9.62 (the reported increase for Westar North average residential customer in Docket 08-WSEE-1041-RTS (*see* Application, Appendix 1, Docket 08-WSEE-1041-RTS)) x 19.090% (representing the percentage of the rate increase request for Westar North in Docket 08-WSEE-1041-RTS relating to EEC (\$17,189,047) divided by the total rate increase request amount of \$90,040,859 for Westar North (*see* Application, Appendix 1, Docket 08-WSEE-1041-RTS)) + (\$1.43 (the reported increase for Westar North average residential customer in Docket 09-WSEE-925-RTS (*see* Application, Appendix 1, Docket 09-WSEE-925-RTS)) x 25.935% (representing the percentage of the rate increase request for Westar North in Docket 09-WSEE-925-RTS relating to EEC (\$2,519,395) divided by the total rate increase request amount of \$9,714,275 for Westar North (*see* Application, Docket 09-WSEE-925-RTS))) + (\$0.71 (the reported increase for Westar South average residential customer in Docket 09-WSEE-925-RTS (*see* Application, Appendix 1, Docket 09-WSEE-925-RTS)) x 37.951% (representing the percentage of the rate increase request for Westar South in Docket 09-WSEE-925-RTS relating to EEC (\$2,268,660) divided by the total rate increase request amount of \$10,005,017 for Westar South (*see* Application, Docket 09-WSEE-925-RTS))).

³⁸ \$9.62 (the reported increase for Westar North average residential customer in Docket 08-WSEE-1041-RTS (*see* Application, Appendix 1, Docket 08-WSEE-1041-RTS)) x 10.503% (representing the percentage of the rate increase request for Westar North in Docket 08-WSEE-1041-RTS relating to Westar-owned wind projects (\$9,456,711) divided by the total rate increase request amount of \$90,040,859 for Westar North (*see* Application, Appendix 1, Docket 08-WSEE-1041-RTS)) + \$10.34 (the reported increase for Westar South average residential customer in Docket 08-WSEE-1041-RTS (*see* Application, Appendix 1, Docket 08-WSEE-1041-RTS)) x 10.797% (representing the percentage of the rate increase request for Westar South in Docket 08-WSEE-1041-RTS relating to Westar-

owned wind projects (\$9,456,711) divided by the total rate increase request amount of \$87,582,521 for Westar South (*see* Application, Appendix 1, Docket 08-WSEE-1041-RTS)) + (\$1.43 (the reported increase for Westar North average residential customer in Docket 09-WSEE-925-RTS (*see* Application, Appendix 1, Docket 09-WSEE-925-RTS)) x 25.935% (representing the percentage of the rate increase request for Westar North in Docket 09-WSEE-925-RTS relating to Westar-owned wind projects (\$3,006,224) divided by the total rate increase request amount of \$9,714,275 for Westar North (*see* Application, Docket 09-WSEE-925-RTS))) + (\$0.71 (the reported increase for Westar South average residential customer in Docket 09-WSEE-925-RTS (*see* Application, Appendix 1, Docket 09-WSEE-925-RTS)) x 37.951% (representing the percentage of the rate increase request for Westar South in Docket 09-WSEE-925-RTS relating to Westar-owned wind projects (\$3,006,224) divided by the total rate increase request amount of \$10,005,017 for Westar South (*see* Application, Docket 09-WSEE-925-RTS))).

³⁹ Westar Energy, Presentation, “Meeting the State Renewable Energy Portfolio Standard,” *available at* [http://www.westarenergy.com/wcm.nsf/resources/Westar%20Wind%20PPA/\\$file/Westar%20Wind%20PPA.pdf?openement](http://www.westarenergy.com/wcm.nsf/resources/Westar%20Wind%20PPA/$file/Westar%20Wind%20PPA.pdf?openement).

⁴⁰ \$352,616 (EEC O&M costs for Westar South reported in Application, Part 2, Schedule 3-C, Docket 09-WSEE-925-RTS) + \$2,149,652 (EEC O&M costs for Westar North reported in Application, Part 1, Schedule 3-C, Docket 09-WSEE-925-RTS).

⁴¹ \$3,071,535 (Wind Farm O&M costs for Westar North reported in Application, Part 1, Schedule 3-C, Docket 09-WSEE-925-RTS) + \$3,071,535 (Wind Farm O&M costs for Westar South reported in Application, Part 2, Schedule 3-C, Docket 09-WSEE-925-RTS).

⁴² 438,191 MWhs x \$52.65 per MWh (Westar’s reported 2011 average natural gas per MWh cost, *see* Westar Energy, Annual Report, 2011, *available at* http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=2&ved=0CCkQFjAB&url=http%3A%2F%2Fphx.corporate-ir.net%2FExternal.File%3Fitem%3DUGFyZW50SUQ9MTMzOTMwfENoaWxkSUQ9LTF8VHlwZT0z%26t%3D1&ei=XjmZUPbCJseq2gWfzID4Aw&usg=AFQjCNG95pQI8MN55RgE2fYxu1PKZQk_zQ.

⁴³ 1,292,976 MWhs x \$35.00 per MWh (wind PPA pricing based upon numbers reported in Westar Energy, Presentation, “Meeting the State Renewable Energy Portfolio Standard,” *available at* [http://www.westarenergy.com/wcm.nsf/resources/Westar%20Wind%20PPA/\\$file/Westar%20Wind%20PPA.pdf?openement](http://www.westarenergy.com/wcm.nsf/resources/Westar%20Wind%20PPA/$file/Westar%20Wind%20PPA.pdf?openement)).

⁴⁴ U.S. Department of Energy, 2011 Wind Technologies Market Report, August 2012.

⁴⁵ Before delving into the results of these analyses, one study in particular deserves additional discussion. In 2008, former Kansas Governor Kathleen Sebelius asked the Corporation Commission to “look at the full range of benefits that renewable energy brings to Kansas and how those relate to additional investment that may be needed to meet” what could be referred to as the Governor’s 2015 Renewable Energy Challenge, which involved installing 1,000 megawatts of renewable energy capacity in Kansas by 2015. The resulting report, authored by Dr. John Cita, Dr. Bob Glass and James Sanderson of the KCC (Cita, John, Glass, Bob, Sanderson, James, “A Benefit Cost Study of the 2015 Wind Challenge: An Assessment of Wind Energy Economics in Kansas for 2006-2034,” *available at* http://kec.kansas.gov/reports/2008_wind_report.pdf) provides perhaps the most thorough analysis of the potential economic impacts of wind generation in the state of Kansas that has been conducted to-date. For those seeking a deep immersion into the subject of Kansas wind, it is an excellent resource. The following Table provides a high-level overview of some of the report’s main findings.

Table 0.1: Levelized Cost of Wind Energy
[in 2005 constant dollars per MWh]

	Column (1)	Column (2)	Column (3)	Column (4)	Column (5)	Column (6)	Column (7)
	Utility's Standalone Cost ⁽¹⁾	Integration Cost ⁽²⁾	Total Levelized Cost ⁽³⁾	Average Retail Rate Change ⁽⁴⁾	Threshold External Cost Level ⁽⁵⁾	Threshold Carbon Tax ⁽⁶⁾	Total Levelized Cost w/o PTC
PPA/Purchase Option							
Original Forecasts	\$32 - \$33	\$4.60	\$37 - \$38	+\$0.46	\$13 - \$14	\$17 - \$18 [\$0] ⁽⁸⁾	\$55 - \$56
Updated Forecasts	\$48 - \$49	\$8.00 ⁽⁷⁾	\$56 - \$57	+\$0.98	\$27 - \$28	\$37 - \$38 [\$10 - \$11] ⁽⁸⁾	\$74 - \$75
Build/Own Option							
Original Forecasts	\$56 - \$57	\$4.60	\$56 - \$57	+\$1.16	\$31 - \$32	\$41 - \$42 [\$14 - \$15] ⁽⁸⁾	\$68 - \$69
Updated Forecasts	\$77 - \$78	\$8.00 ⁽⁷⁾	\$77 - \$78	+\$1.90	\$51 - \$52	\$68 - \$69 [\$41 - \$42] ⁽⁸⁾	\$95 - \$96

Notes: (1) The cost amounts for the purchase option represent PPA prices and, therefore, do not embody the utility's estimated wind integration cost. The cost amounts for the build option reflect all costs incurred by the utility, including the estimated wind integration cost.
 (2) Unless noted, our estimate of the estimated wind integration cost does not include any cost associated with dispatch inefficiencies cause by wind energy production.
 (3) The total levelized cost reflects all costs associated with the utility's acquisition of wind options.
 (4) Average forecast rate change is for the average-cost utility-type. The average forecast rate change varies by utility-type.
 (5) This is the threshold external cost level for only the average-cost utility. The threshold external cost level does vary by utility-type.
 (6) This is the threshold carbon tax per ton of CO₂ for the average-cost utility. The threshold carbon tax varies by utility-type. We assume the carbon tax would be applied on a "statewide basis" and, therefore, to the state's existing mix of electric generation. Since a large share (about 25 percent) of the state's electricity is generated by nuclear fuel, a \$10/ton carbon tax would increase the state's average retail price of electricity by about \$7.50/MWh.
 (7) Recent research shows that integrating wind assets with the existing portfolio of Kansas generation assets is likely to create dispatch inefficiencies. (See Direct Testimony submitted Docket No. 08-WSEE-309-PRE.) That research shows dispatch inefficiencies are likely to fall within the range of \$10 to \$20 per MWh of wind energy. One way to take account of this is by including the cost of dispatch inefficiencies as a component of the estimated wind integration cost. This we have done by (very conservatively) increasing the wind integration cost to \$8.00/MWh.
 (8) This amount shows what the carbon tax would need to be for the Challenge to be cost effective if external cost savings are "credited" at \$20/MWh of wind energy.

⁴⁶ Cita, John, Glass, Bob, Sanderson, James, "A Benefit Cost Study of the 2015 Wind Challenge: An Assessment of Wind Energy Economics in Kansas for 2006-2034," available at http://kec.kansas.gov/reports/2008_wind_report.pdf; EIA Annual Energy Outlook 2012; Lazard's Levelized Cost of Energy Analysis, Version 5.0.

⁴⁷ Wind with PTC: \$68.25 (average from Figure 9); Wind w/o PTC: \$90.25 (average from Figure 9); Conventional Coal: Average of \$97.70 (EIA Annual Energy Outlook 2012); \$111 (Lazard's Levelized Cost of Energy Analysis, Version 5.0); Advanced Coal: \$110.90 (EIA Annual Energy Outlook 2012); CCNG: Average of \$66.10 (EIA Annual Energy Outlook 2012) and \$83 (Lazard's Levelized Cost of Energy Analysis, Version 5.0); Natural Gas Combustion: Average of \$127.90 (EIA Annual Energy Outlook 2012) and \$226.50 (Lazard's Levelized Cost of Energy Analysis, Version 5.0); Nuclear: Average of \$111.40 (EIA Annual Energy Outlook 2012); \$95 (Lazard's Levelized Cost of Energy Analysis, Version 5.0).

⁴⁸ All results are derived from the Energy Information Administration's EIA-923 data (with EIA-906 and EIA-920 data). This comparison includes every project in the reference states that had at least one full year of data in the EIA database as of November 2012. Generation totals (MWh) are the sum of monthly averages for each project. The total installed capacity and number of projects listed will not equal the totals for each state, but only the totals of those that met the criteria to be included in this comparison. Data used is for years 2001 through August 2012, available at <http://www.eia.gov/cneaf/electricity/page/data.html>.

⁴⁹ Wisner, R., Z. Yang, M. Hand, O. Hohmeyer, D. Infield, P. H. Jensen, V. Nikolaev, M. O'Malley, G. Sinden, A. Zervos, 2011: Wind Energy. In IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation [O. Edenhofer, R. Pichs Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, C. von Stechow (eds)], Cambridge University Press. Figure 7.23a.

⁵⁰ *The Empire District Electric Company Annual Report 2007*, p. 2.

⁵¹ Lantz, E.; Wisner, R.; Hand, M. (2012). IEA Wind Task 26: The Past and Future Cost of Wind Energy, Work Package 2, available at <http://www.nrel.gov/docs/fy12osti/53510.pdf>.

⁵² "U.S. coal exports on record pace in 2012, fueled by steam coal growth", EIA, Oct. 23, 2012, available at <http://www.eia.gov/todayinenergy/detail.cfm?id=8490>.

- ⁵³ U.S. Department of Energy, Energy Information Agency, *Annual Energy Review*, Table 7.9: Coal Prices, 1949-2011, available at <http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb0709>, (accessed October, 2012).
- ⁵⁴ Westar Energy Annual Reports and 10K forms, 2008, 2010, 2011, accessed at <http://phx.corporate-ir.net/phoenix.zhtml?c=89455&p=irol-sec>
- ⁵⁵ U.S. Department of Energy, Energy Information Agency, *Short Term Energy Outlook*, October 2012, <http://www.eia.gov/forecasts/steo/archives/oct12.pdf>.
- ⁵⁶ Huber, Lisa, "Utility-Scale Wind and Natural Gas Volatility: Uncovering the Hedge Vale of Wind for Utilities and Their Customers," Rocky Mountain Institute (July 2012).
- ⁵⁷ Docket No. 08-WSEE-309-PRE, "Final Order," p. 20 (Dec. 27, 2007).
- ⁵⁸ Personal Correspondence, November 15, 2012.
- ⁵⁹ Quote by Brian Lammers, Gamesa Energy USA's director of development as reported by Steve Mocarsky, "Pa. Attractive for Wind Farms," *The Wilkes-Barre Times Leader*, March 20, 2006, p. 10A.
- ⁶⁰ On May 4, 2009, Gov. Parkinson announced his deal with Sunflower Electric to allow Sunflower to build one 895 MW coal plant contingent on the legislature passing a comprehensive energy bill, that included net metering and the Renewable Portfolio Standard. (Rothschild, Scott, "State reaches agreement to enable one coal plant to be built at Holcomb", *Lawrence Journal-World*, May 4, 2009, available at <http://www2.ljworld.com/news/2009/may/04/state-reaches-agreement-enable-one-coal-plant-be-b/?breaking>). On May 5, Siemens announced they had selected Hutchinson for the location of their new nacelle manufacturing facility. (Hutchinson Chamber of Commerce, "Siemens Selects Hutchinson for Wind Power Production Facility", Press Release, May 5, 2009, available at <http://www.hutchchamber.com/news.php?newsid=126>)
- ⁶¹ McCallum, Ed, "Renewable Energy Means Jobs", *Trade and Industry Development Magazine*, July 21, 2011, available at <http://www.tradeandindustrydev.com/industry/alternative-energy-fuels/renewable-energy-means-jobs-5416>.
- ⁶² Voorhis, Dan, "Wind farms a cash crop for rural Kansas counties", *Wichita Eagle*, July 12, 2012, available at <http://www.mcclatchydc.com/2012/07/12/v-print/155923/wind-farms-a-cash-crop-for-rural.html>.
- ⁶³ Milburn, John, "Chocolate maker Mars Inc. picks Topeka for factory," *Lawrence Journal-World*, June 29, 2011, available at <http://www2.ljworld.com/news/2011/jun/29/chocolate-maker-mars-inc-picks-topeka-factory/>.