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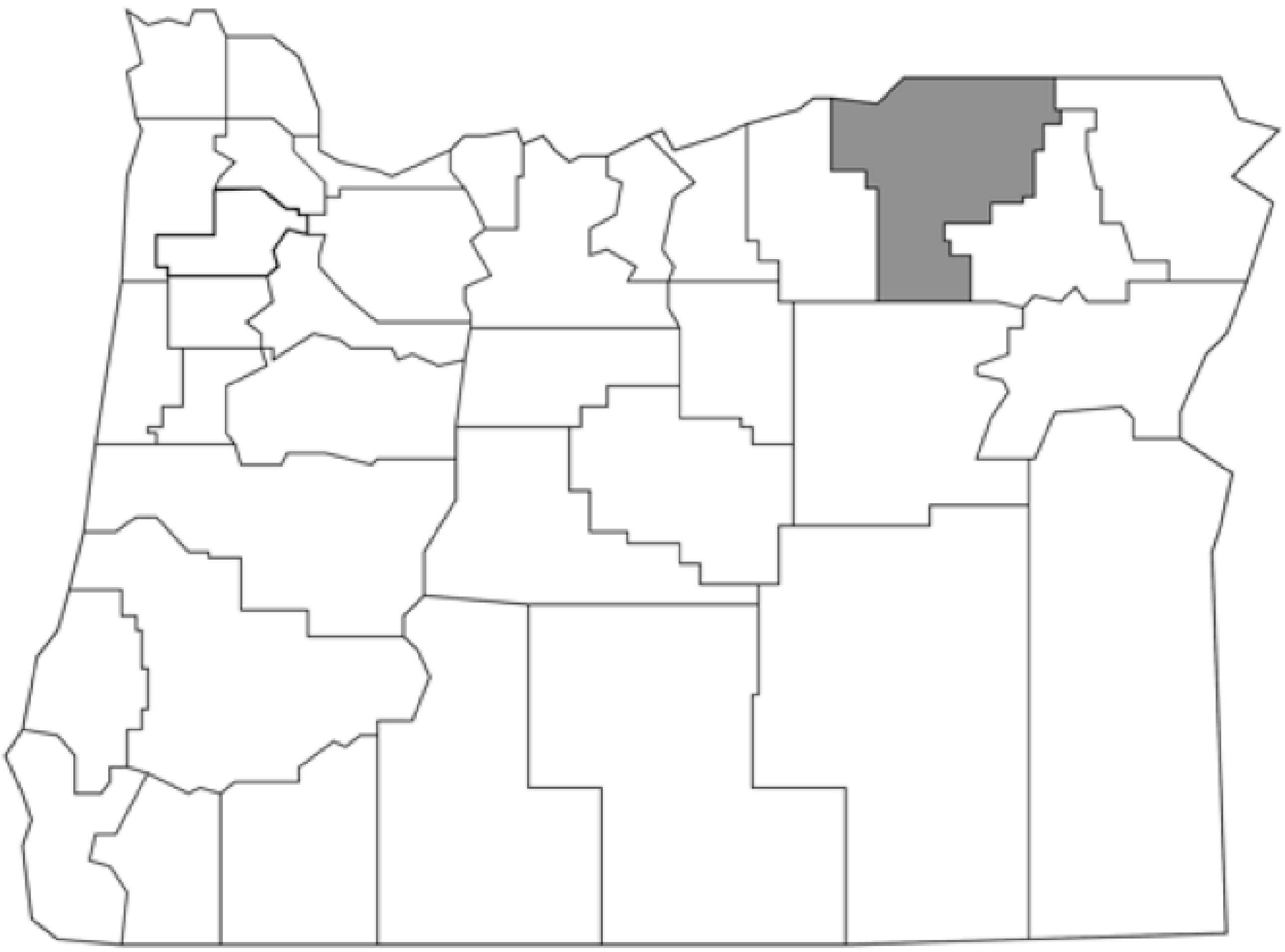
Umatilla County's Economic Structure and the Economic Impacts of Wind Energy Development: *An Input-Output Analysis*



Oregon State University Extension Service

Rural Studies Program
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Umatilla County's Economic Structure and the Economic Impacts of Wind Energy Development: *An Input-Output Analysis*

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Introduction

> "The promise of free land drew thousands of hopeful pioneers to eastern Oregon. They pastured their livestock on native bunchgrass and turned over the heavy sod to plant crops, mainly wheat. By 1880, the region was one of the leading wheat producing areas in the West. The backbone of Umatilla County's economy is its farms and ranches."[1]

From the early years of settlement to present day, Umatilla County's economy has been supported largely by farming and ranching, even as it continues to diversify and grow. For much of the 20th century and on into the 21st century, modern economies everywhere, including Umatilla County's, also have been supported by relatively inexpensive energy. In terms of electrical energy, Umatilla County historically has enjoyed the abundant hydropower resources of regional dams. In recent years, however, a new opportunity has evolved for electricity production: "wind farming."

Umatilla County has led the state of Oregon in developing wind power. With the first commercial wind farm in Oregon at Vansycle Ridge (25 MW) in 1998, part of the largest single wind farm in the world with the Stateline project (120 MW in OR, 300 MW total) and the 2003 completion of the Combine Hills wind project (41 MW), Umatilla County's installed wind generating capacity now stands at 186 MW, more than 70 percent of the total wind capacity installed in Oregon (260 MW) to date. Assuming a 30 percent capacity factor, these installations

[1] Umatilla County Historical Society, 1980.

will produce more than 480,000 MWh of emission-free electricity, which is enough to supply electricity to more than 46,000 homes each year (~1 percent of Oregon's total consumption of 45,255,173 MWh).[2]

Local and statewide decision-makers have shown a great deal of interest in wind power development, which can provide an opportunity to diversify local economies with an industry that requires minimal, if any, public investment. Similarly, many communities are faced with the need to prioritize economic development initiatives that may impact different business sectors (e.g., extended-care facilities versus wind energy development) as well as varying initiatives within the same sector (e.g., locally owned wind energy developments and larger wind energy developments owned by power companies).

The primary purpose of this report is to estimate the economic impacts of wind energy development in Umatilla County, consider ways that the local community can optimize impacts from current wind power development, and to discuss how the economic development impacts of wind energy projects may be evaluated using an input-output modeling system. A secondary function of this study is to provide a comparative analysis of input-output models commonly used to estimate regional economic impacts from wind energy investment—namely models developed for application at the county or state levels, as well as those developed specifically for Umatilla County.

We begin by describing Umatilla County in terms of population and economic trends over the past 3 decades, followed by a more detailed examination of the county's economic base using both regional economic theory and input-output modeling.

This study employs three input-output models to complete an economic impact analysis of Umatilla County: the Jobs and Economic Development Impact (JEDI) model developed by the National Renewable Energy Laboratory, and two variations of the standard Umatilla County IMPLAN model edited for this study. Based on IMPLAN derived data, the JEDI model is available to the public and offers a user-friendly interface for those who may not be familiar with the sometimes complicated spreadsheets and databases associated with economic impact analysis.[3] It also provides a "user add-in" function that allows individuals to input multipliers and personal consumption expenditures specific to their region, in this case, Umatilla County. We compare impacts from the JEDI model to two IMPLAN models that also have been adjusted to more accurately reflect the local economy.

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[2] Calculated using a US Department of Energy estimate of 877 kWh/month average residential use.
[3] See Goldberg et.al, 2004.

The Edited IMPLAN model estimates the impacts of developing wind energy within the current economic structure of Umatilla County, while the Optimized IMPLAN model revises the economic structure to represent potential changes that would increase the local purchasing associated with constructing and operating wind power facilities.

Additionally, policy decisions for wind energy development are often made and supported at the state level. The "out-of-the-box" JEDI model provides users the opportunity to analyze statewide economic impacts without the expense of purchasing and becoming acquainted with an input-output modeling system. For this analysis, the state-level JEDI model is used in comparison with the above-mentioned regional and "optimized" models. While the state-level information is not comparable to regional estimates (due to regional-level leakages), it does provide a more complete picture of the extent to which wind energy can affect all of Oregon. This comparison also provides readers with insight that will enable them to evaluate the time and cost investment necessary to attain more precise, regional estimates. Such estimates are required in order to assess economic impacts within critical sectors of the economy.

While this study largely focuses on the economic impacts from wind energy as it is currently being developed (by investors or corporations located outside the regions where turbines are situated), the report also includes a brief analysis of local or "community" wind ownership. Utilizing a combination of data from both the IMPLAN and JEDI models, we analyze the potential economic benefits for Umatilla County associated with this growing investment trend.

Profile Summary of Umatilla County's Population and Economic Trends

Professor Gary Smith of Washington State University notes in the Northwest Income Indicators Project (NIIP) Web site,

> "Attracting and retaining people to live, work, raise a family, and retire underlies the economic growth of any region. Population growth is both a cause—and a consequence—of economic growth. Patterns of population growth and change reflect differences among regions to attract and retain people both as producers and consumers in their economy."[4]

With this basic understanding, data and graphs from the aforementioned Web site will be examined to further clarify the economic status of Umatilla County.

- Umatilla County is a non-metropolitan county located in the northeast section of Oregon. The Columbia River forms part of the northern boundary along with Washington State.

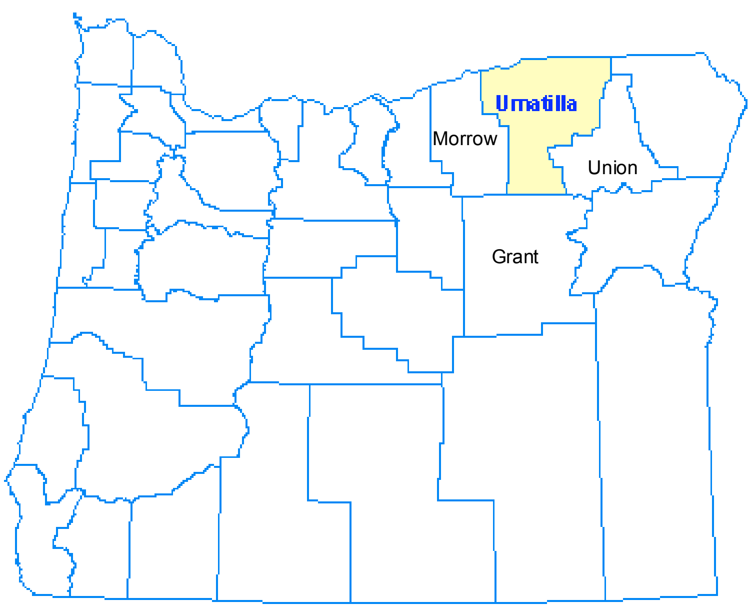
[4] Smith, 2004.

The neighboring county to the west is Morrow County. Grant County lies to the south, while Union and Wallowa counties lie to the east (Figure 1).

- According to the U.S. Census in 2001, the population of Umatilla County consisted of 70,601 people living on 3,215 square miles. Thus the average population density is approximately 22 people per square mile. The county includes 12 incorporated locales, of which Pendleton is the largest in terms of population. Located in the center of Umatilla County, Pendleton is also the county seat. The other major towns are Hermiston, in the northwest section of the county, and Milton-Freewater, in the northeast section.

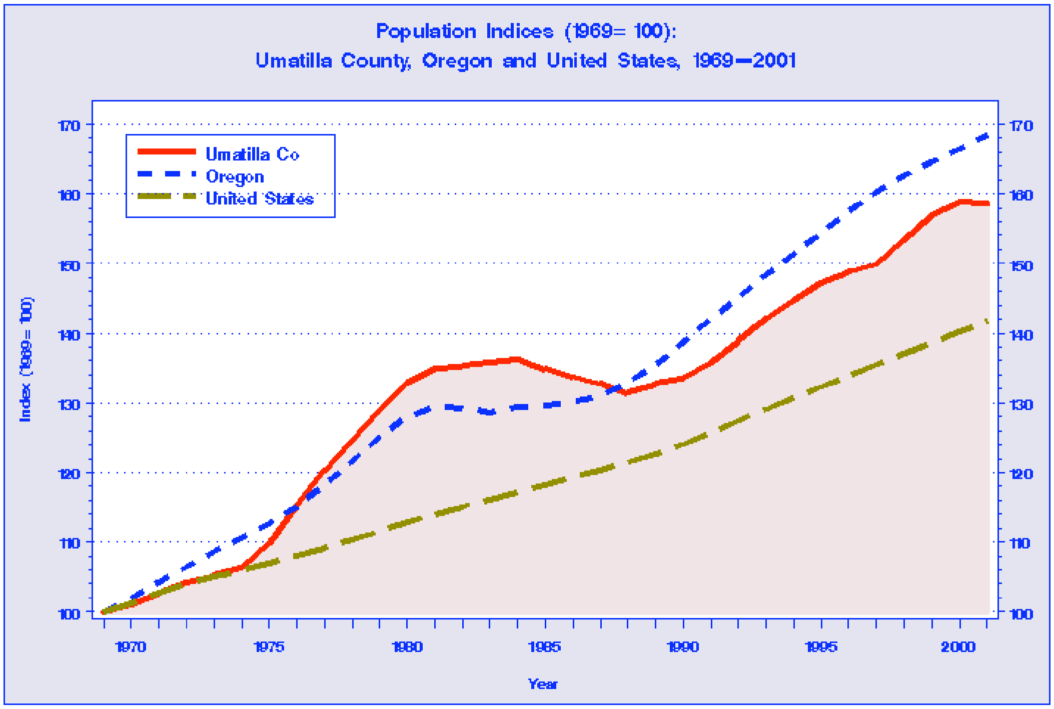
The total population of Umatilla County increased from 44,513 people in 1969 to 70,601 in 2001, an increase of almost 60 percent. Figure 2 (page 6) shows that population growth in Umatilla County paralleled that of Oregon, growing at a slightly faster pace during the late 1970s until the late 1980s, when it slowed and then lagged behind the growth rate of the state. Both the county and state levels of population growth outpaced the growth of the United States, which was just over 40 percent in the given time frame.

Figure 1. Umatilla County, Oregon.*



*Source: Smith, Gary W. 2004. Northwest Income Indicators Project (NIIP) Web site. http://niip.wsu.edu.

Figure 2. Population Indices—Umatilla County, Oregon, and United States 1969–2001.*



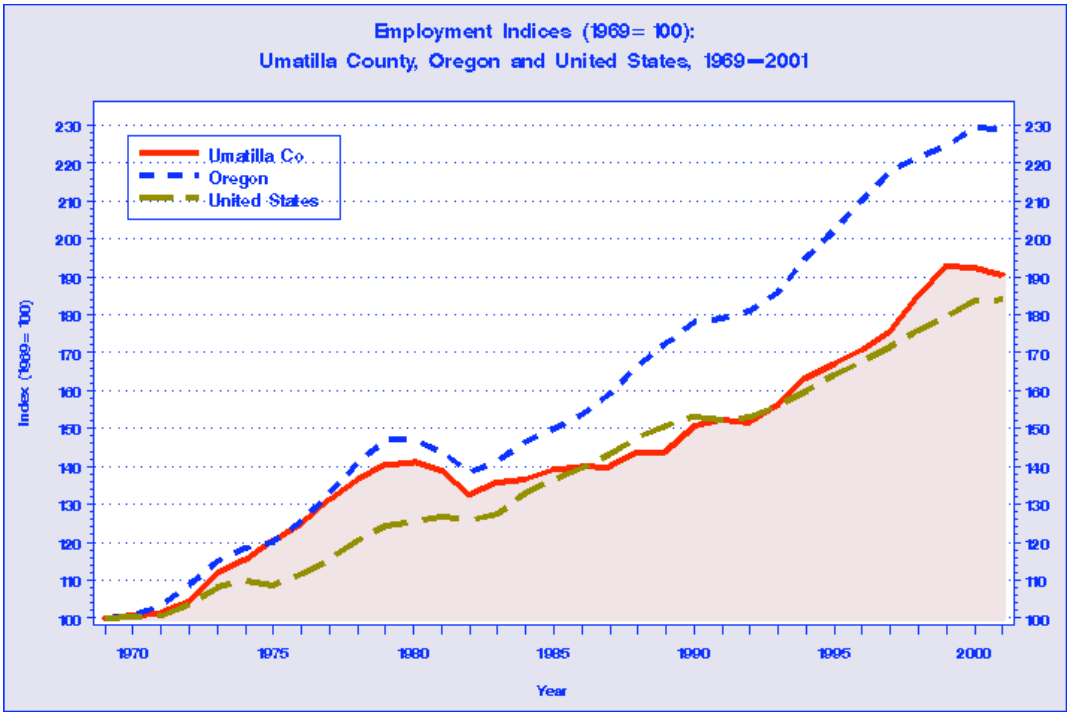
*Source: Smith, Gary W. 2004. Northwest Income Indicators Project (NIIP) Web site. http://niip.wsu.edu.

Employment

According to Smith, "employment numbers remain the most popular and frequently cited statistics used for tracking local area economic conditions and trends." The data discussed below represent both full- and part-time jobs, by place of work. As one person can hold more than one job, the numbers are not necessarily the number of people employed. Furthermore, the jobs counted are all jobs within the county, some of which might be held by people from outside the county.

- From 1969 to 2001, Umatilla County employment grew by 18,281 jobs, from 20,170 jobs in 1969 to 38,451 in 2001, or roughly 91 percent. Figure 3 indicates that while Umatilla County employment grew by 91 percent, the growth was insufficient to keep pace with Oregon, which experienced job growth of 126 percent. However, Umatilla fared better than the nation as a whole, which had just over 80 percent growth in employment. Umatilla County's employment increase was less than non-metro Oregon employment growth, which was 98.6 percent over the 32-year span.

Figure 3. Employment Indices—Umatilla County, Oregon, and United States, 1969–2001.*

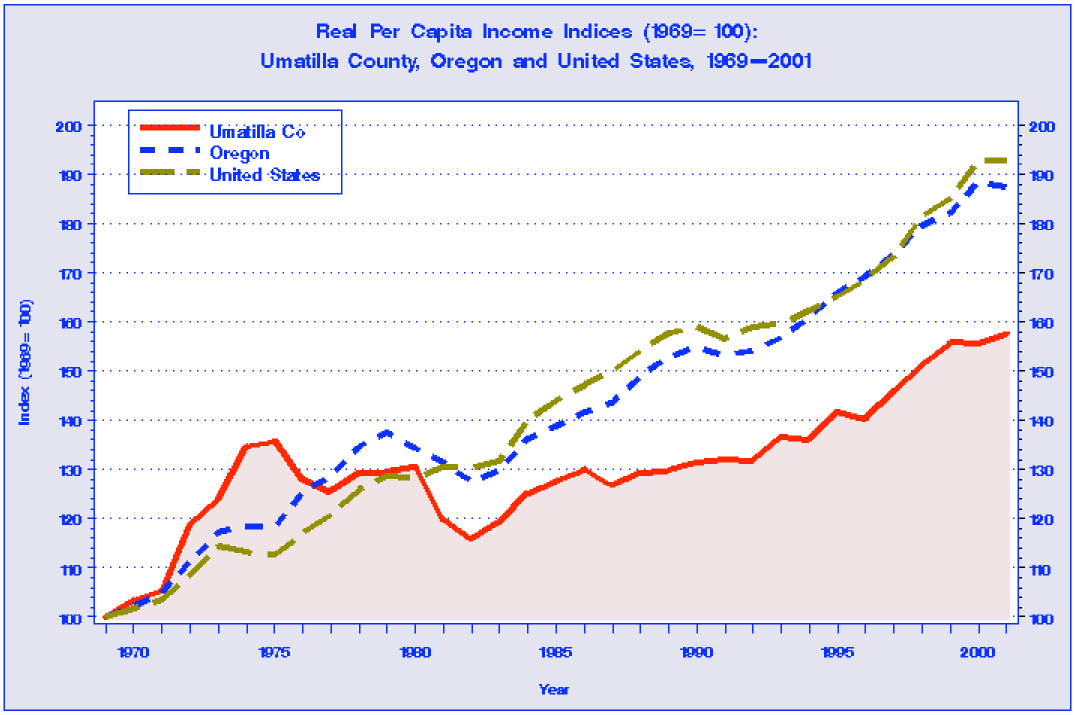


*Source: Smith, Gary W. 2004. Northwest Income Indicators Project (NIIP) Web site. http://niip.wsu.edu.

Income

- Per capita income also grew in Umatilla County since 1969, from just under $13,000 in constant 1996 dollars, to $20,470 in 2001, an increase of 57.6 percent. Measured in terms of current dollars, per capita income grew from $3,473 to $22,427, a 546 percent increase over the 30+ year period. The constant, 1996 dollars reflect real purchasing power.
- Figure 4 shows that Umatilla County's real per capita income growth, while positive at 57.6 percent, did not keep pace with state and national increases of 88 percent and 93 percent respectively. Non-metro Oregon also outpaced Umatilla County in terms of real per capita income, with growth of 69.7 percent.

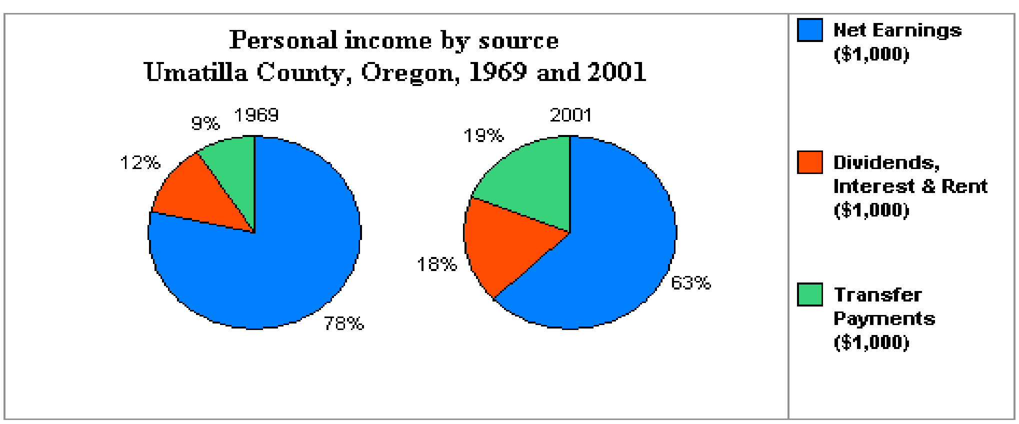
Figure 4. Real per capita income indices Umatilla County, Oregon, and United States, 1969–2001.*



*Source: Smith, Gary W. 2004. Northwest Income Indicators Project (NIIP) Web site. http://niip.wsu.edu.

- Figure 5 illustrates the percentages of personal income by source (net earnings, dividends, interest, and rent and transfer payments). It is noteworthy that the percentage of personal income from dividends, interest, and rent and transfer payments (e.g., federally subsidized income such as Social Security) has increased since 1969 from 12 percent and 9 percent, respectively, to 18 percent and 19 percent. Such an increase suggests that the Umatilla County economy is receiving progressively less of its income from current production or earnings, as more people are relying on previously invested earnings for current income.

Figure 5. Percentage of Personal Income by Source: Umatilla County, Oregon, 1969 and 2001.*

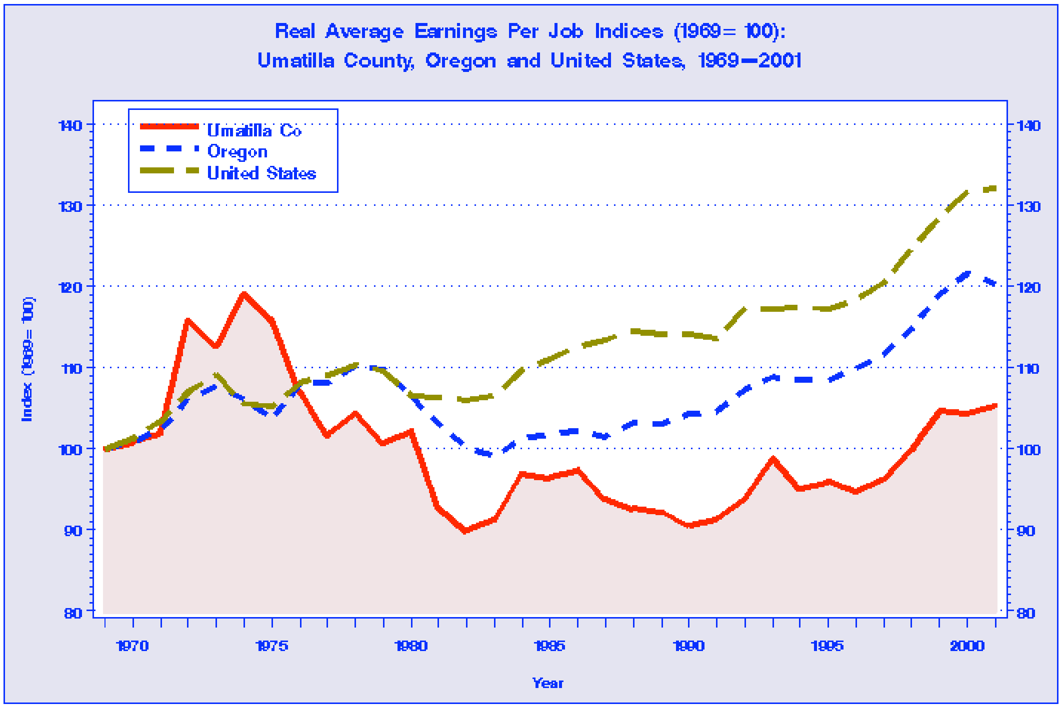


*Source: Northwest Area Foundation and 1969–2001: Bureau of Economic Analysis, Regional Economic Data, Local Area Personal Income, Table CA05 (http://www.bea.gov/bea/regional/reis/).

Average Earnings per Job

- In constant 1996 dollars, average earnings per job increased only slightly, from $23,216 in 1969 to $24,431 in 2001. In terms of current dollars, average earning per job increased from $6,208 in 1969, to $26,767 in 2001.

Figure 6. Real Average Earnings per Job Indices (1969=100): Umatilla County, Oregon, and United States, 1969–2001.*



*Source: Smith, Gary W. 2004. Northwest Income Indicators Project (NIIP) Web site. http://niip.wsu.edu.

- Figure 6 tracks the changes in real average earnings per job in Umatilla County, relative to the state and the nation, indexed to the initial year, 1969. After a brief increase in real average earnings per job in the 1970s, the trend fell below those of the state and nation, rising only 5 percent over the 32-year interval, whereas real average earnings per job grew by 20 percent and 32 percent in Oregon and the U.S., respectively. Non-metro Oregon, by contrast, experienced a 1 percent decrease in average earnings per job from 1969 to 2001.

Considering the above figures, Umatilla County's growth rates have been greater than those of many Oregon counties; however, they did not keep pace with the state or nation. With an unemployment rate higher (9.4 percent) than the state average (6.8 percent)[5] and a major plant closing (Simplot), the county can be considered "economically distressed."

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[5] Oregon Employment Department, March 2005.

Location Quotients: Relative Economic Specializations

Location quotients (LQ's) can be used to make comparisons among sectors within regional economies such as Umatilla County—and more importantly, to contrast industrial specialization with state and national level economies. Location quotients are calculated by taking the percentage of employment that a sector represents in a particular region and dividing it by the percentage of employment the same sector represents in another economy. For the purpose of our research, location quotients can indicate where Umatilla County is relatively more specialized than the statewide or U.S. economy and, presumably, where Umatilla County may have a comparative advantage (or at least did at some time in the past).

Table 1. Umatilla County Location Quotients, 2000.*
$LQ_i=(County_i/County_t)/(Oregon_i/Oregon_t)$ and $LQ_i=(County_i/County_t)/(US_i/US_t)$

Sector	Umatilla 2000	%	OR LQs	US LQs
Employment by Place of Work				
Total full- and part-time employment	38,835	100.00%	1.00	1.00
By type				
Wage and salary employment	30,708	79.07%	0.98	0.95
Proprietors employment	8,127	0.2093	1.08	1.26
Farm proprietors employment	1,950	5.02%	2.69	3.78
Nonfarm proprieters employment	6,177	0.1591	0.91	1.04
By industry				
Farm employment	3,180	0.0819	2.66	4.40
Nonfarm employment	35,655	91.81%	0.95	0.94
Private employment	29,498	0.7596	0.90	0.90
Ag. services, forestry, fishing and other	1,329	3.42%	1.66	2.67
Mining	75	0.0019	1.29	0.41
Construction	2,272	5.85%	1.01	1.03
Manufacturing	4,625	0.1191	0.97	1.04
Transportation and public utilities	2,169	5.59%	1.26	1.13
Wholesale trade	1,253	0.0323	0.67	0.71
Retail trade	7,015	18.06%	1.06	1.10
Finance, insurance and real estate	1,817	0.0468	0.62	0.59
Misc. services	8,943	23.03%	0.77	0.72
Government and government enterprises	6,157	0.1585	1.24	1.17
Federal, civilian	828	2.13%	1.45	1.23
Military	239	0.0062	1.01	0.50
State and Local	5,090	13.11%	1.22	1.23
State government	1,726	0.0444	1.53	1.50
Local government	3,364	8.66%	1.10	1.13

*Source: Bureau of Economic Analysis, 2000, with Undisclosed Estimates from IMPLAN.

If the percentages of employment for a sector are the same for both Umatilla County and Oregon (or the U.S.), the location quotient will be 1.0. If Umatilla County is less specialized in a sector than Oregon or the U.S., the LQ will be less than 1.0, and conversely, if it is more specialized, the LQ will be greater than 1.0. For example, the OR LQ of 2.66 for Farm Employment is the percentage of Umatilla jobs in Farm Employment (8.19 percent) divided by the percentage of jobs in Farm Employment in Oregon (3.08 percent). This LQ for Farm Employment, which is greater than 1, is no surprise and indicates Umatilla County is more specialized in farming than Oregon is statewide.

As indicated in Table 1, other important sectors in which Umatilla County is relatively more specialized (than Oregon) are Agricultural services, forestry, fishing and other, Mining, Construction, Transportation and public utilities, Retail trade, and both the Federal and State/local government sectors.

The Input-Output Model and IMPLAN

An input-output (I-O) model is basically a "snapshot" of an economy's structure at a specific point in time. The economic structure is described in terms of the inter-sectoral linkages measured by flows of money (and implicitly, materials). By quantifying the inter-sectoral linkages in an economy and calculating where goods and services are either used *within* the county to produce other goods and services or are exported or sold *outside* Umatilla County, a set of multipliers is derived. The multipliers represent what's referred to as the "ripple effects" of any change in demand for a good or service that is produced in the economy. The ripple starts with a change in demand for wind energy (or direct effect), extends to suppliers like construction or maintenance contractors (indirect effects) and then to sectors where owners and employees in sectors experiencing the direct and indirect effects spend their incomes—such as food stores or health care (induced effects).

The most significant limitation of input-output models is their static and linear nature. Essentially, this limitation prevents the incorporation of major shifts in economic structure and/or technological changes into a given model. However, since such changes in economic structure can be assumed to occur relatively slowly, the results derived from models can remain robust for many years.

The input-output model for this report is based on year 2000 IMPLAN study area data, which was edited to better represent the Umatilla County economy. Using the "out-of-the-box" IMPLAN model, Umatilla County employment data was checked and adjusted to other datasets, including the Bureau of Economic Analysis' Regional Economic Information System (REIS), the U.S. Census Bureau's County Business Patterns (CBP), the Oregon Labor Market Information System (OLMIS), the Oregon Agricultural Information Network (OAIN), and the local Yellow Pages—all to provide the most accurate representation of the Umatilla County economy.

After making the detailed sectoral adjustments to the model, the sectors were aggregated according to the aggregation structure used by the JEDI model. JEDI's aggregation is a slight modification of the 1-digit Standard Industrial Classification (SIC) aggregation, with manufacturing not fully aggregated (the fabricated metals, industrial machinery, and electrical equipment sectors are listed separately), the trade sector split into wholesale and retail trade, and the services sector into professional and miscellaneous services. This aggregation was used to maintain consistency between the two models.

Using IMPLAN to Estimate Umatilla County's Export Base

A theoretical underpinning of economic impact analysis is that a region's economy is based on its exports to markets outside the region.[6] Exports for each of the various sectors, as well as the economy's dependence on the exports of the sectors, can be estimated using IMPLAN. By simulating changes to a sector's exports, the full importance of each sector to the economy in terms of jobs can be determined. A sector's importance to the economy consists not only of the jobs necessary to produce the exports (direct effects) but also the jobs in other sectors that support and/or supply that particular sector's production of exports (indirect effects) as well as the jobs supported by the subsequent household spending (induced effects) of the people who work in both the direct and indirectly affected sectors.[7]

Table 2 lists the number of export-dependent jobs for each (aggregated) sector in Umatilla County's economy, including households, along with the actual sectoral employment. For example, the Agriculture sector exports supported 3,382 direct jobs, 1,195 jobs in other sectors, and the spending of the workers of the direct and indirect jobs dependent on agricultural exports supported an additional 583 jobs.

The greater the index percentage (the last column of the table) is for a sector, the greater the direct importance of that sector to maintaining economic growth in the economy. Put another way, the sectors with higher index percentages represent the basic or exporting sectors in the economy.

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[6] Maki and Lichty, 2000.
[7] Sorte, 2002.

Table 2. Umatilla County Sectoral and Export-Base Dependent Employment, 2000.*

Sectoral Employment			Export-Dependent Jobs				
Sector	Jobs	%	Direct	Indirect	Induced	Total	Index (%)
Agriculture	4,630	11.8	3,382	1,195	583	5,159	13.1
Mining	75	0.2	99	15	31	144	0.4
Construction	2,575	6.6	2,273	943	1,089	4,304	11
Manufacturing	4,641	11.8	4,480	2,946	1,852	9,278	23.6
Fabricated Metals	26	0.1	41	10	10	61	0.2
Industrial Machinery	100	0.3	62	24	23	109	0.3
Electrical Equipment	11		7	3	3	13	
TCPU	2,168	5.5	634	357	283	1,273	3.2
Wholesale Trade	1,253	3.2	245	56	80	381	1
Retail Trade	7,015	17.9	1,937	195	382	2,513	6.4
FIRE	1,817	4.6	96	39	31	166	0.4
Misc. Services	7,993	20.4	729	142	167	1,037	2.6
Professional Services	753	1.9	333	43	79	455	1.2
Government	6,186	15.8	5,255	152	1,859	7,266	18.5
Households					7,085	7,085	18.1
Total	39,244	100	19,571	6,118	13,555	39,244	100

*Data source: Edited 2000 IMPLAN Data.

Thus, the most critical sectors in Umatilla County's export base, ranked by index, are: Manufacturing (23.6 percent), Government (18.5 percent), Households (18.1 percent), Agriculture (13.1 percent), Construction (11.0 percent), and Retail Trade (6.4 percent). These six sectors represent over 90 percent of the county's export-based employment. The farms and ranches described in the beginning of this report are an important part of the economy of Umatilla County. However, as the index numbers above and experience on the ground shows, Umatilla County's economy has diversified significantly over the years.

The recent development of wind farms in the county is a small but highly visible example of the diversification trend. Umatilla County's strong manufacturing sector and proximity to major transportation outlets (including the Columbia River, Interstate 84, and railroad access) give the local economy an advantage in servicing the current wind industry. Our analysis explores the potential for business development that could *further* increase the regional economic impacts of wind power development in Umatilla County.

Wind Energy Development Economic Impact Scenarios

Wind energy, like most renewable energy applications, is relatively capital intensive. In other words, the bulk of the costs of wind energy developments occur at the beginning of the project's lifespan when the capital equipment is purchased. Furthermore, wind energy has no direct energy input costs, a factor that greatly reduces the variable costs of electricity production from wind. The economic impacts of wind energy development can be divided into a construction phase and an operations phase. Assuming that all pre-planning activities (e.g., resource assessment, permitting, and contracting) of a project are completed and approved, the construction phase of a wind farm will include activities such as access-road construction, foundation construction, assembly and erection of wind turbines, blades and towers, and connection to the grid. The operations phase involves routine monitoring and maintenance, as well as possible emergency maintenance activities.

The values of the direct impacts used in this analysis were obtained from the National Renewable Energy Laboratory's Jobs and Economic Development Impact (JEDI) model,[8] in which the user enters a few project specific details such as the year and location of the project and the number and size (rated capacity) of the turbines to be installed—from which the model calculates the amounts of spending for the various sectors directly impacted. These calculations are based on assumptions (default values) of the cost per kW for the construction phase, and the annual cost per kW for the operations and maintenance phase. The default values in the JEDI model were reviewed with one of the larger wind developers and determined to be good general estimates. When a specific project is planned, the default values can be replaced with estimates from the developer's business plan or feasibility study to further refine the economic impact projections.

Utilizing identical IMPLAN derived Umatilla County multipliers, personal consumption expenditures and regional purchase coefficients, the direct impacts were entered into both input-output models (JEDI and IMPLAN) as dollar-value changes in final demand of the sectors involved. From these initial changes in final demand (direct impacts), the indirect and induced impacts can be found, in terms of employment (jobs), labor income (earnings), and output.

[8] Version 1, 10/06/2004.

Methods

For this analysis, the scenarios estimated include a 50 MW project, typical of the currently existing Northwest wind farms in terms of size and ownership structure (usually a non-local corporation or utility). The impacts for this project were determined using IMPLAN-derived model regional purchase coefficients (RPC's) for Umatilla County—estimating the percentage of the input costs (demand) that remain within the local economy.[9] Inherent in IMPLAN's calculation of model RPC's is the assumption of supply/demand pooling, which infers that local demands are met (to the extent possible) with local supply. If local demands exceed local supply, then the goods and/or services (industry output) must be imported. If local supply exceeds local demand, then that industry's output is exported. Cross-hauling or exchanging goods or services between counties (rather than fulfilling as much of the local demand as possible before exporting) does occur for a variety of reasons; however, the effect of importing what is already available in a county (recorded as an economic leakage) is offset by the exchange (export).

For comparison, the impacts under an "optimized" economic structure were estimated, in which the regional purchase coefficients for the various impacts were increased to a minimum of 75 percent. Those sectors with an RPC over 75 percent were left alone. In other words, increased economic benefits of this particular type of development would be captured in this hypothetical local economy. Not only would the impacts of wind energy developments be greater under this scenario, the optimized economic structure would imply some additional infrastructure improvements to the economy, which could benefit sectors that are not directly related to wind energy.

In addition to exploring the potential county impacts from commercial or "non-local" wind investment, it is important to recognize the growing interest in local or "community" ownership. Direct impacts for these scenarios were derived from both the JEDI model (mentioned above) and basic calculations utilized to estimate projected annual wind energy revenue.

The estimated costs for the construction phase in all scenarios are $1,000 per rated kW. Annual operations and maintenance costs are estimated to be $12.50 per kW. Thus, for a 50 MW (50,000 kW) rated project, the total cost of construction would be $50 million and the annual operations costs would be $900,000. Because currently most of the project costs are not spent

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[9] Also referred to as "Local Share Values" in the JEDI model—however, for the remainder of this report, we will use the term Regional Purchase Coefficient (RPC).

locally (e.g., ~85 percent of project costs are for purchasing the turbines, towers, and blades), the initial impacts used in our analysis (Tables 3a and 3b) were substantially less than the total costs stated above.

Table 3a. Direct Sectoral Impacts and Regional Purchase Coefficients for 50 MW Project Construction.*

50 MW Construction Phase	Demand**	Regional Purchase Coefficent
Agriculture	$0	0.0%
Mining	$0	0.0%
Construction	$3,908,197	100.0%
Manufacturing	$311,191	4.1%
Fabricated Metals	$0	0.0%
Machinery	$0	0.0%
Electrical Equipment	$0	0.0%
Transportation, Communication and Utilities	$1,830,537	81.7%
Wholesale Trade	$0	0.0%
Retail Trade	$0	0.0%
Financial and Real Estate Services	$0	0.0%
Misc. Services	$0	0.0%
Professional Services	$46,500	25.0%
Government	$132,714	96.0%
Total	$6,229,139	

*Demand Values derived from NREL's JEDI model. RPC's derived from Umatilla Edited IMPLAN model.
**2005 Dollars

Table 3b. Direct Sectoral Impacts and Regional Purchase Coefficients for 50 MW Operations Phase.*

	Direct Impact	Land Lease PCE	Plant Employee PCE	Total Impact**	RPC
Agriculture	$0	$838	$3,135	$3,973	69.5%
Mining	$0	$2	$9	$11	30.0%
Transportation, Communication, Utilities	$25,510	$9,148	$34,217	$68,876	81.7%
Construction	$0	$0	$0	$0	100.0%
Manufacturing	$0	$21,376	$79,951	$101,328	4.1%
Fabricated Metals	$3,827	$173	$646	$4,645	2.0%
Industrial Machinery	$0	$143	$536	$679	18.5%
Electric Equipment	$0	$1,399	$5,234	$6,634	4.7%
Wholesale Trade	$0	$5,584	$20,884	$26,468	42.3%
Misc. Services	$25,510	$56,041	$209,605	$291,156	81.7%
Retail Trade	$25,510	$20,824	$77,885	$124,219	92.5%
Professional Services	$0	$1,497	$5,599	$7,096	25.0%
Financial, Insurance and Real Estate	$0	$15,143	$56,637	$71,779	58.1%
Government	$141,667	$832	$3,111	$145,610	96.0%
Totals	**$222,024**	**$133,000**	**$497,449**	**$852,473**	

*Demand Values derived from NREL's JEDI model. RPC's derived from Umatilla Edited IMPLAN model.
**2005 Dollars

The direct impacts calculated in our analysis also include land lease payments to households and plant employee spending (operations phase) in terms of personal consumption expenditures (PCE). PCE's for this analysis were derived from the 2000 Umatilla IMPLAN model by averaging commodity demand proportions across household income levels for the 14 aggregated sectors.

The 50 MW scenario impacts, with appropriate RPC's, were run through the Umatilla JEDI model, and the results were compared to the results from the edited Umatilla County IMPLAN models. Although production functions/multipliers were based on the year 2000 economic structure, all impacts and *impact results* reflect 2005 dollars.

Results

The direct impacts entered into the JEDI model, with IMPLAN derived multipliers, personal consumption expenditures, and regional purchase coefficients for Umatilla County yield the results in Table 4. It is important to remember that the impacts during the construction phase typically last less than 1 year, while the operations phase likely will continue for 20 to 30 years. As mentioned above, the direct impacts in the operations phase include the impacts of the new operations and maintenance jobs created by the project, the demand for materials and services generated by the project, property tax payments to the local government, and land lease payments to landowners.

Table 4. Impacts of Wind Energy Projects for Construction and Operations Phases.*
JEDI Model (utilizing Umatilla County Multipliers for year 2000)

Impacts**		Direct	Indirect	Induced	Total
50 MW Project Construction Phase					
	Output	$5,430,000	$1,180,000	$1,470,000	$8,080,000
	Jobs	40	17	20	77
	Earnings	$1,950,000	$460,000	$520,000	$2,930,000
50 MW Project Operations and Maintenance					
	Output	$510,000	$110,000	$210,000	$830,000
	Jobs	13	1	3	17
	Earnings	$380,000	$40,000	$80,000	$500,000

*Derived from NREL's JEDI Model
**2005 Dollars

Table 5. Impacts of Wind Energy Projects for Construction and Operations Phases.* Edited Umatilla IMPLAN Model with Model RPC's

Impacts**		Direct	Indirect	Induced	Total
50 MW Project Construction Phase					
	Output	$6,171,882	$1,381,194	$1,417,424	$8,970,500
	Jobs	40	18	19	77
	Earnings	$1,882,758	$508,349	$501,281	$2,892,388
50 MW Project Operations and Maintenance					
	Output	$825,442	$122,044	$193,787	$1,141,273
	Jobs	10	1	3	14
	Earnings	$288,069	$43,067	$68,534	$399,670

*Derived from 2000 Edited Umatilla IMPLAN Model
**2005 Dollars

The results using the IMPLAN model are shown in Table 5. Discrepancies between the JEDI and IMPLAN models are related primarily to output estimates—and can be explained by IMPLAN's inherent addition of foreign and domestic trade values to direct impacts.

The impacts of wind energy development for the state of Oregon can be estimated using the "out-of-the-box" JEDI model and are shown in Table 6. Some considerations to keep in mind are: 1) the model, and hence multipliers, represent the entire state of Oregon, and 2) the default percentages for local purchasing are fixed across states. For this report, we have maintained all of the JEDI-produced Oregon default values for local purchasing (RPC's), with the exception of the construction sector. The JEDI model's default RPC for the construction sector is set at 75 percent; however, our IMPLAN-derived Umatilla County RPC for the same sector is 100 percent. Resetting the JEDI model's statewide construction RPC to 100 percent serves to provide a more realistic baseline for our comparative analysis (as it is unlikely that the local RPC for this sector would be higher than the statewide RPC).

Table 6. Impacts of Wind Energy Projects for Construction and Operations Phases.* JEDI Model (utilizing statewide multipliers and default values)

Impacts**		Direct	Indirect	Induced	Total
50 MW Project Construction Phase					
	Output	$6,100,000	$3,480,000	$3,440,000	$13,020,000
	Jobs	48	33	39	120
	Earnings	$1,620,000	$1,070,000	$1,100,000	$3,800,000
50 MW Project Operations and Maintenance					
	Output	$67,000	$27,000	$45,000	$1,390,000
	Jobs	13	3	5	21
	Earnings	$400,000	$80,000	$140,000	$630,000

*Derived NREL's JEDI Model

**2005 Dollars

As anticipated, due to fewer leakages in the larger state economy than the county-level economy, the results from the statewide JEDI model are greater than the impacts estimated by both the regional JEDI and edited IMPLAN models. Also of importance are the low earnings-to-output ratios apparent in the state analysis. This can be explained by the JEDI model's more conservative approach, which assumes out-of-state proprietor income to be spent outside of the state economy. Therefore, only employee compensation is factored into the JEDI model's earnings calculations. JEDI's conservative method is the most accurate for the current structure of the industry; however, as we begin to see a greater interest and capacity to transition to local ownership, the earnings impacts potentially could increase.

Considering the data above, the more significant annual impacts from wind investment (at both the county and state levels) would be realized during the construction phase. This is to be expected, as much of the construction costs (primarily labor) are spent locally. However, since the operations phase extends over many years, the annual impacts from operating costs may eventually exceed the construction phase in a present-value calculation, depending on how local purchases change over time and on the discount rate that is used.

Land Lease Payments and Property Tax Revenue

During the operations phase of a non-locally owned wind project, a county can expect to reap the majority of economic benefits from land lease payments and property tax revenue. Although most (if not all) of the revenue from wind energy sales is expected to leave the county with out-of-area investors, both lease payments and property tax income are more likely to be spent locally in terms of personal consumption and government expenditures, respectively.

The JEDI model for Oregon estimates that proprietors will earn $2,667 per turbine in land lease payments, although research indicates these payments can range anywhere from $2,000 to $5,000 per turbine.[10] As projects are often spread across many farms/parcels, landowners may find their compensation to be modest. However in rural, agriculturally based communities such as Umatilla County, these payments have proven to be a vital source of income for farmers. Analyses have shown that land lease payments can provide a more reliable form of revenue than crops and "can serve to hedge against possible fluctuations in income from crop and livestock production."[11]

In addition to land lease payments, property tax income is another benefit of non-locally owned wind farms that stays within the local economy. Determining estimated property tax revenue for county impact analyses can be a difficult process. Interviews with the Oregon State Department of Revenue reveal that wind farm "property" is assessed using one of three primary methods: cost (e.g., property plus equipment—historical to current-day, minus depreciation), income (e.g., discounted cash-flow analysis) and market value (e.g., system/real market value). "Appraiser judgment" is used to choose a method based on the most reliable data available for the property being considered. Wind farms are re-assessed annually, and the methods used for those calculations are subject to change as more specific information becomes available.

For analyses such as this, the necessary data needed for valuation (e.g., specific property locations and associated market values) is not readily available. One recommended approach is to value each turbine and apply appropriate county tax rates, using data from other reports as well as information from local county tax assessors. While this type of calculation is viable (as the bulk of a property's "value" can be found in the equipment itself), this method can prove to be troublesome in its linearity because turbines are manufactured to produce different outputs, thus are valued differently. Conversely, discrepancies in appraiser judgment can make drawing inferences from existing wind farms misleading in nature.

The models in our report are based on turbines with a maximum output of 1,000 kW each. Utilizing the method above, wind farms with comparable-capacity turbines within Umatilla County were assessed at roughly $975,500 per turbine for the 2003 tax year and taxed at a rate of approximately 1 percent.[12] Applying similar numbers to our projects, we can assume that a

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[10] AWEA, 2005; as cited in GAO, 2004.
[11] GAO, 2004, p. 35.
[12] Paul Chalmers, Umatilla County Assessor, 3/05.

50 MW wind farm (valued at $48,777,500) would likely boost Umatilla County's annual property tax base by $487,775.

These inferred estimates, based on information from interviews and existing county data, are significantly higher than both the statewide JEDI model's default values and IMPLAN's estimated property tax impacts. The JEDI model estimates that a 50 MW wind farm would pay an estimated $141,667 in property taxes. The results are similar in the edited IMPLAN model: a 50 MW wind farm (during the construction phase) would pay $130,696.

For the purpose of this analysis, we took a conservative approach and utilized JEDI's state-level defaults when estimating local economic impacts. More important than the conservative nature of the estimates, our data suggests that estimating property tax impacts from proposed wind development is an imprecise process that demands more refined analysis as additional data (e.g., property locations) becomes available.

"Optimizing" within the Local Economy

As demonstrated above, the construction and operation of wind turbines can provide multimillion-dollar impacts on the Umatilla County economy—primarily through local expenditures, land lease payments, and property tax revenue. However, there is potential for Umatilla County to capture even greater impacts from the development of wind power. For example, the majority of parts/machinery and shipping necessary for construction and maintenance of wind turbines currently are purchased non-locally or imported. By adjusting the Umatilla economy to reflect "optimized" regional purchase coefficients, we can evaluate the potential impacts on the economy if Umatilla County could support a greater share of the goods and services necessary for wind energy development.

The following results (Table 7) are derived from the "optimized" economic model, with increased levels of local purchasing (regional purchase coefficients were set to a minimum of 75 percent for all sectors).

Table 7. Impacts of Wind Energy Projects for Construction and Operations Phases.* Edited Umatilla IMPLAN Model with Optimized RPC's

Impacts**		Direct	Indirect	Induced	Total
50 MW Project Construction Phase					
	Output	6,192,787	1,445,833	1,460,727	9,099,348
	Jobs	42	18	20	80
	Earnings	1,933,925	530,140	516,596	2,980,661
50 MW Project Operations and Maintenance					
	Output	835,883	152,056	215,681	1,203,620
	Jobs	10	2	3	15
	Earnings	314,835	53,203	76,277	444,314

*Derived from 2000 Edited Umatilla IMPLAN Model
**2005 Dollars

As anticipated, the results from the optimized IMPLAN model were greater than the results from both the IMPLAN and JEDI models with model-derived regional purchase coefficients, but totals are still lower than the estimates obtained using the statewide JEDI model. To compare all three models, the results are reorganized according to project/phase and are shown in Tables 8 and 9.

Table 8. Comparison of Model Impacts for 50 MW Project Construction*

Impacts**		Direct	Indirect	Induced	Total
Output	JEDI	$5,430,000	$1,180,000	$1,470,000	$8,080,000
	Edited IMPLAN	$6,171,882	$1,381,194	$1,417,424	$8,970,500
	Optimized IMPLAN	$6,192,787	$1,445,833	$1,460,727	$9,099,348
	JEDI (Oregon)	$6,100,000	$3,480,000	$3,440,000	$13,020,000
Employment	JEDI	40	17	20	77
	Edited IMPLAN	40	18	19	77
	Optimized IMPLAN	42	18	20	80
	JEDI (Oregon)	48	33	39	120
Earnings	JEDI	$1,950,000	$460,000	$520,000	$2,930,000
	Edited IMPLAN	$1,882,758	$508,349	$501,281	$2,892,388
	Optimized IMPLAN	$1,933,925	$530,140	$516,596	$2,980,661
	JEDI (Oregon)	$1,620,000	$1,070,000	$1,100,000	$3,800,000

*Source: JEDI, Edited IMPLAN and Optimized IMPLAN models
**2005 Dollars

Table 9. Comparison of Model Impacts for 50 MW Project Operations and Maintenance.*

Impacts**		Direct	Indirect	Induced	Total
Output	JEDI	$510,000	$110,000	$210,000	$830,000
	Edited IMPLAN	$825,442	$122,044	$193,787	$1,141,273
	Optimized IMPLAN	$835,883	$152,056	$215,681	$1,203,620
	JEDI (Oregon)	$67,000	$27,000	$45,000	$1,390,000
Employment	JEDI	13	1	3	17
	Edited IMPLAN	10	1	3	14
	Optimized IMPLAN	10	2	3	15
	JEDI (Oregon)	13	3	5	21
Earnings	JEDI	$380,000	$40,000	$80,000	$500,000
	Edited IMPLAN	$288,069	$43,067	$68,534	$399,670
	Optimized IMPLAN	$314,835	$53,203	$76,277	$444,314
	JEDI (Oregon)	$400,000	$80,000	$140,000	$630,000

*Source: JEDI, Edited IMPLAN and Optimized IMPLAN models
*2005 Dollars

By further comparing model results by sector, "optimization" analysis can assist community leaders and investors in assessing business development opportunities that complement existing and/or future wind farming ventures. Table A1 (*see appendix*) indicates that Umatilla County, primarily through development of sectors such as manufacturing, fabricated metals, electrical equipment, and professional services, could enhance the local economic benefits associated with non-local wind investment.

Local Ownership Options

In addition to "optimizing" Umatilla County's economic base to support out-of-area wind investment, community ownership represents another opportunity to maximize potential wind energy revenue. As stated earlier, farmers can gain valuable income from land lease payments. However, research indicates that they can earn double to triple these amounts by investing in locally owned projects.[13]

For example, using the land lease default value of $2,667 per turbine from JEDI, a farmer with five turbines (indicative of a 5 MW wind farm) on his/her land has the potential to earn $13,335 a year in land lease payments. However, a farmer who invests in the same size farm (5 MW) can expect to receive $72,000 per year in equity payments (averaged annual interest)

[13] GAO, 2004, p. 38.

during the life of the project—over five times the annual projected income for land lease payments.[14]

Two ownership alternatives of particular promise for Oregon investors are the multiple-owner and Minnesota Flip options,[15] both of which allow investors (local or non-local) to take full advantage of tax incentives available only under specific circumstances.[16] The multiple-owner option generally involves two or more local investors who combine their resources to form a limited liability company (LLC) that, in turn, sells generated energy to local utility companies.[17]

The Minnesota flip option utilizes outside investors who have majority ownership for the first 10 years, at which point ownership "flips" back to local ownership. This approach benefits both local investors who often find it difficult to come up with funds necessary for capital-intensive startup, as well as outside investors who can reap the benefits of a project's tax incentives.

Regardless of whether projects are owned by a single farmer, multiple investors, or a community (e.g., school districts, county governments), rural counties have the potential to gain from local ownership. Revenue from non-locally owned wind farms tends to "escape" the local economy. However, resident investors are more likely to finance projects through local lenders and utilize suppliers in their communities. Additionally wind energy revenues are often spent in local businesses, all resulting in less leakage out of the local economy.

Table 10 shows the impacts generated from a non-locally owned 5 MW wind farm during the operations phase. The construction phase has not been included in this portion of our comparative analysis, as the differences in impacts between non-local and local ownership occur primarily during the operations phase.[18] Inputs are derived using the JEDI model and include land lease payments distributed in terms of personal consumption expenditures.

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[14] Based on NREL's JEDI Model, which utilizes a default 16 percent rate of return (average annual interest rate) during a 10-year repayment period. Figures are based on initial 20 percent equity investment and reflect 2005 dollars.
[15] Bolinger, et. al, 2004.
[16] Particularly Production Tax Credits, which cannot be used to offset passive income (see GAO, 2004).
[17] Bolinger et al, 2004, p. 69.
[18] Grover, 2005, p. 23.

Table 10. Impacts of 5 MW Non-Local Wind Energy Project: Operations Phase.*

Impacts**	Direct	Indirect	Induced	Total
5 MW Non-Locally owned project—*Operations Phase*				
Output	$85,725	$11,094	$20,897	$117,716
Jobs	0.8	0.1	0.3	1.2
Earnings	$26,254	$4,921	$9,307	$40,482

*Source: Edited 2002 IMPLAN Model
**2005 Dollars

Table 11 represents a locally owned 5 MW wind farm (operations phase). In this scenario, direct impacts reflect revenue from wind energy sales, which have been calculated (5 MW x 33 percent rated capacity x 8,760 hrs/year x $34.60 MW base rate) and run through the local utility sector.

Table 11. Impacts of 5 MW Local Wind Energy Project: Operations Phase.*

Impacts**	Direct	Indirect	Induced	Total
5 MW Locally Owned Project—*Operations Phase*				
Output	$500,108	$59,034	$56,212	$615,354
Jobs	1	0.7	0.7	2.5
Earnings	$100,566	$24,117	$19,010	$143,692

*Source: Edited 2002 IMPLAN Model
**2005 dollars

Comparing the data in Tables 10 and 11 indicates that local ownership has the potential to increase earnings or income received within Umatilla County by a factor of 3.5 beyond non-locally owned wind farms.

It is important to note that all ownership options involve consideration of several factors, including but not limited to wind data permits, financing, and tax incentives, and as such, feasibility studies should be performed for any venture as more specific data is available.

Conclusion

Wind energy development projects can be multimillion-dollar contributors to both regional and statewide economies. The extent of the contribution depends on the capacity of local economies to invest in the projects as well as provide the necessary services and components to construct, operate, and maintain wind-farm equipment. Additionally, local leaders can ensure that tax benefits are maximized, particularly when the site is leased to an out-of-county owner and tax costs are incorporated within the lease payments as a net addition to the lease.

While regional economies have less "dense" industrial structures than larger economies, input-output modeling and analysis can be used to suggest ways to increase the extent to which regional economies can benefit from wind power development.

As many rural economies in Oregon have restructured from wood products manufacturing, food processing, and the need to be self-sufficient due to their isolated locations, local design, machining, and transport capabilities have not been as critical. Additionally, design firms, machine shops, and trucking companies have become more technologically intensive and efficient, requiring large-scale production to support the highly trained people and sophisticated machinery necessary for these businesses. Because many rural counties have not been able to maintain the required demand that warrants such large-scale production, these businesses have been forced to close. As a result, wind-farm investors must purchase these professional, manufacturing, and transportation services outside the county where turbines are located.

The Optimized IMPLAN model gives some approximation of the economic potential that wind energy holds for rural areas like Umatilla County if those design, machining, and trucking businesses could be re-established or, in some cases, expanded. When sectoral comparisons of economic impact projections are made between the Edited IMPLAN and Optimized IMPLAN models, an initial list of specific opportunities for economic development initiatives can be considered (see Table A1).

Rural communities have different capacities to develop the necessary levels of business activity to sustain the design, project management, machining, and shipping businesses required to fully realize the benefits projected with the Optimized IMPLAN model. In Umatilla County, the presence of a woolen mill, mobile-home factories, a prison, a strong farm and agricultural processing sector, and a community college may provide a major portion of the necessary demand and training, with only a modest public investment in the form of grants or loans, to encourage the businesses that could take advantage of the potential provided by the growth of the wind industry.

Along with expenditures necessary to construct and maintain wind turbines, as well as lease payments to land owners, tax impacts are a major and persistent economic impact of wind power development in Umatilla County. The default values employed in the JEDI model, as well as the Edited IMPLAN model for Umatilla County, are both conservative. Tax impacts are often difficult to evaluate; if taxes paid by businesses and citizens had not been spent on government services, the revenue could have been used for alternate purposes in the local economy. Weighing the economic impacts of the private versus public uses can be very challenging. That is not the case when wind turbines are owned by out-of-region (and often out-of-state) entities that would not have spent the funds locally if they had not been paid as taxes to government. So any net increase in tax revenues is a net benefit to the region.

While tax revenues and lease payments provide predictable benefits for households and county economies, local ownership is a concept that is gaining strength in many communities. As demonstrated in this analysis, carefully planned projects can yield both increased income for local investors and significantly higher impacts for local economies. An obstacle for local ownership lies in both startup costs and assessing the feasibility of wind investment; learning about wind data, permitting processes, tax incentives, and financing options can be daunting to the local investor. However, resources for potential investors are becoming more and more available as local ownership proves successful in communities across the United States.[19]

Wind energy development in Umatilla County has the potential to grow to an industry of modest depth ($40 million) within the local economy. It also provides an extensive breadth of impacts, with effects extending in some way to more than 90 percent of the industrial sectors within the regional economy. With a collaborative effort by the public and private sectors, the economic effects of wind power development could be greatly enhanced. The jobs that could potentially be created would provide much-needed relief for rural communities that have been disrupted severely in economic terms for 25 years (Figure 6).

This study also finds that accurately estimating the potential for regional economic development associated with wind farming is less contingent on the “type” of model used than the specificity of the data employed by the analyst. This is especially true when comparing the JEDI and IMPLAN models. As the JEDI model is based on IMPLAN-derived multipliers,

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[19] GAO, 2004, p. 41.

personal consumption expenditures, and regional purchase coefficients, we can expect similar output results (given that direct impacts are consistent across models).

On the other hand, as indicated by the major differences between county and state model results in our study, potential investors and government agencies will likely find it worth their time and resources to get the most precise economic data available for their region. Due to their proprietary nature, however, local-level multipliers, personal consumption expenditures, and regional purchase coefficients can be difficult to locate (and afford) for the everyday user. Furthermore, the slightly modified industry aggregation scheme utilized by the JEDI model could make compilation of multipliers problematic for those not familiar with economic databases or analysis. For this purpose, the "out-of-the-box" statewide JEDI model can provide the necessary information to evaluate the need for further research (and more specific data) relevant to potential investment opportunities.

For those who have access to region-specific data as well as some working knowledge of a region's capacity for business development, suggesting a range of impacts from wind power development, along with the assumptions for each level of impact, is useful to inform policy and accurately communicate the uncertainty inherent in any economic development initiative—particularly a new industry. Similar to the optimization analysis performed above, both the IMPLAN and JEDI models can be employed to provide a continuum of impacts associated with wind investment. The JEDI model can be modified (through the user add-in function) to employ county multipliers and regional purchase coefficients, providing the low end of the economic impact range; while the regional user-add in function, or even the "out-of-the-box" statewide JEDI model could provide an initial top-end estimate. Similarly, IMPLAN can provide the same type of evaluation through use of comparative study areas or modified regional purchase coefficients.

If the region under study is interested in taking action to maximize the economic impacts of non-local wind power development, developing comparative models could prove to be advantageous.

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Appendix

Table A1. Sectoral Comparisons of Edited and Optimized IMPLAN Models.*

	50 MW Project Construction**					
	OUTPUT		EMPLOYMENT		EARNINGS	
	IMPLAN	Optimized IMPLAN	IMPLAN	Optimized IMPLAN	IMPLAN	Optimized IMPLAN
Agriculture	$41,131	$49,801	0.63	0.76	$8,405	$10,177
Mining	$156	$170	0.00	0.00	$55	$60
Construction	$3,991,140	$3,994,373	28.67	28.69	$1,432,647	$1,433,807
Manufacturing	***$91,713***	***$316,199***	***0.45***	***1.55***	***$15,202***	***$52,411***
Fabricated Metals	$2,390	$2,449	0.03	0.03	$568	$582
Industrial Machinery	$19,048	$19,831	0.13	0.13	$4,328	$4,506
Electrical Equipment	$4,429	$4,577	0.02	0.03	$949	$980
TCPU	$2,059,780	$2,080,445	13.07	13.20	$504,308	$509,367
Wholesale Trade	$155,606	$164,390	1.90	2.01	$64,125	$67,745
Retail Trade	$486,710	$497,023	10.04	10.25	$223,556	$228,294
FIRE	$476,152	$493,085	2.45	2.54	$76,160	$78,868
Misc. Services	$695,718	$724,646	12.86	13.39	$313,871	$326,922
Professional Services	***$115,582***	***$140,855***	***2.75***	***3.35***	***$72,359***	***$88,180***
Government	$214,858	$218,409	3.88	3.94	$175,856	$178,762

	50 MW Project Operations/Maintenance**					
	OUTPUT		EMPLOYMENT		EARNINGS	
	IMPLAN	Optimized IMPLAN	IMPLAN	Optimized IMPLAN	IMPLAN	Optimized IMPLAN
Agriculture	$7,073	$10,364	0.11	0.16	$1,445	$2,118
Mining	$8	$21	0.00	0.00	$3	$7
Construction	$12,427	$14,180	0.09	0.10	$4,461	$5,090
Manufacturing	***$12,538***	***$86,124***	***0.06***	***0.42***	***$2,078***	***$14,275***
Fabricated Metals	***$122***	***$3,536***	***0.00***	***0.04***	***$29***	***$841***
Industrial Machinery	$1,067	$1,797	0.01	0.01	$242	$408
Electrical Equipment	***$515***	***$5,262***	***0.00***	***0.03***	***$110***	***$1,127***
TCPU	$106,319	$115,458	0.67	0.73	$26,031	$28,268
Wholesale Trade	$20,822	$33,087	0.25	0.40	$8,581	$13,635
Retail Trade	$158,837	$164,021	3.28	3.38	$72,957	$75,338
FIRE	$113,360	$135,262	0.58	0.70	$18,132	$21,635
Misc. Services	$304,053	$330,033	5.62	6.10	$137,173	$148,894
Professional Services	***$7,333***	***$11,782***	***0.17***	***0.28***	***$4,591***	***$7,376***
Government	$151,303	$153,092	2.73	2.76	$123,838	$125,302

*Data Source: 2000 Umatilla County Edited IMPLAN models

**2005 dollars