CLEAN JOBS, NEW PROSPERITY

ECONOMIC IMPACT STUDY OF PROPOSITION C
THE MISSOURI CLEAN ENERGY INITIATIVE

Sponsored by The Missouri Coalition for the Environment
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Overview

Proposition C-The Missouri Clean Energy Initiative is on the November 2008 ballot. It will require the state's investor-owned utilities to acquire 15 percent of their electricity from renewable sources by 2021. Passage of the Clean Energy Initiative will make Missouri the 27th U.S. state, plus the District of Columbia, to adopt such a required regulatory standard.

In Missouri, renewable energy is most likely to come from wind, solar, and biomass, displacing some fossil fuel electricity generation (currently 82 percent of Missouri's electricity comes from coal).

Increasing the percentage of renewable energy in Missouri's electricity portfolio has multiple benefits to Missouri residents, the economy, and the environment. Renewable energy development will have direct, positive economic impacts on Missouri by creating manufacturing and construction jobs, similar to the impacts found in the other states implementing a Renewable Electricity Standard (RES).[1] Economic impact studies conducted in other states like Texas and Michigan found both actual and significant potential job creation.[2]

In terms of environmental benefits, the Clean Energy Initiative will improve air quality and reduce climate change. An earlier analysis of the Clean Energy Initiative indicates that by 2021, the initiative will reduce carbon emissions by five tons, which is equivalent to removing two million cars from the road.

"Clean Jobs, New Prosperity" is concerned with estimating the economic impact of the Clean Energy Initiative through its potential job creation and related economic activity.

The Clean Energy Initiative

Proposition C-The Clean Energy Initiative is an RES requiring Missouri investor-owned utilities (Ameren, Empire, Aquila, and Kansas City Power & Light) to acquire 15 percent of renewable generation by 2021. The Clean Energy Initiative would require utility companies to generate 2% of total retail electric sales from renewable sources in 2011, 5% in 2014, 10% in 2018, and 15% by 2021. In addition, the standard includes a 2% solar "carve out," meaning that 2% of the required electricity in any given year must come from solar power. The initiative allows utilities to have discretion over how they develop their mix of electrical sources to meet the renewable standard. The Clean Energy Initiative places a cost-cap ensuring that consumers' costs for renewable energy generation as a result of the policy cannot exceed a 1% rate increase over 20 years. This rate cap will remain in place over the entire duration of time the RES is in effect and would provide the most stringent RES consumer protection in the country. In Missouri, wind power and biomass are assumed to be the most cost-effective means for meeting the renewable standard, although technological advancements will continue to make solar a viable option as well. Another part of the equation is that utilities will receive a renewable multiplier of 1.25 kilowatt hours (KWh) for every 1 KWh of renewable energy generated in the State of Missouri, thereby reducing the amount of electricity needed to be generated to be in compliance with the Clean Energy Initiative.

[1] As a practical matter, an RES is synonymous with the Renewable Portfolio Standards (RPS) found in other states.

[2] A report on the State of Texas entitled "Renewable Resources: The New Texas Energy Powerhouse," found that a renewable energy standard put in place in 1999, produced direct wind–related employment of 2,500 in manufacturing and construction and another 2,900 in indirect jobs by 2002. Another study on the potential impacts of a renewable energy standard in the State of Michigan by the Environment Michigan Research & Policy Center estimated that 80,000 jobs would be created by 2020 under a 25% renewable energy standard.

Economic Impact Analysis: An Overview

The economic analysis of Proposition C-The Clean Energy Initiative begins with the calculation of a set of direct job and investment impacts that spur a series of additional impacts. The direct impacts result from an increase of the goods and services produced by the industries directly associated with the Clean Energy Initiative. For example, the increase in demand for wind turbines, solar panels, and the technology to retrofit fossil fuel plants for biomass power would generate new jobs and capital investment.

In turn, this change in demand for Clean Energy Initiative-related industries would stimulate new demand in industries that supply goods and services to them. These impacts are most often described as "indirect" and include a second round of new jobs and investment. For example, if a Missouri manufacturer of wind turbines orders component parts such as ball bearings, brakes, blade extenders, and couplings, the resulting increase in demand for these parts is considered an indirect impact. This increase in demand for component parts creates jobs and investment in the means to manufacture the parts. A third and final round of economic activity is stimulated when the income generated by the direct and indirect impacts is spent by households on consumer items. This round is referred to as "induced." An example includes the income earned by workers employed in Clean Energy Initiative-related industries which would be spent on a wide range of consumer goods, including everyday necessities such as food and clothing, home maintenance, and entertainment.

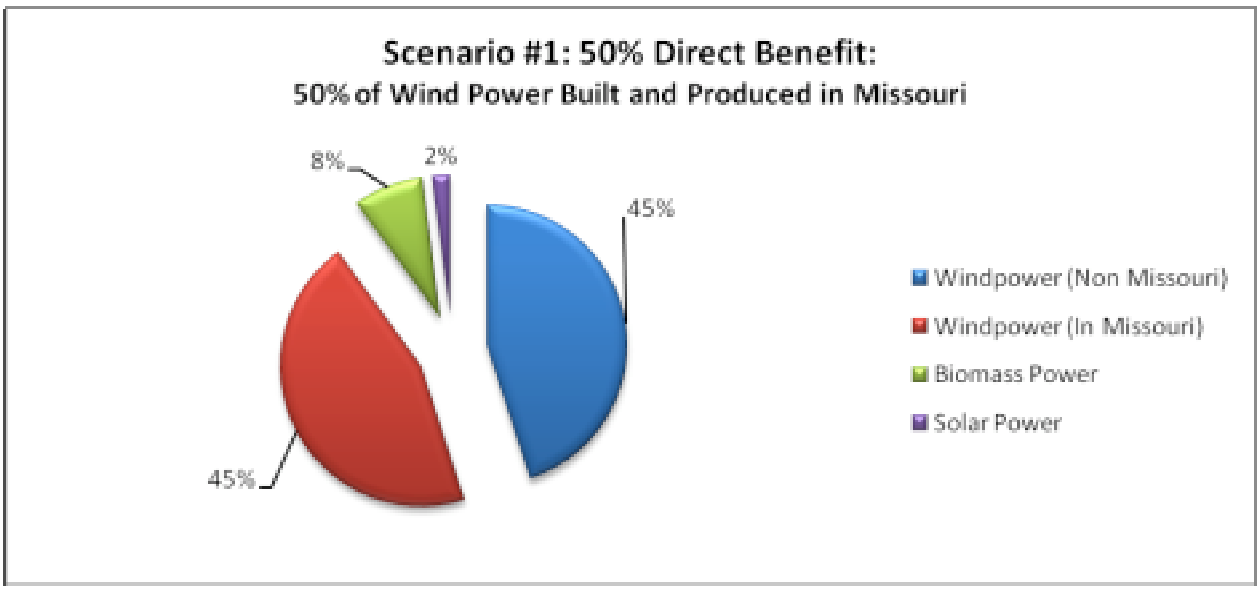
The estimates of the direct, indirect, and induced employment are a result of the increased demand for goods and services provided by the creation of renewable energy facilities, their components, and the stimulus they provided for positive growth in economic activity.

In the following tables, the column headed "Output Value" refers to the value of the sale of goods and services related to the Clean Energy Initiative while the column headed "Income" is the sum of the new household income generated by the increase in demand for goods and services produced in Clean Energy Initiative-related industries. This income includes employee compensation (with benefits), proprietary income for the self-employed, other property-type income, and indirect business taxes such as sales and excise taxes.

It is important to note that in estimating the direct job impacts, it was assumed that all jobs would be new to Missouri and that all workers in related Clean Energy Initiative manufacturing and construction trades would live in Missouri as well. This has the effect of maximizing their impact on the Missouri economy as income and consumption does not "leak" to other states. The sum of potential impacts then includes those occurring directly in the industries receiving an infusion of new jobs and additional capital; those in industries that supply goods and services to them; and households' expenditure of new income on consumer goods and services.

The Economic Impacts of the Clean Energy Initiative

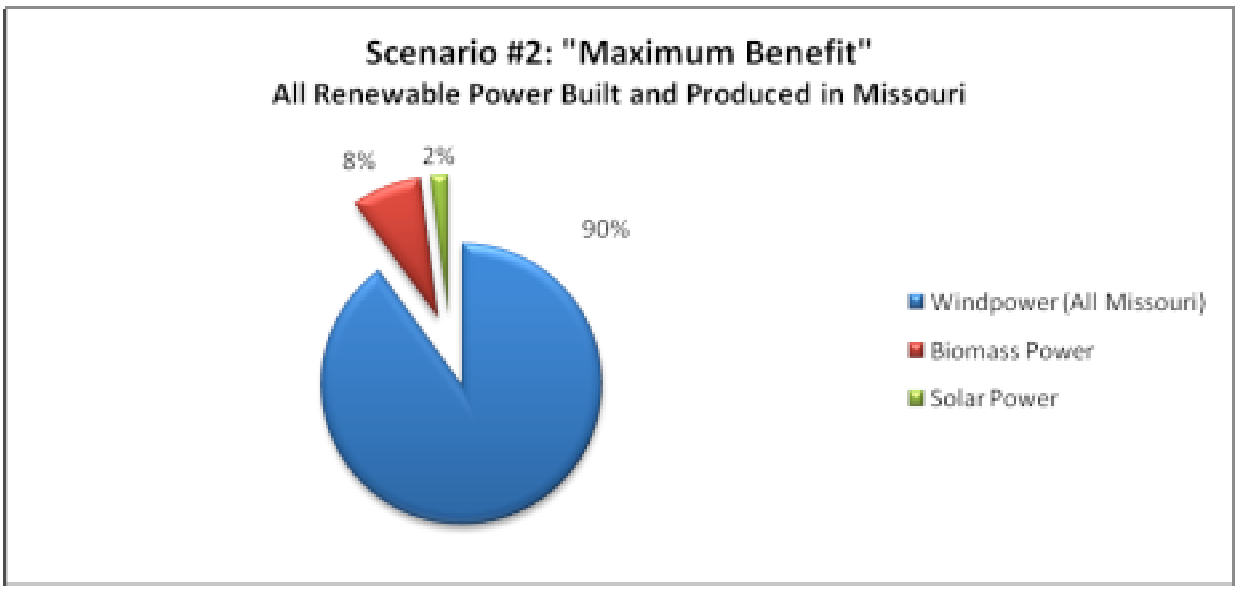
The impacts of Proposition C-The Clean Energy Initiative are presented in two scenarios that offer a range of potential benefits to the State of Missouri. The economic impacts of the first scenario assume that 50% of the electricity needed to comply with the Clean Energy Initiative will be generated in Missouri and will be by produced by 90% wind power, 8% biomass power, and 2% solar power. This scenario also assumes that half of the components necessary to generate this electricity will be manufactured in Missouri and that all construction jobs will go to workers who will live and work in Missouri. This is a likely scenario in which significant manufacturing capacity is developed in the State of Missouri, but half of the electricity required by the Clean Energy Initiative is purchased from out-of-state sources, along with half of the components for wind turbines and power transmission, solar panels, and technology for biomass retrofitting of existing power plants.



The 50% Direct Benefit scenario provides a basic illustration of the job creation and investment potential of the Clean Energy Initiative. Under this scenario, half of the manufacturing capacity would be developed in Missouri and would provide significant job and income growth. To manufacture the necessary components, to install them, and to generate the electricity locally, would create 9,591 jobs by the year 2021. The value of this activity would be $2.86 billion and would provide an additional $856.6 million in income to workers in Missouri. The indirect impact on local suppliers would create an additional 8,530 jobs, increase the value of their output by $1.25 billion, and provide $643.5 million in new income to workers. Induced impacts due to increased household consumption would support an additional 4,278 jobs, increase the total value of the output of these industries by $453.3 million, and provide an additional $263.8 million in income to workers. Overall, the 50% Direct Benefit scenario would stimulate a job creation potential of 22,399 jobs while increasing the value of Missouri-based output by $4.57 billion and increasing income among Missouri workers by $1.76 billion.

50% Missouri Power Scenario			
Impacts	Employment	Output Value*	Income *
Direct	9,591	$2,866.4	$ 856.6
Indirect (Supplier)	8,530	$1,253.7	$ 643.5
Induced Household Consumption	4,278	$ 453.3	$ 263.8
Total	22,399	$4,573.4	$1,763.9
* In millions of 2006 dollars			

A second scenario shows the potential maximum impact of the Clean Energy Initiative. Under this scenario Missouri would develop the necessary manufacturing capacity to deliver all the components and technology that would generate enough electricity to be in compliance with the renewable energy standard provided by the Clean Energy Initiative. This "Maximum Benefit" scenario assumes that 90% of the required electricity would come from in-state wind power sources built and manufactured in Missouri. Likewise, 8% of the required electricity would come from biomass sources in Missouri and 2% from Missouri solar energy sources.



The estimates of the economic impacts of the 100% in Missouri or Maximum Benefit scenario are presented in the table below. They represent the economic activity that would be stimulated by the investment in renewable energy sources to the year 2021. The Direct Impacts of the Clean Energy Initiative would include 13,991 jobs in manufacturing, construction, and operation, an increase of $3.49 billion in the value of the goods and services produced in Clean Energy Initiative-related industries and $1.043 billion in new income to workers.

In turn these increases would stimulate increase in demand for the goods and services in industries that supply the renewable energy-related industries resulting in 10,406 additional jobs, an increase of $1.40 billion in the value of the goods and services produced in the supplier industries, and $781.5 million in new income to workers. These estimates are called the Indirect Impacts of the Direct Impact on Clean Energy Initiative-related industries.

Finally, the combination of Direct and Indirect Impacts stimulates another round of activity that is related to the consumption associated with the increase in worker income. These induced impacts are estimated to create an additional 5,547 jobs, increase the value of the goods and services produced to meet this household demand by $587.5 million, and add another $339.8 million in worker income. Taken together, the economic impact of the Maximum Benefit scenario could potentially create 29,944 jobs and stimulate an increase of $5.48 billion in the value of goods and services purchased in the state and an additional $2.21 billion in income to Missouri workers. A report by the Renewable Energy Policy Project has noted that Missouri has significant existing manufacturing capacity in a wide range of industries that would be directly and indirectly involved in renewable energy production.[3]

[3] The report "Component Manufacturing: Missouri's Future in the Renewable Energy Industry" by the Renewable Energy Policy Project estimates the amount of manufacturing capacity that currently exists in Missouri and how that capacity would contribute to a national renewable energy standard of 20%. Missouri would rank 13th out of twenty states with industries that are properly suited to manufacture the components of renewable energy technologies. Furthermore, the report identifies 20 Missouri counties with the greatest manufacturing capacity for renewable energy technologies. These industries include, but are not limited to, power transmission equipment and measuring and controlling devices for wind power, storage batteries and sheet metal work for solar power, power boilers, metal tanks, and air and gas compressors for biomass power.

100% Missouri Power Scenario			
Impacts	Employment	Output Value*	Income *
Direct	13,991	$3,489.0	$1,043.2
Indirect (Supplier)	10,406	$1,405.0	$ 781.5
Induced Household Consumption	5,547	$ 587.5	$ 339.8
Total	29,944	$5,481.5	$2,214.5
* In millions of 2006 dollars			

The estimates provided in this impact analysis show that there is significant job creation and income growth potential associated with the Clean Energy Initiative. While it is unlikely that either scenario will unfold precisely as assumed for this analysis, it does demonstrate the relationship between industries related to the Clean Energy Initiative and the Missouri economy and the potential for economic growth.

For example, this analysis shows that under the 100% Maximum Benefit scenario, for every job directly created in Missouri related to the Clean Energy Initiative, there would be another 1.14 jobs created in supplier and retail entities. Likewise, for every dollar of direct output value created, another $ .57 is created in the value of supplier goods and services and an increase of $1.03 in household income for every dollar of direct jobs created. Similarly, under the 50% benefit scenario, for every direct job created there would be 1.34 indirect and induced jobs created and for every dollar of direct output and Income created, there would be $ .60 of additional demand for goods and services and an additional $1.06 in household income.

Direct Job Impact

The estimates provided by this analysis show that the Clean Energy Initiative's potential impact on Missouri's economy would be significant. Jobs in manufacturing, construction and the operation and maintenance of facilities in the transition to a 15% generation of renewable energy by the year 2021 would range from an estimated 9,591 under the 50% scenario to 13,991 jobs created under the 100% scenario. These Direct Impacts would then have the effect of creating jobs and new income in supplier industries and in retail and services for household consumption. The table below summarizes these estimated Direct Job Impacts by renewable energy source and industry.

Clean Energy Initiative Direct Job Impact				
	Wind 100%	Wind 50%	Solar	Biomass
Manufacturing	2,203	887	4,055	1,143
Construction	6,534	4,479	Na	Na
Operation	56	38	Na	Na
Total	8,793	5,405	4,055	1,143

Summary of the Economic Impact Analysis

The Clean Energy Initiative would require that 15% of the electricity consumed by 2021 be generated by renewable energy sources such as wind, solar, and biomass power. It is estimated that this requirement of a 15% renewable energy standard would:

- Create a maximum of 13,991 jobs in manufacturing, construction, operation, and maintenance. This includes approximately 7,400 jobs in manufacturing, 6,500 in construction, and the remainder in the operation and maintenance of the renewable energy facilities..
- Create a maximum of $1.16 billion in new income to Missourians or an average of approximately $83,000 per job. ($83,000 includes salaries, wages, and benefits; without benefits, salaries and wages are $58,900. Jobs are in highly specialized industries and construction).
- Create a maximum of 15,953 jobs in supplier, retail, and service industries with an estimated average of $73,000 per job including salaries, wages and benefits.
- Create an estimated 1.14 new jobs in supplier, retail, and service industries for every new job added in Clean Energy Initiative-related industries.

Study Methodology and Key Assumptions

The estimation of the economic impacts of the Clean Energy Initiative was a multi-step process beginning with an extensive review of existing information on the costs of generating electricity through renewable sources and culminating in the employment of an input/output model of the State of Missouri. The primary objective of the review of the extant literature on the generation of renewable energy was the calculation of responsible and reasonable direct job and investment impacts of the Clean Energy Initiative for Missouri. These direct impacts serve as the input for the economic model of the State of Missouri that will in turn calculate estimates of the indirect and induced impacts of these economic events. As simulations of future events that are largely unknown, these model outputs are meaningful only to the extent that the direct impacts have high degrees of accuracy and are consistent with previous research. Therefore, the majority of the research in this study was devoted to the calculation of the direct impacts of the Clean Energy Initiative. The steps taken in the methodology employed in this study are listed below.

Review Extant Literature

The literature on Renewable Energy is extensive and reflects the growing interest and concern regarding the negative impacts on the environment from the continued dependence on fossil fuel for electrical power generation. To this end, there are numerous models that have been developed that calculate the energy requirements of various renewable energy standards and the impacts of those standards on the national economy and the states with those standards. A review of the renewable energy literature included these studies and models, but also included studies that estimated the direct job impacts in related industries such as component manufacturing and construction. It also included comparing various projections on the demand for electricity during the study period.

Calculate Clean Energy Initiative Requirements

Establishing the base of required electrical energy from renewable sources was a critical first step. Once established, the amount of electricity needed to be generated from numerous sources could then be estimated. The

first step is done by projecting electricity demand throughout the study period based upon demand studies such as those provided by the Energy Information Administration and the Missouri Public Service Commission. (Demand for electricity was assumed to grow at 1.33% per year based upon historical growth rates and a slight reduction in demand due to energy efficiencies). The required electricity from renewable sources is then calculated based upon the Clean Energy Initiative requirements and the schedule it sets for attaining certain percentages of the electricity generated to be from renewable sources. Based upon percentages of electrical retail sales, the required number of MW (or megawatt hours) of electricity were then calculated.

Develop Cost and Electricity Portfolio Assumptions

While it is largely unknown how the investor-owned utilities will decide to develop their portfolio of renewable energy sources, it is assumed for this study that it will be predominately wind power, followed by solar power (as required in the Clean Energy Initiative) and biomass power. It was also necessary to assume what proportion of the renewable energy portfolio would come from these sources and for the purposes of this study, it was assumed that 90% would come from wind power, 2% from solar and 8% from biomass. From these assumptions about the RES portfolio, the required amount of MWh of electricity could be calculated for each renewable source.

Determine Cost of Renewable Energy Generation

For the purposes of estimating the direct job and investment impacts of the Clean Energy Initiative, the literature was instrumental in determining the cost of producing a MWh of energy from each of the assumed sources. Generally, the cost of generating electricity from renewable sources was determined on a per MWh basis. This step included gathering and comparing numerous studies conducted on the costs and benefits of renewable energy standards.

Estimate Direct Job and Investment Impacts

Based upon the calculation of the MWh of electricity required to be in compliance with the standards set by the Clean Energy Initiative and the cost of generating electricity through renewable sources, it is possible to estimate the amount of jobs and investment that will be created. Compliance with the Clean Energy Initiative will create jobs in component manufacturing, related construction trades, and in the operation and maintenance of facilities, such as wind turbines. These job estimates form the basis or the basic inputs of the input/output analysis and the measurement of their impact on the Missouri economy. Likewise, the amount of capital investment required to construct renewable energy generation facilities can be estimated based upon assumptions about the distribution of renewable sources in the utility portfolios and the cost of these facilities on a per MWh basis. These estimates of capital investment will have similar impacts on the Missouri economy and the input/output model of the State of Missouri will measure these impacts.

For the purposes of this study, two scenarios were developed in order to present possible outcomes based upon differing sets of assumptions. One scenario assumed that all of the wind-generated electricity required would be generated in Missouri. It would also assume that all the components for the wind turbines would be manufactured and assembled in Missouri. This would have the effect of reducing the amount of MW required under the Clean Energy Initiative, but add a significant amount of jobs in the construction of wind turbines and transmission of the electricity and in the manufacturing sector. A second scenario would have half of the wind power required generated in Missouri with all the necessary components for this amount manufactured and assembled in Missouri as well.

Calibrate and Run Input/output Model of the State of Missouri

The estimates of the direct job and investment attributed to compliance with the Clean Energy Initiative are then distributed to specific industries and sectors for proper specification in the input/output model. This distribution is based upon information provided in previous studies on the sectors that include the manufacture of components

and the occupations needed to construct, operate and maintain the renewable energy facilities. Once the distribution is complete, the model was run to estimate the direct, indirect, and induced impacts of the jobs created and the capital investment required to be in compliance with the Clean Energy Initiative.

Finalize and Summarize Outputs

The results of the impact analysis are then compiled into presentation quality graphics and tables and checked for consistency with similar or previous studies. The summary of impacts include the direct, indirect and induced impacts as measured in employment, output and total value added. The indirect and induced impacts are measurements of the multiplier effects of the direct impacts on the specific sectors of the Missouri economy affected by the Clean Energy Initiative.

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