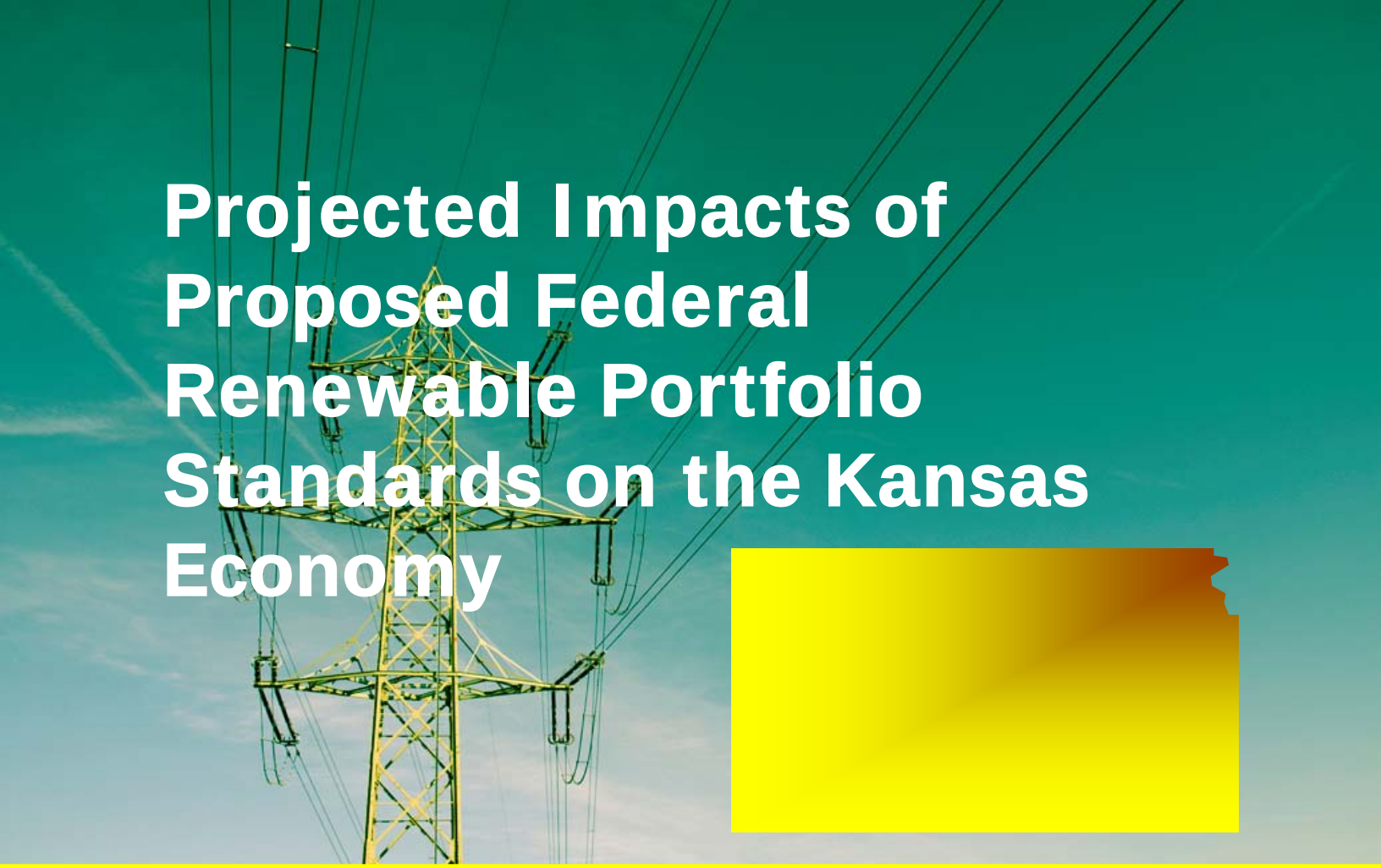

Projected Impacts of Proposed Federal Renewable Portfolio Standards on the Kansas Economy

Final Report to

Bipartisan Policy Center

by

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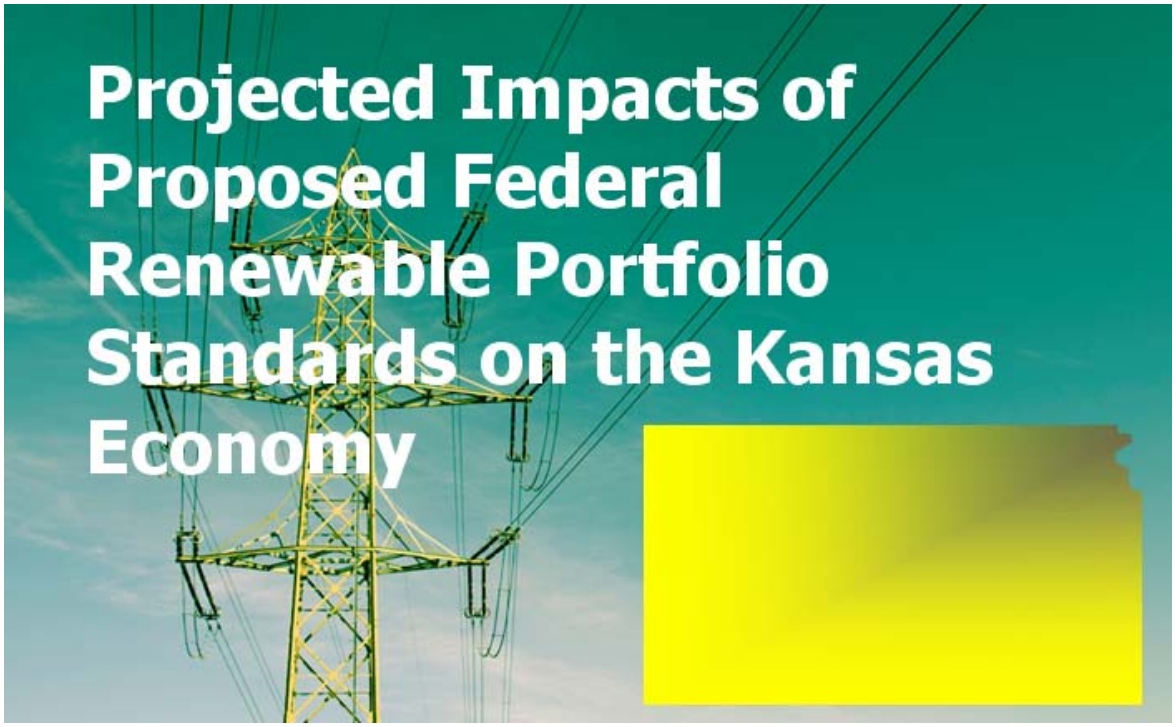

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Executive Summary

The purpose of this study is to project how meeting proposed Federal Renewable Electricity Standards (RES) might impact the Kansas economy and its agricultural production sector. The two proposals considered are a 20% RES and the 25% RES.

Projections of future electricity demands and renewable energy requirements under each of the two policy scenarios were used to project the amounts of renewable energy that would need to be generated. Once projections of renewable energy requirements for the state were made, the type and number of facilities required to meet these energy needs was projected. Renewable energy technologies were assessed to determine their ability to contribute to meeting the additional renewable energy requirements given the resource base of Kansas. Incorporated in the analysis is an assessment of potential renewable energy resources in Kansas. The expenditures on construction of additional renewable energy facilities and recurring operating expenditures on inputs to renewable energy generation were then used to project the economic impacts of meeting the additional renewable energy requirements. These impacts include measurements of increased activity as a result of investments in renewable energy facilities and the operation of these faculties. The impacts are estimated and broken down at state adjusted Bureau of Economic Analysis (BEA) region level as well as by renewable energy source. Estimates of economic activity added and jobs created are provided. These estimates are provided by tracing economic transactions using a regional input/output model, IMPLAN. Individual IMPLAN models are used to project the economic impacts from expenditures by the renewable electricity industry at both state and BEA regions. Economic impacts from the renewable electricity generation, renewable electricity feedstock production, such as dedicated energy crop production or collecting livestock wastes, from leasing of land for wind energy projects, and from electricity rate per kWh changes are projected. Renewable energy sources evaluated included wind, co-fire of dedicated energy crops, and co-fire of livestock manure. The projected requirements under the 25% RES of 7.7 billion kWh and the 20% RES of 6.7 billion kWh, are far exceeded by planned wind projects in Kansas (Table ES.1). In addition to wind, limited opportunities to co-fire manure and dedicated energy crops exist within the state at current power generating facilities.

Table ES.1. Summary Electricity Production By Projected Energy Source For Kansas, 2015 and 2025

	2015		2025	
	RES		RES	
Energy Source	20%	25%	20%	25%
	Billion kWh			
Total Generation [a]	40.9	45.4	40.9	45.4
Generation from Renewable Sources				
Co-fire:				
Dedicated Energy Crops	0.8	0.8	0.8	0.8
Manure	0.2	0.2	0.2	0.2
Wind [b]	21.4	21.4	21.4	21.4

In 2007, Kansas recorded retail sales of 40.2 billion kWh of electricity. This is projected to be 40.9 in 2015 and 45.4 billion kWh in 2025. The sales projections are based on EIA projections.

[a] Total generation is based on EIA projections.

[b] Current planned wind projects are assumed to be on line by 2012.

Statewide, the projected 2015 economic activity or Total Industry Output (TIO) from operating additional renewable facilities is $5.2 billion under federal policy proposals (Table ES.2). This annual operating TIO is projected to continue through 2025. The Wichita-Winfield Region is

projected to experience the greatest addition to economic activity, with the Salina Region second, and the Topeka Region third.

Table ES.2. Summary of the Projected Economic Impacts for Kansas by Scenario, 2015 and 2025[a]

	20% RES	25% RES	20% RES	25% RES
	2015		2025	
Total Industry Output:	Million Dollars		Million Dollars	
Operating	5,164.20	5,164.20	5,164.20	5,164.20
Household [b]	-56.3	-43.10	-188.9	-219.2
Agriculture and Forestry:				
Wind Leases	20.4	20.4	20.4	20.4
Feedstocks	66.9	66.9	66.9	66.9
Investment Impacts[c]	30,377.0	30,377.0	30,377.0	30,377.0
Employment Impacts:	Jobs		Jobs	
Operating	21,046.00	21,046.00	21,046.00	21,046.00
Investment	208,876.00	208,876.00	208,876.00	208,876.00
	Dollars/kWh		Dollars/kWh	
Projected change in energy price	0.0018	0.0024	0.0088	0.0076

[a] Does not include cost impact on price of energy saving technologies
[b] Projected change in energy price ($/kWh) only includes kWh of renewable energy required for the RES and does not include the additional kWh that could be sold outside the state.
[c] Investment impacts are one time impacts and for 2015 take place between 2010-2015 and for 2025 take place between the 2021-2025 time period

If developed, the annual impacts from dedicated energy crop production and manure collection for co-firing are estimated at $66.9 million. In addition to feedstock production/collection, the agricultural sector could benefit through leasing of farmland for wind energy projects. Projections are an additional $20.4 million in TIO from land leases each year.

To place this in perspective, Kansas farmers received slightly more then $10 billion in cash receipts in 2006 up nearly $3 billion in 2005 and averaged $11 billion over the past 8 years. Farm expenses averaged $9.7 billion over this same period. Net farm income in Kansas average $1.6 million. The RES in Kansas, regardless of the policy scenario, has the potential to increase net farm income by nearly $87 million on the 63,800 Kansas farms.

Although there are negative household income impacts from increased electricity prices, the overall net economic impacts from the additional renewable electricity industry are still positive. The state's projected production of renewable electricity exceeds to the federal requirements. Though not accounted for in this analysis, this renewable energy could be sold to utilities in other states that require additional renewable energy. The total impact of the two scenarios is positive for the state and within each BEA region of the state. The net projected economic impact for 2025 is just over $4.9 billion per year.

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Projected Impacts of Proposed Federal Renewable Energy Portfolio Standards on the Kansas Economy

Study Purpose

The purpose of this study is to project how meeting proposed Federal Renewable Energy Portfolio Standards might impact the Kansas economy. The two proposals analyzed, which will be discussed later in this document, are the 25% RES and the 20% RES. To conduct the analysis, these two proposed Federal Renewable Energy Portfolio Standards are compared with Kansas' existing and planned renewable energy generation. Changes from projected renewable energy generation to amounts required meet the proposed Federal standards are estimated. Renewable energy technologies are assessed to determine their ability to contribute to meeting the additional renewable energy requirements given the resource base of Kansas. The investment expenditures on construction of additional renewable energy facilities and recurring operating expenditures on inputs to renewable energy generation are then used to project the economic impacts of meeting the additional renewable energy requirements. These impacts are projected for the state and for Bureau of Economic Analysis (BEA) regions within the state (Figure 1).

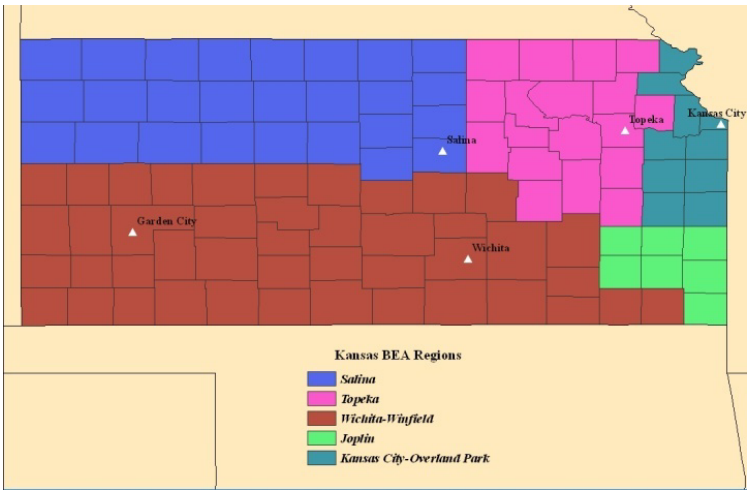


Figure 1. Kansas Modified Bureau of Economic Analysis Regions

Methods of Analysis

In this analysis, projections of renewable energy requirements for the state of Kansas will be made for two policy scenarios: 1) the 20% RES and 2) the 25% RES. Once projections of renewable energy requirements for the state are made, the type and number of facilities required to meet these energy needs must be determined. The number and type of facilities are determined not only at the state level, but also at the Bureau of Economic Analysis (BEA) region level.

The number and type of facilities in each BEA region are determined based upon plans for facility construction or the potential for facilities based on resources in the region. For example, co-fire of dedicated energy crop conversion facilities are placed in BEA regions according to location of current crop production. Because in many cases, the sizes and technologies of facilities that might be placed in a region are unknown, representative technologies and sizes for facilities that be placed in a region are assumed. These sizes and technologies are selected based upon previous literature and availability of engineering cost data.

Costs, facility sizes, and input requirements for representative renewable energy technologies are then used to project required facility expenditures. Descriptions of the representative technologies are in Appendix B of this document. The costs and prices presented in the tables in Appendix B are all in $2006. A regional input/output model, IMPLAN (Olson and Lindall, 1999) is used to project the economic impacts from expenditures by the energy conversion facilities both statewide and by BEA regions. Impacts from the various technologies differ depending on the pre-specified demand for that technology, the capital costs involved, and the operating costs. The dollar value projections presented in the document from the IMPLAN model are all in $2009.

The IMPLAN model results presented include estimates of Total Industry Output (TIO), Employment, and Value-Added. Total Industry Output, a measure of economic activity, is defined as the value of production by industry per year. Employment represents total wage and salary employees, as well as self-employed jobs in a region, for both full-time and part-time workers. Total Value-added is defined as all income to worker paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses. The IMPLAN results presented include both direct and total impacts. Direct effects measure the response for a given industry given a change in final demand for that same industry. Indirect effects represent the response by all local industries from a change in final demand for a specific industry. Induced effects represent the response by all local industries caused by increased (decreased) expenditures of new household income and inter-institutional transfers generated (lost) from the direct and indirect effects of the change in final demand for a specific industry. Total effects are the sum of direct, indirect, and induced effects. For purposes of brevity, only direct and total effects are presented.

The operating costs for the various technologies shown in Appendix B are used to generate "breakeven" prices for each technology. The breakeven price for each technology is then weighted by projected electricity sales from that technology to arrive at an overall weighted renewable electricity price. The difference between the electricity prices with the additional renewable energy under the two federal proposals and without the additional renewable energy are assumed to be passed on to consumers either directly through changes in electricity rates or indirectly through rate increases to commercial users that then pass on these costs to consumers through increases in prices of goods and services. The household incomes of consumers in the IMPLAN model were then impacted by this overall amount.

The analysis in this document will be as follows. First, the requirements under the proposed federal renewable portfolio and energy efficiency savings (the 20% and the 25% RES) policies will be presented. Second, an energy profile of Kansas will be presented. Third, the state's energy situation by potential source of renewable energy will be analyzed, including assessment of potential for feedstocks to supply sufficient energy. Fourth, projections of Kansas' renewable energy demand under the under the 20% RES and the 25% RES will be presented. Fifth, the economic impacts of meeting the renewable energy requirements under the policy scenarios will be projected.

The Proposed Federal Renewable Portfolio Standards and Federal Energy Savings Requirements

Two proposals have been put forward regarding federal energy standards. The first is for a federal renewable energy portfolio standard. The second proposes energy savings requirements for utilities and a renewable energy portfolio standard.

The 20% RES

The proposed new PURPA Section 610-Federal Renewable Portfolio Standard made by Bingaman, or the 20% RES, would require that electric utilities obtain certain percentages of their sales of electricity to consumers from new renewable energy, existing renewable energy, or energy efficiency (Summary of Bingaman Discussion Draft, 2009). These percentages are as shown in Table 1.

Eligible sources include solar, wind, ocean or geothermal energy, biomass, landfill gas, or incremental hydropower. The proposed means of compliance are that the electric utility will submit renewable energy credits, federal energy efficiency credits, or alternative compliance payments. Federal energy efficiency credits cannot be used to meet more than 25% of the requirement. The required percentages shown in Table 1 are adjusted by 25% energy efficiency credits, with these adjusted values shown in the far right column. The alternative compliance payments are at a rate of 3 cents per kWh.

Table 1. Proposed Federal RPS Annual Renewable Energy Percentage Requirement Under the New PURPA Section 610 by Bingaman (the 20% RES)

Year	Required Annual Percentage of Sales	Required Annual Percentage Adjusted for Energy Efficiency Credits
2011-2012	4.0	3.0
2013-2015	8.0	6.0
2016-2018	12.0	9.0
2019-2020	16.0	12.0
2021-2039	20.0	15.0

The 25% RES

The second proposal is an energy savings act coupled with a renewable energy portfolio standard, termed the "Save American Energy Act" (Save American Energy Act, 2009) and the "American Renewable Energy Act" (American Renewable Energy Act, 2009) respectively. This set of proposals was made by Markey (the 25% RES) to amend PURPA. The "Save American Energy Act" would require nationwide minimal levels of electricity and natural gas savings to be obtained through utility efficiency programs, building energy codes, appliance standards, and related efficiency measures (Save American Energy Act, 2009). The performance standards as they relate to retail electricity distributors are shown in Table 2.

Table 2. Proposed Electricity Savings Requirements for Retail Electricity Distributors Under the "Save American Energy Act" (the 25% RES)

Year	Cumulative Electricity Savings Percentage
2012	1.00
2013	2.00
2014	3.25
2015	4.50
2016	6.00
2017	7.50
2018	10.00
2019	12.50
2020	15.00

The "American Renewable Energy Act" requires the following annual percentages of renewable energy displayed in Table 3. The percentage may be met by submitting the Federal renewable energy credit or an alternative compliance payment. The payment is equal to the lesser of 200% of the Federal renewable electricity credit for the previous compliance year or 5 cents adjusted by the Gross Domestic Product Implicit Price Deflator. The proposed Act treats wind, solar, geothermal, biomass or landfill gas, qualified hydropower, and marine or hydrokinetic renewable energy as qualified renewables.

Table 3. Proposed Annual Renewable Energy Percentage Requirement Under the "American Renewable Energy Act" (the 25% RES)

Year	Required Annual Percentage
2012-2013	6.00
2014-2015	8.50
2016-2017	11.00
2018-2019	14.00
2020-2021	17.50
2022-2023	21.00
2024	23.00
2025	25.00

The Department of Energy, Energy Information Administration (EIA) conducted an analysis of the 25% RES for a federal renewable energy portfolio (EIA, 2009). The percentages projected by EIA, given exclusion of small power retailers, hydro sales, municipal solid waste (MSW) sales, and energy efficiency credits, are shown in Table 4.

Table 4. The 25% RES for Federal Renewable Energy Portfolio Standard: Analysis by the Energy Information Administration

Calendar Year	Required in Proposed Law	Small Power Retailers	Annual Percentage Excluding: Small Power Retailers, Hydro Sales, and MSW Sales	Annual Percentage Excluding: Sm. Power Retailers, Hydro and MSW Sales, and States Taking Allowable Energy Effic. Credits
			Percent	
2012	6.0	5.3	5.0	3.4
2013	6.0	5.3	5.0	3.4
2014	8.5	7.5	7.1	4.9
2015	8.5	7.5	7.1	4.9
2016	11.0	9.7	9.2	6.3
2017	11.0	9.7	9.2	6.3
2018	14.0	12.3	11.8	8.0
2019	14.0	12.3	11.8	8.0
2020	17.5	15.4	14.7	10.0
2021	17.5	15.4	14.7	10.0
2022	21.0	18.5	17.6	12.0
2023	21.0	18.5	17.6	12.0
2024	23.0	20.2	19.3	13.1
2025	25.0	22.0	21.0	17.0

(Source: EIA, 2009).

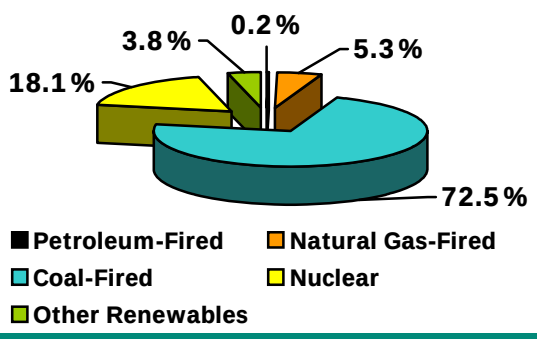
Kansas' Current Energy Profile

Kansas' net electricity generation for 2008 was 46.9 million MWh (Table 5). Kansas' current energy portfolio is currently heavily reliant upon coal-fired electricity. Based upon 2008 data, about 72.5 percent comes from coal-fired and about 18.0 percent comes from nuclear (Figure 1). Non-hydroelectric renewables account for just under two percent.

Table 5. Kansas Net Electricity Generation, 2008

	Million MWh
Total Net Electricity Generation	46.9
By Source:	
Petroleum-Fired	.1
Natural Gas-Fired	2.5
Coal-Fired	34.0
Nuclear	8.5
Hydroelectric	0
Other Renewables	1.8
Other	0

Figure 2. Sources of Net Electricity Generation, 2008



Source: Department of Energy, Energy Information Administration, Electric Power Monthly

Renewable Electricity Generators

Facilities using renewable sources to produce energy had a total of 1,012.4 MW of nameplate capacity as of May 2009. This can be compared with 2007 9,794 MW of nameplate capacity for all facilities in the state. Currently, Kansas' renewable electricity generation is derived from wind. The names, locations, energy sources, and nameplate capacities of facilities using wind are displayed in Table 6. Figure 3 shows a map of the existing and planned wind facilities as of May 2009.

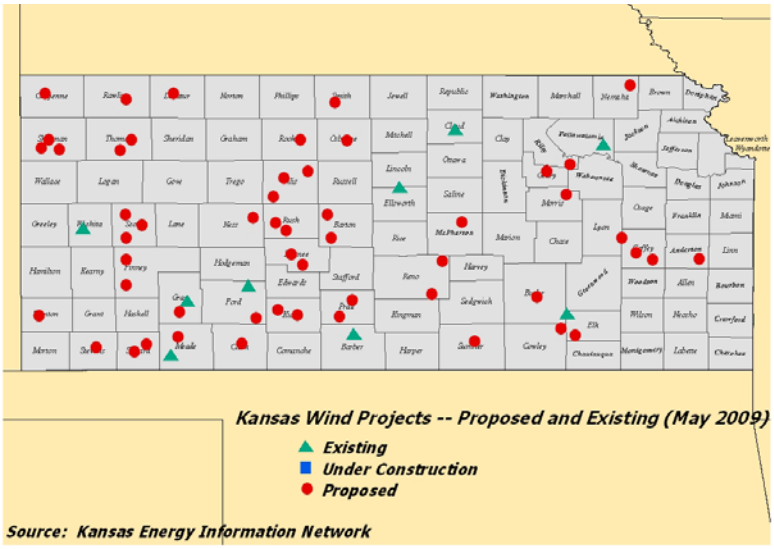


Figure 3. Existing and Planned Wind Facilities, 2009

Table 6. Kansas Electricity Generation Facilities Using Wind, 2009

Facility Name	Nameplate	Unit	Energy Source	County
Central Plains Wind Farms	99	MW	WND	Wichita
Elk River Wind Farm	150	MW	WND	Elk
Flat Ridge Wind Farm Phase 1	100	MW	WND	Barber
Gray County Wind Farm	112	MW	WND	Gray
Kansas-Smith Farms	0.2	MW	WND	Meade
Meridian Way Wind Farm	200	MW	WND	Cloud
Smoky Hills Wind Projects	250	MW	WND	Lincoln/Ellsworth
Spearville Wind Farm	100	MW	WND	Ford
Wester Wind	1.2	MW	WND	Pottawatomie
Total	1,012.4	MW		

(Source: Kansas Energy Information Network)

Potential for Energy Generation to Meet Renewable Energy Requirements

Several sources are candidates for renewable energy in Kansas. In the case of wind energy, this source is already being used to generate renewable electricity. The potential for sources to supply electricity are discussed in the following section. The potential sources include wind, co-fire with cattle manure, and co-fire with a dedicated energy crop.

Wind

In addition to the existing projected listed in Table 6, several other electricity generation sites have been proposed that would use wind energy. These locations are shown in Table 7. The largest facilities would be the Clark County and Finney County Wind Farm projects, each with at least 1,000 MW of nameplate capacity. The proposed total is 6,502 MW of capacity to generate about 21,357 million kWh per year.[1]

Table 7. Proposed Kansas Electricity Generation Facilities Using Wind, 2009

Facility Name	Nameplate	Unit	Energy Source	County
Barton County Wind Project -2	150	MW	WND	Barton
British Pastures	100	MW	WND	Riley/Geary
Caney River Wind Project	150	MW	WND	Cowley
Cheyenne County Wind Farm	40	MW	WND	Cheyenne
Clark County Wind Project	1,000	MW	WND	Clark
Coffey County Wind Project	100	MW	WND	Coffey
Conestoga Winds, LLC	200	MW	WND	Stevens
Decatur County Wind Farm	30	MW	WND	Decatur
Deer Creek Wind Project	100	MW	WND	Anderson
Eagle Rock Wind Project	150	MW	WND	McPherson
Elk River II	150	MW	WND	Elk
Ellis County Wind Project	200	MW	WND	Ellis
Ellis County Wind Ranch	100	MW	WND	Ellis
Finney County Wind Project	600	MW	WND	Finney
Finney County Wind Project	405	MW	WND	Finney
Gray County Wind Project	101	MW	WND	Gray
Hamilton County Wind Farm	135	MW	WND	Stanton
Leon Wind Project	100	MW	WND	Butler
Lyon County Wind Project	250	MW	WND	Lyon
Munkers Creek	200	MW	WND	Morris
Nemaha County Wind Farm	135	MW	WND	Nemaha
Ness County Wind Farm	150	MW	WND	Ness
Pratt Wind Project	115	MW	WND	Pratt
Rawlins County Wind Farm	300	MW	WND	Rawlins

[1] 22% of Kansas is classified as wind class zone 4 and 17% as wind class zone 5. Assuming wind farms will be established in areas with a wind class of 4 or higher, and given the annual capacity factor of .35 on wind class 4 and 0.4 on wind class 5 (King, 2006), a capacity factor of 0.375 is assumed in this analysis (See Appendix B, Table B.1).

Table 7. Proposed Kansas Electricity Generation Facilities Using Wind, 2009

Facility Name	Nameplate	Unit	Energy Source	County
Reno County Wind Project	200	MW	WND	Reno
Rooks County Wind Project	50	MW	WND	Rooks
Rush County Wind Project - 2	50	MW	WND	Rush
Scott County Wind Project	161	MW	WND	Scott
Sherman County Wind Project	150	MW	WND	Sherman
Smith County Wind Project	300	MW	WND	Smith
Sumner County Wind Project	200	MW	WND	Sumner
Thomas County Wind Farm	130	MW	WND	Thomas
Thomas County Wind Project	300	MW	WND	Thomas
Total	6,502	MW		

(Source: Kansas Energy Information Network)

Cattle Manure

Kansas has a significant fed cattle industry and cattle manure can be used to generate electricity through co-fire with coal. According to the 2007 Census of Agriculture, Kansas has 6.7 million cattle and 2.7 million cattle on feed. The cattle are concentrated around the Garden City, Kansas area. Maps of the number of cattle and cattle shipped directly from feedlots by county for Kansas are shown in Figures 4 and 5. Sweeten, et al. (2002) provided costs of conversion for cattle feedlot manure co-firing with coal. Sweeten et al. (2009) estimated that cattle on feed produce about a ton of manure over a 5 month period. Annualized, this is about 2.4 tons per year. Sweeten, et al. (2002) also provided estimates of the BTU in manure as taken at about 3,445 Btu per pound. Hence, over a year, an animal unit would provide manure to be converted to about 16.5 million BTU. Discussed in the co-fire section below, one coal fired plant is in close proximity to the Garden City, Kansas area, a cattle feeding center. That is the Holcomb plant which has a capacity of 348.7 MW. Using the Holcomb plant as an example, at a 10% co-fire rate, this is 34.9 MW or about 244.4 million kWh/year from

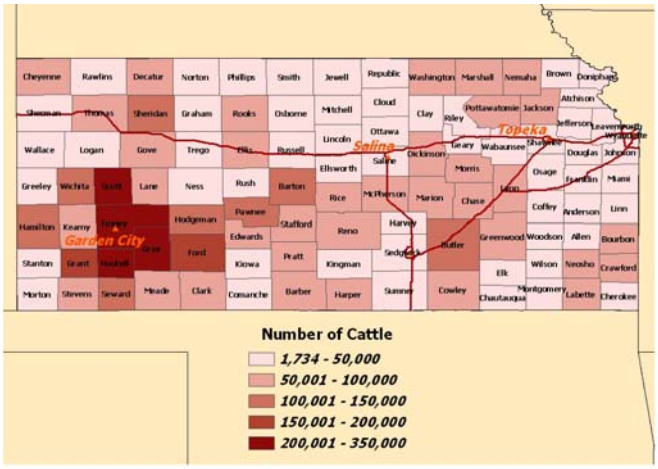


Figure 4. Number of Cattle, 2007

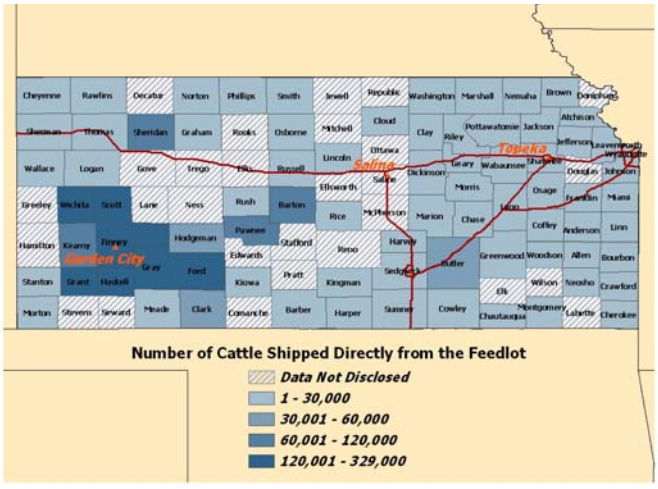


Figure 5. Number of Cattle Shipped Directly from Feedlots, 2007

manure (833,822 million BTU/year). Given that each animal is estimated to produce manure for 16.5 million BTU, this size of facility and rate of co-firing would be able to take manure from about 50,425 head could be used or manure from one or two large feedlot facilities (See Table B.2 in Appendix B for conversion of manure to energy).

Co-Fire

Kansas' coal fired plants have the potential for co-firing biomass, such as cattle manure, dedicated energy crops, or wood wastes. Most of the coal fired plants are located in the eastern part of the state. Hence, they would not be in close proximity to the large cattle feeding areas around Garden City. However, dedicated energy crops or wood wastes might serve as potential feedstock sources for these plants. The plant at Holcomb is in close proximity to Garden City and could have the potential for co-firing cattle manure.

Table 8. Electricity Generators Using Sub-Bituminous or Bituminous Coal

Utility Name	Plant Name	City	State	Zip	Nameplate Capacity (MW)
Empire District Electric Co	Riverton	Riverton	KS	66730	37.5
Empire District Electric Co	Riverton	Riverton	KS	66730	50
Kansas City City of	Nearman Creek	Kansas	KS	66104	261
Kansas City City of	Quindaro	Kansas	KS	66104	81.6
Kansas City City of	Quindaro	Kansas	KS	66104	157.5
Kansas City Power & Light Co	La Cygne	LaCygne	KS	66040	685
Kansas City Power & Light Co	La Cygne	LaCygne	KS	66040	893
Sunflower Electric Power Corp	Holcomb	Holcomb	KS	67851	348.7
Westar Energy Inc	Jeffrey Energy Center	St. Mary's	KS	66536	720
Westar Energy Inc	Lawrence Energy Center	Lawrence	KS	66049	49
Westar Energy Inc	Lawrence Energy Center	Lawrence	KS	66049	114
Westar Energy Inc	Lawrence Energy Center	Lawrence	KS	66049	403
Westar Energy Inc	Tecumseh Energy Center	Tecumseh	KS	66542	82
Westar Energy Inc	Tecumseh Energy Center	Tecumseh	KS	66542	150
				Total	4,032.3

(Source: Energy Information Administration)

If all remaining coal fired plants, other than the Holcomb plant, in Kansas co-fired at a rate of 15%, 552.4 MW of co-fire capacity or about 3,872 million kWh per year would be produced. This could use up to 2.6 million dry tons of dedicated energy crop feedstock (see the Table B.3 in Appendix B for assumptions about kWh per dry ton of dedicated energy crop). If co-firing only occurred in smaller scale facilities, say 200 MW or less, than the co-fire capacity would be 108.2 MW or about 759 million kWh per year, using about 503,287 dry tons of feedstock.

The potential for dedicated energy crop production will likely be based on the amount of cropland/pastureland that can be converted. In addition, the price of that feedstock will likely be related to quantities demanded. As estimates for these data, a solution from POLYSYS from a prior study is used (English et al., 2006). From this analysis, there are 4.5 million tons of dedicated energy crop estimated to be available in 2015, 23.6 million in 2020, and 39.4 million in 2025. Acreage yields used in the analysis are 2.5, 4.4, and 4.4 tons per acre, respectively, over the same period. The price per ton for dedicated energy crops in Kansas ranged from $45 to $75 per ton. The price $63.00 per ton was used for all three periods in this analysis.

Projections of Kansas Electricity Demand and Net Generation

Because the federal proposals specify percentages of electricity kWh sales that would need to be derived from renewables, it is necessary to obtain projections of electricity demand for the state through 2025. In order to calculate electricity demand and net generation projections for Kansas, several pieces of information were used -- actual electricity demand and net generation statistics for 2008 from EIA's Electric Power Monthly and annual growth rate projections for the Southwest Power Pool regions from EIA's Annual Energy Outlook. The actual values of net generation and electricity sales for 2008 are shown, along with the projected values, in Figure 6. By the year 2025, the projections are about 45.4 million MWh of sales and 52.6 million MWh of net generation.

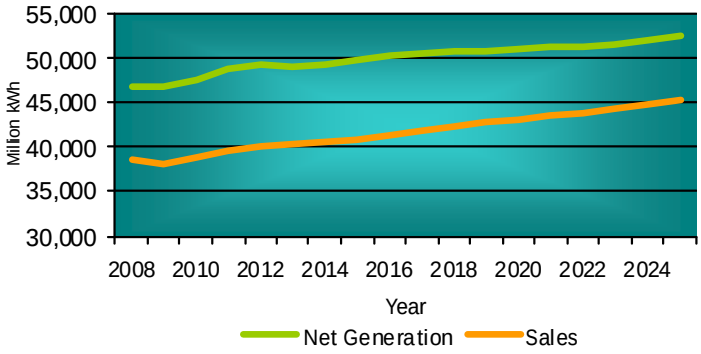


Figure 6. Projected Net Generation and Sales of Electricity for Kansas

Projections to Meet the Federal Proposals

The 20% RES

Requirements under the 20% RES for a federal renewable energy portfolio standard are shown in Table 9. The 20% RES percentages are listed in the table. The percentages are taken of the prior year's electricity sales. Under the 20% RES, 25% or less can be met with energy efficiency credits. Therefore, in the table, the percentages adjusted for the 25% energy efficiency credits are calculated. These adjusted percentages are used to calculate the million kWh required under the 20% RES. Shown in Table 9, by 2025, the 20% RES would require an additional 6,740 million kWh.

Table 9. Projected Requirements Under the 20% RES

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Projected Electricity Demand (Million kWh)															
38,803	39,522	40,100	40,339	40,578	40,938	41,340	41,762	42,278	42,729	43,163	43,542	43,910	44,391	44,935	45,437
Percentage Required Under the 20% RES															
0	4	4	8	8	8	12	12	12	16	16	20	20	20	20	20
Percentage Required With 25% Energy Efficiency Credit															
0	3	3	6	6	6	9	9	9	12	12	15	15	15	15	15
20% RES Requirement (Million kWh)															
0	1,164	1,186	2,406	2,420	2,435	3,684	3,721	3,759	5,073	5,127	6,474	6,531	6,587	6,659	6,740

The 25% RES

The percentages of renewable energy required under the 25% RES (using the Energy Information Administration's projected percentages) are displayed in Table 10 (Adjusted Percentage). Based upon the projected electricity demand shown and these percentages, the projected million kWh requirements under the 25% RES are calculated. Notably, by 2025, an additional 7,724 million kWh would need to be from renewable sources.

Table 10. Projected Requirements Under the 25% RES

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Projected Electricity Demand (Million kWh)															
38,803	39,522	40,100	40,339	40,578	40,938	41,340	41,762	42,278	42,729	43,163	43,542	43,910	44,391	44,935	45,437
Adjusted Percentage															
0	0	3	3	5	5	6	6	8	8	10	10	12	12	13	17
25% RES Requirement (Million kWh)															
0	0	1,363	1,372	1,988	2,006	2,604	2,631	3,382	3,418	4,316	4,354	5,269	5,327	5,887	7,724

Placement of Additional Renewable Energy Facilities Across the State

The projected allocation of generation by wind facilities by BEA region is shown in Figure 7. As can be seen from this figure, the majority of planned wind generation will occur in the Wichita-Winfield BEA. All planned wind projects are assumed to come online by 2015.

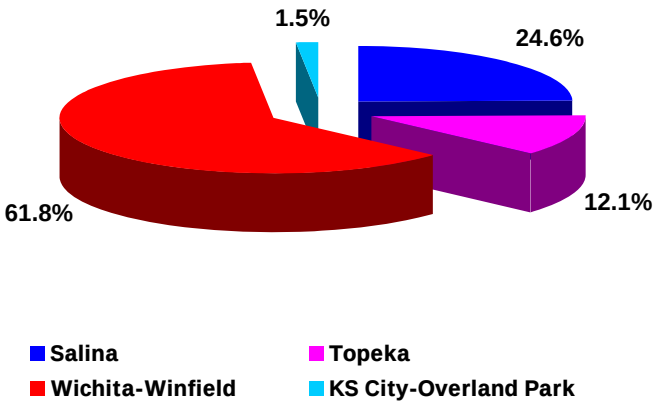


Figure 7. Projected Percentages of Wind Generation by BEA Region, Kansas

The locations for potential co-firing are located where coal fired plants with less than 200 MW already exist. All co-firing comes from dedicated energy crop, except the co-firing in the Wichita-Winfield region, which is derived from cattle manure. The projected allocation of generation by co-fire facilities by BEA region is shown in Figure 8. As can be seen from this figure, the largest share of co-fire generation will occur in the Kansas City-Overland Park Region followed by the Wichita-Winfield Region.

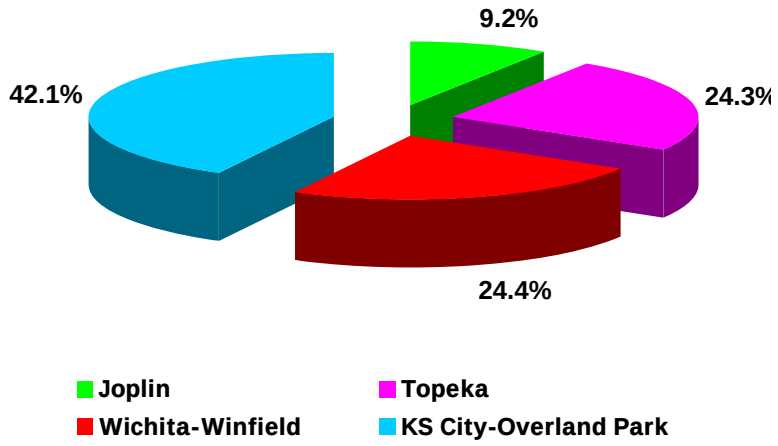


Figure 8. Projected Percentages of Co-Fire Generation by BEA Region, Kansas

The number of potential wind and co-fire facilities and projected kWh by BEA are shown in Table 11. The number of planned wind facilities is 33, with potential for about 21.4 billion kWh, while 9 plants are potential sites for co-firing, with potential for about 1 billion kWh from the co-fire.

Table 11. Planned and Potential Renewable Electricity Facilities, Kansas

	Planned Wind Facilities		Potential Co-Fire Facilities	
BEA Region/State	Number	Projected Mil. kWh	Number	Projected Mil. kWh
Joplin	0	0.0	2	92.0
Kansas City-Overland Park	1	328.5	4	422.7
Salina	10	5,256.0	0	0.0
Topeka	5	2,578.7	2	243.9
Wichita-Winfield	17	13,195.9	1	244.4
Kansas	33	21,359.1	9	1,003.0

Economic Impacts: Investment and Operating

Multiple annual impacts accrue from development of a renewable energy industry. The impacts reported in this section include both the impacts of investing in and operating a renewable electricity industry. The impacts from the renewable electricity industry will come not only from electricity generation, but also from production of feedstocks for renewable electricity. Therefore, impacts are also reported for harvesting dedicated energy crops, collecting livestock manure, and of land shifts out of traditional crops to dedicated energy crops, rent to farmers for wind turbines on farmland, and the impacts of a change in electricity prices (assuming the increased cost of producing the renewable electricity is passed on to consumers). Impacts presented include total industry output, employment, and value-added to the state's and BEA Regions' economies.

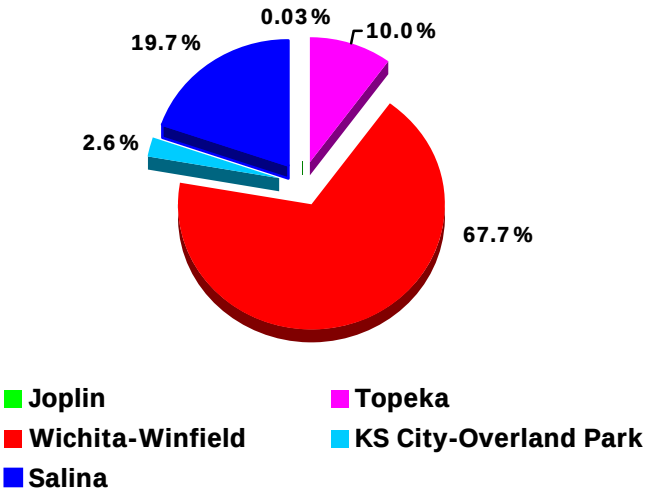
More detailed tables are presented in Appendix C, which display two types of impacts, direct and total. The direct impacts are the expenditures directly from the additions to demand for a particular industry. The total impacts include the direct impacts along with impacts from multiplier effects. These additional impacts include both indirect and induced. The indirect impacts are those that result from the industry's expenditures on input supplies and services. The induced impacts are those that result from those who are employed in the industry spending their income in the study region.

Economic Impacts: Investment in a Renewable Electricity Industry

Based upon the facilities numbers, facilities locations by BEA Region, and expenditures by representative facilities shown in Appendix B, economic impacts are projected using IMPLAN. Economic impacts by BEA Region from the investment in additional renewable energy facilities under each of the three policy scenarios are shown in Appendix C Tables C.1-C.3. Table C.1 displays the TIO from the investment in the additional renewable energy facilities, while Table C.2 displays the employment, and Table C.3 displays the value-added. It should be noted that investment impacts are one-time impacts that occur in the year when the facilities are constructed. It should be noted that because the planned investment in wind facilities in the next few years exceeds what would be required under the renewable energy standards, the economic impacts from either proposal would be the same.

Economic Activity (Total Industry Output) from Investment

Figure 9 displays the TIO that would occur from investment in additional renewable electricity facilities under the two policy scenarios (The 25% RES and the 20% RES) for 2015 and 2025. The figure provides the overall TIO and what shares the BEA Regions would accrue. These TIO values represent total impacts (direct + indirect + induced impacts). Under both scenarios, the Wichita -Winfield Region is projected to experience the greatest TIO, with the Salina Region second, and the Topeka Region third. Statewide, the 2015 TIO from investment in additional renewable facilities is $30.4 billion under either federal proposal.



Year	Statewide Total Industry Output (Million $)
2015	$30,376.8

Figure 9. Total Industry Output from Investment in a Renewable Electricity Industry Under the 20% and 25% RES's, Kansas, 2015

Employment from Investment

The total number of jobs involved in the renewable energy industry directly as a result of investment in facilities in 2015 is 95,741 (Table 12). Including multiplier effects, the additional jobs created from investment in 2015 are 208,876. These jobs are distributed similarly to the projected economic activity, with Wichita-Winfield adding the greatest number of jobs.

Table 12. Employment Projections From Investment in a Renewable Electricity Industry Under the Federal Policy Scenarios, Kansas, 2015

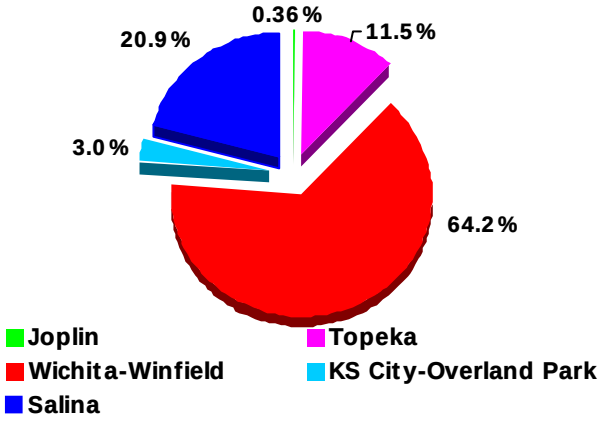
BEA Region/State	Direct	Total
Joplin	37	57
Kansas City-Overland Park	1,524	3,243
Salina	22,230	36,400
Topeka	10,033	17,676
Wichita-Winfield	55,454	102,342
Kansas	95,741	208,876

Economic Impacts: Year-to-Year Operations of a Renewable Electricity Industry

Some economic impacts occur each year as a result of the year-to-year business activities of the renewable energy industry. This section presents a summary of those projections. Detailed economic impacts by BEA Region from the year-to-year operations of the additional renewable energy facilities for the three policy scenarios are shown in Tables C.4-C.6. Table C.4 shows the total industry output from the annual operations of the additional renewable energy facilities, while Table C.5 displays the employment, and Table C.6 shows the value-added.

Economic Activity (Total Industry Output) from Operating

In addition to economic activity resulting from investment in renewable facilities, operation of the renewable energy facilities is projected to add economic activity to Kansas' economy annually. In 2015, the annual impact is $5.2 billion, if either federal proposal is adopted. This annual impact is projected to occur each year through 2025. Figure 10 displays the Total Industry Output that would occur from operations of the additional renewable energy facilities for 2015. The figure provides the overall TIO and what shares the BEA regions would accrue. These TIO values represent total impacts (direct + indirect + induced impacts). Under each policy scenario, the Wichita-Winfield Region is projected to experience the greatest TIO, with the Salina Region second, and the Topeka Region third. The values for TIO in 2020 and 2025 are projected to be the same as in 2015.



Year	Statewide Total Industry Output (Million $)
2015	$5,164.2

Figure 10. Total Industry Output from Operating a Renewable Electricity Industry Under the 20% RES and the 25% RES, Kansas, 2015

In Table C.7, the total industry output (including direct, indirect, and induced impacts) from year-to-year operations by BEA Region and by renewable technology are shown for each of the three policy scenarios. Figure 11 contains the economic impacts as measured by increased total industry output for 2015 as a result of the individual projected technologies. As can be seen these figures, the largest annual operating economic impacts are projected to be derived from wind.

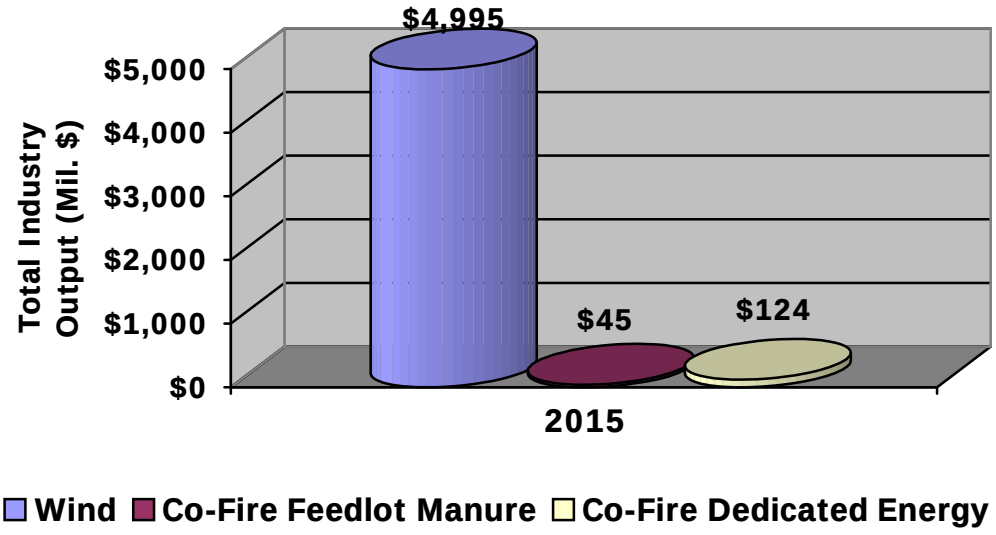
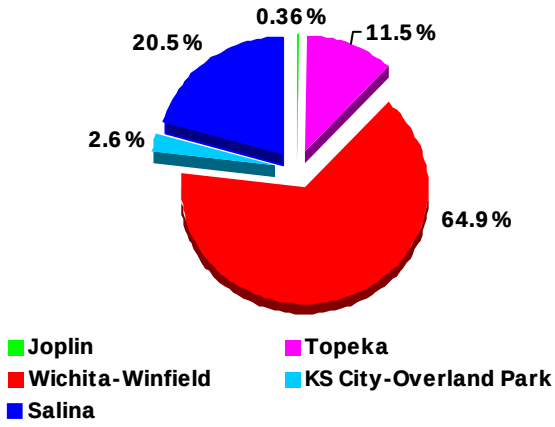


Figure 11. Total Industry Output from Operating a Renewable Electricity Industry Under the Federal Proposals, By Renewable Energy Technology, Kansas, 2015

Employment from Operating

The total number of jobs involved in the renewable energy industry directly created from operating is 2,917 each year from 2015 through 2025. When the multiplier effects are included, the jobs annually are 21,046 each year from 2015 through 2025. Figure 12 represents the jobs by BEA Region, with the Wichita-Winfield Region attaining the greatest number of jobs annually from operating the renewable energy industry.



Year	Statewide Employment
2015	21,046

Figure 12. Employment from Operating the Renewable Energy Industry Under the 20% RES and the 25% RES, By BEA Region, Kansas, 2015

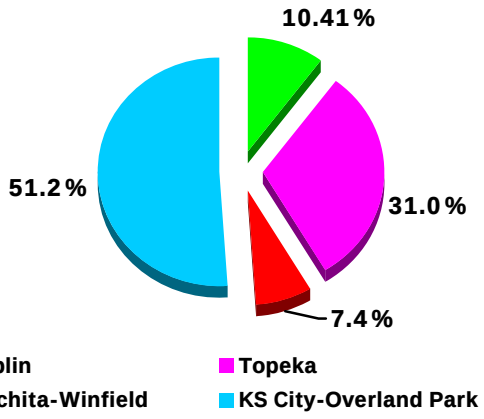
Economic Impacts: Agricultural Sector

Several types of impacts from with agricultural activity associated with the renewable energy industry are measured in this analysis – the impact of growing a dedicated energy crop, of collecting cattle feedlot manure, and the impact of land use changes toward dedicated energy crops. Projected land use changes that occur in Kansas as a result of producing dedicated energy crops on agricultural lands were derived from previous POLYSYS analysis done for 25x25. For every acre of dedicated energy crop grown, 0.39 acres of traditional cropland (corn, cotton, soybeans, and wheat) were converted. Other lands required for a dedicated energy crop came from pastureland with the remaining pastureland under increased management so that the same animal units could be maintained. The direct economic activity under the federal proposals is estimated to exceed $36.5 million annually. When multiplied through the economy, this increases to $66.9 million (Table 13). The largest share of this economic activity is projected to take place in the Kansas City-Overland Park Region, followed by the Topeka Region. See Appendix C, Tables C8 through C10 for detailed estimates of changes in economic activity, jobs, and value-added, respectively.

Table 13. Annual Total Industry Output from Additions to Agricultural Feedstock Production, Kansas, 2015

BEA Region/State	Direct	Total
	(Million $)	
Joplin	$4.1	$6.0
Kansas City-Overland Park	$19.0	$32.4
Salina	$0	$0
Topeka	$10.9	$17.7
Wichita-Winfield	$2.5	$5.1
Kansas	$36.6	$66.9

Figure 13 shows the total employment from agricultural feedstock production by BEA region. An additional 410 jobs from year-to-year operations of agricultural feedstock production would occur. The largest employment impacts would occur in the Kansas City-Overland Park region.



Year	Statewide Total Employment
2015	410

Figure 13. Employment from Agricultural Feedstock Production Under the 20% and 25% RES's, By BEA Region, Kansas, 2015

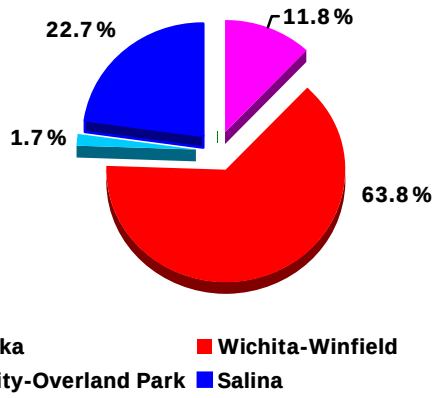
Economic Impacts: Wind Energy on Farmland

Farmers receive a direct payment from allowing the installation and generation of electricity from wind turbines. These payments can be based on revenues generated, an annual lease, or some combination of the two with such things as escalating clauses imbedded in the lease. Jim Ploger, Kansas State Energy office, stated that a typical landowner lease payment per megawatt might range between $2,000 and $4,000 per year (Bipartisan Policy Institute, 2009). In this study, the lower end of the range, $2,000 per MW installed nameplate capacity, is assumed. Direct additional annual payments to the landowners in Kansas are estimated to be $13,004,018 with the Wichita-Winfield BEA receiving $8 million and the Salina BEA $3.2 million annually (Table 14). The values in Table 14 are in $2009.

Table 14. Annual Estimated Income Received from Wind Lease Payments, Kansas

BEA	Income Per Year
Kansas City-Overland Park	$200,016
Salina	$3,200,251
Topeka	$1,570,123
Wichita-Winfield	$8,033,629
State	$13,004,018

To determine how this income would flow through the states' economy, the 2007 Agricultural Census's county level data on the number of farms by sales bracket was aggregated to BEA and state. These data are then used to weight the lease payments to IMPLAN household income brackets and IMPLAN is run at the BEA and state levels. The estimates of resulting economic impacts (TIO) by BEA can be seen in Figure 14. The TIO value presented in Figure 14, $20.4 million) includes direct, indirect, and induced effects. Detailed presentation of the TIO, employment, and value-added from the lease payments can be found in Appendix C, Tables C.11-C.13.



Year	Statewide Total Industry Output (Million $)
2015	$20.4

Figure 14. Total Industry Output from Wind Lease Payments Under the 20% and 25% RES's, By BEA Region, Kansas, 2015

Economic Impacts of Potential Rate Increases

With the additional renewable electricity, electric rates per kWh are projected to increase. As outlined in the methods, the rate increase projections are based upon "breakeven" prices for the various technologies and projections of electricity sales by type of technology. Shown in Table 15, the projected electricity rate change per kWh is less than one cent in each of the three years presented. This projection only includes kWh that are necessary to meet the RES for Kansas and not additional renewable electricity that might be produced and sold to other states.

Table 15. Projected Electricity Rate Changes Under the Federal Policy Scenarios, Kansas, 2015, 2020, and 2025

Year	Electricity Rate Change	
	$/kWh	
	25% RES	20% RES
2015	0.0024	0.0018
2020	0.0053	0.0044
2025	0.0076	0.0088

The projected economic impacts occurring each year from the rate changes (Table 15) are displayed in Table 16. Notably, in 2025, including multiplier effects, the negative impact on household incomes decreases total industry output by $219.2 million and jobs by 1,578 under the 25% RES. Including these same effects, for 2025, under the 20% RES, the projected negative total industry output impacts are $188.9 million and 1,360 jobs.

Table 16. Projected Annual Economic Impacts from Electricity Rate Changes Under the Federal Policy Scenarios, Kansas

	2015			
	25% RES		20% RES	
	Direct	Total	Direct	Total
TIO	-$26.8	-$43.1	-$35.0	-$56.3
Jobs	-166	-310	-217	-405
TVA	-$10.6	-$19.7	-$13.9	-$25.8
	2020			
	25% RES		20% RES	
	Direct	Total	Direct	Total
TIO	-$71.0	-$114.3	-$86.5	-$139.2
Jobs	-440	-822	-537	-1,002
TVA	-$28.1	-$52.3	-$34.3	-$63.7
	2025			
	25% RES		20% RES	
	Direct	Total	Direct	Total
TIO	-$136.2	-$219.2	-$117.3	-$188.9
Jobs	-845	-1,578	-728	-1,360
TVA	-$53.9	-$100.3	-$46.5	-$86.4

Conclusions

This study projected potential economic impacts for Kansas under two proposed federal energy policies: the 25% RES and the 20% RES. To conduct the analysis, renewable electricity requirements under the federal proposals are projected. The changes in economic activity resulting from the changes in renewable electricity requirements are projected using IMPLAN, an economic input-output model. Projected economic impacts are reported for the years 2015, 2020, and 2025.

Because extensive wind energy projects are already planned, the requirements for Kansas under either of the two federal energy proposals could be met with the planned wind energy. However, co-firing in existing coal-fired plants under 200MW is also considered as part of this study. The renewable energy produced with projections of wind and co-firing would exceed the requirements under either proposal, so the projected economic impacts are the same under either scenario.

The Kansas agricultural sector averaged over $11 billion in receipts during 2000 to 2007. With $9.5 billion in expenses, the agricultural sectors realized net farm income has average slightly more than $1.5 billion over the same period (Figure 15). With either RES, the potential impacts to the agricultural sector are multiple, occurring from production of dedicated energy crops, collection of livestock wastes, and from lease payments to farmers for wind projects. Multiple areas of the state could benefit, with coal-fired facilities primarily being located in the eastern part of the state, and wind projects being located in the middle and western parts of the state. Economic activity from either RES could increase by $2.8 billion by 2015 or $53,537 per farm if the planned wind and potential co-fire projects are undertaken (Appendix D).

It should be noted, however, that electricity from renewable energy technologies is more expensive than from conventional sources, such as coal. Therefore, the overall electricity price is projected to increase. These increases in costs per kWh will have a negative impact on household incomes available for spending on other goods and services.

Table 17. Summary of Annual Economic Impacts, Kansas, 2025

Impact	Total Industry Output (Million $)	
	25% RES	20% RES
Operating*	5,164.2	5,164.2
Household	-219.2	-188.9
Net	4,945.0	4,975.3
Contribution from agriculture	66.9	66.9
Contribution from wind leases	20.4	20.4

*Operating impacts and contribution from wind leases include sales of wind energy outside the state beyond what is needed for the RES.

Although there are negative impacts from increased electricity prices, around $200 million under either scenario in 2025, the overall economic impacts from operating the additional renewable electricity industry are still positive (over $4,900 million). Of these operating impacts, nearly $67 million come from agriculture. In addition to the operation of the facilities to produce feedstocks and convert them, economic activity would occur as a result of leases paid to farmers for placing wind turbines on their farmland ($20.4 million).

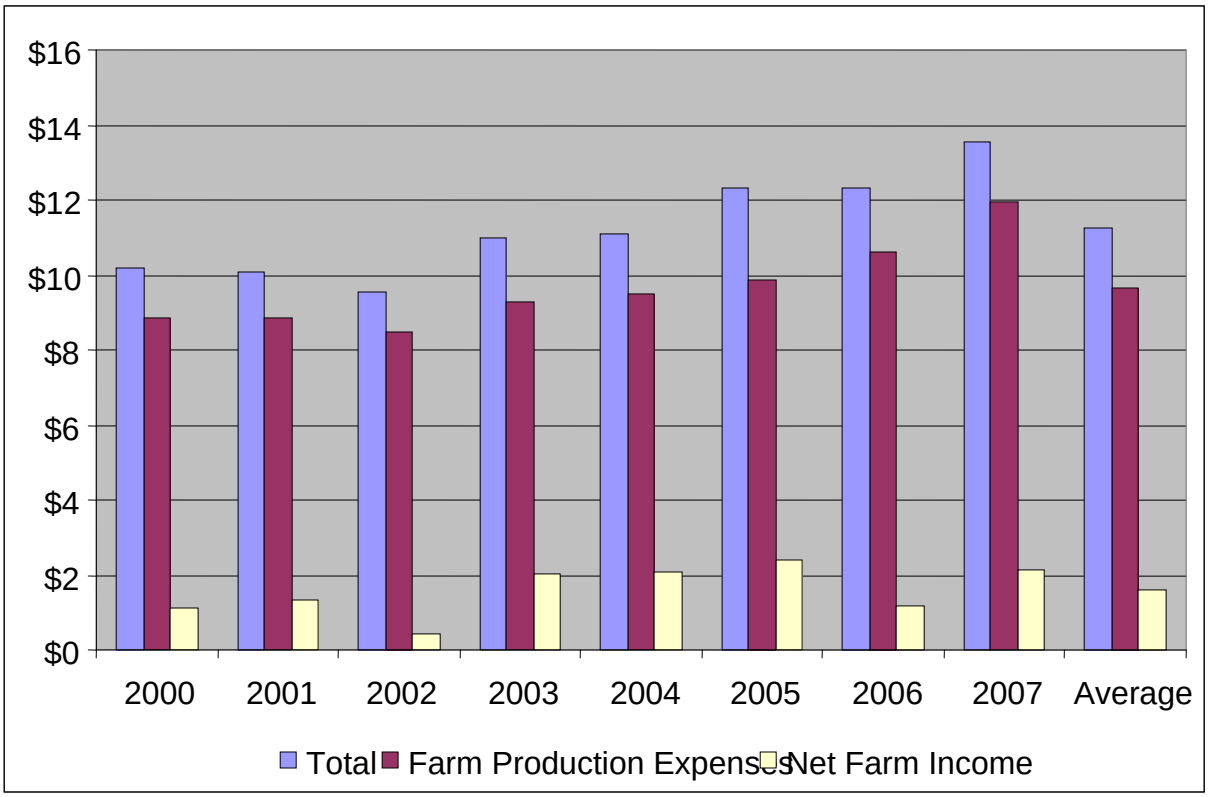


Figure 15. Kansas agricultural receipts, expenses, and realized net farm income, 2000 - 2008.

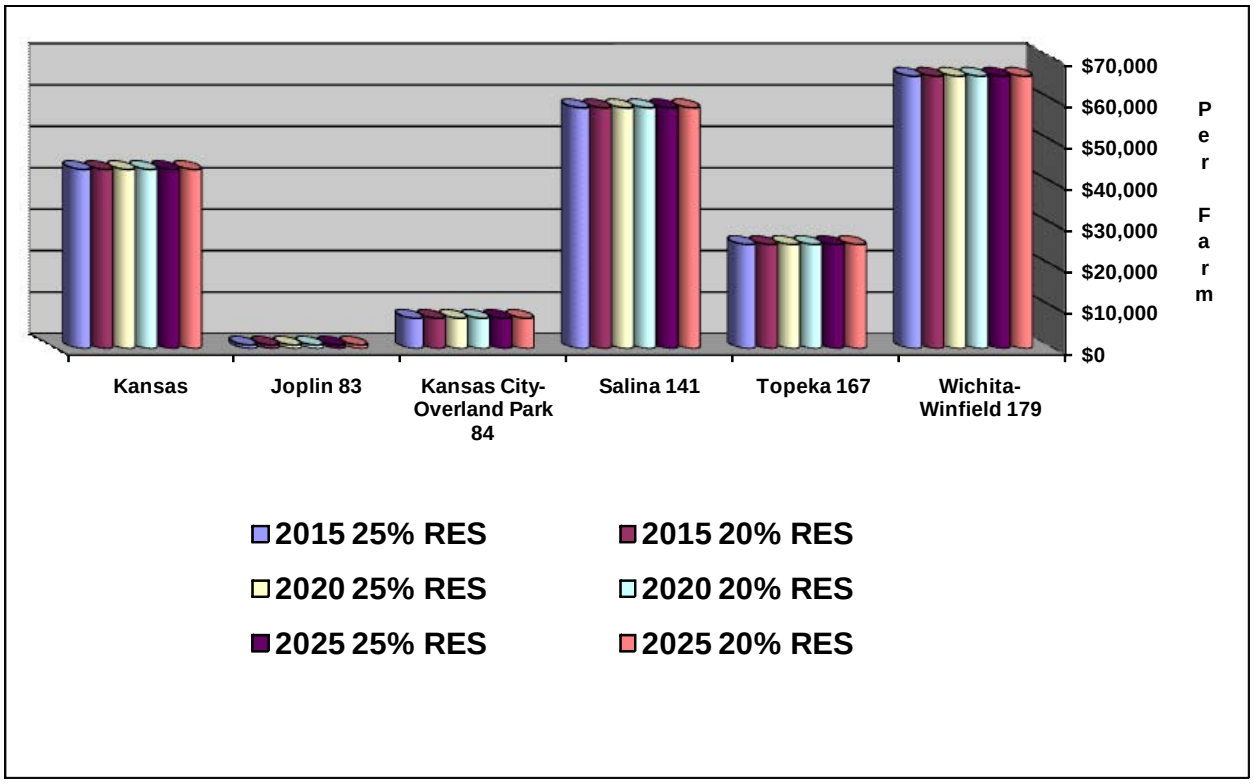


Figure 16. Potential Gains in Per Farm Economic Activity by BEA, 2015, 2020, and 2025.

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APPENDIX A
ENERGY SOURCE ABBREVIATIONS

Table A.1. Energy Source Abbreviations

Abbrev-iation	Description	Abbrev-iation	Description
BIT	(Anthracite Coal, Bituminous Coal)	BLQ*	Black Liquor
LIG	Lignite Coal	GEO*	Geothermal
SUB	Subbituminous Coal	LFG*	Landfill Gas
WC	Waste/Other Coal (Anthracite Culm, Bituminous Gob, Fine Coal, Lignite Waste, Waste Coal)	MSW*	Municipal Solid Waste
SC	Coal Synfuel. Coal-based solid fuel that has been processed by a coal synfuel plant, and coal-based fuels such as briquettes, pellets, or extrusions, which are formed from fresh or recycled coal and binding materials.	OBS*	Other Biomass Solid (Animal Manure and Waste, Solid Byproducts, and other solid biomass not specified)
DFO	Distillate Fuel Oil (includes all Diesel and No. 1, No. 2, and No. 4 Fuel Oils)	OBL*	Other Biomass Liquid (Ethanol, Fish Oil, Liquid Acetonitrile Waste, Medical Waste, Tall Oil, Waste Alcohol, and other Biomass not specified)
JF	Jet Fuel	OBG *	Other Biomass Gases (Digester Gas, Methane, and other biomass gases)
KER	Kerosene	OTH	Other (Batteries, Chemicals, Coke Breeze, Hydrogen, Pitch, Sulfur, Tar Coal, and miscellaneous technologies)
RFO	Residual Fuel Oil (includes No. 5 and No. 6 Fuel Oils and Bunker C Fuel Oil)	PUR	Purchased Steam
WO	Oil-Other and Waste Oil (Butane (Liquid), Crude Oil, Liquid Byproducts, Oil Waste, Propane (Liquid), Re-refined	SLW	Sludge Waste
PC	Petroleum Coke	SUN*	Solar (Photovoltaic, Thermal)
NG	Natural Gas	TDF	Tires
BFG	Blast Furnace Gas	WAT	Water (Conventional, Pumped Storage)
OG	Other Gas (Butane, Coal Processes, Coke-Oven, Refinery, and other processes)	WDS*	Wood/Wood Waste Solids (Paper Pellets, Railroad Ties, Utility Poles, Wood Chips, and other wood solids)
PG	Propane	WDL*	Wood Waste Liquids (Red Liquor, Sludge Wood, Spent Sulfite Liquor, and other wood related liquids not
SG	Synthetic Gas, other than coal-derived	WND*	Wind
SGC	Synthetic gas, derived from coal		
NUC	Nuclear (Uranium, Plutonium, Thorium)		
AB*	Agriculture Crop Byproducts/Straw/Energy Crops		

*Classified as “renewable” energy sources in this study.

APPENDIX B
EXPENDITURES BY REPRESENTATIVE RENEWABLE ENERGY FACILITIES

Conversion Technology: Horizontal Axis Wind Turbine Power Plant
Facility Size (Nameplate): 16 MW
Capacity Factor: 0.375
Generation/Year: 52,560,000 kWh/year
Total Industry Output: $3,621,384 ($0.0689/kWh)
Breakeven Total Industry Output: $6,432,677 ($0.1224/kWh)
Employees: 7
Source: Renewable Energy Technical Assessment Guide—TAG-RE: 2006. EPRI, Palo Alto, CA: 2007. 1012722

Table B.1. IMPLAN Expenditures for Horizontal Axis Wind Turbine Power Plant

Type	IMPLAN Sector	IMPLAN Sector Description	Expenditures
Investment	41	Other New Construction (Foundations, Civil Engineering, Installation & Commissioning, etc.)	$7,344,000
Investment	285	Turbine & Turbine Generator Set Units Manufacturing (Tower, Wind Turbine/Generator, Power Collection System)	$11,296,000
Investment	316	Industrial Process Variable Instruments (Electrical/Controls/Instrumentation)	$5,232,000
Investment	334	Motor & Generator Manufacturing (Rotor Assembly)	$6,672,000
Investment	394	Truck Transportation (Transportation & Freight)	$1,280,000
Investment	425	Banking (Project & Process Contingency)	$288,000
Investment	437	Legal Services (Due Diligence, Permitting, Legal)	$6,000,000
Investment	439	Architectural & Engineering Services (Engineering)	$192,000
Investment	442	Computer Systems Design Services (SCADA & Communications)	$320,000
Operating	485	Commercial Machinery Repair & Maintenance (includes Turbines, BOP, insurance, admin.)	$880,000
Depreciation	41	Other New Construction (Foundations, Civil engineering, Substation, Metering, Interconnection, Sensors, etc.)	$367,000
Depreciation	285	Turbine & Turbine Generator Set Units Manufacturing (Tower, Wind Turbine/Generator, Power Collection System)	$1,129,600
Depreciation	316	Industrial Process Variable Instruments (Electrical/Controls/Instrumentation)	$523,200
Depreciation	334	Motor & Generator Manufacturing (Rotor Assembly)	$667,200

*2006 dollars

Expenditure Summary for Horizontal Axis Wind Turbine Power Plant

Expenditure Type	Total $	$/kWh
Investment	$38,624,000	$0.73
Operating	$880,000	$0.02
Depreciation	$2,687,200	$0.05

*2006 dollars

Conversion Technology: Co-fire (10%) of Cattle Feedlot Biomass with Coal (Feedlot Size 15,111 head)
Facility Size (Nameplate): 10.5 MW
Capacity Factor: 0.800
Generation/Year: 73,233,600 kWh/year
Feedstock kWh/ton: 2,019.3
Total Industry Output: $5,045,795 ($0.0689/kWh)
Breakeven Total Industry Output: $6,316,977 ($0.0863/kWh)
Employees: 7
Source: Sweeten J., K. Annamalai, K. Heflin, and M. Freeman. 2002. "Cattle Feedlot Manure Quality for Combustion in Coal/Manure Blends". Presented at the 2002 ASAE Annual International Meeting, Chicago. Paper No. 024092; English, B., J. Menard, M. Walsh, and K. Jensen. 2004. "Economic Impacts of Using Alternative Feedstocks in Coal-Fired Plants in the Southeastern United States".

Table B.2. IMPLAN Expenditures for Co-fire (10%) of Cattle Feedlot Biomass with Coal (Feedlot Size 15,111 head)

Type	IMPLAN Sector	IMPLAN Sector Description	Expenditures
Investment	41	Other New Construction (Biomass Handling System Installation, Civil Structural, Electrical)	$2,346,421
Investment	232	Prefabricated Metal Buildings and Components (Wood Silo with Live Bottom)	$75,243
Investment	292	Conveyor & Conveying Equipment Manufacturing (Conveyor #1, Radial Stacker, Radial Screw, Conveyor #2, etc.)	$522,830
Investment	298	Industrial Process Furnace & Oven Manufacturing (Modification at Burners)	$34,209
Investment	316	Industrial Process Variable Instruments (Controls)	$165,213
Investment	346	Motor Vehicle Body Manufacturing (Truck Tipper with Hopper and Feeder)	$123,326
Investment	425	Banking (Contingency (30%))	$907,930
Investment	439	Architectural & Engineering Services (Engineering @ 10%)	$389,953
Operating	11	Cattle Ranching/Farming (Feedstock)	$725,351
Operating	18	Agriculture & Forestry Support Activities	$179,715
Operating	407	Gasoline Stations (Fuel/Lube)	$71,608
Operating	425	Banking (Depreciation & Capital)	$338,257
Operating	485	Commercial Machinery Repair & Maintenance (Repair)	$688,519
Depreciation	41	Other New Construction (Biomass Handling System Installation, Civil Structural, Electrical)	$234,642
Depreciation	232	Prefabricated Metal Buildings and Components (Wood Silo with Live Bottom)	$3,762
Depreciation	292	Conveyor & Conveying Equipment Manufacturing (Conveyor #1, Radial Stacker, Radial Screw, Conveyor #2, etc.)	$52,283
Depreciation	298	Industrial Process Furnace & Oven Manufacturing (Modification at Burners)	$3,421
Depreciation	316	Industrial Process Variable Instruments (Controls)	$16,521
Depreciation	346	Motor Vehicle Body Manufacturing (Truck Tipper with Hopper and Feeder)	$12,333

*2006 dollars

Expenditure Summary for Co-fire (10%) of Cattle Feedlot Biomass with Coal (Feedlot Size 15,111 head)

Expenditure Type	Total $	$/kWh
Investment	$4,565,125	$0.06
Operating	$2,003,450	$0.03
Operating w/out Feedstock Expenditures	$282,178	$0.004
Depreciation	$322,962	$0.004

*2006 dollars

Conversion Technology: Co-fire (15%) of Cellulosic Residues (Dedicated Energy Crop) with Coal
Facility Size (Co-fire Nameplate): 15.6 MW
Capacity Factor: 0.800
Generation/Year: 109,850,400 kWh/year
Feedstock kWh/ton: 1,508.1
Total Industry Output: $7,568,693 ($0.0689/kWh)
Breakeven Total Industry Output: $11,182,970 ($0.1018/kWh)
Employees: 7
Source: English, B., J. Menard, M. Walsh, and K. Jensen. 2004. "Economic Impacts of Using Alternative Feedstocks in Coal-Fired Plants in the Southeastern United States".

Table B.3. IMPLAN Expenditures for: Co-fire (15%) of Cellulosic Residues (Dedicated Energy Crop) with Coal

Type	IMPLAN Sector	IMPLAN Sector Description	Expenditures*
Investment	41	Other New Construction (Biomass Handling System Installation, Civil Structural, Electrical)	$2,346,421
Investment	232	Prefabricated Metal Buildings and Components (Wood Silo with Live Bottom)	$75,243
Investment	292	Conveyor & Conveying Equipment Manufacturing (Conveyor #1, Radial Stacker, Radial Screw, Conveyor #2, etc.)	$522,830
Investment	298	Industrial Process Furnace & Oven Manufacturing (Modification at Burners)	$34,209
Investment	316	Industrial Process Variable Instruments (Controls)	$165,213
Investment	346	Motor Vehicle Body Manufacturing (Truck Tipper with Hopper and Feeder)	$123,326
Investment	425	Banking (Contingency (30%))	$907,930
Investment	439	Architectural & Engineering Services (Engineering @ 10%)	$389,953
Operating	16	Dedicated Energy Crop (Feedstock)	$4,588,983
Operating	485	Commercial Machinery Repair & Maintenance	$282,178
Depreciation	41	Other New Construction (Biomass Handling System Installation, Civil Structural, Electrical)	$234,642
Depreciation	232	Prefabricated Metal Buildings and Components (Wood Silo with Live Bottom)	$3,762
Depreciation	292	Conveyor & Conveying Equipment Manufacturing (Conveyor #1, Radial Stacker, Radial Screw, Conveyor #2, etc.)	$52,283
Depreciation	298	Industrial Process Furnace & Oven Manufacturing (Modification at Burners)	$3,421
Depreciation	316	Industrial Process Variable Instruments (Controls)	$16,521
Depreciation	346	Motor Vehicle Body Manufacturing (Truck Tipper with Hopper and Feeder)	$12,333

*2006 dollars

Expenditure Summary for Co-fire (15%) of Cellulosic Residues (Dedicated Energy Crop) with Coal

Expenditure Type	Total $*	$/kWh
Investment	$4,565,125	$0.04
Operating	$4,871,161	$0.04
Operating w/out Feedstock Expenditure	$282,178	$0.003
Depreciation	$322,962	$0.003

*2006 dollars

APPENDIX C
ECONOMIC IMPACTS FROM ADDITIONAL RENEWABLE ENERGY FACILITIES

Table C.1. Total Industry Output From Investment in Additional Renewable Electricity Under the 25% and 20% RES Proposals*

BEA Region/State	25% RES		20% RES	
		2015		
	Direct	Total	Direct	Total
Joplin	$3,901,860	$5,718,040	$3,901,860	$5,718,040
Kansas City-Overland Park	$280,546,680	$487,689,355	$280,546,680	$487,689,355
Salina	$2,364,683,100	$3,632,136,800	$2,364,683,100	$3,632,136,800
Topeka	$1,095,209,946	$1,843,052,809	$1,095,209,946	$1,843,052,809
Wichita-Winfield	$7,367,252,079	$12,500,714,122	$7,367,252,079	$12,500,714,122
Kansas	$16,943,066,308	$30,376,812,199	$16,943,066,308	$30,376,812,199
		2020		
	Direct	Total	Direct	Total
Joplin	$0	$0	$0	$0
Kansas City-Overland Park	$0	$0	$0	$0
Salina	$0	$0	$0	$0
Topeka	$0	$0	$0	$0
Wichita-Winfield	$0	$0	$0	$0
Kansas	$0	$0	$0	$0
		2025		
	Direct	Total	Direct	Total
Joplin	$0	$0	$0	$0
Kansas City-Overland Park	$0	$0	$0	$0
Salina	$0	$0	$0	$0
Topeka	$0	$0	$0	$0
Wichita-Winfield	$0	$0	$0	$0
Kansas	$0	$0	$0	$0

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade. All dollar value impacts are in $2009.

Table C.2. Employment From Investment in Additional Renewable Electricity Under 25% and 20% RES Proposals*

BEA Region/State	25% RES		20% RES	
		2015		
	Direct	Total	Direct	Total
Joplin	37	57	37	57
Kansas City-Overland Park	1,524	3,243	1,524	3,243
Salina	22,230	36,400	22,230	36,400
Topeka	10,033	17,676	10,033	17,676
Wichita-Winfield	55,454	102,342	55,454	102,342
Kansas	95,741	208,876	95,741	208,876
		2020		
	Direct	Total	Direct	Total
Joplin	0	0	0	0
Kansas City-Overland Park	0	0	0	0
Salina	0	0	0	0
Topeka	0	0	0	0
Wichita-Winfield	0	0	0	0
Kansas	0	0	0	0
		2025		
	Direct	Total	Direct	Total
Joplin	0	0	0	0
Kansas City-Overland Park	0	0	0	0
Salina	0	0	0	0
Topeka	0	0	0	0
Wichita-Winfield	0	0	0	0
Kansas	0	0	0	0

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade.

Table C.3. Value-Added From Investment in Additional Renewable Electricity Under 25% and 20% RES Proposals*

BEA Region/State	25% RES		20% RES	
	2015			
	Direct	Total	Direct	Total
Joplin	$1,830,289	$2,875,207	$1,830,289	$2,875,207
Kansas City-Overland Park	$117,335,369	$237,320,565	$117,335,369	$237,320,565
Salina	$990,534,700	$1,714,961,300	$990,534,700	$1,714,961,300
Topeka	$511,178,342	$953,974,932	$511,178,342	$953,974,932
Wichita-Winfield	$3,312,698,716	$6,108,313,950	$3,312,698,716	$6,108,313,950
Kansas	$6,774,560,506	$14,155,302,383	$6,774,560,506	$14,155,302,383
	2020			
	Direct	Total	Direct	Total
Joplin	$0	$0	$0	$0
Kansas City-Overland Park	$0	$0	$0	$0
Salina	$0	$0	$0	$0
Topeka	$0	$0	$0	$0
Wichita-Winfield	$0	$0	$0	$0
Kansas	$0	$0	$0	$0
				$0
	$0	$0	$0	$0
Joplin	$0	$0	$0	$0
Kansas City-Overland Park	$0	$0	$0	$0
Salina	$0	$0	$0	$0
Topeka	$0	$0	$0	$0
Wichita-Winfield	$0	$0	$0	$0
Kansas	$0	$0	$0	$0

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade. All dollar value impacts are in $2009.

Table C.4. Total Industry Output From Year-to-Year Operations of Additional Renewable Electricity Under 25% and 20% RES Proposals*

BEA Region/State	25% RES		20% RES	
			2015	
	Direct	Total	Direct	Total
Joplin	$10,047,676	$16,920,306	$10,047,676	$16,920,306
Kansas City-Overland Park	$89,638,323	$139,778,906	$89,638,323	$139,778,906
Salina	$688,051,500	$974,753,900	$688,051,500	$974,753,900
Topeka	$364,507,474	$539,233,810	$364,507,474	$539,233,810
Wichita-Winfield	$1,750,264,895	$3,001,153,715	$1,750,264,895	$3,001,153,715
Kansas	$2,901,821,816	$5,164,183,335	$2,901,821,816	$5,164,183,335
			2020	
	Direct	Total	Direct	Total
Joplin	$10,047,676	$16,920,306	$10,047,676	$16,920,306
Kansas City-Overland Park	$89,638,323	$139,778,906	$89,638,323	$139,778,906
Salina	$688,051,500	$974,753,900	$688,051,500	$974,753,900
Topeka	$364,507,474	$539,233,810	$364,507,474	$539,233,810
Wichita-Winfield	$1,750,264,895	$3,001,153,715	$1,750,264,895	$3,001,153,715
Kansas	$2,901,821,816	$5,164,183,335	$2,901,821,816	$5,164,183,335
			2025	
	Direct	Total	Direct	Total
Joplin	$10,047,676	$16,920,306	$10,047,676	$16,920,306
Kansas City-Overland Park	$89,638,323	$139,778,906	$89,638,323	$139,778,906
Salina	$688,051,500	$974,753,900	$688,051,500	$974,753,900
Topeka	$364,507,474	$539,233,810	$364,507,474	$539,233,810
Wichita-Winfield	$1,750,264,895	$3,001,153,715	$1,750,264,895	$3,001,153,715
Kansas	$2,901,821,816	$5,164,183,335	$2,901,821,816	$5,164,183,335

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade. All dollar value impacts are in $2009.

Table C.5. Employment From Year-to-Year Operations of Additional Renewable Electricity Under 25% and 20% RES Proposals*

BEA Region/State	25% RES		20% RES	
		2015		
	Direct	Total	Direct	Total
Joplin	6	67	6	67
Kansas City-Overland Park	71	485	71	485
Salina	700	3,770	700	3,770
Topeka	359	2,118	359	2,118
Wichita-Winfield	1,781	11,921	1,781	11,921
Kansas	2,917	21,046	2,917	21,046
		2020		
	Direct	Total	Direct	Total
Joplin	6	67	6	67
Kansas City-Overland Park	71	485	71	485
Salina	700	3,770	700	3,770
Topeka	359	2,118	359	2,118
Wichita-Winfield	1,781	11,921	1,781	11,921
Kansas	2,917	21,046	2,917	21,046
		2025		
	Direct	Total	Direct	Total
Joplin	6	67	6	67
Kansas City-Overland Park	71	485	71	485
Salina	700	3,770	700	3,770
Topeka	359	2,118	359	2,118
Wichita-Winfield	1,781	11,921	1,781	11,921
Kansas	2,917	21,046	2,917	21,046

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade.

Table C.6. Value-Added From Year-to-Year Operations of Additional Renewable Electricity Under 25% and 20% RES Proposals*

BEA Region/State	25% RES		20% RES	
			2015	
	Direct	Total	Direct	Total
Joplin	$5,380,861	$10,014,135	$5,380,861	$10,014,135
Kansas City-Overland Park	$44,099,700	$73,342,226	$44,099,700	$73,342,226
Salina	$306,496,900	$461,172,800	$306,496,900	$461,172,800
Topeka	$164,774,883	$266,137,945	$164,774,883	$266,137,945
Wichita-Winfield	$783,877,266	$1,392,787,101	$783,877,266	$1,392,787,101
Kansas	$1,304,323,114	$2,451,748,842	$1,304,323,114	$2,451,748,842
			2020	
	Direct	Total	Direct	Total
Joplin	$5,380,861	$10,014,135	$5,380,861	$10,014,135
Kansas City-Overland Park	$44,099,700	$73,342,226	$44,099,700	$73,342,226
Salina	$306,496,900	$461,172,800	$306,496,900	$461,172,800
Topeka	$164,774,883	$266,137,945	$164,774,883	$266,137,945
Wichita-Winfield	$783,877,266	$1,392,787,101	$783,877,266	$1,392,787,101
Kansas	$1,304,323,114	$2,451,748,842	$1,304,323,114	$2,451,748,842
			2025	
	Direct	Total	Direct	Total
Joplin	$5,380,861	$10,014,135	$5,380,861	$10,014,135
Kansas City-Overland Park	$44,099,700	$73,342,226	$44,099,700	$73,342,226
Salina	$306,496,900	$461,172,800	$306,496,900	$461,172,800
Topeka	$164,774,883	$266,137,945	$164,774,883	$266,137,945
Wichita-Winfield	$783,877,266	$1,392,787,101	$783,877,266	$1,392,787,101
Kansas	$1,304,323,114	$2,451,748,842	$1,304,323,114	$2,451,748,842

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade. All dollar value impacts are in $2009.

Table C.7. Total Industry Output From Year-to-Year Operations Under the Two Federal Policy Scenarios, 2015, 2020, 2025

	25% RES			20% RES		
BEA Region/State	2015	2020	2025	2015	2020	2025
			Wind			
Joplin	$0	$0	$0	$0	$0	$0
Kansas City-Overland Park	$70,488,968	$70,488,968	$70,488,968	$70,488,968	$70,488,968	$70,488,968
Salina	$974,753,900	$974,753,900	$974,753,900	$974,753,900	$974,753,900	$974,753,900
Topeka	$497,693,803	$497,693,803	$497,693,803	$497,693,803	$497,693,803	$497,693,803
Wichita-Winfield	$2,958,821,533	$2,958,821,533	$2,958,821,533	$2,958,821,533	$2,958,821,533	$2,958,821,533
Kansas	$4,994,774,669	$4,994,774,669	$4,994,774,669	$4,994,774,669	$4,994,774,669	$4,994,774,669
			Co-Fire Feedlot Biomass			
Joplin	$0	$0	$0	$0	$0	$0
Kansas City-Overland Park	$0	$0	$0	$0	$0	$0
Salina	$0	$0	$0	$0	$0	$0
Topeka	$0	$0	$0	$0	$0	$0
Wichita-Winfield	$42,332,182	$42,332,182	$42,332,182	$42,332,182	$42,332,182	$42,332,182
Kansas	$45,047,295	$45,047,295	$45,047,295	$45,047,295	$45,047,295	$45,047,295
			Co-Fire Dedicated Energy			
Joplin	$16,920,306	$16,920,306	$16,920,306	$16,920,306	$16,920,306	$16,920,306
Kansas City-Overland Park	$69,289,939	$69,289,939	$69,289,939	$69,289,939	$69,289,939	$69,289,939
Salina	$0	$0	$0	$0	$0	$0
Topeka	$41,540,007	$41,540,007	$41,540,007	$41,540,007	$41,540,007	$41,540,007
Wichita-Winfield	$0	$0	$0	$0	$0	$0
Kansas	$124,361,372	$124,361,372	$124,361,372	$124,361,372	$124,361,372	$124,361,372

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade. All dollar value impacts are in $2009.

Table C.8. Total Industry Output from Agricultural Feedstock Production Under the Two Federal Policy Scenarios, 2015, 2020, and 2025*

BEA Region/State	25% RES		20% RES	
		2015		
	Direct	Total	Direct	Total
Joplin	$4,123,110	$6,035,693	$4,123,110	$6,035,693
Kansas City-Overland Park	$18,995,756	$32,407,341	$18,995,756	$32,407,341
Salina	$0	$0	$0	$0
Topeka	$10,945,875	$17,665,293	$10,945,875	$17,665,293
Wichita-Winfield	$2,505,020	$5,127,110	$2,505,020	$5,127,110
Kansas	$36,569,760	$66,898,971	$36,569,760	$66,898,971
		2020		
	Direct	Total	Direct	Total
Joplin	$4,123,110	$6,035,693	$4,123,110	$6,035,693
Kansas City-Overland Park	$18,995,756	$32,407,341	$18,995,756	$32,407,341
Salina	$0	$0	$0	$0
Topeka	$10,945,875	$17,665,293	$10,945,875	$17,665,293
Wichita-Winfield	$2,505,020	$5,127,110	$2,505,020	$5,127,110
Kansas	$36,569,760	$66,898,971	$36,569,760	$66,898,971
		2025		
	Direct	Total	Direct	Total
Joplin	$4,123,110	$6,035,693	$4,123,110	$6,035,693
Kansas City-Overland Park	$18,995,756	$32,407,341	$18,995,756	$32,407,341
Salina	$0	$0	$0	$0
Topeka	$10,945,875	$17,665,293	$10,945,875	$17,665,293
Wichita-Winfield	$2,505,020	$5,127,110	$2,505,020	$5,127,110
Kansas	$36,569,760	$66,898,971	$36,569,760	$66,898,971

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade. All dollar value impacts are in $2009.

Table C.9. Employment from Agricultural Feedstock Production Under the Two Federal Policy Scenarios, 2015, 2020, and 2025*

BEA Region/State	25% RES		20% RES	
		2015		
	Direct	Total	Direct	Total
Joplin	15	38	15	38
Kansas City-Overland Park	70	187	70	187
Salina	0	0	0	0
Topeka	40	113	40	113
Wichita-Winfield	10	27	10	27
Kansas	139	410	139	410
		2020		
	Direct	Total	Direct	Total
Joplin	15	38	15	38
Kansas City-Overland Park	70	187	70	187
Salina	0	0	0	0
Topeka	40	113	40	113
Wichita-Winfield	10	27	10	27
Kansas	139	410	139	410
		2025		
	Direct	Total	Direct	Total
Joplin	15	38	15	38
Kansas City-Overland Park	70	187	70	187
Salina	0	0	0	0
Topeka	40	113	40	113
Wichita-Winfield	10	27	10	27
Kansas	139	410	139	410

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade. All dollar value impacts are in $2009.

Table C.10. Value-Added from Agricultural Feedstock Production Under the Two Federal Policy Scenarios, 2015, 2020, and 2025*

BEA Region/State	25% RES		20% RES	
		2015		
	Direct	Total	Direct	Total
Joplin	$3,161,855	$4,300,213	$3,161,855	$4,300,213
Kansas City-Overland Park	$14,567,117	$22,527,541	$14,567,117	$22,527,541
Salina	$0	$0	$0	$0
Topeka	$8,393,972	$12,531,501	$8,393,972	$12,531,501
Wichita-Winfield	$251,034	$1,326,047	$251,034	$1,326,047
Kansas	$26,374,526	$43,254,531	$26,374,526	$43,254,531
		2020		
	Direct	Total	Direct	Total
Joplin	$3,161,855	$4,300,213	$3,161,855	$4,300,213
Kansas City-Overland Park	$14,567,117	$22,527,541	$14,567,117	$22,527,541
Salina	$0	$0	$0	$0
Topeka	$8,393,972	$12,531,501	$8,393,972	$12,531,501
Wichita-Winfield	$251,034	$1,326,047	$251,034	$1,326,047
Kansas	$26,374,526	$43,254,531	$26,374,526	$43,254,531
		2025		
	Direct	Total	Direct	Total
Joplin	$3,161,855	$4,300,213	$3,161,855	$4,300,213
Kansas City-Overland Park	$14,567,117	$22,527,541	$14,567,117	$22,527,541
Salina	$0	$0	$0	$0
Topeka	$8,393,972	$12,531,501	$8,393,972	$12,531,501
Wichita-Winfield	$251,034	$1,326,047	$251,034	$1,326,047
Kansas	$26,374,526	$43,254,531	$26,374,526	$43,254,531

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade. All dollar value impacts are in $2009.

Table C.11. Total Industry Output from Wind Lease Payments on Farmland Under the Two Federal Policy Scenarios, 2015, 2020, and 2025*

BEA Region/State	25% RES		20% RES	
			2015	
	Direct	Total	Direct	Total
Joplin	$0	$0	$0	$0
Kansas City-Overland Park	$195,862	$303,491	$195,862	$303,491
Salina	$3,106,513	$4,070,549	$3,106,513	$4,070,549
Topeka	$1,527,169	$2,118,551	$1,527,169	$2,118,551
Wichita-Winfield	$7,826,383	$11,435,278	$7,826,383	$11,435,278
Kansas	$12,728,068	$20,436,185	$12,728,068	$20,436,185
			2020	
	Direct	Total	Direct	Total
Joplin	$0	$0	$0	$0
Kansas City-Overland Park	$195,862	$303,491	$195,862	$303,491
Salina	$3,106,513	$4,070,549	$3,106,513	$4,070,549
Topeka	$1,527,169	$2,118,551	$1,527,169	$2,118,551
Wichita-Winfield	$7,826,383	$11,435,278	$7,826,383	$11,435,278
Kansas	$12,728,068	$20,436,185	$12,728,068	$20,436,185
			2025	
	Direct	Total	Direct	Total
Joplin	$0	$0	$0	$0
Kansas City-Overland Park	$195,862	$303,491	$195,862	$303,491
Salina	$3,106,513	$4,070,549	$3,106,513	$4,070,549
Topeka	$1,527,169	$2,118,551	$1,527,169	$2,118,551
Wichita-Winfield	$7,826,383	$11,435,278	$7,826,383	$11,435,278
Kansas	$12,728,068	$20,436,185	$12,728,068	$20,436,185

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade. All dollar value impacts are in $2009.

Table C.12. Employment from Wind Lease Payments Under the Two Federal Policy Scenarios, 2015, 2020, and 2025*

BEA Region/State	25% RES		20% RES	
		2015		
	Direct	Total	Direct	Total
Joplin	0	0	0	0
Kansas City-Overland Park	1	2	1	2
Salina	20	31	20	31
Topeka	9	15	9	15
Wichita-Winfield	47	81	47	81
Kansas	79	146	79	146
		2020		
	Direct	Total	Direct	Total
Joplin	0	0	0	0
Kansas City-Overland Park	1	2	1	2
Salina	20	31	20	31
Topeka	9	15	9	15
Wichita-Winfield	47	81	47	81
Kansas	79	146	79	146
		2025		
	Direct	Total	Direct	Total
Joplin	0	0	0	0
Kansas City-Overland Park	1	2	1	2
Salina	20	31	20	31
Topeka	9	15	9	15
Wichita-Winfield	47	81	47	81
Kansas	79	146	79	146

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade. All dollar value impacts are in $2009.

Table C.13. Value-Added from Wind Lease Payments on Farmland Under the Two Federal Policy Scenarios, 2015, 2020, and 2025*

BEA Region/State	25% RES		20% RES	
			2015	
	Direct	Total	Direct	Total
Joplin	$0	$0	$0	$0
Kansas City-Overland Park	$76,761	$140,418	$76,761	$140,418
Salina	$1,025,283	$1,578,559	$1,025,283	$1,578,559
Topeka	$523,600	$880,998	$523,600	$880,998
Wichita-Winfield	$2,801,008	$4,763,957	$2,801,008	$4,763,957
Kansas	$4,910,588	$9,207,965	$4,910,588	$9,207,965
			2020	
	Direct	Total	Direct	Total
Joplin	$0	$0	$0	$0
Kansas City-Overland Park	$76,761	$140,418	$76,761	$140,418
Salina	$1,025,283	$1,578,559	$1,025,283	$1,578,559
Topeka	$523,600	$880,998	$523,600	$880,998
Wichita-Winfield	$2,801,008	$4,763,957	$2,801,008	$4,763,957
Kansas	$4,910,588	$9,207,965	$4,910,588	$9,207,965
			2025	
	Direct	Total	Direct	Total
Joplin	$0	$0	$0	$0
Kansas City-Overland Park	$76,761	$140,418	$76,761	$140,418
Salina	$1,025,283	$1,578,559	$1,025,283	$1,578,559
Topeka	$523,600	$880,998	$523,600	$880,998
Wichita-Winfield	$2,801,008	$4,763,957	$2,801,008	$4,763,957
Kansas	$4,910,588	$9,207,965	$4,910,588	$9,207,965

* The Kansas numbers are greater than the sum of the BEA regions. This is due to interregional trade. All dollar value impacts are in $2009.

APPENDIX D
KANSAS ECONOMIC ACTIVITY FOR SELECTED RES SCENARIOS BY BEA

Table D.1. Economic Activity for Kansas' Agricultural and State Economy, 2006

	Direct Economic Activity [a]							
State/BEA Region	Total State	Agricultural	Logging	Fishing	Hunting/ Trapping	Total Ag/For	*Proportion of Agriculture to Total Economy*	*Number of Farms[b]*
			Million 2006 $				Proportion	Number
Kansas	$254,151.4	$10,349.6	$34.9	$0.0	$50.0	$10,434.4	0.041	65,531
Joplin 83	$7,543.8	$457.2	$0.8	$0.0	$2.8	$460.8	0.061	4,926
Kansas City-Overland Park 84	$91,945.2	$583.7	$3.7	$0.0	$11.8	$599.3	0.007	8,550
Salina 141	$13,121.7	$2,019.8	$4.2	$0.0	$9.9	$2,034.0	0.155	11,839
Topeka 167	$31,603.8	$1,528.6	$10.5	$0.0	$5.9	$1,545.0	0.049	13,895
Wichita-Winfield 179	$109,937.1	$5,760.2	$15.7	$0.0	$19.5	$5,795.4	0.053	26,321

Sources: [a] Data developed from IMPLAN data bases; [b] 2007 Census of Agriculture

Table D.2. Projected Agricultural Economic Impacts as a Result of Selected Renewable Electricity Standards, Kansas, by BEA Region, 2015, 2020, and 2025

	2015		2020		2025	
	25% RES	***20% RES***	***25% RES***	***20% RES***	***25% RES***	***20% RES***
Kansas	$2,832,811,056	$2,832,811,056	$2,832,811,056	$2,832,811,056	$2,832,811,056	$2,832,811,056
Joplin 83	$4,123,110	$4,123,110	$4,123,110	$4,123,110	$4,123,110	$4,123,110
Kansas City-Overland Park 84	$62,343,001	$62,343,001	$62,343,001	$62,343,001	$62,343,001	$62,343,001
Salina 141	$688,051,500	$688,051,500	$688,051,500	$688,051,500	$688,051,500	$688,051,500
Topeka 167	$348,779,162	$348,779,162	$348,779,162	$348,779,162	$348,779,162	$348,779,162
Wichita-Winfield 179	$1,730,202,337	$1,730,202,337	$1,730,202,337	$1,730,202,337	$1,730,202,337	$1,730,202,337

Table D.3. Estimated 2007 Gross Receipts Per Farm and Estimated Potential Per Farm Economic Impacts of Selected RES Scenarios for Kansas by BEA, 2015, 2020, and 2025

		2015		2020		2025	
State/BEA Region	2007 Agricultural Gross Receipts	***25% RES***	***20% RES***	***25% RES***	***20% RES***	***25% RES***	***20% RES***
				Dollars/farm			
Kansas	159,229	43,229	43,229	43,229	43,229	43,229	43,229
Joplin 83	93,536	837	837	837	837	837	837
Kansas City-Overland Park 84	70,090	7,292	7,292	7,292	7,292	7,292	7,292
Salina 141	171,805	58,117	58,117	58,117	58,117	58,117	58,117
Topeka 167	111,190	25,101	25,101	25,101	25,101	25,101	25,101
Wichita-Winfield 179	220,183	65,735	65,735	65,735	65,735	65,735	65,735

APPENDIX E – Adjusted Bureau of Economic Analysis Regions Defined by County

Table E.1. Adjusted Bureau of Economic Analysis Region Assignment by County

County	Bureau of Economic Analysis Region
Allen	Joplin
Anderson	Kansas City-Overland Park
Atchison	Kansas City-Overland Park
Barber	Wichita-Winfield
Barton	Wichita-Winfield
Bourbon	Joplin
Brown	Topeka
Butler	Wichita-Winfield
Chase	Topeka
Chautauqua	Wichita-Winfield
Cherokee	Joplin
Cheyenne	Salina
Clark	Wichita-Winfield
Clay	Topeka
Cloud	Salina
Coffey	Topeka
Comanche	Wichita-Winfield
Cowley	Wichita-Winfield
Crawford	Joplin
Decatur	Salina
Dickinson	Topeka
Doniphan	Kansas City-Overland Park
Douglas	Kansas City-Overland Park
Edwards	Wichita-Winfield
Elk	Wichita-Winfield
Ellis	Salina
Ellsworth	Salina
Finney	Wichita-Winfield
Ford	Wichita-Winfield
Franklin	Kansas City-Overland Park
Geary	Topeka
Gove	Salina
Graham	Salina
Grant	Wichita-Winfield
Gray	Wichita-Winfield
Greeley	Wichita-Winfield
Greenwood	Wichita-Winfield
Hamilton	Wichita-Winfield
Harper	Wichita-Winfield
Harvey	Wichita-Winfield
Haskell	Wichita-Winfield

Table E.1. Adjusted Bureau of Economic Analysis Region Assignment by County

County	Bureau of Economic Analysis Region
Hodgeman	Wichita-Winfield
Jackson	Topeka
Jefferson	Topeka
Jewell	Salina
Johnson	Kansas City-Overland Park
Kearny	Wichita-Winfield
Kingman	Wichita-Winfield
Kiowa	Wichita-Winfield
Labette	Wichita-Winfield
Lane	Wichita-Winfield
Leavenworth	Kansas City-Overland Park
Lincoln	Salina
Linn	Kansas City-Overland Park
Logan	Salina
Lyon	Topeka
McPherson	Wichita-Winfield
Marion	Wichita-Winfield
Marshall	Topeka
Meade	Wichita-Winfield
Miami	Kansas City-Overland Park
Mitchell	Salina
Montgomery	Wichita-Winfield
Morris	Topeka
Morton	Wichita-Winfield
Nemaha	Topeka
Neosho	Joplin
Ness	Wichita-Winfield
Norton	Salina
Osage	Topeka
Osborne	Salina
Ottawa	Salina
Pawnee	Wichita-Winfield
Phillips	Salina
Pottawatomie	Topeka
Pratt	Wichita-Winfield
Rawlins	Salina
Reno	Wichita-Winfield
Republic	Salina
Rice	Wichita-Winfield
Riley	Topeka
Rooks	Salina
Rush	Wichita-Winfield

Table E.1. Adjusted Bureau of Economic Analysis Region Assignment by County

County	Bureau of Economic Analysis Region
Russell	Salina
Saline	Salina
Scott	Wichita-Winfield
Sedgwick	Wichita-Winfield
Seward	Wichita-Winfield
Shawnee	Topeka
Sheridan	Salina
Sherman	Salina
Smith	Salina
Stafford	Wichita-Winfield
Stanton	Wichita-Winfield
Stevens	Wichita-Winfield
Sumner	Wichita-Winfield
Thomas	Salina
Trego	Salina
Wabaunsee	Topeka
Wallace	Salina
Washington	Topeka
Wichita	Wichita-Winfield
Wilson	Joplin
Woodson	Joplin
Wyandotte	Kansas City-Overland Park