The Brattle Group

Job and Economic Benefits of Transmission and Wind Generation Investments in the SPP Region

March 2010

Johannes Pfeifenberger
Judy Chang
Delphine Hou
Kamen Madjarov

Prepared for

SPP Southwest Power Pool

JOB AND ECONOMIC BENEFITS OF TRANSMISSION AND WIND GENERATION INVESTMENTS IN THE SPP REGION

EXECUTIVE SUMMARY

This study is an update to the work presented in Attachments 5 and 6 of the February 1, 2010, *SPP Priority Projects Phase II Report*, which analyzed the job and economic stimulus benefits of wind development and transmission investment in the SPP footprint. This update analyzes the impact on jobs, earnings, and economic output from two groups of transmission investments (Group 1 and Group 2, consisting of 345 kV transmission lines and 765 kV lines operated at 345 kV) in combination with the investment of an additional 3,196 MW and 7,616 MW of wind farms.

To perform our economic impact analysis, we measure the *direct* impacts on jobs, earnings, and economic activity in SPP member states stimulated by the increased spending on transmission and wind generation. We also measure the *indirect* impacts that arise as in-region suppliers to the transmission and wind generation industries, as well as other upstream producers, benefit from the increased investment. Lastly, we measure the *induced* impacts that arise as the increased income from jobs created by the transmission and wind build-out is spent on services and other industry sectors and ripples through the regional economy. To quantify these impacts, we rely on two models—the Minnesota IMPLAN Group Model and the Department of Energy's ("DOE") Job and Economic Development Impact ("JEDI") Model—that are widely used by economists and policy analysts to estimate how specified investments affect every sector of a state's or region's economy.

Our analysis only focuses on the job and economic activity stimulated by the transmission and wind generation investment. It does not address the economic impacts associated with the recovery of investment costs through utility rates, does not analyze the potential effects of additional renewable generation on other existing generating sources, and does not quantify any other economic benefits of transmission investments—such as improved reliability, reduced power prices and production costs, or increased competition and power market liquidity.

Table A below summarizes our findings regarding the overall (*i.e.*, direct, indirect, and induced) employment and economic impacts during the transmission and wind plant construction cycle (*e.g.*, over the next 5 to 10 years) as well as a 20-year wind plant operating period. The combination of the transmission build-out and 3,196 MW of wind development in SPP are estimated to support in-region jobs accounting for approximately 38,000 full-time-equivalent years ("FTE-years") of employment. This impact is associated with approximately $1.5 billion in earnings by employees, which is supported by and paid from over $4.4 billion in increased economic activity within the SPP footprint. This economic activity (*i.e.*, the stimulated "economic output") is measured as the sum of all increased sales and resale revenues within each state of the SPP region.

Table A
Employment and Economic Impacts of Transmission and Wind Investments
(Combined construction and 20-year wind-operation period impacts;
without in-region manufacturing of transmission and wind plant components)

	Employment		Overall Economic Output (2010$ Million)
	Earnings (2010$ Million)	Full-Tme-Equivalent Years (FTE-years)	
3,196 MW of New Wind			
Wind Plant Construction	$577	17,072	$1,826
Wind Plant Operation	$501	13,163	$1,633
Transmission Construction (Group 1)	$421	8,482	$1,095
Transmission Construction (Group 2)	$368	7,475	$962
Combined (Group 1)	$1,499	38,717	$4,554
Combined (Group 2)	$1,446	37,710	$4,421
7,616 MW of New Wind			
Wind Plant Construction	$1,389	40,207	$4,355
Wind Plant Operation	$1,221	31,361	$3,991
Transmission Construction (Group 1)	$421	8,482	$1,095
Transmission Construction (Group 2)	$368	7,475	$962
Combined (Group 1)	$3,031	80,050	$9,441
Combined (Group 2)	$2,978	79,043	$9,308

Similarly, the combination of the analyzed transmission build-out with 7,616 MW wind power development is estimated to support over 79,000 FTE-years of employment, approximately $3.0 billion in earnings, and over $9.3 billion in overall economic activity within the region.

These results conservatively assume that none of the components used in the construction of transmission lines and wind power plants (*e.g.*, transmission wire, towers, circuit breakers, wind turbine blades, and transformers) would be manufactured within the SPP footprint.

Additional jobs and overall economic benefits will be stimulated if some of the transmission wire, towers, circuit breakers, wind turbine blades, and transformers used in the construction of these transmission and wind generation facilities are manufactured within the SPP region—which is a highly likely outcome considering the existing manufacturing capabilities within the SPP footprint. Increasing the in-region manufacturing of these components from 0% to 50% is estimated to increase the number of construction-period jobs supported through the transmission and wind investments by approximately 40%, increase earnings by approximately 50%, and magnify SPP-wide overall economic activity by up to 80% compared to the construction-period results shown in Table A. Under this higher in-region manufacturing scenario, the combined investment of the Group 1 transmission projects and 7,616 MW of new wind generation would—over the course of both the construction and operating phases of the facilities—support approximately 100,000 FTE-years of employment, $3.9 billion of earnings by SPP-region employees, and over $13 billion of total economic activity (*i.e.*, sales and resale revenues) within the SPP member states.

TABLE OF CONTENTS

Acknowledgements

The authors would like to acknowledge the contributions of Coleman Bazelon and Abhinab Basnyat. Opinions expressed in this article, as well as any errors or omissions, are the authors' alone.

I. INTRODUCTION

This report updates our prior analysis of the job and economic benefits of transmission and wind generation investments to the region served by the Southwest Power Pool ("SPP"). The previous analysis was included as Attachments 5 and 6 of the February 1, 2010, *SPP Priority Projects Phase II Report*, which was prepared by the SPP Engineering/Planning group. SPP staff has since provided us with updated investment scenarios for both transmission and wind generation investments within the SPP footprint, which is reflected in this report.

Our prior analysis and the base case of this updated analysis conservatively assumed that transmission line and wind plant components would all be imported from regions outside the SPP footprint. Because some of these components can be and, in fact, are manufactured within the SPP member states, we also estimate the additional job and economic benefits that would accrue to the region if some of these wind power and transmission line components used in the construction of these facilities are manufactured within the SPP footprint.

The approach and models employed in this update are the same as those in our prior analysis. To measure the impact on jobs, income, and overall economic activity stemming from investments in electric transmission and wind generation, we rely on a class of models known as *input-output* models. Input-output models utilize detailed production data to estimate the economic impact associated with particular investment projects, based on the nature of the local (*e.g.*, region-wide) economy. An input-output model "rebalances" the overall economy after an increase in expenditures on particular types of products (*e.g.,* electric transmission, wind generation), so that the quantity produced again equals the quantity consumed for every industry. Input-output models, therefore, use multipliers and consumption patterns that are computed from detailed national and regional economic and demographic data to represent the extent to which increases in demand lead to changes in employment, output, and earnings. This is a standard approach for assessing the economic impacts of specific investment projects, which takes into account the nature of production within the SPP footprint, including the import of goods and services sourced outside of SPP member states.

To estimate the economic impact from transmission investments, we rely on the well-known and widely-used IMPLAN® Model of the Minnesota IMPLAN Group. This model specifically considers how much of the consumed products and services are supplied from each sector of a given state or regional economy. Only activities that occur in that state or region are counted towards the measured economic impact.

The effects of increased development of wind generation are derived using the Department of Energy's ("DOE") Job and Economic Development Impact ("JEDI") Wind Energy model. Developed specifically for DOE as a tool for measuring the economic impact of generation investment, JEDI provides estimates of the increased jobs, income, and economic activity that result from developing specified wind power projects within a specific state. JEDI relies on IMPLAN® data, making the results from both models comparable and complementary.

Both IMPLAN® and JEDI quantify economic impacts in three categories: (i) number of jobs created in the region (in full-time-equivalent years of employment or "FTE-years");[1] (ii) the resulting personal income earned by employees in the region (*i.e.*, "earnings"); and, (iii) the economic activity generated in the region (*i.e.*, increased "economic output" as measured in total sales and resale revenues of businesses in SPP member states). Income (*i.e.*, earnings) refers to the compensation for workers in all of the directly or indirectly affected industry categories as supported by the stimulated increased output of goods and services. Since these models report economic activity as the sum of the values of all goods and services sold at each level of the supply chain (*i.e.*, sales and resale revenues), the reported economic output refers to the total flow of money that occurs throughout the local economy. The measured impact is the cumulative (undiscounted) amount of jobs (FTE-years), earnings by employees (in 2010 dollars), and overall economic activity (also in 2010 dollars) associated with investing in the assumed

---

[1] JEDI and IMPLAN® job impacts are reported as full-time-equivalents ("FTE") employment years, that is, 2,080 hour units of employment. For example, reporting 100 jobs could mean 200 workers supported for 6 months, 100 workers supported for a year, or 10 workers supported for 10 years. Operations period job impact is also reported in FTE-year terms, but since those jobs are reported as annual impacts, they can be interpreted as long-term jobs. See also: http://apps1.eere.energy.gov/wip/pdfs/tap_webcast_20090729_jedi.pdf.

investment in transmission and wind generation projects over the entire construction phase and subsequent operational period.

It is important to understand that the quantified economic stimulus benefits do not consider the economic costs of recovering this investment through utility rates or taxes, nor do these benefits reflect any potential impact that the additional wind development may have on other segments of the energy industry (*e.g.*, decreased coal and natural gas-fired generation). This analysis only quantifies the jobs, earnings, and overall economic activity related to the assumed level of wind generation and transmission investments.

Similarly, our study also does not quantify other economic benefits provided by these investments in transmission and wind generation assets, which directly offset investment-related costs. These other benefits include the following:

- increased power system reliability, reduced transmission congestion, and lower transmission losses;

- environmental benefits associated with reduced emissions (*e.g.*, SO_x, NO_x, CO_2, Mercury, particulates, reduced water use and discharge) due to increased renewable power generation;

- possible reductions in fuel prices due to a lower demand for fossil fuels;

- reductions in electric wholesale power market prices and generation costs associated with higher renewable generation and possible reduction of fuel prices;

- increased liquidity and fuel diversity of power markets due to the transmission investments' expansion of the geographic region in which different suppliers compete; and

- reduced ancillary costs of integrating mandated renewable resources (*i.e.*, the costs of providing backup generation capacity, regulation, and load-following services, as well as costs associated with resolving over-generation conditions) due to the transmission investments' expansion of the relevant geographic footprint.

The remainder of this report is organized as follows. Section II presents our estimates of job and economic benefits associated with the updated transmission investment. Section III presents our job and economic benefits estimates for the updated wind generation development assumptions. Section IV then quantifies the additional job and economic benefits of manufacturing transmission line and wind generation components within the SPP footprint.

II. ESTIMATING JOB AND ECONOMIC IMPACTS OF TRANSMISSION INVESTMENT IN SPP MEMBER STATES

A. THE IMPLAN® MODEL

The IMPLAN® (IMpact analysis for PLANing) economic impact modeling system is developed and maintained by the Minnesota IMPLAN Group ("MIG"), which has continued the original work on the system done at the University of Minnesota in close partnership with the U.S. Forest Service's Land and Management Planning Unit. IMPLAN® divides the economy into 440 sectors and allows the user to specify the expenditure allocations associated with a given expansion in demand to all relevant parts of the local economy in order to derive the economic impacts—changes in employment, earnings, and economic output. According to the U.S. Department of Agriculture, currently "over 1,500 clients across the country use the IMPLAN® model, making the results acceptable in inter-agency analysis."[2] In 2009, the U.S. Army Corps of Engineers Civil Works program utilized IMPLAN® employment multipliers "to estimate the potential number of jobs preserved or created" by the American Recovery and Reinvestment Act of 2009.[3] In addition, the U.S. Department of Commerce, the Bureau of Economic Analysis, the U.S. Department of Interior, the Bureau of Land Management, and the Federal Reserve System member banks are also among the agencies that utilize IMPLAN® for economic impact analysis.

---

2 http://www.economics.nrcs.usda.gov/technical/implan/implanmodel.html (last accessed: March 5, 2010).

3 http://www.usace.army.mil/cecw/planningcop/documents/pa_newsletter/v12i3.pdf (last accessed: March 5, 2010).

B. Specific Assumptions And Modeling Approach

We use the IMPLAN® model to estimate the direct, indirect, and induced impacts on employment, earnings, and overall economic activity ("economic output"), and local tax impacts that will be stimulated by the investments related to transmission line construction in the SPP footprint.[4]

We evaluate the impacts of two build-out scenarios: (i) "Group 1" projects which includes a portfolio of 345 kV single- and double-circuit lines plus two 765 kV lines operated at 345 kV; and (ii) "Group 2" projects which includes the same portfolio of 345 kV single- and double-circuit projects plus an alternative build-out to the 765 kV lines mentioned above as two 345 kV double-circuit lines. The results are broken out by project into direct, indirect, and induced effects within the state in which the expenditures occur. We do not measure the spill-over effects outside of the state in which the expenditure is made.

As noted previously, the IMPLAN® model divides the economy into 440 sectors. For the base case analyses, which does not consider the benefits of manufacturing any of the materials used in the construction of transmission facilities (*e.g.*, towers, wires, and circuit breakers) within the SPP footprint, we rely on the same six sectors selected in our previous analysis to allocate costs associated with construction labor and design work. In other words, we distribute the construction labor and design costs of transmission projects across the six economics sectors shown in Table 1. In addition, when we analyze the additional benefits of manufacturing some transmission materials in the SPP footprint (Section IV), we distribute the costs of those materials across four additional sectors, as also shown in Table 1.

---

[4] Note that the "direct" impact reported by IMPLAN includes the economic impacts form purchasing transmission equipment and materials. This standard convention differs from the model ("JEDI") used to estimate economic impacts from wind development, which reports the direct economic impact associated with equipment purchases only in combination with other indirect supply-chain impacts.

Table 1
IMPLAN® Cost Categories

1	Electric power generation, transmission, and distribution	Construction
2	Construction of other new nonresidential structures	Construction
3	Maintenance and repair construction of nonresidential maintenance and repair	Construction
4	Architectural, engineering, and related services	Construction/Design
5	Environmental and other technical consulting services	Design
6	Scientific research and development services	Design
7	Aluminum product manufacturing from purchased aluminum	Materials*
8	Plate work and fabricated structural product manufacturing	Materials*
9	Switchgear and switchboard apparatus manufacturing	Materials*
10	Wiring device manufacturing	Materials*

Source: www.implan.com
* Sectors identified as materials are included only for in-state manufacturing sensitivities.

Table 2 below shows the total cost of transmission lines by project and state. We apply the expenditures by category associated with the proposed investments at the state level and aggregate the impacts for all Group 1 and Group 2 projects.

Table 2
Total Cost of Transmission Lines by Project and State
(2010$, Millions)

Transmission Projects	Capacity	Arkansas	Kansas	Missouri	Nebraska	Oklahoma	Texas	Total
Both Transmission Groups:								
Hitchland-Woodward	2 - 345 kV					$238		$238
Valiant-NW Texarkana	1 - 345 kV	$13				$105	$13	$131
Nebraska City-Maryville-Sibley	1 - 345 kV			$289	$12			$301
Tulsa-Riverside 138 kV Reactor						$1		$1
Group 1:								
Comanche-Woodward District EHV	765 kV at 345 kV		$13			$119		$132
Spearville-Comanche-Medicine Lodge-Wichita	765 kV at 345 kV		$478					$478
Group 2:								
Comanche-Woodward District EHV	2 - 345 kV		$11			$97		$108
Spearville-Comanche-Medicine Lodge-Wichita	2 - 345 kV		$356					$356
Group 1 Transmission Lines Total		$13	$491	$289	$12	$463	$13	$1,282
Group 2 Transmission Lines Total		$13	$367	$289	$12	$442	$13	$1,136

C. Scope and Interpretation of Transmission Results

The economic stimulus from a given expenditure is reported by IMPLAN® as direct, indirect, and induced effects. Direct effects represent the changes in employment, earnings and overall economic activity in the industries which directly benefit from the investment (*i.e.*, construction, materials, and design services). Indirect effects measure the changes in the supply chain and inter-industry purchases generated from the new demand (*e.g.*, suppliers to transmission towers manufacturers). Induced effects reflect changes in spending resulting from increased earnings generated by the direct and indirect effects (*e.g.*, spending on restaurants and groceries by the projects' workers).[5] The impacts on employment, earnings, output, and tax are reported by state in Table 3 for Group 1 and Group 2 projects.

For Group 1 projects (under the base-case assumption that none of the transmission-related materials are manufactured in the region), the transmission investment would support approximately 8,500 FTE-years of employment (e.g., 850 full time jobs each year over a 10 year construction period) producing $421 million in earnings from these jobs. Overall, the transmission investment is estimated to stimulate $1.1 billion in economic activity (*i.e.*, "economic output" measured as the sum of stimulated sales and resale revenues) within the SPP footprint. In addition to any property and right-of-way lease payments directly paid by the transmission owners (which are not quantified in our study), this level of economic activity is estimated to generate approximately $39 million in additional local tax revenue. As Table 3 shows, the economic stimulus impacts for Group 2 projects are slightly smaller due to the lower investments associated with the Group 2 projects.

---

5 We do not capture trade flows between states. For example, an expenditure made in Texas could produce trade flows that result in jobs in New Mexico (*i.e.*, in another state in our study) or elsewhere, neither of which are captured.

Table 3

GROUP 1 TRANSMISSION LINES: ECONOMIC OUTPUT AND EMPLOYMENT EFFECTS

Transmission Project	Capacity	State	Earnings (2010$ Millions)	Full-Time Equivalent Years (FTE-Years)				Economic Output (2010$ Millions)				Tax Impact (2010$ Millions)
			Total	*Direct*	*Indirect*	*Induced*	*Total*	*Direct*	*Indirect*	*Induced*	*Total*	*Total*
Hitchland - Woodward	2 - 345 kV	OK	$66	902	263	311	1,477	$102	$40	$40	$181	$6.02
Spearville - Comanche - Medicine Lodge - Wichita	765 kV at 345 kV	KS	$150	1,675	480	729	2,885	$215	$74	$94	$383	$14.07
Comanche-Woodward District EHV	765 kV at 345 kV	KS	$4	46	12	19	79	$6	$2	$3	$11	$0.39
Comanche-Woodward District EHV	765 kV at 345 kV	OK	$34	476	139	161	776	$53	$21	$21	$95	$3.16
Valliant - NW Texarkana	1 - 345 kV	OK	$36	492	143	169	806	$56	$22	$22	$99	$3.29
Valliant - NW Texarkana	1 - 345 kV	AR	$4	63	16	18	98	$7	$2	$2	$12	$0.40
Valliant - NW Texarkana	1 - 345 kV	TX	$5	63	15	19	98	$7	$3	$3	$13	$0.40
Riverside Station - Tulsa Power Station (Add Reactor)		OK	$0	4	1	1	6	$0	$0	$0	$1	$0.03
Nebraska City - Maryville-Sibley	1 - 345 kV	NE	$4	51	14	20	86	$6	$2	$3	$11	$0.39
Nebraska City - Maryville-Sibley	1 - 345 kV	MO	$116	1,176	399	595	2,172	$153	$57	$79	$290	$10.99
Total			**$421**	**4,949**	**1,480**	**2,041**	**8,482**	**$606**	**$223**	**$266**	**$1,095**	**$39.14**

Source and Notes: Results generated uisng IMPLAN Professional v3.0

GROUP 2 TRANSMISSION LINES: ECONOMIC OUTPUT AND EMPLOYMENT EFFECTS

Transmission Project	Capacity	State	Earnings (2010$ Millions)	Full-Time Equivalent Years (FTE-Years)				Economic Output (2010$ Millions)				Tax Impact (2010$ Millions)
			Total	*Direct*	*Indirect*	*Induced*	*Total*	*Direct*	*Indirect*	*Induced*	*Total*	*Total*
Hitchland - Woodward	2 - 345 kV	OK	$66	902	263	311	1,477	$102	$40	$40	$181	$6.02
Spearville - Comanche - Medicine Lodge - Wichita	2 - 345 kV	KS	$106	1,208	339	513	2,062	$153	$54	$66	$273	$10.08
Comanche-Woodward District EHV	2 - 345 kV	KS	$3	37	9	15	61	$5	$2	$2	$8	$0.31
Comanche-Woodward District EHV	2 - 345 kV	OK	$27	376	107	125	608	$42	$17	$16	$74	$2.49
Valliant - NW Texarkana	1 - 345 kV	OK	$36	492	143	169	806	$56	$22	$22	$99	$3.29
Valliant - NW Texarkana	1 - 345 kV	AR	$4	63	16	18	98	$7	$2	$2	$12	$0.40
Valliant - NW Texarkana	1 - 345 kV	TX	$5	63	15	19	98	$7	$3	$3	$13	$0.40
Riverside Station - Tulsa Power Station (Add Reactor)		OK	$0	4	1	1	6	$0	$0	$0	$1	$0.03
Nebraska City - Maryville-Sibley	1 - 345 kV	NE	$4	51	14	20	86	$6	$2	$3	$11	$0.39
Nebraska City - Maryville-Sibley	1 - 345 kV	MO	$116	1,176	399	595	2,172	$153	$57	$79	$290	$10.99
Total			**$368**	**4,373**	**1,305**	**1,785**	**7,475**	**$531**	**$198**	**$233**	**$962**	**$34.40**

Source and Notes: Results generated uisng IMPLAN Professional v3.0

The reported employment estimates represent the amount of labor (measured in full-time-equivalent years of 2,080 hours per year) that would be required to meet the demand created by the construction expenditures and is based on the output-to-worker relationship in the study area for the particular industry. Whether or not these employment estimates represent a net increase in employment depends in part on whether or not these resources (people) would be employed elsewhere in the absence of the projects analyzed. To the extent that the construction activities and indirect and induced economic activities use labor that would otherwise be idle, the employment effects reported here represent a net increase in employment. To the extent that these labor resources would be employed elsewhere absent the analyzed projects, the net effects on employment would be smaller than the gross effect reported here. Similarly, the estimates of gross economic impact and indirect tax revenues make no assumptions about how much money would be spent or how that money would be spent otherwise.

III. ESTIMATING JOB AND ECONOMIC IMPACTS OF WIND POWER DEVELOPMENT IN SPP MEMBER STATES

A. THE JEDI MODEL

To estimate the economic stimulus impact of wind generation development, we utilize the Job and Economic Development Impact ("JEDI") model, which is based on and consistent with IMPLAN®. JEDI is a computational tool specifically calibrated for the estimation of the economic impacts of developing and operating wind power projects at the state level. It was developed in 2002 for the U.S. Department of Energy's National Renewable Energy Laboratory ("NREL") to demonstrate the state and local economic development impacts associated with developing wind power plants in the United States.[6] The JEDI model is considered "the standard when analyzing the economic impacts of wind project development."[7] JEDI has been frequently

---

6 U.S Department of Energy, "20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply," July 2008. JEDI was originally developed and is currently maintained by Marshall Goldberg of MRG & Associates under contract from NREL.

7 Reategui, et al. "Generating Economic Development from a Wind Power Project in Spanish Fork Canyon, Utah: A Case Study and Analysis of State-Level Economic Impacts," January, 2009.

utilized by the U.S. Department of Energy, state and county policy-makers, public utility commissions, potential project developers, and others focused on examining the economic impacts from new wind project construction and operation.[8]

JEDI allows the user to enter project-specific information on capacity size, turbine size and quantity, location, and all levels and types of development costs. The model allocates those expenditures across 14 major industry types[9] to estimate the economic impacts in terms of jobs, earnings, and economic output. It is important to note that JEDI comes with pre-populated state-specific cost data for wind projects of a given size, which are continually updated by NREL. As a result, JEDI allows estimation of economic impacts even when the researcher does not have access to all aspects of a potential wind project's cost data.[10] JEDI allows users to adjust the local supply of total project construction, design and materials manufacturing activities (which ultimately drive the local economic impacts) to specify the proportion of the project cost spent locally.

The JEDI model is designed to estimate the job and economic impact of wind developments for individual states based on IMPLAN® "multipliers" used to simulate how investments affect a state's economic activities. This also means that when a wind project is sited in one state, even though some jobs and economic activities might be created in (*i.e.*, "spill over" into) a neighboring state, the model does not estimate these "spill-over" benefits. Therefore, similar to our IMPLAN® analysis of transmission investments, our wind generation economic impact estimates are conservative because they do not include the potential job and economic impact of

---

8 http://www.nrel.gov/analysis/jedi/about_jedi_wind.html (last accessed: March 5, 2010). A current list of U.S. DOE studies utilizing the JEDI model is posted at http://www.nrel.gov/analysis/jedi/publications.html.

9 JEDI models the economic effects of expenditures related to building wind farms to flow through 14 industries: agriculture, mining, construction, manufacturing, fabricating metals, machinery, electrical equipment, transportation/communication/public utilities, wholesale trade, retail trade, finance/insurance/real estate, other miscellaneous services, professional services, and government.

10 It is often the case that such project-specific detailed information is considered proprietary information by private developers, which makes obtaining it difficult.

each wind project on the economies of neighboring states. This omission might create the impression that each project only benefits the state in which it resides, when in fact, the region as a whole would experience additional benefits. For example, wind projects located in Oklahoma, Kansas, and Missouri may create jobs in Arkansas but this effect has not been captured directly. Economic theory and intuition, however, suggest that, given its geographical proximity to numerous potential wind projects, Arkansas also will benefit from such economic development, both in terms of jobs supported directly or indirectly by construction activities as well as, additionally, from the manufacturing activities analyzed in Section IV below.

Our results of employment effects estimated with the JEDI model are also reported in full-time-equivalent years ("FTE-years"). A FTE-year corresponds to 2,080 hours of work. As noted earlier, the employment impacts associated with the wind projects are net job gains if the labor force is not being utilized elsewhere in the economy absent the projects. If the rate of unemployment is low, these jobs would not necessarily be new and additional. Instead, employees might simply be shifting jobs from other sectors or other projects to support the wind projects under study.

Depending on how project development is implemented, there might be some economies of scale associated with larger projects. For example, if two or more projects are undertaken in close proximity or as a combined venture, some savings in labor, expertise and resources might be achieved, which would reduce the aggregate employment and economic impact compared to undertaking the two projects independently. In our analysis, we have assumed each project in the list provided in the assumption table is a stand-alone project, and have not captured any economies of scale. Thus, the estimated job and economic impact is greater than if the projects are developed in larger aggregations.

B. SPECIFIC ASSUMPTIONS AND MODELING APPROACH

The JEDI model utilizes data on project-specific characteristics and costs to estimate the direct, induced, and indirect effects on employment, earnings, and output from developing and operating the project. Consequently, the JEDI wind model requires three general groups of input data—project description, project cost, and wind farm annual operating and maintenance costs. The categories of input assumptions are summarized in Table 4 below.

Table 4
Assumption Categories for the JEDI Wind Model

Project Descriptive Data
Project Location
Total Project Size - Nameplate Capacity (MW)
Turbine Size (KW)
Project Cost Data
Construction Costs
Equipment Costs
Turbines, Blades, Towers, Transportation
Balance of Plant
Materials, Labor, Development, Engineering, Legal, and Other Costs
Labor
Wind Farm Annual Operating and Maintenance Costs
Labor
Personnel
Materials and Services
Other Parameters
Financial Parameters
Tax Parameters
Land Lease Parameters
Payroll Parameters

To estimate the job and economic activity stimulated by the wind generation development, we used project-specific data for all wind projects designated as part of two wind investment levels to be analyzed. Specifically, we have been asked to evaluate two wind development scenarios: a "Level 1" scenario of 3,196 MW of new wind projects to reach a total of 7,000 MW and a "Level 2" scenario of 7,616 MW of new wind investment to reach a total of 11,300 MW of wind in the SPP footprint. The specific projects comprising the two levels of wind development are summarized in Table 5 and Table 6 below.

Table 5
Level 1 - 3,196 MW of Wind Projects Added in SPP
(To Reach a Total of 7,000 MW)

project unique name	MAX CAPACITY (MW)	Location	STATE
Fairport_MO_1	300	Fairport	MO
Fairport_MO_2	150	Fairport	MO
Fairport_MO_3	150	Fairport	MO
Hitchland_OK_4	192	Hitchland	OK
Hitchland_OK_5	335	Hitchland	OK
Hitchland_OK_6	100	Hitchland	OK
Hitchland_OK_7	300	Hitchland	OK
Hitchland_OK_8	150	Hitchland	OK
Hoskins_NE_9	196	Hoskins	NE
Gentlemen_NE_10	100	Gentlemen	NE
Gentlemen_NE_11	96	Gentlemen	NE
Spearville_KS_12	55	Spearville	KS
Spearville_KS_13	100	Spearville	KS
Spearville_KS_14	150	Spearville	KS
Spearville_KS_15	300	Spearville	KS
Woodward_OK_16	300	Woodward	OK
Woodward_OK_17	150	Woodward	OK
Woodward_OK_18	72	Woodward	OK
Total	**3,196.00**	**MW**	

Table 6
Level 2 - 7,616 MW of Wind Projects Added in SPP
(To Reach a Total of 11,300 MW)

project unique name	MAX CAPACITY (MW)	Location	STATE
Fairport_MO_1	300	Fairport	MO
Fairport_MO_2	150	Fairport	MO
Fairport_MO_3	150	Fairport	MO
Fairport_MO_4	33	Fairport	MO
Hitchland_OK_5	192	Hitchland	OK
Hitchland_OK_6	360	Hitchland	OK
Hitchland_OK_7	300	Hitchland	OK
Hitchland_OK_8	100	Hitchland	OK
Hitchland_OK_9	300	Hitchland	OK
Hitchland_OK_10	150	Hitchland	OK
Hitchland_OK_11	300	Hitchland	OK
Hitchland_OK_12	400	Hitchland	OK
Hoskins_NE_13	200	Hoskins	NE
Hoskins_NE_14	100	Hoskins	NE
Hoskins_NE_15	53	Hoskins	NE
Gentlemen_NE_16	100	Gentlemen	NE
Gentlemen_NE_17	100	Gentlemen	NE
Gentlemen_NE_18	75	Gentlemen	NE
Gentlemen_NE_19	78	Gentlemen	NE
Spearville_KS_20	400	Spearville	KS
Spearville_KS_21	300	Spearville	KS
Spearville_KS_22	200	Spearville	KS
Spearville_KS_23	200	Spearville	KS
Spearville_KS_24	150	Spearville	KS
Spearville_KS_25	100	Spearville	KS
Spearville_KS_26	100	Spearville	KS
Spearville_KS_27	100	Spearville	KS
Spearville_KS_28	100	Spearville	KS
Spearville_KS_29	100	Spearville	KS
Spearville_KS_30	100	Spearville	KS
Spearville_KS_31	100	Spearville	KS
Spearville_KS_32	100	Spearville	KS
Spearville_KS_33	55	Spearville	KS
Woodward_OK_34	300	Woodward	OK
Woodward_OK_35	150	Woodward	OK
Woodward_OK_36	72	Woodward	OK
Washington Cty_AR_37	197.5	Washington Cty	AR
Knoll_KS_38	200	Knoll	KS
Potter_TX_39	400	Potter	TX
Potter_TX_40	200	Potter	TX
Broken Bow_NE_41	80	Broken Bow	NE
Albion_NE_42	120	Albion	NE
Roosevelt_NM_43	300	Roosevelt	NM
Grapevine_TX_44	50	Grapevine	TX
Total	**7,615.50**	**MW**	

While these projects would likely be developed over the course of the next decade and the job and economic benefits would accrue to the SPP footprint spread out over the entire construction cycle, our analysis treats these projects as if they were built in 2010, with an on-line date of 2011, and an operating life of 20 years. If, in reality, these investments are spread out evenly over a 10-year construction cycle, the *average annual impact* of the construction activity would be one-tenth of the reported total construction-related impact.

The most recent version of the JEDI model available publicly from NREL[11] incorporates recent changes in capital costs, productivity improvements, and changing industry practices. The model now contains updated construction and operating and maintenance ("O&M") labor ratios (number of workers) based on current industry averages. The multiplier data is 2006 data from the Minnesota IMPLAN Group, reflecting the most recent data available from the Bureau of Economic Analysis.[12] We have updated the equipment cost assumptions, which reflect an average overnight project cost for the portfolio of wind projects of approximately $2,011/kW for the Level 1 (3,196 MW) wind development scenario and $2,014/kW for the Level 2 (7,616 MW) scenario. Average annual O&M costs are approximately $19/kW-year.

As in our previous analysis (and consistent with JEDI default assumptions), our base case analysis assumes that none of the wind turbines, blades, towers, and transformers associated with the wind generation development would be manufactured by suppliers within the SPP footprint. This yields a conservative estimate of regional jobs and economic stimulus impacts. The additional economic benefits of such manufacturing activity within the SPP footprint are discussed in Section IV of this report.

Economic impact estimates from the JEDI model are reported separately for the construction period and the operational phase of the wind project. We have reported the employment effects during both the construction and operating period in FTE-years, recognizing that, given a 20-year operating life, 20 FTE-years during the operating phase are equivalent to one full-time job

[11] http://www.nrel.gov/analysis/jedi/

[12] http://www.windpoweringamerica.gov/filter_detail.asp?itemid=707

that lasts 20 years. In addition, all jobs, earnings, and economic output estimates for the operating period are reported as the simple sum over the 20-year lifecycle of the wind assets and have not been discounted for the time value net of inflation.[13]

C. Scope and Interpretation of Wind Modeling Results

The job and economic stimulus benefits of wind generation for the Level 1 and Level 2 investment scenarios are reported in Table 7 and Table 8. These impacts represent the direct, indirect, and induced impacts associated with the wind investment, which JEDI reports as "project development and on-site labor impacts," "turbine and supply-chain impacts," and "induced" impacts.[14]

Table 7 summarizes the economic stimulus impact in the SPP region by state for the Level 1 investment scenario (3,196 MW of new wind generation). As shown, the construction phase of this wind power expansion scenario is estimated to support jobs with approximately 17,000 FTE-years of employment in the SPP region (*e.g.*, an average of 1,700 full time jobs each year over a 10-year wind construction cycle, if the entire group of projects will take 10 years to complete). This produces $0.6 billion in income by in-region employees over the course of the construction period. The associated overall SPP economic activity (*i.e.*, economic output measured as the total revenues associated with stimulated sales and resale revenues) supported by the wind generation investment is estimated to be $1.8 billion.

---

[13] Given the fact that both Level 1 and Level 2 scenarios are assumed to complete construction in 2010 and have an equal operating period of 20 years, discounting the earnings and economic output streams would not change the relative comparisons between the two levels.

[14] Note that the "direct" impact reported in Tables 7 and 8 based on JEDI simulations include only the direct impacts associated with the on-site construction activity of the wind power plant. The economic impacts from purchasing the wind turbines and related equipment are reported as in combination with other indirect supply-chain impacts, the sum of which is reported here as "indirect" effects. In this regard JEDI deviates from the general convention used in models such as IMPLAN, which would report the economic impacts associated with purchasing wind turbines and related power plant equipment as "direct" impacts, while reporting as "indirect" only the economic effects on suppliers to the construction firms and turbine manufacturers. Due to this difference in reporting convention, the ratio of direct to indirect economic impacts differs for the transmission- and wind-related economic impacts. This difference in reporting conventions, however, neither affect estimates of induced effects nor overall (*i.e.*, the sum of direct, indirect and induced) impacts.

As Table 7 also shows, the cumulative economic benefits during the 20-year operation of an additional 3,196 MW of wind capacity are estimated at approximately 13,000 FTE-years of employment across the SPP region (*i.e.*, 650 full-time jobs lasting 20 years each), producing $0.5 billion in earnings by those employees. The associated economic activity over this 20-year operating period is approximately $1.6 billion in total sales and resale revenues.

Adding the construction and operating phase impacts shown in Table 7, the addition of 3,196 MW of wind generation (assuming no in-region manufacturing of plant components) would support 30,000 FTE-years of employment in the SPP region, $1.1 billion in additional income earned by employees across the SPP region, and $3.4 billion of economic activities.

The results in Table 8 show the economic impacts of 7,616 MW of new wind generation development in the SPP footprint (again conservatively assuming that none of the turbines, blades, towers, and transformers would be manufactured in SPP states). In this "Level 2" investment scenario, a total of 40,000 FTE-years of employment would be supported during the construction phase, producing $1.4 billion of income by employees over the course of the construction period. The corresponding economic activity (total sales and resale revenues) is estimated to be $4.4 billion.

In addition, the aggregate economic benefits during the 20-year operation of the additional 7,616 MW of wind capacity are estimated to support 31,000 FTE-years of employment across the SPP region (*i.e.*, 1,550 full-time jobs lasting 20 years), providing approximately $1.2 billion of additional income and an overall economic activity of $4.0 billion.

Combining construction and operating phase impacts, the addition of 7,616 MW of wind generation (assuming no in-region manufacturing of plant components) would support 71,000 FTE-years of employment, $2.6 billion in income earned by employees, and $8.4 billion of economic activities within the SPP footprint.

Table 7
3,196 MW of New Wind Constructed, Lifespan of 20 Years

EMPLOYMENT STIMULATED BY WIND PROJECTS DURING CONSTRUCTION PERIOD

STATE	Earnings (2010$ million)	*Full-Tme Equivalent Years (FTE-yrs)* Direct	Indirect	Induced	Total
Arkansas	*Positive indirect effects from neighboring projects not quantified*				
Oklahoma	$261	894	5,706	1,986	**8,586**
Kansas	$115	366	2,049	748	**3,163**
Texas	*Positive indirect effects from neighboring projects not quantified*				
Missouri	$127	323	2,028	874	**3,225**
New Mexico	*Positive indirect effects from neighboring projects not quantified*				
Nebraska	$74	238	1,333	528	**2,099**
SPP Total	**$577**	**1,821**	**11,116**	**4,136**	**17,072**

EMPLOYMENT STIMULATED BY WIND PROJECTS DURING 20-YEAR OPERATING PERIOD

STATE	Earnings (2010$ million)	*Full-Tme Equivalent Years (FTE-yrs)* Direct	Indirect	Induced	Total
Arkansas	*Positive indirect effects from neighboring projects not quantified*				
Oklahoma	$233	1,717	2,550	2,494	**6,761**
Kansas	$92	640	950	629	**2,219**
Texas	*Positive indirect effects from neighboring projects not quantified*				
Missouri	$112	648	988	953	**2,589**
New Mexico	*Positive indirect effects from neighboring projects not quantified*				
Nebraska	$64	445	665	484	**1,594**
SPP Total	**$501**	**3,451**	**5,154**	**4,559**	**13,163**

ECONOMIC OUTPUT STIMULATED BY WIND PROJECTS DURING CONSTRUCTION PERIOD

STATE	Increased Economic Output (2010$ million) *Total*	*Direct*	*Indirect*	*Induced*
Arkansas	*Positive indirect effects from neighboring projects not quantified*			
Oklahoma	$880	$50	$631	$198
Kansas	$346	$25	$243	$78
Texas	*Positive indirect effects from neighboring projects not quantified*			
Missouri	$369	$24	$250	$96
New Mexico	*Positive indirect effects from neighboring projects not quantified*			
Nebraska	$231	$15	$161	$55
SPP Total	**$1,826**	**$115**	**$1,285**	**$426**

ECONOMIC OUTPUT STIMULATED BY WIND PROJECTS DURING 20-YEAR OPERATING PERIOD

STATE	Increased Economic Output (2010$ million) *Total*	*Direct*	*Indirect*	*Induced*
Arkansas	*Positive indirect effects from neighboring projects not quantified*			
Oklahoma	$838	$76	$513	$249
Kansas	$260	$38	$157	$65
Texas	*Positive indirect effects from neighboring projects not quantified*			
Missouri	$345	$41	$199	$104
New Mexico	*Positive indirect effects from neighboring projects not quantified*			
Nebraska	$190	$25	$115	$50
SPP Total	**$1,633**	**$180**	**$984**	**$469**

Sources: Results generated with JEDI Model Ver. 01D_Wind_Model_rel._W1.09.03e.
Construction and operating jobs are in full-time equivalent years (1 FTE = 2,080 hours).
State-level economic impacts do not consider "spillover" benefits associated with investments in neighboring states.
Analysis assumes none of the major components (e.g. turbines, towers, blades, transformers) are purchased in-state.
Economic output and earnings during operating period represent the cumulative effect over the full operating lifespan of the facilities and have not been discounted.

Table 8
7,616 MW of New Wind Constructed, Lifespan of 20 Years

EMPLOYMENT STIMULATED BY WIND PROJECTS DURING CONSTRUCTION PERIOD

STATE	Earnings	*Full-Tme Equivalent Years (FTE-yrs)*			
	(2010$ million)	*Direct*	*Indirect*	*Induced*	*Total*
Arkansas	$32	108	728	240	**1,076**
Oklahoma	$426	1,419	9,363	3,253	**14,034**
Kansas	$436	1,372	7,805	2,848	**12,025**
Texas	$124	363	1,948	713	**3,023**
Missouri	$136	369	2,140	928	**3,437**
New Mexico	59	155	1,053	462	**1,671**
Nebraska	$175	625	3,084	1,231	**4,940**
SPP Total	**$1,389**	**4,412**	**26,120**	**9,675**	**40,207**

EMPLOYMENT STIMULATED BY WIND PROJECTS DURING 20-YEAR OPERATING PERIOD

STATE	Earnings	*Full-Tme Equivalent Years (FTE-yrs)*			
	(2010$ million)	*Direct*	*Indirect*	*Induced*	*Total*
Arkansas	$31	218	323	379	**920**
Oklahoma	$379	2,770	4,172	4,081	**11,022**
Kansas	$361	2,571	3,640	2,426	**8,637**
Texas	$121	681	887	1,132	**2,700**
Missouri	$120	699	1,051	1,012	**2,762**
New Mexico	$58	308	544	730	**1,582**
Nebraska	$152	1,044	1,561	1,133	**3,738**
SPP Total	**$1,221**	**8,291**	**12,177**	**10,894**	**31,361**

ECONOMIC OUTPUT STIMULATED BY WIND PROJECTS DURING CONSTRUCTION PERIOD

	Increased Economic Output (2010$ million)			
STATE	*Total*	*Direct*	*Indirect*	*Induced*
Arkansas	$106	$6	$77	$23
Oklahoma	$1,441	$81	$1,036	$325
Kansas	$1,315	$93	$926	$296
Texas	381	27	265	89
Missouri	$392	$27	$264	$101
New Mexico	$180	$11	$125	$45
Nebraska	$540	$40	$372	$128
SPP Total	**$4,355**	**$284**	**$3,064**	**$1,007**

ECONOMIC OUTPUT STIMULATED BY WIND PROJECTS DURING 20-YEAR OPERATING PERIOD

	Increased Economic Output (2010$ million)			
STATE	*Total*	*Direct*	*Indirect*	*Induced*
Arkansas	$120	$9	$74	$37
Oklahoma	$1,370	$123	$840	$407
Kansas	$1,006	$154	$600	$252
Texas	$467	$44	$282	$142
Missouri	$367	$44	$212	$111
New Mexico	$214	$18	$125	$70
Nebraska	$447	$59	$270	$118
SPP Total	**$3,991**	**$451**	**$2,403**	**$1,137**

Sources: Results generated with JEDI Model Ver. 01D_Wind_Model_rel._W1.09.03e.
Construction and operating jobs are in full-time equivalent years (1 FTE = 2,080 hours).
State-level economic impacts do not consider "spillover" benefits associated with investments in neighboring states.
Analysis assumes none of the major components (e.g. turbines, towers, blades, transformers) are purchased in-state.
Economic output and earnings during operating period represent the cumulative effect over the full operating lifespan of the facilities and have not been discounted.

IV. ADDITIONAL ECONOMIC BENEFITS FROM LOCAL MANUFACTURING

A. Low and Higher In-Region Manufacturing Scenarios

The base case results discussed above assumed that all transmission-related materials and wind components are manufactured outside the SPP footprint. We consider this base case to be a very conservative "low in-region supply" scenario. We have developed as a comparison, a "higher in-region" supply scenario assuming that 50% of all transmission-related materials and 50% of certain wind plant components (blades, towers, and transformers) would be manufactured within the SPP footprint. Significant in-region manufacturing of transmission and wind plant components is a highly likely outcome considering even preexisting manufacturing capabilities within the SPP footprint. For example, a number of wind-generation-related manufacturing facilities are already located in Arkansas, Kansas, Missouri, Nebraska and Oklahoma. They are reported to include LM Glasfiber, Mitsubishi Power Systems, Nordex, Emergya Wind Technologies, Siemens, DMI Industries, Bergey WindPower, Katana Summit, and NorthStar Wind Towers.[15] Higher levels of in-region manufacturing capability will be stimulated by additional transmission and wind generation investment, thereby magnifying the economic stimulus benefits of the investments to the region.

The following tables compare the total investment costs allocated by broad input categories and the associated in-region share for the low and higher in-region supply scenarios. Table 9 lists the broad cost categories in IMPLAN® with the breakdown for each spending category as a percentage of total transmission construction costs. The table shows that the Group 1 set of transmission projects at a total investment cost of $1.3 billion consists of the following cost components: 38% for construction labor, 53% for materials; and 10% for design work. Group 2, at a total cost of $1.1 billion, has a slightly different allocation of 39% for construction labor, 53% for materials; and 8% for design work.

---

[15] SPP Economic Development Presentation, February 10, 2010, slides 50-57.

As also shown on the right side of Table 9, the low in-region scenario assumes that all transmission construction and design activities are provided by in-region suppliers (*e.g.*, SPP transmission owners and local construction companies) while all materials are provided by suppliers from outside the SPP member states. For the higher in-region scenario, we assume that 50% of all transmission materials such as towers, wire, circuit breakers, and other hardware are manufactured in the region. As shown in Table 9, this means that only 47% of the total transmission project costs (including materials and construction services) are provided by in-region suppliers in the base case, whereas in the higher in-region scenario, that overall in-region cost share increases to 74%.

Table 9
IMPLAN® Construction Cost Allocation and Share of In-Region Supply for Group 1 and Group 2 Transmission Projects

	Total Cost (2010$ Millions)				Share of In-Region Supply			
					Low		High	
	Group 1	%	Group 2	%	Group 1	Group 2	Group 1	Group 2
Transmission Cost Allocations								
Construction Labor	$481	*38%*	$442	*39%*	100%	100%	100%	100%
Materials	$676	*53%*	$605	*53%*	0%	0%	50%	50%
Design	$124	*10%*	$89	*8%*	100%	100%	100%	100%
Total	**$1,282**	***100%***	**$1,136**	***100%***				
In-Region Share of Expenditures					**47%**	**47%**	**74%**	**73%**

Tables 10 and 12 list the broad construction-phase cost categories for wind generation. Tables 11 and 13 list the cost categories and percentage of total O&M costs during the operating phase of the wind projects. As shown, the overall construction-phase project spending consists of approximately: 45% for turbines; 30% for blades, towers, and related transportation; 16% for other supplies; and 9% for on-site labor, project design, and management. Accompanying these cost allocation percentages are the low and higher in-region shares where it is assumed that either zero or 50% of certain wind components (blades, towers, and transformers) are manufactured in the SPP footprint. JEDI default assumptions are used for the in-region supply share for all other wind generation cost components.

Table 10
JEDI Construction Cost Allocation and Share of In-Region Supply
for 3,196 MW Wind Portfolio

Project Construction Cost Inputs for JEDI	Costs	Percent of Total	Low In-Region Share	High In-Region Share
	(Millions 2010$)	(%)	(%)	(%)
Equipment Costs				
Turbines	2,925	46%	0%	0%
Blades, Towers, Transportation	1,956	30%	0%	50%
Materials				
Construction (concrete, rebar, site prep)	693	11%	90%	90%
Transformer	78	1%	0%	50%
Wire/Electrical/Other	233	4%	81%	81%
Labor				
Foundation, Erection, Electrical	100	2%	78%	78%
Management/Supervision/Other	264	4%	46%	46%
Development/Other				
Interconnection	62	1%	71%	71%
Engineering	65	1%	0%	0%
Siting	52	1%	100%	100%
Total	**6,427**	**100%**	**17%**	**33%**

Table 11
JEDI Annual O&M Cost Allocation and Share of In-Region Supply
for 3,196 MW Wind Portfolio

Project Annual Operation Cost Inputs for JEDI	Costs	Percent of Total	Low In-Region Share	High In-Region Share
	(Millions 2010$)	(%)	(%)	(%)
Labor Costs	10	16%	100%	100%
Materials				
Site Maintenance/Parts/Other	37	61%	13%	13%
Fees, Permits, Licenses, Insurance	11	19%	3%	3%
Other	3	5%	100%	100%
Total	**62**	**100%**	**29%**	**29%**

Table 12
JEDI Construction Cost Allocation and Share of In-Region Supply
for 7,616 MW Wind Portfolio

Project Construction Cost Inputs for JEDI	Costs	Percent of Total	Low In-Region Share	High In-Region Share
	(Millions 2010$)	(%)	(%)	(%)
Equipment Costs				
Turbines	6,966	45%	0%	0%
Blades, Towers, Transportation	4,662	30%	0%	50%
Materials				
Construction (concrete, rebar, site prep)	1,655	11%	90%	90%
Transformer	187	1%	0%	50%
Wire/Electrical/Other	558	4%	81%	81%
Labor				
Foundation, Erection, Electrical	251	2%	78%	78%
Management/Supervision/Other	633	4%	46%	46%
Development/Other				
Interconnection	149	1%	71%	71%
Engineering	155	1%	0%	0%
Siting	124	1%	100%	100%
Total	**15,339**	**100%**	**17%**	**33%**

Table 13
JEDI Annual O&M Cost Allocation and Share of In-Region Supply
for 7,616 MW Wind Portfolio

Project Annual Operation Cost Inputs for JEDI	Costs	Percent of Total	Low In-Region Share	High In-Region Share
	(Millions 2010$)	(%)	(%)	(%)
Labor Costs	24	16%	100%	100%
Materials				
Site Maintenance/Parts/Other	89	60%	13%	13%
Fees, Permits, Licenses, Insurance	27	18%	3%	3%
Other	8	5%	100%	100%
Total	**148**	**100%**	**30%**	**30%**

Overall, only 17% of the total construction, development and materials for the wind power portfolio are assumed to be provided by in-region suppliers in the low in-region share scenario (or base case). In the higher in-region scenario, that in-region expenditure share increases to 33% of total wind project expenditure. This differentiation of in-region manufacturing shares does not impact the operations-phase expenditures of the wind plants shown in Table 11 and Table 13.

B. Economic Benefits from Higher In-Region Manufacturing of Wind Generation and Transmission Components

Tables 14 and 15 summarize the estimated construction-period impact of increasing from 0% to 50% the in-region manufacturing share of transmission materials and certain wind generation components. The estimated additional benefits from higher in-region manufacturing are summarized in Table 14 for the Group 1 transmission projects and the two wind development scenarios (3,196 MW and 7,616 MW). Table 15 reports the additional benefits for the Group 2 transmission build-out and the two wind development scenarios.

For 3,196 MW of wind development, increasing the in-region manufacturing of selected components and materials from 0% to 50% yields construction-period economic impacts that are approximately 40% higher in terms of employment (for a total of 34,000 FTE-years), approximately 50% higher in terms of earnings by employees (for a total of $1.4 billion), and up to 80% higher in terms of overall economic output (sales and resale revenues; for a total of approximately $4.8 billion). The percentage increase in benefits from higher in-region manufacturing is similar for the 7,616 MW wind portfolio.

Table 14
Employment and Economic Output Impacts of Higher In-Region Manufacturing of Wind and Group 1 Transmission Components

3,196MW of New Wind Constructed

EMPLOYMENT AND ECONOMIC OUTPUT STIMULATED DURING CONSTRUCTION PERIOD

	Employment		
	Earnings (2010$ million)	Full-Tme Equivalent Years (FTE-yrs)	Increased Economic Output (2010$ million)
SPP Impact with 0% In-Region Manufacturing			
Wind Generation	$577	17,072	$1,826
Transmission (Group 1)	$421	8,482	$1,095
Combined	$998	25,554	$2,921
SPP Impact with 50% In-Region Manufacturing			
Wind Generation	$910	24,645	$3,360
Transmission (Group 1)	$532	10,571	$1,603
Combined	$1,442	35,216	$4,964
SPP Incremental Impact of 50% In-Region Manufacturing			
Percentage	**44%**	**38%**	**70%**

7,616MW of New Wind Constructed

EMPLOYMENT AND ECONOMIC OUTPUT STIMULATED DURING CONSTRUCTION PERIOD

	Employment		
	Earnings (2010$ million)	Full-Tme Equivalent Years (FTE-yrs)	Increased Economic Output (2010$ million)
SPP Impact with 0% In-Region Manufacturing			
Wind Generation	$1,389	40,207	$4,355
Transmission (Group 1)	$421	$8,482	$1,095
Combined	$1,810	48,689	$5,450
SPP Impact with 50% In-Region Manufacturing			
Wind Generation	$2,172	57,786	$7,993
Transmission (Group 1)	$532	$10,571	$1,603
Combined	$2,705	68,357	$9,596
SPP Incremental Impact of 50% In-Region Manufacturing			
Percentage	**49%**	**40%**	**76%**

Manufacturing Assumptions: For wind construction impacts, the "base" case (0% in-region manufacturing) assumes no local expenditures on blades, towers, transportation, and transformers, while the "high" case (50% in-region manufacturing) assumes 50% of expenditures on the above components are directed to local sources.
For transmission construction impacts, the "base" case (0% in-region manufacturing) assumes no local expenditures on any transmission materials and components, while the "high" case (50% in-region manufacturing) assumes 50% of all transmission materials and components are purchased locally.

Table 15
Employment and Economic Output Impacts of Higher In-Region Manufacturing of Wind and Group 2 Transmission Components

3,196MW of New Wind Constructed

EMPLOYMENT AND ECONOMIC OUTPUT STIMULATED DURING CONSTRUCTION PERIOD

	Employment		
	Earnings (2010$ million)	Full-Tme Equivalent Years (FTE-yrs)	Increased Economic Output (2010$ million)
SPP Impact with 0% In-Region Manufacturing			
Wind Generation	$577	17,072	$1,826
Transmission (Group 2)	$368	7,475	$962
Combined	$945	24,547	$2,788
SPP Impact with 50% In-Region Manufacturing			
Wind Generation	$910	24,645	$3,360
Transmission (Group 2)	$468	9,345	$1,417
Combined	$1,378	33,990	$4,778
SPP Incremental Impact of 50% In-Region Manufacturing			
Percentage	**46%**	**38%**	**71%**

7,616MW of New Wind Constructed

EMPLOYMENT AND ECONOMIC OUTPUT STIMULATED DURING CONSTRUCTION PERIOD

	Employment		
	Earnings (2010$ million)	Full-Tme Equivalent Years (FTE-yrs)	Increased Economic Output (2010$ million)
SPP Impact with 0% In-Region Manufacturing			
Wind Generation	$1,389	40,207	$4,355
Transmission (Group 2)	$368	$7,475	$962
Combined	$1,757	47,682	$5,317
SPP Impact with 50% In-Region Manufacturing			
Wind Generation	$2,172	57,786	$7,993
Transmission (Group 2)	$468	$9,345	$1,417
Combined	$2,640	67,131	$9,410
SPP Incremental Impact of 50% In-Region Manufacturing			
Percentage	**50%**	**41%**	**77%**

Manufacturing Assumptions: For wind construction impacts, the "base" case (0% in-region manufacturing) assumes no local expenditures on blades, towers, transportation, and transformers, while the "high" case (50% in-region manufacturing) assumes 50% of expenditures on the above components are directed to local sources.
For transmission construction impacts, the "base" case (0% in-region manufacturing) assumes no local expenditures on any transmission materials and components, while the "high" case (50% in-region manufacturing) assumes 50% of all transmission materials and components are purchased locally.

As shown in Tables 14 and 15, the transmission investment combined with the higher level of wind development would support 67,000 FTE-years of total employment, $2.6 billion in earnings, and approximately $9.5 billion in total economic output (sales and resale revenues) over the course of the *construction period* of the transmission and wind facilities. When the wind projects' economic impact during the *operational period* is added to that, the combined investment of the Group 1 transmission projects and 7,616 MW of new wind generation would—over the course of both the construction and operating phases of the facilities—support approximately 100,000 FTE-years of employment, $3.9 billion of earnings by SPP-region employees, and over $13 billion of total economic activity (*i.e.*, sales and resale revenues) within the SPP member states.

C. SALES INCREASES FOR LOCAL ELECTRIC AND NATURAL GAS UTILITIES

This section analyzes the extent to which the increased economic activity associated with transmission and wind plant construction also increases revenues of electric and natural gas utilities in the SPP footprint. These additional utility revenues, as reported in Table 16, are a portion of the indirect and induced economic output effects reported for transmission construction activities in Sections II and IV above. As Table 16 shows, the Group 1 set of transmission projects provides between $14.0 and $22.7 million in revenues (from indirect and induced economic output) by electric and natural gas utilities in the SPP footprint, depending on the in-region manufacturing share. For the Group 2 set of transmission projects, between $12.3 and $20.0 million in additional electricity and gas sales revenues are associated with the higher economic activity within the SPP footprint. Increased natural gas sales account for approximately 20% to 22% of the combined impact on electric and natural gas utilities.

Table 16
Impact of Transmission Investments
on SPP Electric and Natural Gas Utility Revenues

Transmission Projects	Low In-Region Manufacturing			Higher In-Region Manufacturing		
	Indirect	*Induced*	*Total*	*Indirect*	*Induced*	*Total*
	(2010$ Millions)			*(2010$ Millions)*		
Group 1	$4.8	$9.2	$14.0	$10.9	$11.8	$22.7
Group 2	$4.3	$8.0	$12.3	$9.7	$10.3	$20.0

Source and Notes:
The impact on electricity and gas revenues is captured through the indirect and induced impacts from expenditures in each set of transmission line buildouts. The impacts affect the following IMPLAN sectors: electric power generation, transmission, and distribution; natural gas distribution; federal electric utilties; and state and local government electric utilities.

While the analysis above is based on our IMPLAN® modeling results and was undertaken only for transmission investments, we estimate that approximately the same ratio of utility sales increases to total in-region supply of transmission development would also apply to wind development. This implies that every $1 billion of in-region spending from wind and transmission investment activities is estimated to generate $23 million to $24 million in additional electric and natural gas utility sales within the SPP footprint. As a result, under the higher in-region manufacturing scenario, the combined in-region supply activities associated with Group 1 transmission projects and Level 2 wind generation development would stimulate approximately $140 million in additional electric and natural gas utility retail revenues during the construction phase of these projects. This estimate of utility retail sales increases captures only the impact of transmission and wind construction activities. It does not reflect the extent to which increases in supply options and reliability resulting from transmission investments or reductions in local wholesale power prices resulting from wind development may be able to attract new businesses to the SPP footprint. On the other hand, it does not account for any potential impact of changes in retail electricity prices on SPP's ability to attract businesses or residents.