

# ANNUAL ECONOMIC IMPACTS OF KANSAS WIND ENERGY

## 2020 REPORT

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## **I. EXECUTIVE SUMMARY**

### **A. OVERVIEW**

Since 2001, forty utility-scale wind energy generation projects have been constructed across the state of Kansas. These projects have significantly benefitted the Kansas economy at the local, county and state levels; however, specific data about the real economic impacts of these projects is not readily available. To address this deficiency, beginning in 2012 Polsinelli P.C. in partnership with the Kansas Energy Information Network, published a series of reports providing empirical, factual data drawn from publicly available reports which conveyed the actual experiences of Kansas' citizens, utilities, and wind project developers. This publication ("2020 report") updates those previous reports report with new empirical data from the operating projects in Kansas, regulatory filings before the Kansas Corporation Commission, and nonpartisan academic sources to further examine the economic impacts of wind generation for state and local economies.

### **B. KEY FINDINGS**

The key findings of this report are as follows:

1. *Wind energy often provides the lowest costs for consumers:* With costs routinely under \$20 per megawatt-hour ("MWh") of generation, new wind generation in Kansas is now commonly less expensive than energy from traditional sources, including intermittent or peaking natural gas generation, and is almost always the lowest cost energy resource available.
2. *Wind energy provides stability through a diverse portfolio:* Wind generation is an important part of a well-designed electricity generation portfolio. By including wind farms in traditional electricity portfolios, utility companies are able to better hedge against potential increases in the price of coal and natural gas over the next twenty years, thus allowing them to better serve consumers.
3. *Wind energy creates both upfront and ongoing jobs:* Wind generation has created, and continues to create a significant number of jobs for Kansas' citizens.
4. *Wind energy provides additional revenue for the state:* Wind generation from currently operating wind projects will bring over \$1.61 Billion in direct economic benefits to Kansas counties and land owners through contribution agreement payments, property tax payments, and lease payments.

### **C. ANALYSIS**

#### ***1. Low Costs for Consumers:***

Recent regulatory filings show that wind projects are providing Kansas' utilities with low cost power, and wind is now the least expensive form of generations per MWh compared to other forms of intermittent or peaking electricity generation. As a result, adding new wind generation saves retail customers money when compared to the rate impact that would be caused by continuing to operate more expensive fossil fuel generation or adding other forms of new generation.

## ***2. Stability through a Diverse Portfolio***

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 generally 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 through a power purchase agreement which sets a predetermined rate for the life of the project), utilities use wind generation to offset the future cost volatility of fossil fuels against the known costs of wind generation. As the total amount of wind in the southwest power pool reaches higher penetration, it eliminates the need for the least efficient and most expensive coal or natural gas power plants entirely, leading to savings to Kansas ratepayers.

## ***3. Creation of Upfront and Ongoing Jobs***

Wind generation has created a significant number of jobs for Kansas' citizens.

### **Jobs Created by Kansas Wind Generation<sup>1</sup>**

	<b>Total Impact</b>	<b>Per Avg. Project (200 MW)</b>
<b>Total Jobs Created</b>	<b>22,002</b>	<b>602</b>
Construction Phase	8,682	238
Operation Phase	563	16
Indirect/Induced Jobs (per U.S. Dept. of Energy)	12,757	349

## ***4. Additional Revenue for the State***

Wind generation has created a significant positive impact for Kansas landowners and provided resources for areas of the local economy that would otherwise remain underfunded, through donation agreements and community contributions.

### **Additional Economic Benefits of Kansas Wind Generation<sup>2</sup>**

	<b>Total Impact</b>	<b>Per Avg. Project (200 MW)</b>
<b>Landowner Lease Payments</b>		
Annually	\$48,111,890	\$1,317,051
<b>Over 20-Year Project Life</b>	<b>\$962,237,800</b>	<b>\$26,341,029</b>
<b>Donation Agreements and Property Tax</b>		
<b>Payments</b>	<b>\$657,726,485</b>	<b>\$18,005,105</b>

## **II. INTRODUCTION**

Unfortunately, very few empirical studies have been conducted that provide an accurate, empirical analysis of the true economic impacts of the wind industry on the local, county and state economies of Kansas. This report endeavors to build on the 2014 report, and continues to answer some of the fundamental questions that are raised as Kansas maps out its energy future:

1. What is the actual cost of new wind generation as compared to similar new generation from other resources?
2. How does wind energy help utilities better serve the citizens that rely on them?
3. How many jobs does the wind industry create in the state of Kansas?
4. What kind of economic resources does wind energy provide for the state of Kansas?
5. What are the intangible benefits that wind energy can bring to the state of Kansas?

In order to facilitate thoughtful policy discussions about these issues, this report analyzes the ample public data that has been available from wind developers, utilities, and other stakeholders across the state. Combined with various academic and economic analyses of the impacts that wind generation has brought to the state, the data can provide information on the actual benefits that Kansas wind generation has brought to the Kansan economy, without the need for any speculation based on events which have not yet occurred.

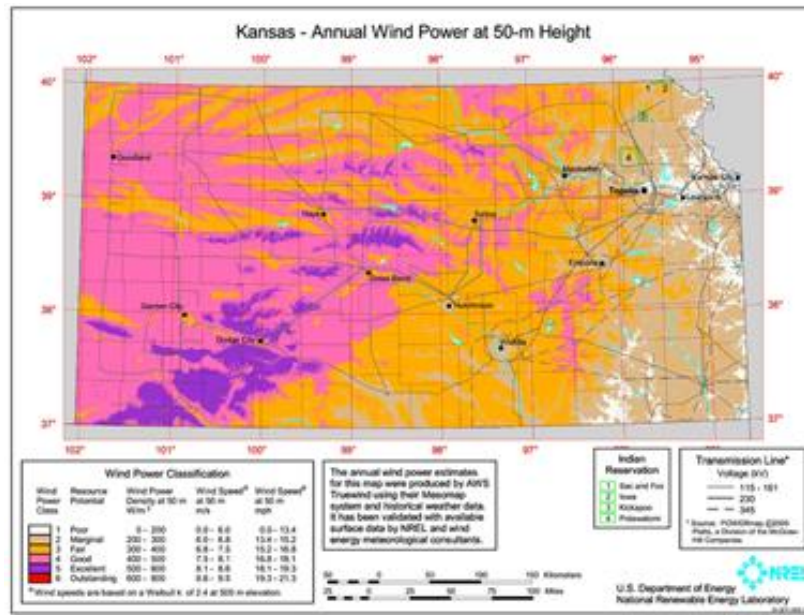
## **III. PRIMER ON KANSAS' WIND RESOURCE**

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 benefits from its extraordinary wind resource.

### **A. KANSAS HAS ABUNDANT WIND RESOURCES**

Kansas enjoys one of the best wind resources in the world.<sup>3</sup> This resource is measured by measuring wind speeds at several heights (50 meters, 80 meters, 100 meters, and above), reflecting typical wind tower hub heights. 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.

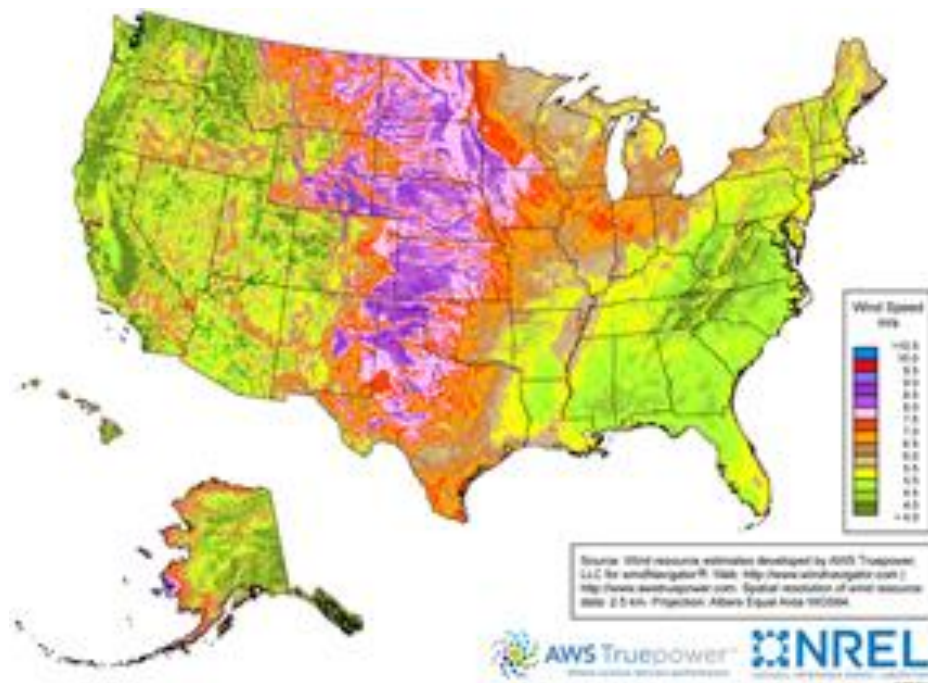




**Figure 1: Kansas Annual Wind Speeds at 50 meters<sup>4</sup>**

Source: U.S. Department of Energy, National Renewable Energy Laboratory<sup>5</sup>

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 present across the United States at the same 50-meter height.

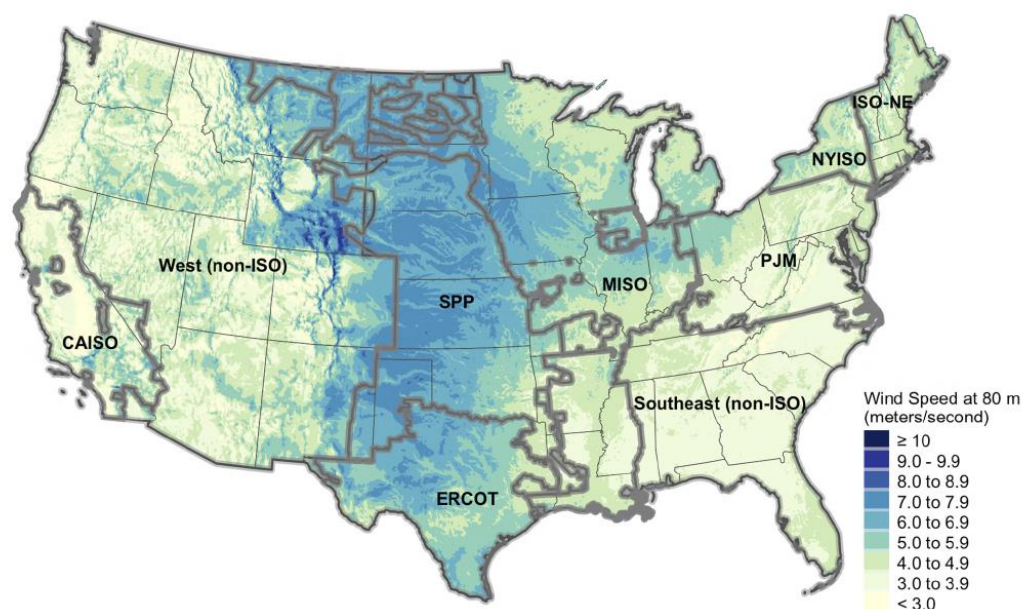


**Figure 2: U.S. Wind Resource Map at 50 Meters<sup>6</sup>**

Source: 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. Additionally, as Figure 3 below shows, the electrical transmission grid in the United States is broken into distinct electrical transmission regions, most of which are overseen by Regional Transmission Organizations (“RTOs”). For Kansas wind projects, the most significant RTOs are the Southwest Power Pool (“SPP”), which serves Kansas, Oklahoma, Nebraska, and portions of states further south and north, MISO, serving parts of Missouri, Iowa, Illinois, and states north, and ERCOT, which serves most of Texas. Being located both in the heart of the Wind Belt and also strategically located near numerous surrounding transmission authorities, Kansas is in a prime position to export power from its excellent wind resource well beyond its borders.



**Figure 3: The United States Transmissions Grid.<sup>7</sup>**

*Source:* Lawrence Berkley National Lab

As of 2020, Kansas ranked fourth in installed wind power capacity,<sup>8</sup> with a robust pipeline of projects also in development. Currently, Kansas wind projects that are in operation account for approximately 7,306 MWs,<sup>9</sup> with approximately 3,394 turbines erected in the state.<sup>10</sup>

## B. OPERATING PROJECTS

The substantial growth in Kansas’ wind energy capacity in 2019 and 2020 has been a culmination of almost two decades of hard work by Kansas’ citizens, utilities and electric cooperatives, as well as local, county and state officials, and third-party participants.

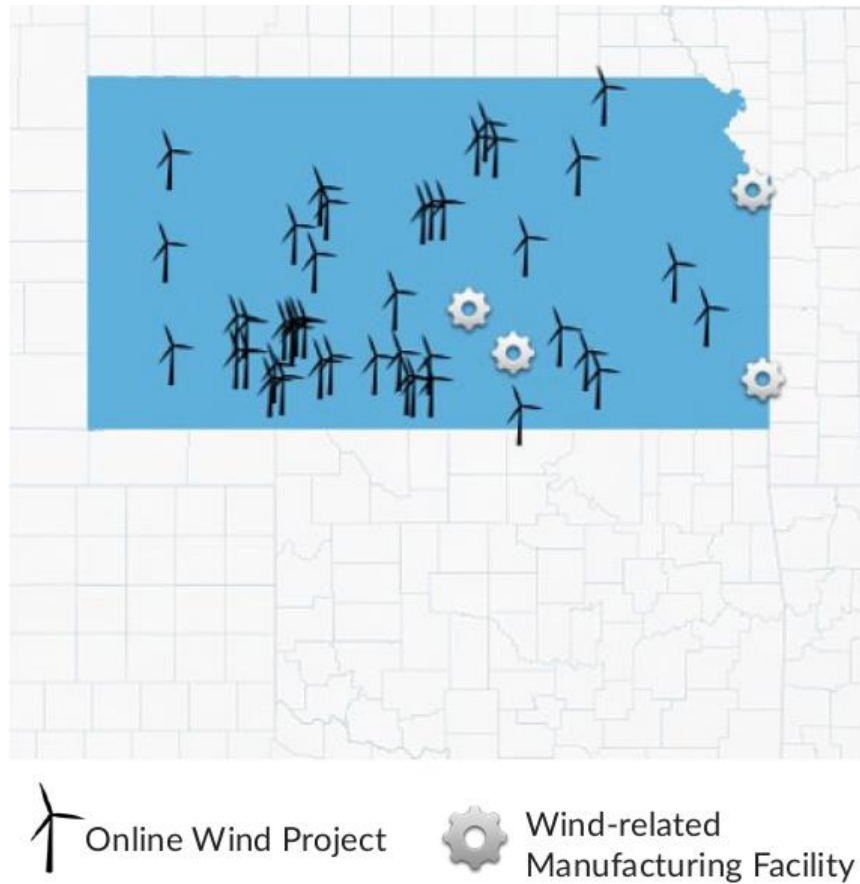
Although Kansas has long been known for the winds sweeping across its prairielands, it was not until 1999 that Westar Energy (then “Western Resources”) took the first steps into utility-scale wind power with the installation of two 600 KW *Vestas* wind turbines near the Jeffrey Energy Center in Pottawatomie 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, projects have been consistently constructed each year from 2008 through 2020.

<b>Name</b>	<b>County</b>	<b>Size (MW)</b>	<b>Began Operation</b>
Gray County	Gray	112	2001
Elk River	Butler	150	2005
Spearville	Ford	100.5	2006
Meridian Way	Cloud	204	2008
Smoky Hills I	Lincoln/ Ellsworth	100.8	2008
Smoky Hills II	Lincoln/ Ellsworth	150	2008
Central Plains	Wichita	99	2009
Flat Ridge 1	Barber	100	2009
Greensburg	Kiowa	12.5	2009
Spearville II	Ford	48	2010
Caney River	Elk	200	2010
Cimarron I	Gray	165	2011
Cimarron II	Gray	131	2012
Ensign	Gray	99	2012
Flat Ridge 2	Barber, Kingman, Sumner, Harper	470.4	2012
Ironwood	Ford	168	2012
Post Rock	Lincoln/Ellsworth	201	2012
Shooting Star	Kiowa	105	2012
Spearville III	Ford	100.8	2012
Buffalo Dunes	Finney, Haskell, Grant	249.75	2012
Alexander	Rush	48.3	2013
Buckeye	Ellis	200	2015
Cedar Bluff	Ness & Trego	200	2015
Slate Creek	Sumner	150	2015
Marshall	Marshall	74	2015
Waverly	Coffey	199	2016
Ninnescah	Pratt	200	2016
Kingman	Kingman	200	2017
Cimarron Bend	Clark	400	2017
Bloom	Ford/Clark	178	2017
Western Plains	Ford	280	2018
Pratt	Pratt	243.4	2018
Diamond Vista	Marion	300	2019
Solomon Forks	Thomas	276	2019

East Fork	Thomas	196	2019
Prairie Queen	Allen	199.3	2019
Reading	Lyon	200	2019
Neosho Ridge	Neosho	300	2020
Soldier Creek	Nemaha	300	2020
Cimarron Bend 3	Clark	199.9	2020
<b>Total</b>		<b>7,306.25</b>	



**Figure 4: Utility-Scale Wind Generation in Kansas**

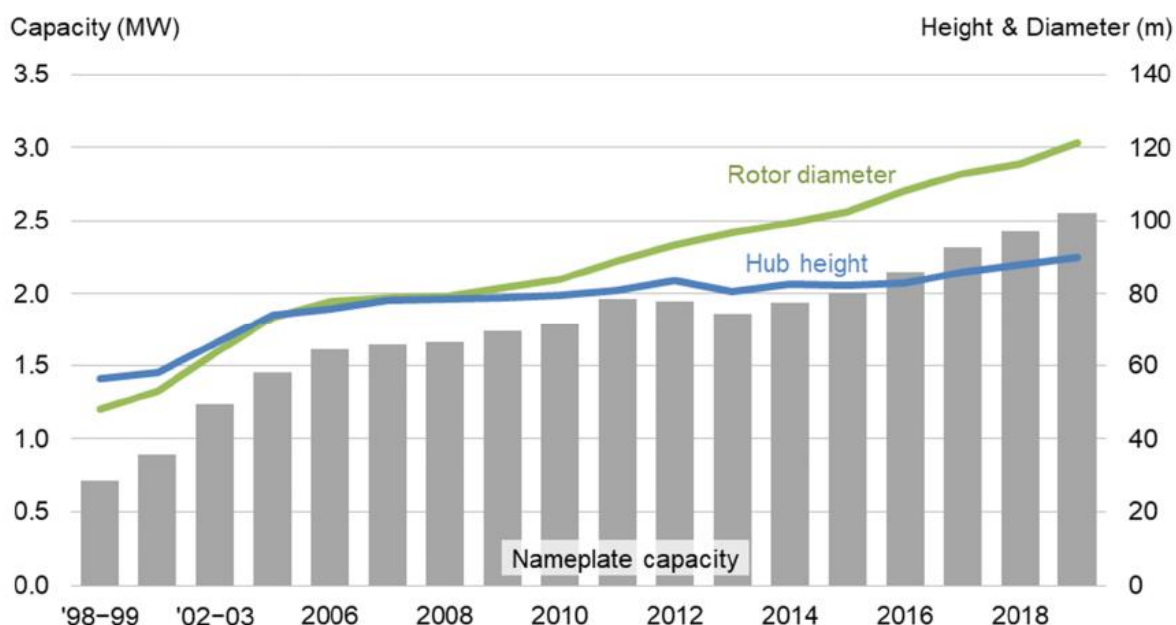
*Source: American Wind Energy Association, Kansas State Fact Sheet (accessed 9/7/20)*

### **C. FUTURE PROJECT DEVELOPMENT**

Despite the significant growth that the Kansas wind industry has experienced over the past few years, the vast majority of the state's wind resources remain 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 project sites ready to be developed. While some potential wind project sites require incremental improvements in wind generation technology, many simply await a buyer or require expansion of transmission infrastructure to bring the electricity to markets and consumers.

One of the most fundamental technological improvements that has benefited wind technology over the last 20 years have been improvements to hub heights, rotor diameters, and turbine technology. Generally speaking, wind speeds increase as turbine heights (referred to in the industry as “hub heights”) increase. Wind speed is the single most important factor in creating electricity out of the wind, thus tapping into more high speed winds is a vital step to developing successful wind projects. For this reason, the most noticeable wind turbine technology improvements have focused on increasing hub heights and expanding the diameter of the rotors attached to the generators. These improvements have led to significant increases in efficiency, which have resulted in wind farms with higher capacity factors in high wind areas, and allowed for similar capacity factors in areas with lesser winds or lower elevations.

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 5 below, over the last decade, hub heights across the country have steadily increased from an average of approximately 60 meters in 2001, to 86 meters in 2019.

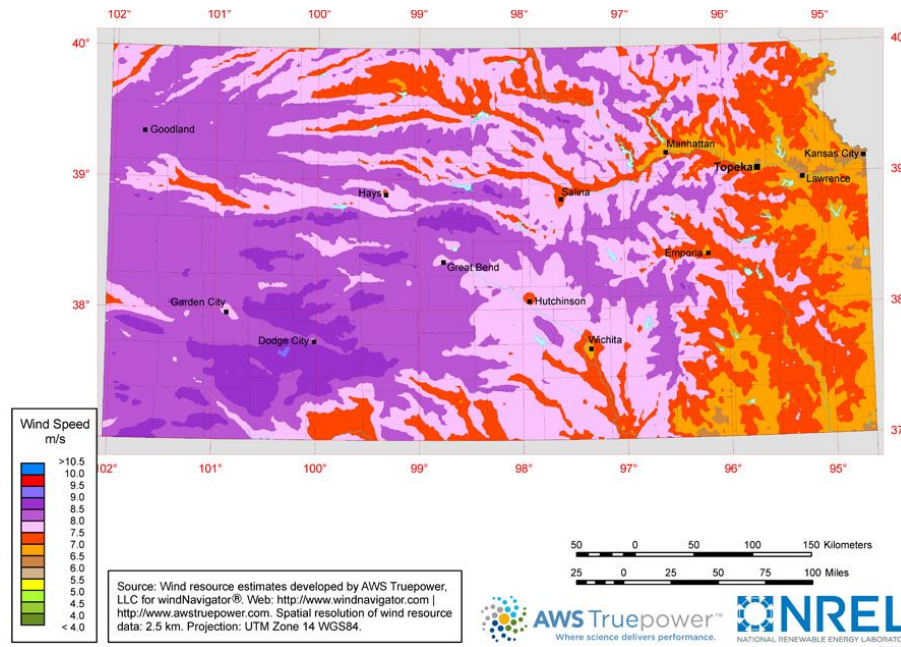


**Figure 5: Increases in Hub Heights and Rotor Diameters (1998-2019)<sup>11</sup>**

Source: Lawrence Berkley National Lab

On average, Kansas possesses robust wind resources at a height of 50 meters, and superb resources at 80 meters. As Figure 6 below illustrates, at a height of 80 meters, roughly half of the state experiences average wind speeds between eight to nine meters per second, which is well above the seven to eight meters per second that is commonly found at a height of 50 meters. Essentially, this difference means that as hub heights continue to increase, space can be used more and more efficiently to produce wind energy.

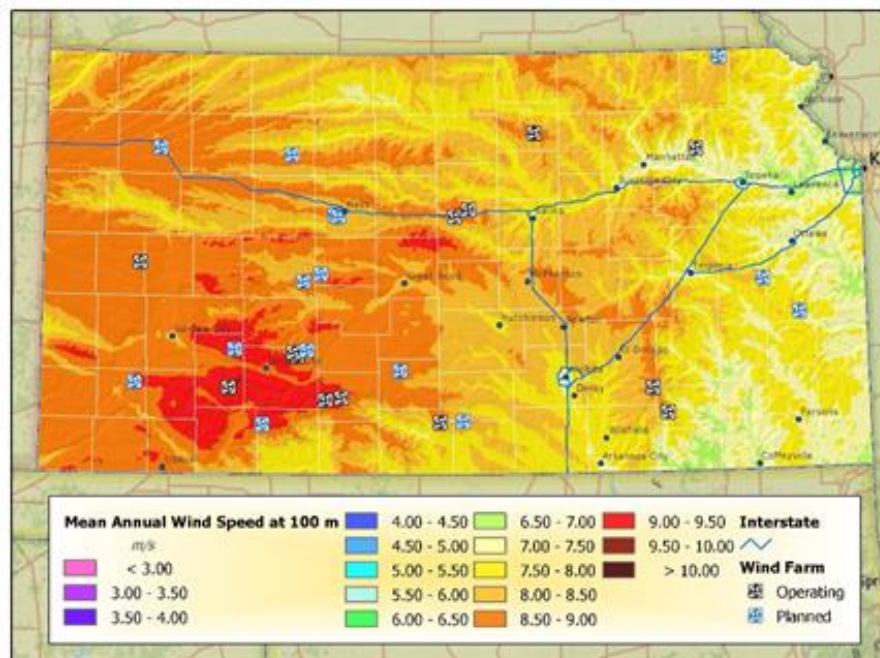




**Figure 6: Kansas Annual Wind Speeds at 80 meters.<sup>12</sup>**

Source: National Renewable Energy Laboratory

As the average hub heights for Kansas wind projects increases from the current average of 80 meters and approaches 100 meters, access to high quality wind resources will increase and more locations in Kansas will be economically viable sites for strong wind development, as indicated by Figure 8.



**Figure 7: Kansas Annual Average Wind Speeds at 100m<sup>13</sup>**

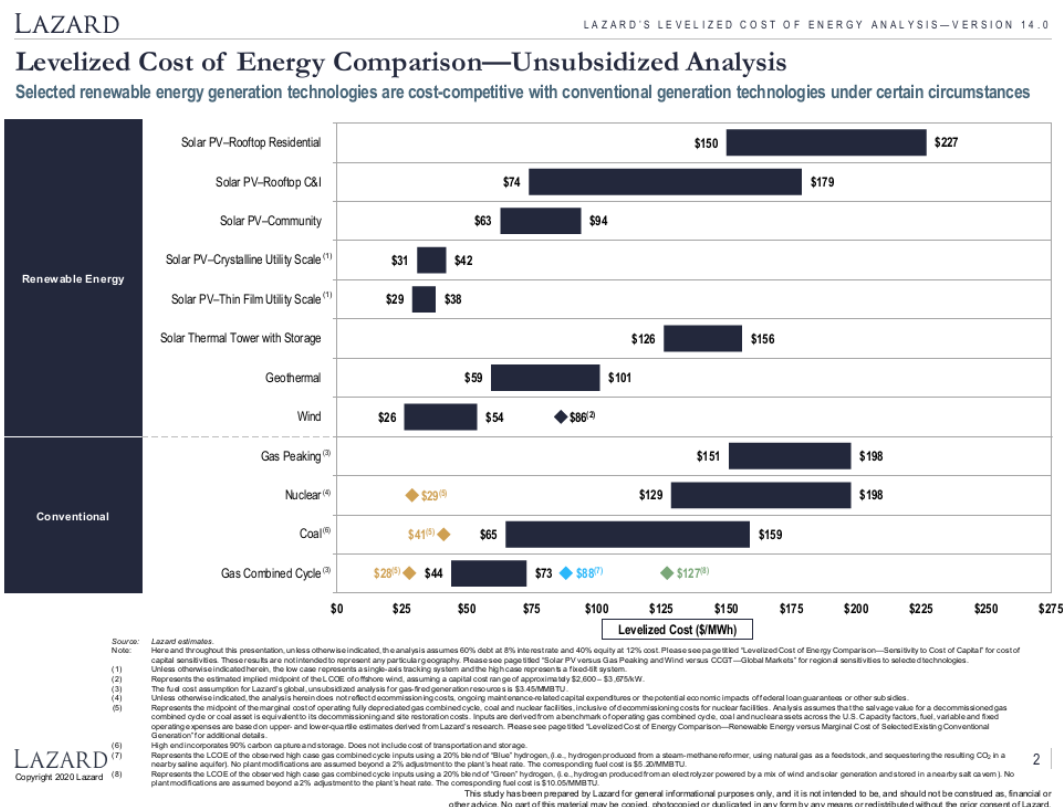
Source: AWS Truepower

## IV. COST OF NEW WIND GENERATION

Any time that a public utility purchases power at wholesale or installs new generation assets, the costs of that energy are passed to customers through their electricity rates—wind generation does this no differently than coal, natural gas or nuclear plants. 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 pay for generation from other types of resources.

### A. COMPARING THE COSTS OF VARIOUS ENERGY TECHNOLOGIES

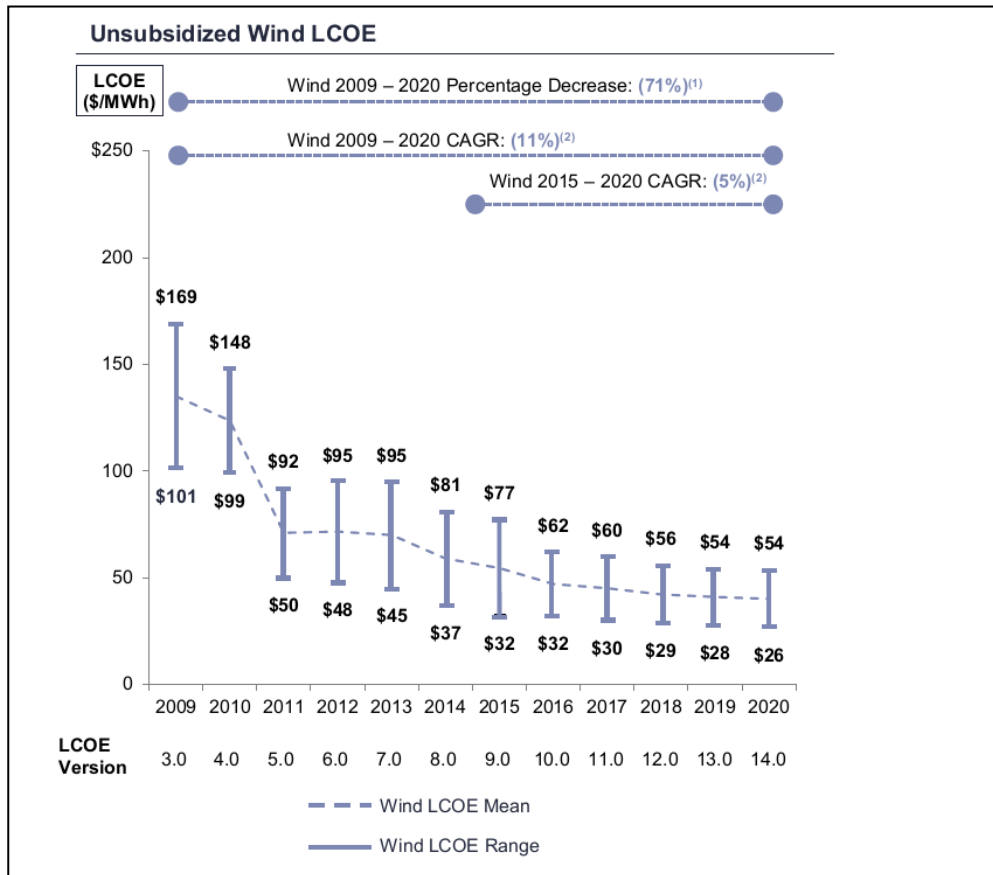
It is well-established that the all-in cost of generating electricity from wind is less expensive than the all-in cost of generating electricity from coal. In most cases, the all-in cost of generating electricity from wind is also less expensive than the all-in cost of generating electricity from natural gas. Lazard’s Levelized Cost of Energy Analysis—Version 14.0 (Oct. 2020) reports that the cost per megawatt-hour (“MWh”) of electricity generated by wind, before tax credits, is between \$26 and \$54, while the cost per MWh of electricity from coal is between \$65 and \$159, and the cost per MWh of electricity from a combined cycle natural gas plant is between \$44 and \$73.<sup>14</sup> In Kansas, the levelized cost of energy is even lower than this national comparison.



**Figure 8: Lazard Levelized Cost of Energy Comparison**

Source: Lazard’s Levelized Cost of Energy Analysis—Version 14.0 (Oct. 2020), p. 2, available at <https://www.lazard.com/media/451419/lazards-levelized-cost-of-energy-version-140.pdf>.

Further, the unsubsidized levelized cost of wind energy continues to decline:



**Figure 9: Lazard Unsubsidized Wind Levelized Cost of Energy – 2009-2020**

Source: Lazard’s Levelized Cost of Energy Analysis—Version 14.0 (Oct. 2020), p. 8.

Locally, the 2018 Integrated Resource Plan (“IRP”) filed by Evergy Missouri Metro (formerly Kansas City Power & Light (“KCP&L”)) reported that the estimated “utility cost plus probable environmental cost” of wind was \$48.15 per MWh, compared to coal at \$82.80, coal with carbon capture at \$111.80, and combined cycle natural gas at \$58.80.



Technology Ranking by Nominal Probable Environmental Cost			
Rank	Technology	Capacity Factor (%)	Nominal Utility Cost (\$/MWh)
1	Wind	54%	\$ 48.15
2	CC: 2x1 7FA	60%	\$ 58.80
3	Landfill Gas	88%	\$ 75.94
4	SCPC	85%	\$ 82.80
5	Small Modular Reactors	90%	\$ 92.14
6	IGCC	85%	\$ 100.82
7	Large Scale Nuclear	90%	\$ 101.75
8	SCPC w/CC	85%	\$ 111.80
9	Solar PV Single Axis Tracking	16%	\$ 117.79
10	Compressed Air Energy Storage	23%	\$ 128.03
11	IGCC w/CC	85%	\$ 130.11
12	CT: 7FA.05	10%	\$ 143.05
13	Biomass BFB Boiler	85%	\$ 145.20
14	Solar PV Central Station	17%	\$ 163.69
15	Pumped Hydro Energy Storage	27%	\$ 166.81
16	Reciprocating Engines	10%	\$ 171.93
17	Lithium-ion Battery	27%	\$ 217.41
18	CT: LMS100 (1X)	10%	\$ 231.54
19	CT: LM6000 (2X)	10%	\$ 249.12
20	Fuel Cell - Solid Oxide	30%	\$ 311.65

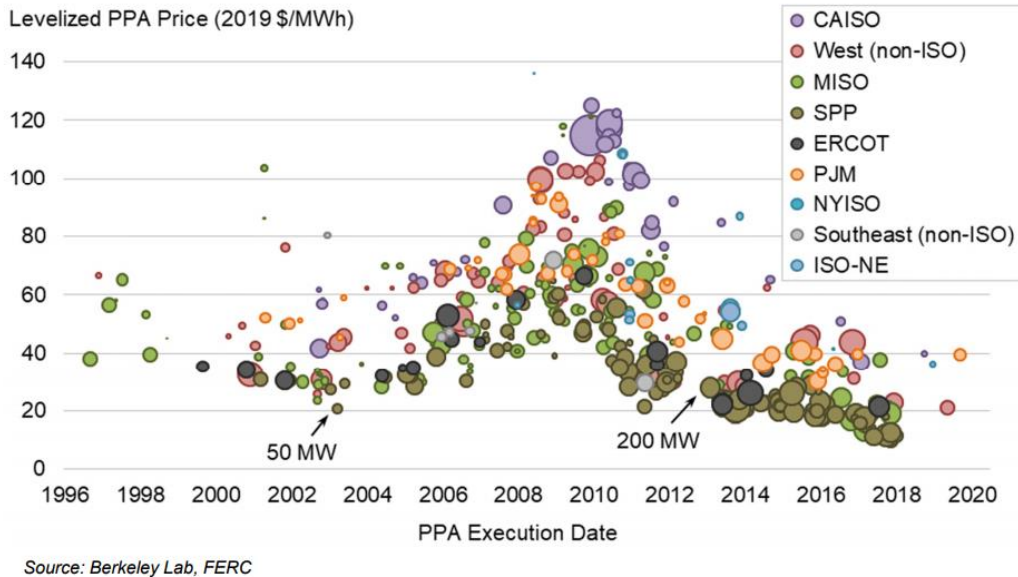
**Figure 10: Evergy 2018 Integrated Resource Plan Cost Comparison**

Source: Missouri Public Service Commission, Case No. EO-2018-0268, KCP&L Integrated Resource Plan, Volume 4, p. 28, Table 14 (Apr. 2018).

The “utility cost plus probable environmental cost,” represented above, attempts to estimate the total capital requirement for building the unit, including the plant capital costs, transmission capital costs, owner costs, and interest during construction. It also accounts for the fixed and variable O&M costs, fuel costs, and probable environmental costs (forecasted allowances prices for SO<sub>2</sub>, NO<sub>x</sub>, and CO<sub>2</sub>) over the life of the asset.

While this estimate indicates wind is marginally more cost-effective than combined cycle gas, a recent real-world example indicates ownership of wind is actually much cheaper: in 2018, Westar Energy, Inc. (“Westar”) (now Evergy Kansas Central) reported that the levelized cost of ownership of Western Plains Wind Farm was projected to be \$18.89/MWh.<sup>15</sup> This figure is nearly \$30 per MWh cheaper than the “utility cost plus probably environmental cost” charted above. The projection for Western Plains Wind Farm is also more in line with power purchase agreement (“PPA”) prices, which have been trending below \$20.00/MWh in the Southwest Power Pool (“SPP”) over the last few years.<sup>16</sup> PPA prices in SPP, including in Kansas, are represented by the brown circles in the chart below, which was prepared by the Lawrence Berkeley National Laboratory, a U.S. Department of Energy National Laboratory managed by the University of California.<sup>17</sup> These PPA prices, and the publicly available data referenced above, show that wind energy in Kansas is very often the lowest cost electricity alternative, including when compared to operating fossil fuel generation.

### Levelized wind PPA prices by PPA execution date and region (full sample)



**Figure 11: Levelized Wind PPA Prices**

#### B. ACCOUNTING FOR THE UNRECOVERED INVESTMENTS IN COAL

Based on the foregoing cost comparisons, if we were to build the electric grid anew based on the most economic sources of energy, coal would not have an economic place in the generation mix. In fact, SPP has not added any new coal capacity since 2013.<sup>18</sup> However, because very large investments have been made in coal generation, coal plants cannot be retired without accounting for the unrecovered portion of those investments. For example, KCP&L and Westar spent \$1.23 billion on environmental retrofits at the La Cygne coal plant, which were completed in 2015. When the retrofit expenses were approved, La Cygne was expected to have a remaining useful life of more than two decades.<sup>19</sup>

Unfortunately, there are no publicly-available studies that provide a comprehensive cost-benefit analysis of continuing to operate existing coal plants in Kansas versus replacing those coal plants with new wind generation.<sup>20</sup> Such a study would need to account for some form of cost-recovery mechanism for the undepreciated portion of the retired coal plants, and there are many variations of cost-recovery mechanisms. A securitization mechanism, such as the one included in Senate Bill 245, under consideration in the 2021 Kansas legislative session, is one such mechanism. A comprehensive cost-benefit study would also need to address reliability issues.

Despite the lack of a comprehensive cost-benefit analysis of existing coal versus new wind, there are publicly available sources that show the cost of continuing to operate coal generation in Kansas is more expensive than replacing the coal generation with Kansas wind.

For example, in Westar's 2018 rate case before the Kansas Corporation Commission ("KCC"), Westar witness John Bridson testified as follows:

We have found the all in cost of wind is very competitive with the variable or incremental cost of fossil generation. Variable or incremental costs include only the fuel and a small amount of operations and maintenance expense associated with running the plant. In fact, at times, the all-in cost of wind energy has been even lower than our total fleet average annual production cost. In other words, adding these wind resources *reduces* our customers' all-in cost. While our existing plants are still quite necessary to provide *capacity*, relying on them less for *energy* not only reduces emissions, but also reduces customers' rates.<sup>21</sup>

Mr. Bridson further testified that the results of a 2015 request for proposals "indicated that the proposed additions [of wind generation] would reduce our annual production costs because the all-in costs of a new wind farm would be lower than the marginal costs of energy (largely fuel costs) from our other sources."<sup>22</sup>

The poor economics of coal were also addressed in a recent KCC proceeding regarding Westar's purchase of an 8% interest in Jeffery Energy Center ("JEC"), the largest coal plant in Kansas. Westar and KCP&L owned the other 92% of JEC when it entered into an agreement in early 2019 to purchase the 8% interest at the end of a sale-leaseback agreement with its financial partners. During the investigation, Westar provided its own cash flow analysis for the 8% interest in JEC that showed the cost of operating JEC outweighed the market cost of energy in SPP by over \$8 million/year from 2019-2035, for cumulative estimated losses of over \$138 million.<sup>23</sup> The following chart shows the year-over-year losses from operating the 8% interest in JEC.

Jeffery Energy Center 8% Cash Flow				
Year	Total Cash Outflow	Total Cash Inflow	Annual Surplus/Deficit	Cummulative Deficit
2015	\$22,976,208	\$19,310,716	(\$3,665,492)	
2016	\$21,318,870	\$15,313,829	(\$6,005,041)	
2017	\$17,140,877	\$12,209,396	(\$4,931,481)	
2018	\$20,478,651	\$16,001,597	(\$4,477,054)	
2019	\$26,473,331	\$16,401,636	(\$10,071,695)	(\$10,071,695)
2020	\$27,244,847	\$16,811,677	(\$10,433,170)	(\$20,504,865)
2021	\$27,702,075	\$17,231,969	(\$10,470,106)	(\$30,974,971)
2022	\$26,911,742	\$17,662,768	(\$9,248,974)	(\$40,223,945)
2023	\$26,235,233	\$18,104,338	(\$8,130,895)	(\$48,354,840)
2024	\$26,866,535	\$18,556,946	(\$8,309,589)	(\$56,664,429)
2025	\$27,171,783	\$19,020,870	(\$8,150,913)	(\$64,815,342)
2026	\$27,076,262	\$19,496,392	(\$7,579,870)	(\$72,395,212)
2027	\$27,476,353	\$19,983,801	(\$7,492,552)	(\$79,887,764)
2028	\$28,280,446	\$20,483,396	(\$7,797,050)	(\$87,684,814)
2029	\$28,468,942	\$20,995,481	(\$7,473,461)	(\$95,158,275)
2030	\$29,466,250	\$21,520,368	(\$7,945,882)	(\$103,104,157)
2031	\$29,920,791	\$22,058,378	(\$7,862,413)	(\$110,966,570)
2032 (JEC3 Last Year)	\$31,044,995	\$22,609,837	(\$8,435,158)	(\$119,401,728)
2033 (JEC2 Last Year)	\$21,812,537	\$15,527,306	(\$6,285,231)	(\$125,686,959)
2034 (JEC1 Last Year)	\$10,280,247	\$7,838,972	(\$2,441,275)	(\$128,128,234)
2035	\$10,226,321	\$0	(\$10,226,321)	(\$138,354,555)

**Figure 12: Jeffery Energy Center Cash Flow**

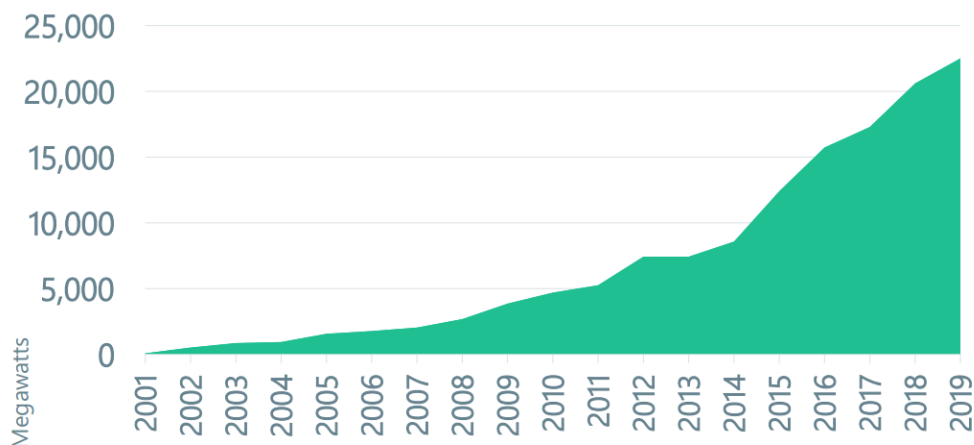
Source: KCC Docket No. 19-WSEE-355-TAR, Exhibit MPG-1, p. 3, attached to the Direct Testimony of Michael P. Gorman (June 4, 2019).

In 2019, London Economics International LLC (“LEI”) was selected by the Kansas legislature to study how effective current electric ratemaking practices are at encouraging the best practical combination of price, quality and service by electric utilities in Kansas. LEI was also tasked with evaluating options available to the Kansas Corporation Commission to make Kansas electricity prices regionally competitive.

One of the central findings by LEI was that Kansas ratepayers are inadequately protected from resources that are underutilized—in particular, coal plants. LEI found that the average capacity utilization rate of coal plants in Kansas declined 29% between 2007 and 2018—from a 79% utilization rate to a 50% utilization rate.<sup>24</sup> The drop in utilization is a result of coal competing with the dramatic growth in cheaper wind resources in the wholesale energy markets of SPP.

As Mr. Bridson said in his 2018 testimony, “[w]ind generation has increased in the SPP from 4,000 MW in 2011 to 17,596 MW in 2017. Because of the nature of the SPP market, this additional wind has the potential to reduce capacity factors at fossil units in the SPP....”<sup>25</sup> A visual of the increase in wind capacity in SPP is shown below:

## INSTALLED WIND CAPACITY BY YEAR



**Figure 13: Installed Wind Capacity by Year in Southwest Power Pool**

*Source: SPP 101 An Introduction to Southwest Power Pool<sup>26</sup>*

Despite the drop in utilization of coal plants, the majority of the costs to own and operate coal plants (including depreciation expense and fixed operations and maintenance) has not dropped and has not been removed from retail customers' bills. Because of these large, unrecovered costs of coal investments, the benefits of cheaper wind have not been fully realized by retail electric customers in Kansas.

### C. IMPACT OF TRANSMISSION COSTS ON THE COMPETITIVENESS OF WIND

One common criticism of wind generation is that it requires additional transmission to move the electricity to market. Part II of the Legislative Study, which was conducted by AECOM, addresses this concern through its study of the impact of transmission investment in Kansas. The AECOM study found:

While transmission investments affect the average retail electricity price through the revenue requirements of the various transmission zones, they also provide benefits to ratepayers by lowering transmission congestion and line losses throughout the system. This creates benefits for the end-users through access to more reliability and more efficient electric generation.<sup>27</sup>

AECOM noted that a precipitous drop in wholesale electric generation prices between 2013 and 2019 coincided with increased transmission investments. Accordingly, the cost of transmission does not offset the benefits of additional wind generation.

## V. WIND GENERATION CREATES JOBS

### A. METHODOLOGY

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 on the economic benefits of wind energy to a state. However, even with this overwhelming magnitude of information, there is a lack of information specific to Kansas empirical data from the 40 utility-scale wind projects that have been constructed in the state. In order to get a better idea of what benefits wind energy has brought Kansas, this report quantifies the economic impact from empirical data found in publicly-released sources.

Fortunately, most Kansas wind developers have been willing to disclose information about the economic benefits of their projects. As a result, for this *Section VI*, and *Section VII* below, an average impact per megawatt of generation has been calculated, which can then be utilized to estimate data points for projects where information has not been readily accessible, and conclusions can be accurately drawn.

### B. JOB CREATION

**Table 1: Wind Job Creation in the state of Kansas<sup>28</sup>**

	<b>Total Impact</b>	<b>Per 200 MW</b>
<b>Total Jobs Created</b>	<b>22,002</b>	<b>602</b>
Construction Phase	8,682	238
Operation Phase	563	16
Indirect/Induced Jobs (per U.S. Dept. of Energy)	12,757	349

With numerous multi-million-dollar construction projects already operating across Kansas, often in rural or economically-depressed areas, job creation is one of the most significant benefits that wind generation provides to Kansas' citizens. Over the last two decades, our analysis indicates that the forty wind farms in operation in Kansas have created approximately 9,245 jobs relating directly to the construction and operation of the projects. Of those jobs, approximately 8,682 positions relate to project construction, and approximately 563 positions relate to on-going operation and maintenance of the projects.

Other 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.<sup>29</sup> 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.<sup>30</sup>

Additionally, the influx of new labor brought by wind project construction, operations and maintenance creates a ripple effect that benefits other areas of the economy. For example, based upon the U.S. Department of Energy estimates, the 7,306 MW of wind generation in Kansas created an additional 11,441 jobs during the construction phase of the projects, and an additional

1,315 jobs during the operation phase of the projects.<sup>31</sup> These estimates look specifically at indirect jobs, such as employees of the banks financing the projects, component suppliers, manufacturers of equipment, as well as induced jobs: such as employees of restaurants, lodging providers, retail establishments, child care providers and others who serve the workers.

## VI. ECONOMIC RESOURCES BROUGHT TO KANSAS BY WIND ENERGY

With forty wind projects currently in operation in Kansas, an important question for Kansas' citizens and policymakers is what impact those projects have had on the state economy, beyond just jobs. Using the methodology described above in *Section VI*, this Section examines the revenue that flows into the state from wind energy.

### A. 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 \$48,111,890 annually to the landowners who host wind projects on their property.

**Table 2: Landowner Lease Payments in the state of Kansas**

	Total Impact	Per Avg. Project (200 MW)
<b>Landowner Lease Payments</b>		
Annually	\$48,111,890	\$1,317,051
<b>Over 20-Year Project Life</b>	<b>\$962,237,800</b>	<b>\$26,341,029</b>

This estimate is supported by a recent study by the National Renewable Energy Laboratory, which found that land lease payments to landowners range from \$1,300 per MW to \$5,000 per MW across the Midwest.<sup>32</sup> Applying this rather broad range of numbers to Kansas, the report determined that, per 1,000 MW of installed capacity, Kansas landowners receive between \$2 million and \$8 million per year from wind project developers.

### B. 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 donations 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 have committed to pay a total of \$657,726,485 over the lifetimes of the various projects to Kansas state, county, and local jurisdictions through a combination of voluntary donations and property tax payments. To calculate this total impact of voluntary donations, the authors have compiled copies of all of the Payment-in-Lieu of Taxes Agreements, Contribution Agreements, and Donation Agreements from the projects operating in Kansas and compiled the totals through Kansas Open Records Act requests and publicly available sources.<sup>33</sup> Additionally, for those projects that have been constructed after Kansas implemented a 10-year tax exemption, the authors have estimated the property tax payments for the applicable projects based upon an assumed capital cost of \$1.67 million per MW.<sup>34</sup>



**Table 3: Donation Agreements and Property Tax in the state of Kansas**

	<b>Total Impact</b>	<b>Per Avg. Project (200 MW)</b>
<b>Donation Agreements and Property Tax</b>		
<b>Payments</b>	<b>\$657,726,485</b>	<b>\$18,005,105</b>

## **VII. CONCLUSION**

Kansas' energy resources and geography position it to be at the forefront of the energy industry, and to market itself as truly pursuing a well-rounded approach to power generation. 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, and many factually incorrect statements, there had not yet been a good study that evaluated the data as to what had happened, until the first edition of this report came out in 2014. Fortunately, because the Kansas utilities have embraced wind energy generation as a valuable component of their energy portfolios and made significant strides towards an increased reliance on renewable energy, the data required to do this economic analysis is publicly available, and this 2020 update was possible.

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 often the lowest cost option when compared to other sources of new electricity generation and many currently operating power plants, 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.
4. Wind energy provides important economic benefits for landowners and local economies.
5. With companies increasingly asking for renewable energy, Kansas must use its strategic geographical location to remain competitive in attracting industry.

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.

## ENDNOTES:

<sup>1</sup> *Total Operating Wind Farms in KS as of September, 2020*: Kansas Department of Commerce, Wind Resources of Kansas, available at <https://www.kansascommerce.gov/wp-content/uploads/2019/08/Kansas-Wind-Map-Project-List-2019.pdf>; [http://www.kansasenergy.org/KS\\_wind\\_projects\\_case.htm](http://www.kansasenergy.org/KS_wind_projects_case.htm).  
*Construction and Ongoing Maintenance Job Generation Data Derived From*: See e.g. Voorhis, Dan, “Wind farms a cash crop for rural Kansas counties,” *Wichita Eagle*, July 12, 2012, available at <https://www.kansas.com/news/business/article1095432.html>; Iberdrola Renewables, Fact Sheet, “Elk River Wind Power Project,” available at [http://www.iberdrolarenewables.us/pdf/Elk\\_River\\_fact\\_sheet.pdf](http://www.iberdrolarenewables.us/pdf/Elk_River_fact_sheet.pdf); <http://beaumonthotelks.com/elk-river-wind-project/>; Vandernack, Tim, “Wind Farm, Company to Energize County with \$9.73M”, *The Hutchinson News*, December 9, 2006, available at <http://www.windaction.org/posts/2988-wind-farm-company-to-energize-county-with-9-73>; 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>; 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<https://www.aweablog.org/buffalo-dunes-wind-project-a-lesson-in-export-affordability-and-transmission/>; [http://www.hdnews.net/news/wind-farm-officially-online/article\\_e25ec466-e23e-5f8e-abb1-d7a60586d5f9.html](http://www.hdnews.net/news/wind-farm-officially-online/article_e25ec466-e23e-5f8e-abb1-d7a60586d5f9.html); <http://www.och-c.com/?q=article/wind-turbines-transforming-southern-horizon>; <https://www-wichita.westarenergy.com/content/about-us/news/2014-news-releases/cedar-bluff-wind>; <http://www.wellingtondailynews.com/article/20150515/NEWS/150519613>; <https://www.evwind.es/2017/03/02/west-ar-completes-280-mw-western-plains-wind-farm-in-kansas/58985>; <https://www.windpowerengineering.com/nextera-westar-energy-celebrate-commissioning-two-kansas-wind-farms/>; <http://www2.ljworld.com/news/2016/apr/08/new-400-mw-wind-farm-planned-southwest-kansas/>; <https://www.dodgeglobe.com/news/20170421/wind-farm-projects-continue>; <https://www.power-technology.com/projects/diamond-vista-windfarm-kansas/>; 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<sup>2</sup> *Additional Sources for lease and donation agreement payments*: [http://www.hdnews.net/news/wind-farm-officially-online/article\\_e25ec466-e23e-5f8e-abb1-d7a60586d5f9.html](http://www.hdnews.net/news/wind-farm-officially-online/article_e25ec466-e23e-5f8e-abb1-d7a60586d5f9.html); <http://www.och-c.com/?q=article/wind-turbines-transforming-southern-horizon>; <https://www.wichita.westarenergy.com/content/about-us/news/2014-news-releases/cedar-bluff-wind>; <http://www.wellingtondailynews.com/article/20150515/NEWS/150519613>; <http://www.windsystemsmag.com/news/detail/684/marshall-wind-energy-mortenson-team-up-on-74-mw-kansas-project>; <https://www.wichita.westarenergy.com/content/about-us/news/2015-news-releases/western-plains>; <https://www.wichita.westarenergy.com/content/about-us/news/2015-news-releases/ninnescah-wind-farm-announcement>; <http://www2.ljworld.com/news/2016/apr/08/new-400-mw-wind-farm-planned-southwest-kansas/>; <https://www.capitalpower.com/generationportfolio/US/Bloom/Bloom%20Wind%20Fact%20Sheet.pdf>; <https://www.wind-watch.org/news/2016/01/10/no-wind-farms-yet-for-finney-county-but-the-potential-is-there/>; <http://www.pratttribune.com/article/20160121/NEWS/160129876>; *See also*,

<https://www.wibw.com/content/news/Gov-Kelly-announces-Kansas-wind-farm-construction-571356791.html>; Additionally, copies of each Payment in Lieu of Taxes Agreements, Contribution Agreements, and Donation Agreements for all projects listed were obtained through Kansas Open Records Act requests or publicly available sources and compiled for this report. To estimate the property tax liability for projects subject to the 10-year state property tax exemption, this Report has assumed an average per MW capital cost of \$1.1666M, depreciated down to a 20% floor, and a blended tax rate of 0.03.

<sup>3</sup> Kansas is tied for 2nd with Montana behind Texas 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>.

<sup>4</sup> Kansas Wind map at 50-m Height, Wind Powering America, U.S. Department of Energy, *available at* [http://www.windpoweringamerica.gov/maps\\_template.asp?stateab=ks](http://www.windpoweringamerica.gov/maps_template.asp?stateab=ks).

<sup>5</sup> United States Wind map at 50-m Height, Wind Powering America, U.S. Department of Energy, *available at* <http://www.nrel.gov/gis/pdfs/windmodel4pub1-1-9base200904enh.pdf>.

<sup>6</sup> United States Wind map at 50-m Height, Wind Powering America, U.S. Department of Energy, *available at* <http://www.nrel.gov/gis/pdfs/windmodel4pub1-1-9base200904enh.pdf>.

<sup>7</sup> Wiser, R.; Bolinger, M.; Hoen, B.; Millstein, D.; Rand, R.; Barbose, G.; Dargouth, N.; Gorman, W.; Jeong, S.; Mills, A.; Paulos, B.; Lawrence Berkeley National Lab, “Wind Energy Technology Data Update: 2020 Edition, August 2020, *available at* [https://emp.lbl.gov/sites/default/files/2020\\_wind\\_energy\\_technology\\_data\\_update.pdf](https://emp.lbl.gov/sites/default/files/2020_wind_energy_technology_data_update.pdf).

<sup>8</sup> American Wind Energy Association, Kansas State Fact Sheet, *available at* <https://www.awea.org/Awea/media/Resources/StateFactSheets/Kansas.pdf>.

<sup>9</sup> See, American Wind Energy Association, Kansas State Fact Sheet, *available at* <https://www.awea.org/Awea/media/Resources/StateFactSheets/Kansas.pdf>, with additional MWs added to account for projects expected to complete construction through the end of 2020.

<sup>10</sup> American Wind Energy Association, Kansas State Fact Sheet, *available at* <https://www.awea.org/Awea/media/Resources/StateFactSheets/Kansas.pdf>.

<sup>11</sup> Wiser, R.; Bolinger, M.; Hoen, B.; Millstein, D.; Rand, R.; Barbose, G.; Dargouth, N.; Gorman, W.; Jeong, S.; Mills, A.; Paulos, B.; Lawrence Berkeley National Lab, “Wind Energy Technology Data Update: 2020 Edition, August 2020, *available at* [https://emp.lbl.gov/sites/default/files/2020\\_wind\\_energy\\_technology\\_data\\_update.pdf](https://emp.lbl.gov/sites/default/files/2020_wind_energy_technology_data_update.pdf).

<sup>12</sup> Kansas Wind map at 80-m Height, Wind Powering America, U.S. Department of Energy, *available at* [http://www.windpoweringamerica.gov/pdfs/wind\\_maps/ks\\_80m.pdf](http://www.windpoweringamerica.gov/pdfs/wind_maps/ks_80m.pdf).

<sup>13</sup> AWS Truepower

<sup>14</sup> Lazard’s Levelized Cost of Energy Analysis—Version 14.0 (Oct. 2020), p. 2, *available at* <https://www.lazard.com/media/451419/lazards-levelized-cost-of-energy-version-140.pdf>.

<sup>15</sup> Kansas Corporation Commission, Case No. 18-WSEE-328-RTS, Direct Testimony of John T. Bridson, p. 20 (Feb 1, 2018).

<sup>16</sup> <https://emp.lbl.gov/wind-power-purchase-agreement-ppa-prices>.

<sup>17</sup> Lawrence Berkeley National Laboratory, Wind Energy Technology Update: 2020 Edition, p. 62, *available at* [WindReport.lbl.gov](http://WindReport.lbl.gov).

<sup>18</sup> *Id.*, p. 8.

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<sup>19</sup> Kansas Corporation Commission, Docket No. 11-KCPE-581-PRE, Order Granting KCP&L Petition for Predetermination of Rate-Making Principles and Treatment, ¶ 66 (Aug. 19, 2011).

<sup>20</sup> See KCC Docket No. 19-KCPE-096-CPL, Order Adopting Integrated Resource Plan and Capital Plan Framework, ¶ 22 (Feb. 6, 2020) (“To date, the Commission has not been presented with a cost/benefit study comparing the continued use of coal plants to substituting renewable resources for all generation requirements”).

<sup>21</sup> KCC Docket No. 18-WSEE-328-RTS, Direct Testimony of John T. Bridson, p. 7 (Feb. 1, 2018) (emphasis in original).

<sup>22</sup> Id. at 9.

<sup>23</sup> KCC Docket No. 19-WSEE-355-TAR, Exhibit MPG-1, p. 3, attached to the Direct Testimony of Michael P. Gorman (June 4, 2019).

<sup>24</sup> London Economics International LLC, Study of Retail Rates of Kansas Electric Public Utilities, p. 93 (Jan. 8, 2020) (filed in KCC Docket No. 20-GIME-068-GIE).

<sup>25</sup> KCC Docket No. 18-WSEE-328-RTS, Rebuttal Testimony of John T. Bridson, p. 24 (July 3, 2018).

<sup>26</sup> Available at: <https://www.spp.org/documents/31587/spp101%20-%20an%20introduction%20to%20spp%20-%20all%20slides%20for%20print.pdf>

<sup>27</sup> AECOM, Study of Consequential Issues Materially Affecting Kansas Electricity Rates, p. 97 (July 2, 2020) (filed in KCC Docket No. 20-GIME-068-GIE).

<sup>28</sup> See e.g. Voorhis, Dan, “Wind farms a cash crop for rural Kansas counties,” Wichita Eagle, July 12, 2012, available at <https://www.kansas.com/news/business/article1095432.html>; Iberdrola Renewables, Fact Sheet, “Elk River Wind Power Project,” available at [http://www.iberdrolarenewables.us/pdf/Elk\\_River\\_fact\\_sheet.pdf](http://www.iberdrolarenewables.us/pdf/Elk_River_fact_sheet.pdf); <http://beaumonthotelks.com/elk-river-wind-project/>; Vandernack, Tim, “Wind Farm, Company to Energize County with \$9.73M”, The Hutchinson News, December 9, 2006, available at <http://www.windaction.org/posts/2988-wind-farm-company-to-energize-county-with-9-73>; 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.heartlandrec.com/documents/HB29.pdf>; Mayworm, Mark, Westar Presentation to KCC, “Central Plains”, [http://kcc.ks.gov/energy/kwrec\\_09/presentations/D1\\_Mayworm.pdf](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.resamericas.com/en/news-events/press-releases/archive/2003/2003/sunflower-electric-wind-farm-to-be-built-inwestern-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](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](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 Cimmarron Wind Energy Project – Phase 1, November 2011, available at [http://www.tva.gov/environment/reports/cimmarron\\_wind/final\\_environmental\\_assessment.pdf](http://www.tva.gov/environment/reports/cimmarron_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.windwatch.org/news/2012/03/02/ford-county-commission-oks-pilot-agreement-with-enxco/>; [http://www.kslegislature.org/li\\_2012/b2011\\_12/committees/misc/ctte\\_h\\_engy\\_utls\\_1\\_20120123\\_01\\_other.pdf](http://www.kslegislature.org/li_2012/b2011_12/committees/misc/ctte_h_engy_utls_1_20120123_01_other.pdf); <https://www.power-technology.com/projects/post-rock-wind-farm-kansas-us/>; <https://www.aweablog.org/buffalo-dunes-wind-project-a-lesson-in-export-affordability-and-transmission/>; <http://www.hdnews.net/news/wind-farm->

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<sup>30</sup> National Renewable Energy Laboratory, *Economic Development Impact of 1,000 MW of Wind Energy in Texas*, 2011, available at <http://www.nrel.gov/docs/fy11osti/50400.pdf>.

<sup>31</sup> U.S. Department of Energy, "Economic Benefits, Carbon Dioxide (CO<sub>2</sub>) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Kansas," June 2008, *available at* <https://www.nrel.gov/docs/fy08osti/43517.pdf>. To extrapolate the total impact from this DOE report to the current projects operating in Kansas, this Report divides the job creation totals from the DOE report by 1,000 to reach a per MW number, and then multiplies this per MW number by the 7,306 MWs currently operating in Kansas.

<sup>32</sup> Lantz, E & Tegen, S., "Variables Affecting Economic Development of Wind Energy," National Renewable Energy Laboratory, CP-500-43506 (July 2008) (Figure 1) available at <http://www.nrel.gov/docs/fy08osti/43506.pdf>.

<sup>33</sup> Copies of each Payment in Lieu of Taxes Agreements, Contribution Agreements, and Donation Agreements for all projects listed were obtained through Kansas Open Records Act requests or publicly available sources and compiled for this report.

<sup>34</sup> To estimate the property tax liability for projects subject to the 10-year state property tax exemption, this Report has assumed an average per MW capital cost of \$1.1666M, depreciated down to a 20% floor, and a blended tax rate of 0.03.