Assessing the Economic Development Impacts of Wind Power

FINAL REPORT

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Prepared for

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Executive Summary

Introduction

Interest in wind power development as a means of expanding local economies is growing. It holds promise for providing a new source of short-term employment during construction of the facility and long-term employment from operating and maintaining the facility. It may add to the supply of electric power in the area and support some expansion of the local economy through the ripple effect of initial increases in jobs and income.

Despite a growing body of information about the local impacts — both positive and negative — of wind power, the economic impacts of existing wind power developments have not been analyzed in a consistent manner. This study uses three case studies to estimate the effects of wind power development on local economies. Both the effects of the construction and the annual operation and maintenance were studied.

Objectives

While there is a growing body of information about the local impacts of wind power, the economic impacts from existing wind power developments have not yet been documented and analyzed thoroughly and consistently. The primary objective of this study is to provide examples of thorough and consistent analysis and documentation of economic impacts from wind power development. The methodology employed is illustrated through case studies for three existing wind power projects. Specific results presented apply to the respective locales studied and are not meant to be representative of wind power development in general. However, where possible, insights and generalizations suggested by the case study results are offered.

Case Studies

The three case study areas are Lincoln County, Minnesota, Morrow and Umatilla counties, Oregon, and Culberson County, Texas. In Lincoln County, the project studied was Lake Benton I, placed in operation in 1998 with 107 MW. In Morrow and Umatilla counties, the project was Vansycle Ridge, placed in operation in 1998 with 25 MW. For Culberson County, the project was Delaware Mountain, placed in operation in 1999 with 30 MW.

To understand how an economy is affected by some external change, we develop a snapshot of the economy at a particular point in time. This snapshot shows us that some parts or "sectors" in the economy are linked to each other. Purchases made from outside the local economy are called "imports." Money spent on imports is said to be a "leakage" from the local economy. Businesses typically do not sell all of their production to businesses in the local area, but sell some or all of their production to businesses outside the local area. Products sold outside the local area are "exports," and money received for exports generally increases the size of the local economy through a multiplier effect.

The extent to which exports are able to expand the local economy is greatly dependent on how much of the money received *remains* in the local economy. As money is received for exports, the local supplier then spends that money. To the extent that there are plenty of other local businesses on which this local supplier can depend, less of this money leaves the local economy to buy imports. If there are few local businesses from which needed purchases can be made, much of the money will leave the local economy.

The household sector is linked to all economic sectors as it provides the labor and management needed by all sectors. Changes that affect the incomes of the household sector typically have significant impacts on a local economy compared to a change in the sales of other sectors. We use an economic model, called IMPLAN (see Technical Appendix for a detailed discussion), to develop this picture of a local economy. This picture shows us the sectors that exist in a local area at a particular point in time, the links between them, and the level of economic activity that occurred at that time.

Lake Benton I, Lincoln County, Minnesota

Lincoln County is located in southwest Minnesota, bordered on the west by South Dakota. Agriculture is the main economic base of the county. Dairy, beef, and hogs are the most common livestock enterprises. Commonly grown crops are corn, alfalfa, soybeans, and small grains.

The population in Lincoln County has declined in recent years, dropping nearly seven percent between 1990 and 2000. The farm and agricultural services sectors provide nearly

28 percent of the total jobs in the county. While unemployment is low (3.5 percent in 2001), per capita incomes were about 65 percent of the state average and 12 percent of county residents lived below the poverty level.

Lake Benton I is the second wind power development in Lincoln County, the first being Buffalo Ridge (25 MW), just southeast of the town of Lake Benton. Lake Benton I consists of an array of 143 Zond 750 kW turbines located in several northwesterly strings from Lake Benton. Enron Wind brought the facility into production in August 1998, and the power is sold to Xcel Energy.

This study found that a total of about eight jobs and over $98 thousand in personal income in the Lincoln County economy were supported by the construction phase of the project. While this study focused on Lincoln County impacts, additional jobs were also supported in neighboring counties. A total of about 31 jobs and over $909 thousand in personal income in the Lincoln County economy are supported annually by the operation and maintenance phase of the project.

The Lake Benton I wind power development resulted in the payment of $71,800 in total county property taxes in 1999, $611,200 in 2000, and $621,000 in 2001. Assuming that the project caused zero or only minor increases in government and school budgets, these tax payments have decreased the tax burden of other local taxpayers, as they pay less taxes than they otherwise would. This has a direct effect on household income, which is equal to the taxes paid by the project owner.

The Lake Benton I wind development includes lands that have been leased, as well as permanent easement purchases. Landowners receive a total net (after-tax) annual revenue of $501,125, which is a direct effect on household income.

Vansycle Ridge, Morrow and Umatilla Counties, Oregon

Morrow and Umatilla counties are located in northeast Oregon, bordered by the Columbia River to the north and the Blue Mountains to the south. These counties have the most diversified economic base of the study areas, and a very strong agricultural base. There has been rapid expansion in the last decade with a number of new businesses locating in the area.

The population of these counties has been growing, increasing almost 20 percent between 1990 and 2000. While the agricultural base has remained strong, other sectors of the economy have been expanding, particularly the trade and services sectors. The area formerly had a well developed forest industries base, but this has declined as timber harvest levels have dropped, and unemployment rates have been high in recent years.

The Vansycle Ridge wind power development is the first of two wind power developments located in Umatilla County. It consists of 38 Vestas 660 kW turbines in an array of two strings. Production started in November 1998. The project is owned by FPL Energy, which sells the project's power to Portland General Electric.

Employment and income impacts during the construction phase were small, with construction activities supporting a total of about four jobs and over $105 thousand in personal income. About six jobs and over $103 thousand in personal income are supported annually by the operation and maintenance phase of the project. Total taxes paid to local government in 1999 were over $243 thousand. In Umatilla County, total annual net (after tax) revenue to landowners was estimated at $64,300.

Delaware Mountain, Culberson County, Texas

Culberson County is located in the Upper Rio Grande region of west Texas. The Guadalupe Mountains National Park, a major tourist attraction, is located in Culberson County. The county seat, Van Horn, accommodates many travelers due to its location on Interstate 10 about midway between El Paso and Midland-Odessa. Historically, minerals and oil production have been important to the local economy, while ranching and farming have also made significant contributions. The county population declined almost nine percent between 1990 and 2000, with employment declining at about the same rate during the same period. County unemployment rates are high, per capita income is about 55 percent of the state average, and about one-third of the population is estimated to live below the poverty level.

Delaware Mountain Wind Farm is located on private ranchland northeast of Van Horn. It is located on the same site of Kenetech's West Texas Wind Farm Power Project started in 1994. It utilizes 40 Zond 750 kW turbines for a capacity rating of 30 MW, and produces approximately 100 million kWh of electricity annually. The electricity is sold to the Lower Colorado River Authority and Reliant Energy.

Employment and income impacts during the construction phase were significant, with construction activities supporting a total of about 26 jobs and over $391 thousand in personal income. Much of the labor was provided by non-resident workers who temporarily lived in the area and made purchases from local lodging, eating, drinking, and retail establishments. Consequently, expenditures by non-resident workers were larger than in the other three case studies. More labor was also provided by county residents than in the other case studies; consequently, residents received greater household income. It is estimated that a total of about 11 jobs and over $346 thousand in personal income in the Culberson County economy were supported annually by the operation and maintenance phase of the project. Taxes paid to local government and other entities were over $387 thousand in 2000. Estimated average royalty payments to landowners, resulting in total annual net (after tax) revenue to landowners, was $51,000.

Summary and Conclusions

Tables ES-1, ES-2 and ES-3 summarize the impacts of wind power development on employment, income, and taxes for the three case study areas, during the initial construction phase, and the operation and maintenance phase.

Table ES-1
Summary of Employment and Income Impacts from Construction Phase

Case Study Area	Employment *(# of jobs)*	Personal Income *($1,000s)*
Lincoln County, Minnesota	8	$98.4
Morrow and Umatilla Counties, Oregon	4	$105.4
Culberson County, Texas	26	$391.3

Table ES-2
Summary of Annual Employment and Income Impacts from Operation and Maintenance Phase

Case Study Area	Employment *(# of jobs)*	Personal Income *($1,000s)*
Lincoln County, Minnesota	31	$909.2
Morrow and Umatilla Counties, Oregon	6	$103.6
Culberson County, Texas	11	$346.1

Table ES-3
Summary of Tax Effects in 2000 and Annual Landowner Revenues

Case Study Area	Tax Effects *($1,000s)*	Personal Income *($1,000s)*
Lincoln County, Minnesota	$611	$501
Morrow and Umatilla Counties, Oregon	$242	$64
Culberson County, Texas	$387	$51

Based upon our analysis of the three case study areas, we can draw the following conclusions about the economic impacts of wind power development in local areas:

- In each of the case study areas, wind power development provided a modest to moderate source of new economic activity and new family wage jobs. The impacts are likely to vary greatly from place to place and project to project.

- The leasing of land has an important economic effect on local areas, provided the income from leasing goes to local residents and adds to local household incomes. While there were differences between the study areas in the mix of annual leases and permanent easements and the size and type of payment, the annual revenue received by households in all of the areas was a significant source of household income and had a significant total effect on the local economies. In all cases, the cost of foregone opportunities from

farming and livestock grazing was small compared to the revenues obtained from leases for wind power.

- Tax effects, particularly property taxes that support local entities, were important in all cases. If the entities' budgets do not increase as a result of a project, the assessed value of the tax base increases, and there is a redistribution of the local tax burden from residents to outside owners. This, in effect, shows up as an increase in household income, which can directly affect the local economy. If the entities increase their budgets, the additional revenues could be spent on improving local services and infrastructure, such as building new schools and roads.

- The counties represented in the case studies had comparatively few economic sectors. Consequently, sector multipliers are comparatively low and leakages of direct expenditures are comparatively high. Because the counties included in the study did not manufacture any of the equipment (towers and turbines) which represents the bulk of the construction costs, these were imported and the impacts occurred elsewhere. If more of the inputs were manufactured locally, local economic impacts would have been greater.

- A major difference among the case study areas was the current rate of economic expansion. Two of the areas, Lincoln County and Culberson County, have both experienced population declines in the last decade, while the populations of Morrow and Umatilla counties have expanded in the past decade. While wind power development was important to the economies of all case study areas, it was relatively more important to the counties in decline.

- The return on capital could be an important component of local annual income. In the three case studies, little or none of this income was received by local residents. Local ownership, where feasible, would retain more of this income in the local area and increase the size of the impact. No data was collected on sources of capital for this study, but little apparently came from the local area.

In recent years, there has been considerable interest in a value-added approach to economic development in rural areas. This generally involves adding additional processing to an existing output or resource, which results in a more valuable product being exported from the area. Wind power development fits this approach by adding value to an existing resource. In this way, it can be a valuable means for adding to the economy.

Introduction

Case Study Methodology

Interest in wind power development as a means of expanding local economies is growing. It holds promise for providing a new source of short-term employment during construction of the facility and long-term employment from operating and maintaining the facility. Further, it may add to the supply of electric power in the area and support some expansion of the economy. Residents of rural counties understand that new jobs can have an additional ripple effect, multiplying the initial increase in jobs by the round by round spending of the income from the new jobs.

While there is a growing body of information about the local impacts of wind power, the economic impacts from existing wind power developments have not yet been documented and analyzed thoroughly and consistently. The primary objective of this study is to provide examples of thorough and consistent analysis and documentation of economic impacts from wind power development. The methodology employed is illustrated through case studies for three existing wind power projects. Specific results presented apply to the respective locales studied and are not meant to be representative of wind power development in general. However, where possible, insights and generalizations suggested by the case study results are offered.

It has been said that wind power can be viewed as a new "cash crop" for rural areas where favorable sites may be located. While electricity represents a significant part of the production process of some industries, the customers of electricity producers are virtually all local businesses, government agencies, and households, and all may benefit from increases in supply. Electricity producers purchase inputs from much fewer local businesses to construct their plants and to operate and maintain them. Those that supply inputs for the construction, operation, and maintenance of wind power projects are of specific interest in this study. Expenditures on these inputs have an effect on local economies. The nature and extent of

these effects is of interest to local planners and elected officials, economic development professionals, policy analysts, and others. A second objective of this study is to provide these interested parties with information about the local and regional economic impacts of the construction and operation and maintenance of existing wind power projects.

The case studies included in this report cover the development and operation of projects that are already constructed and operating. No complete historical records of economic activity were available for any of the projects, thus heavy reliance was placed on interviews with local contacts and their recollection of events. Some responses were limited by considerations of confidentiality. These issues of accurately recalling past events and concerns for confidentiality likely resulted in some understatement of actual impacts.

Intended Audience

It is expected that this report will be of interest to a broad audience, reflecting the variety of interests, many of which are represented in the membership of the National Wind Coordinating Committee. The purpose of the report is to improve the understanding of those having a stake in wind power development. Those stakeholders where the development is taking place are particularly interested in understanding the nature of the impacts of development on the local economy. Those particularly interested are landowners, local government officials, economic development practitioners, and other local interest groups. To this end, the report presents information in a non-technical manner. Those interested in more technical aspects are referred to the Technical Appendix.

Organization of Report

The report begins with a discussion of how the study was conducted, beginning with concepts of how dollars flow through an economy and tracing out how dollars enter the local economy during the construction and operation phases of wind power development. This is followed by a discussion of the kinds of effects one might find associated with a wind power development in an economy. The report then focuses on the three individual case studies, first describing for each what the local economy is like and then discussing the effects of a specific wind power project for that case. The report concludes by comparing and contrasting similarities and differences between the individual cases and draws implications for local economies.

How the Study Was Conducted

Economic Links in Rural Economies

To understand how an economy is affected by some external change, we develop a snapshot of the economy at a particular point in time. This snapshot shows us that some parts or "sectors" in the economy are linked to each other. In the Pacific Northwest, using the forest industries as an example, the sawmill industry buys logs from the logging industry, which buys trees from the forest owners, who in turn then buy seedlings from the nursery industry and forest services sector to reforest their lands. These are referred to as backward linkages. If there were further processing beyond the sawmill industry, such as making lumber into doors and windows, this is called a forward linkage. Typically, most economic sectors also need to make purchases of goods and materials from outside of the local economy. Purchases made from outside the local economy are called "imports." Money spent on imports is said to be a "leakage" from the local economy.

Likewise, businesses typically do not sell all of their production to businesses in the local area, but sell some or all of their production to businesses outside the local area. Products sold outside the local area are "exports," and money received for exports brings "new" money into the area and increases the size of the local economy through a multiplier effect.

The extent to which exports are able to expand the local economy is greatly dependent on how much of the money received from exports *remains* in the local economy. As money is received for exports, the local supplier then spends that money. To the extent that there are plenty of other local businesses on which this local supplier depends, less of this money leaves the local economy to buy imports. If there are few local businesses from which needed purchases can be made, much of the money will leave the local economy.

As other local businesses receive a portion of the money from the first supplier, they too can spend the money either within or outside the local economy. The more money spent within

the local economy, the larger the local impact from the initial money received for the export. This round by round pattern of spending associated with export production is called the multiplier effect. The size of this multiplier effect depends on how local businesses are linked together and how much leakage there is to outside areas for imports. If the economy has numerous sectors that are linked, multipliers will be higher than if there are few linkages between sectors.

The household sector is linked to all sectors as it provides the labor and management needed by all sectors. Changes that affect the incomes of the household sector typically have more significant impacts on a local economy compared to a change in the sales of other sectors. This does not mean that the effect on an individual sector, such as retail trade, will be insignificant as it will also indirectly affect the household sector.

We use an economic model, called IMPLAN (see Technical Appendix for a detailed discussion), to develop this picture of a local economy. This picture shows us the sectors that exist in a local area at a particular point in time, the links between them, and the level of economic activity that occurred at that time.

The methodology used for this study closely parallels the methodology used for economic analysis in the preparation of National Environmental Policy Act (NEPA) environmental impact statements. The NEPA methodology is basically an issue driven methodology, addressing issues raised in the scoping process. Experience gained in applying this methodology provided guidance as to the general nature of the impact categories that can be expected to emerge through the scoping process. Typically, the economic issues focus on effects on employment, income, taxes, and provision of community services, very similar to the impacts analyzed in this study.

The scoping process involves outreach efforts to stakeholders, including public meetings and interviews, that are intended to surface important concerns that need to be addressed in the environmental impact statement. While it is predictable that certain economic issues are highly likely to emerge from the scoping process, it is also quite common for additional economic issues to be raised, particularly those specifically of a local nature.

The scoping process was not a part of the methodology of this study. Limited resources precluded holding public meetings or local on-site interviewing. Several local economic issues surfaced in the review process that had not been identified initially. It is likely that these issues would have been identified and addressed if some form of scoping were conducted in each case study area. Including this methodological step in future case studies would be useful in identifying specific local economic issues.

Other limitations of the methodology include:

- Much of the data on direct expenditures was proprietary and had to be estimated;
- The study did not quantify spillover effects on neighboring counties or impacts at the state level; and
- The study did not consider the impacts of subsequent wind developments in the case study areas.

Care should be used in extrapolating data from these areas to other areas. Significant differences in local economic conditions and the amount of goods and services that are purchased locally vs. imported can limit the applicability of these results to areas that are materially different.

Identifying Construction Needs

To measure the effect that the construction of a wind power project has on a local economy, we need to identify the mix of things (inputs) that are necessary to construct a wind power project, and we need to do so in a way that allows us to relate this information to the picture we have of the economy. This mix of things is like a recipe, with the ingredients measured in dollars: so many dollars for turbines, so many dollars for towers, so many dollars for wiring, so many dollars for various labor and management skills, etc. Ideally this list of inputs would be made up from what actually was used in constructing the project. Second best is to develop the list from a variety of sources that can be assumed to approximate what was actually used in the project. As there was no list of local inputs available for the three projects included in this study, data on the inputs from local sources was developed by contacting sources in the local areas.

Not all of the items on the list are of equal importance for measuring impacts on a local area. For example, turbines made in Europe and towers made in Louisiana will not affect a local economy (outside of Europe or Louisiana, of course), as they are imported. Those things on the list that are purchased from local sources have the most effect on the local economy, and are therefore the most important for measuring local impacts. To help identify what these may be we use the picture of the local economy to determine which businesses can be local sources.

About 80 percent of construction costs are estimated to be for the equipment (rotor assembly, tower, generator, etc.) and its installation (U.S. Department of Energy and Electric Power Research Institute). All of these equipment items and the specialized skills needed for their

installation are typically imported from outside rural areas such as those included as case studies here. The remaining 20 percent, referred to as "Balance of Station," is for the preparation of the site for installing the equipment. This involves the construction of roads, foundations for the towers, operations buildings, etc. These activities provide the greatest opportunities for local inputs and local impacts.

Our search for information focused on these activities. No records or other documents of what expenses were actually incurred during construction were available for any of the study areas. Local officials and potential suppliers of inputs were contacted to obtain estimates of what they knew about the nature and amounts of local inputs that were used in each study area, how many workers from the study area were employed, and how many workers from outside the study area resided in the study area during construction, and where and on what these workers spent money locally. Since this approach relied upon recall of events some time after they occurred, some items were no doubt overlooked, and impacts are understated to the degree this occurred in each study area.

Using the picture of the local economy and the list of ingredients that come from local sources, we get a picture of those ingredients that have a direct effect on the local economy. A direct effect is the first round of buying and selling. In these case studies, this was the purchase of some local inputs, such as fuel, the spending of income earned by workers, annual landowner revenues, and the income effects of tax changes. We use these direct effects to identify additional rounds of buying and selling for other sectors and to identify the effect on rounds of spending by local households. The information about how the total output of the economy is affected by the round by round multiplier effect of the construction provides us with the basis for estimating the total effect of the construction on employment and income.

Identifying Operation and Maintenance Needs

A similar procedure is followed to estimate the effect of annual operation and maintenance activities on the local economy. In this case, we develop a "recipe" for the inputs needed annually after the project is in operation. A high proportion of operation and maintenance needs are labor and management inputs. As more wind turbines are installed in an area, more of the labor and management for operation and maintenance are permanently located in the local area and less is imported from outside the area. Local officials were contacted to obtain estimates of labor and management residing in the impact area and other inputs purchased locally. The inputs from local sources have a direct effect on the economy. They are used to estimate the round by round multiplier effects and the effects on jobs and income as described above.

Another major input into operation and maintenance is the return on the initial capital investment. This was considered an import for the three case study areas because all of the projects were owned by outside interests and very little if any of the capital investment is owned by local residents. In other cases, where the capital is supplied from local investors, this return on investment may provide significant local impacts.

General Effects of Wind Power Development

Local Interest in Wind Power Development

Residents and administrators of rural counties are generally supportive of new businesses locating in their county that will provide family wage jobs locally. They want to provide attractive opportunities for their young people so that they do not have to move elsewhere and can remain in the community. They also are interested in the benefits new businesses may provide to existing businesses by expanding their local markets.

Wind power development may be attractive to rural counties for these reasons. In addition to providing family wage jobs and expanding markets for existing businesses, these developments may provide new rents and/or dividends to landowners who provide easements and leases to the developers. The developments may also add to the property tax base, which can result in a redistribution of the tax burden.

Landowner Revenues

Wind power developments can be a source of supplemental revenue for landowners in rural areas. Wind developers tend to lease land from landowners rather than purchase the land outright, although in some instances easements are purchased. The specific arrangements are discussed further in the case studies section. Each lease contract with each developer can be different and is usually negotiated individually. However, there are some generalities that can be made about these lease contracts.

Each megawatt (MW) of turbine capacity generally requires 25 to 50 acres, and the landowner usually loses the use of about two to four percent of these acres, including access roads. Payments to landowners are often a percentage of the gross revenues of the wind

project, usually between one and three percent. A typical annual royalty payment to landowners ranges from $1,500 to $2,000 per turbine (approximately $40 to $50 per acre), with the landowner still able to farm or allow grazing on all areas surrounding the turbines. In addition, there is sometimes an upfront payment of $1,000 to $3,000 from the developer to the landowner for the assessment of the property for wind resource potential (Brown and Woelfel 2000). Landowners who sell easements for wind power projects typically receive a one-time, upfront payment.

Job Creation

We are interested in the creation of new jobs because new jobs increase business and household income, which in turn creates more jobs which further increase business and household income, and so on. A problem faced by some rural counties is that this process is in reverse, with jobs leaving and the economy contracting. To stem or reverse this process in counties where it is occurring, ways must be found to bring in new jobs or new income or both.

Some rural counties have tried to attract retirees to bolster their economies. Retirees have found some rural counties attractive as affordable places to live and have relocated to them, bringing with them their retirement incomes. We see this effect where transfer payments, such as pensions and social security, are becoming a growing source of personal income in these areas. Not all rural communities, however, can provide specialized services, such as health care, at sufficient levels to attract retirees.

Natural resources have played an important role in the economic life of rural areas in the past and it is not unusual for these areas to view these resources as a potential source of economic stability. For those areas with suitable wind resources and links to electric power transmission facilities, wind power may offer an opportunity to create some long-term jobs and long-term income from wind power leases and easements.

Tax Effects

Taxes are a redistribution of benefits from wind power production to the federal, state, and local government jurisdictions in which the wind power production and sales occur. Thus, determining the impact of taxes on a specific community depends entirely on the tax make-up of that jurisdiction. Some general concepts regarding taxation of wind power projects are outlined in the following paragraphs.

Generally, federal tax effects from wind power developments accrue from business income (franchise) and excise taxes, as well as employee social security and income taxes. In the Energy Policy Act of 1992, a 1.5¢ per kWh excise tax credit was enacted for wind power plants (Public Law 102-486, 102 Stat. 2776 at 3021-22 (1992)a). Thus, the case studies discussed in this report received the benefit of federal tax credits. In 2002, this law was extended to December 31, 2003, and it seems likely that further tax credits for wind power will be passed into law in the future.

State taxes related to wind power developments include franchise, sales, and income (business and personal) taxes. Some states also apply personal and real property taxes to businesses and utilities. Minnesota and Texas both have franchise and sales and use taxes. Oregon charges excise taxes, but does not have a state sales tax.

Counties generally charge real estate and/or personal property taxes. In most cases, taxes collected by the counties are distributed to various levels of local government and district services, such as city and town governments, water and sanitation districts, emergency response districts, and school districts, to pay for these services as well as other infrastructure.

Further, in addition to any taxes collected by counties on behalf of cities and towns, smaller localities are also often able to charge sales and income taxes. As the tax make-ups of each of the case study localities are divergent, they will be discussed below on a case-by-case basis.

This study focuses on local tax effects. There are both direct and indirect local tax effects from wind power projects. Direct taxes are collected locally from local taxpayers and remain in the local area to support local budgets for local entities. Indirect taxes are collected by entities outside of the local area, usually state government, to support state budgets for state and, in some cases, local entities. Some of the state funding returns to the local area as support for state agency activities and some may return as state support for local entities. For the purposes of this study, local direct effects include both real estate and personal property taxes, while indirect effects include sales and income taxes.

Real estate taxes are paid by landowners, and since the land that wind power projects stand on is generally leased, the landowners pay these taxes. Tax impacts depend on any changes in the assessed value of the land or the real estate tax rate.

Personal property tax payments for wind power projects are based on the installed capital cost of the wind plants. Personal property tax payments tend to be a greater source of tax revenues than other types of generation, per installed megawatt, because they require greater capital investment. Generally speaking, the tax payments on wind power plants may range between one and three percent, depending on the state and jurisdiction. However, there are some states, notably Texas and Minnesota, which provide some tax abatement to wind

developers over a specified period of time. In Texas, wind power plants are taxed at one-half the value of the installed capital cost, and in Minnesota, wind power plants are taxed at one-quarter the value of the installed capital cost (Brown and Woelfel 2000).

Income taxes may be impacted by the construction of wind power projects in two ways, the greatest impact coming from the increase in income of landowners leasing property to the project developers. The other potential impact is from income accrued from permanent local employment at the wind power project, which is usually small due to the relatively low level of employment generated by the projects.

The impact on sales tax is a potential indirect effect, stemming from two sources. The primary source of sales taxes is the construction and operation and maintenance crews' local purchases of equipment and supplies, including hardware and convenience items. The second source of sales taxes is the potential increase in local disposable income for both landowners and project employees, which could be used for local expenditures.

Determining how to actually tax wind power projects is a complex issue faced by all local taxing entities where these projects are developed. Each locality seems to go about this process in a different way. For example, in Lincoln County, Minnesota, the wind farms are treated as personal property, but classified as real property. In Culberson County, Texas, the wind farms are taxed as personal property, and in Umatilla County, Oregon, the wind farms are taxed as real property, but depreciated over time.

Economic Setting for Case Studies and Economic Effects on Case Study Economies

Lake Benton I (1998, 107 MW): The Economy of Lincoln County, Minnesota

Lincoln County is promoted by the local tourism groups both as the "Little Europe" of Minnesota, and the "Windpower Capital of the United States." The county is located in southwest Minnesota, bordered on the west by South Dakota. It comprises 537 square miles of land area, the smallest of the case study areas discussed in this report.

Agriculture forms the main economic base of the county. Dairy, beef, and hogs are the most common livestock enterprises, while commonly grown crops include corn, alfalfa, soybeans, and small grains.

Nearby regional population centers are Brookings, South Dakota, and Marshall, Minnesota, both about 30 miles from Lake Benton, and Sioux Falls, South Dakota, about 70 miles away.

Lake Benton I is the second wind power development in Lincoln County, the first being Buffalo Ridge, just southeast of the town of Lake Benton. Lake Benton I consists of an array of 143 Zond 750 kW turbines located in several northwesterly strings from Lake Benton. The total number of acres on which the project is located is 19,168 acres, however, the actual "footprint" of the turbine pads and access roads is about 70 acres. The project's total rating is 107 MW and it produces approximately 327 million kWh of electricity annually. Enron Wind brought the facility into production in August 1998, and the power is sold to Xcel Energy.

Industrial Base

An input-output model was developed for each of the case study regions using IMPLAN data and software, discussed in more detail in the Technical Appendix. The base data, which provides a "snapshot" of the local economy, are displayed in Table 1. Nearly $231 million in goods and services are produced within Lincoln County, with local industry supporting more than 3,600 jobs and earnings of nearly $93 million. Agriculture is a very important industry for Lincoln County, contributing $81 million, or over a third of total industry output for the county, as well as providing more than 960 jobs, or a quarter of the local workers. Employment in the services sector is also significant, with over 1,000 jobs, and total industry output of $42 million.

Table 1
Lincoln County IMPLAN Model Base Data

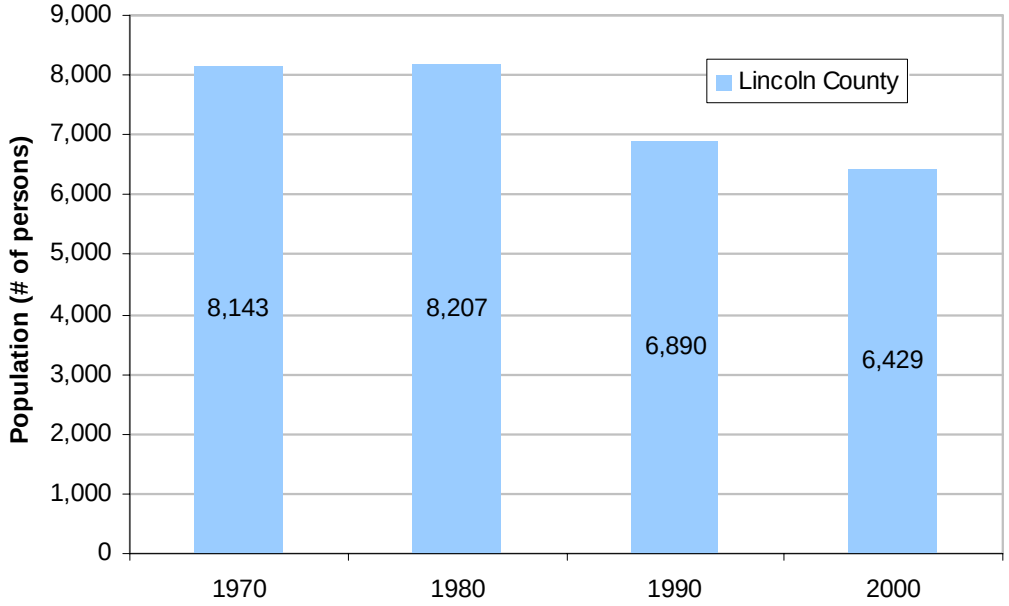
Industry	Output *($millions)*	Income *($millions)*	Employment *(# of jobs)*
Agriculture, Forestry, & Fishing	$81.015	$16.515	963
Mining	$0.000	$0.000	0
Construction	$29.941	$10.120	322
Manufacturing	$7.195	$1.985	65
Transportation, Communication, & Public Utilities	$23.178	$13.394	158
Trade (Retail & Wholesale)	$18.768	$10.749	614
Finance, Insurance, & Real Estate	$13.838	$8.942	120
Services	$42.001	$18.643	1,012
Government	$14.666	$12.017	382
Other	$0.163	$0.163	0
TOTAL	**$230.766**	**$92.629**	**3,636**

Source: 1998 IMPLAN data from Minnesota IMPLAN Group, Inc., with modifications by NEA.

Population

The population of Lincoln County has declined in recent years, as shown in Figure 1. The 2000 Census reported a population of 6,429, a drop of nearly seven percent since 1990, and 22 percent since 1980. The county is fairly sparsely populated, with a population density of 12.0 persons per square mile in 2000, as compared to 61.8 for the entire state of Minnesota. The majority of the population is white (99 percent), with the remainder divided between other races. Less than one percent of the population is of Hispanic or Latino origin. Lincoln County appears to be home for a large number of retirees, as the percentage of the population that is age 65 years or older is nearly 25 percent, as compared to only 12 percent for the state of Minnesota.

Figure 1
Lincoln County, Minnesota, 1970-2000 Population



Source: U.S. Census of Population and Housing, relevant years.

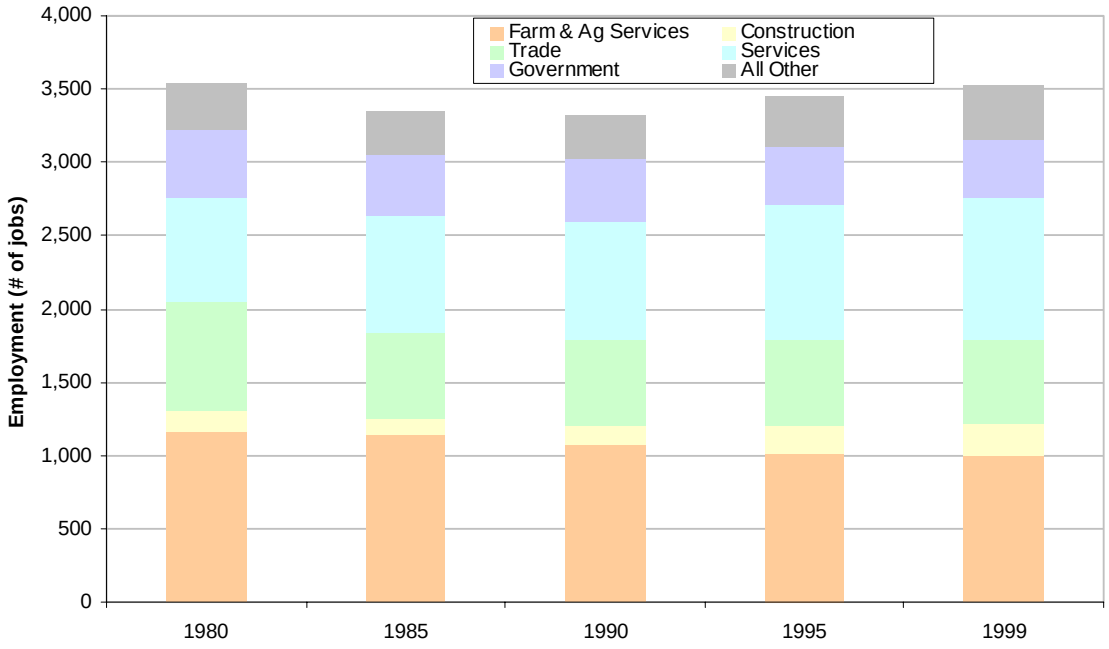
The county population is spread out among a number of towns and rural areas. Tyler is the largest city in Lincoln County, with 1,218 people, followed by Ivanhoe, the county seat, with 679 people. The 16 other townships and cities reported populations of less than 300 in the 2000 Census. Lake Benton, the township closest to the case study project, has a population of 244.

Employment

Recent employment trends for Lincoln County are shown in Figure 2. The farm and agricultural services sectors continue to dominate employment, with nearly 1,000 jobs in 1999, or 28 percent of the total jobs in the county. Other significant employers are services, with nearly 28 percent of the jobs, and trade, which includes both wholesale and retail, with 16 percent of the jobs. The distribution of jobs among the various sectors has remained fairly stable throughout the period shown, 1980 through 1999.

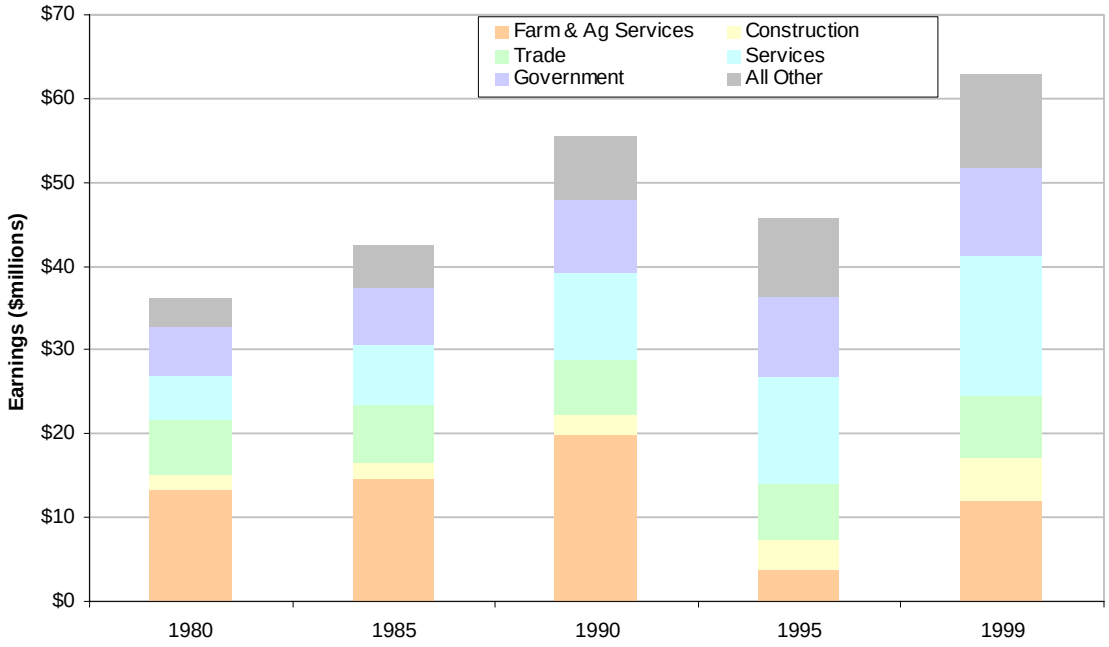
Recent trends in earnings by industry are shown in Figure 3, which shows that total earnings have increased over the time period. While farm and agricultural services sectors employ the largest number, earnings are lower, at only 19 percent of the county total in 1999. These earnings are also highly variable, due primarily to fluctuations in prices received by farmers, as can be seen with the extreme drop in 1995. The services sector maintains about 27 percent of the total earnings, while earnings within the trade sector were about 12 percent of total in 1999.

Figure 2
Lincoln County, Minnesota, 1980-1999
Full- and Part-Time Employment by Category



Source: Adapted from U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, *Regional Economic Information System 1969-99*, May 2001.

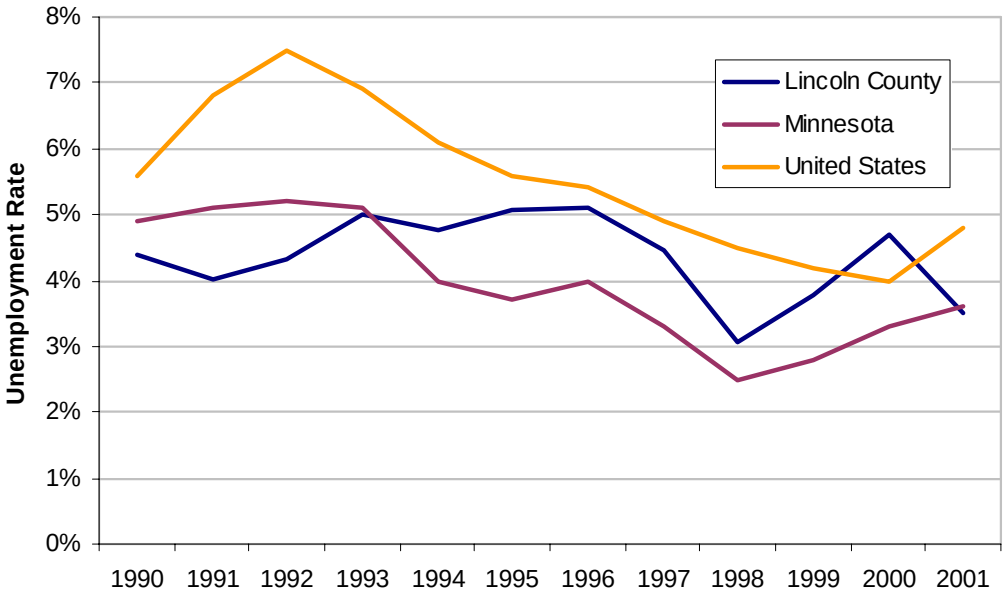
Figure 3
Lincoln County, Minnesota, 1980-1999
Earnings by Industry



Source: Adapted from U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, *Regional Economic Information System 1969-99*, May 2001.

Recent trends in unemployment rates for Lincoln County, Minnesota, and the United States are shown in Figure 4. In most recent years, Minnesota and Lincoln County have enjoyed lower unemployment rates than the rest of the nation. Most recently, in 2001, the unemployment rate for Lincoln County was 3.5 percent, down from a high of 5.1 percent in 1995 and 1996.

Figure 4
Annual Average Unemployment Rates, 1990-2001



Source: Minnesota Department of Economic Security, Research and Statistics Office.

Indicators of Economic Well-Being

Per capita income is often used to compare regions in order to evaluate the "well-being" of the residents. In 1999, Lincoln had a per capita income of $19,935, which is 65 percent of the average for Minnesota State, $30,742, and 70 percent of the national average of $28,546. In terms of per capita income, Lincoln ranked 81st of Minnesota's 87 counties in 1999.

Another measure often used to indicate economic well-being in a region is the percentage of people who are estimated to live below the poverty level. In 1997, the most recently available data, 12 percent of the residents of Lincoln County lived below the poverty level, compared to nine percent for the state of Minnesota. It is important to note that these data are based on national levels set for minimum income requirements for various different sizes of households. There is no correction for the variation in costs of living among areas. For example, if housing prices and food prices in a county were lower than national levels, then a family in that county with an income at the national poverty level might be better off than a family with the same income living elsewhere in the nation.

Tax Structure

Direct Effects

Minnesota law allows for the taxation of wind generation facilities as commercial real estate by counties. The market value of the facilities is determined by the state appraiser annually based on a list of property additions, deletions, and depreciation rates provided by the facility owners. As mentioned above, the law allows only 25 percent of the market value of large-scale (12 MW or more) wind generation plants' turbine tower property to be taxed, "including the foundation and support pad, the associated supporting and protective structures, and the turbines, blades, transformers, and its related equipment" (Minnesota Statutes 2001). Starting in 2002, the generation units (turbines and generators), will be exempt from the school portion of the real estate tax (Nielsen 2002). Total commercial real estate taxes in Minnesota are determined by multiplying the market value of the property, up to $150,000, by one tax rate, and then adding this to the product of a second, higher tax rate multiplied by the value of the property above $150,000.

Indirect Effects

In the State of Minnesota, both franchise taxes and sales taxes are applied to businesses and utilities. Lincoln County receives the benefits of these taxes indirectly via state services and transfer payments. However, as less than 10 of the more than 3,500 jobs in Lincoln County are in state government, it appears that state government services have a limited direct impact on Lincoln County (U.S. Department of Commerce 2001).

Community Services

In Lincoln County, the Lincoln County Sheriff's Department and municipal police departments provide police service in the project area. Fire protection services are provided locally in Lincoln County by volunteer fire fighters (Minnesota Department of Trade and Economic Development). Emergency Medical Services are also provided in the local communities; however, there are some county-wide services.

Lincoln County communities have local grade and junior high schools. Lake Benton and Ivanhoe have senior high schools. Nearby post-secondary schools include Minnesota West Community and Technical College - Pipestone, Minnesota West Community and Technical College – Worthington, Minnesota West Community and Technical College – Canby, Southwest State University in Marshall, South Dakota State University in Brookings, and Augustana College in Sioux Falls (Minnesota Department of Trade and Economic Development).

There are several parks and recreation facilities in Lincoln County. Lakeshore Park has a campground with facilities, swimming, fishing, two local bed and breakfasts, and a nine-hole golf course. Lions Park has a pool. Hole-in-the-Mountain County Park, Norwegian Creek County Park, and Picnic Point each have campgrounds.

Otter Tail Power Company provides electricity services. Interstate Telecommunications Cooperative and Frontier Communications of Minnesota provide local telephone service to the county. Peoples Natural Gas provides natural gas service to various communities in the county, including Hendricks and Ivanhoe (Minnesota Department of Trade and Economic Development).

The City of Lake Benton provides water service to the community. Lincoln Pipestone Rural Water provides water service in other parts of the county.

As the temporary and permanent impact of employment from this development is minimal, the community services already in place were adequate to meet the needs arising from the construction and operations and maintenance of the Lake Benton I Project.

Effects on the Economy of Lincoln County, Minnesota

The direct effects on Lincoln County from the construction phase came primarily from expenditures made by non-resident workers and from household income received by resident workers. Most of the construction workers came from outside the county, with only a few residing in the county for a short period of time.

Local sources reported that about 19 new jobs were located in Lincoln County to support the operation and maintenance of wind power. It appears that this staff supports both the initial Buffalo Ridge project as well as the Lake Benton I projects. However, it is likely that had Lake Benton I not been built, the size of the operation and maintenance work force would not have changed, as the construction of Lake Benton I provided an economy of size that made it more appealing to establish a sizeable workforce locally rather than import these services from outside the area.

Effects from operation were primarily from household income received by resident workers with additional expenditures locally for fuel and some supplies needed for maintenance. The input-output model was used to estimate the multiplier effects of these direct expenditures on employment and personal income.

Employment

It is estimated that a total (direct, indirect, and induced) of about eight jobs in the Lincoln County economy were supported by the construction phase of the project. The major sectors affected were the trade and services sectors. This is not unexpected as the primary source of the direct effect was on income received by households, and the trade and services sectors are the sectors where much of the household income is spent. Table 2 shows the total effect on employment from the construction phase.

Table 2
Total Employment from Construction Phase of Lake Benton I

Industry	Total Jobs
Agriculture	0.1
Mining	0.0
Construction	0.1
Manufacturing	0.0
Transportation, Communication, Public Utilities	0.2
Trade	3.3
Finance, Insurance, Real Estate	0.3
Services	3.5
Government	0.1
Other	0.0
Institutions	0.0
Total	**7.6**

It is estimated that a total of about 31 jobs in the Lincoln County economy were supported annually by the operation and maintenance phase of the project. As with the construction phase, the major sectors affected were the trade and services sectors. Again, this is not unexpected as the primary source of the direct effect was from household income. Table 3 shows the total effect on employment from the operation and maintenance phase.

Table 3
Total Employment from Operation and Maintenance Phase of Lake Benton I

Industry	Total Jobs
Agriculture	0.1
Mining	0.0
Construction	0.2
Manufacturing	0.1
Transportation, Communication, Public Utilities	19.3*
Trade	5.9
Finance, Insurance, Real Estate	0.7
Services	4.2
Government	0.2
Other	0.0
Institutions	0.0
Total	**30.8**

***** Includes 19 jobs estimated from local sources and not estimated using the IMPLAN model.

Personal Income

It is estimated that a total of over $98 thousand in personal income in the Lincoln County economy were supported by the construction phase of the project. The major sectors affected were the trade and services sectors. Again, this is not unexpected as the primary source of the direct effect was from household income. Table 4 shows the total effect on personal income from the construction phase.

Table 4
Total Personal Income from Construction Phase of Lake Benton I

Industry	**Total *($1,000s)***
Agriculture	$0.9
Mining	$0.0
Construction	$3.2
Manufacturing	$0.8
Transportation, Communication, Public Utilities	$5.4
Trade	$32.0
Finance, Insurance, Real Estate	$6.8
Services	$46.5
Government	$2.8
Other	$0.0
Institutions	$0.0
Total	**$98.4**

It is estimated that a total of over $909 thousand in personal income in the Lincoln County economy was supported annually by the operation and maintenance phase of the project. The major sectors affected were the trade and services sectors. Table 5 shows the total effect on personal income from the operation and maintenance phase.

Table 5
Total Personal Income from Operation and Maintenance Phase of Lake Benton I

Industry	**Total *($1,000s)***
Agriculture	$1.8
Mining	$0.0
Construction	$6.0
Manufacturing	$1.5
Transportation, Communication, Public Utilities	$737.9*
Trade	$63.3
Finance, Insurance, Real Estate	$14.4
Services	$78.6
Government	$5.7
Other	$0.0
Institutions	$0.0
Total	**$909.2**

***** Includes $737,900 in personal income estimated from local contacts and not estimated using the IMPLAN model.

Tax Rates and Levels

In 2001, all commercial property valued up to $150,000 was taxed at 2.4 percent and all property value beyond $150,000 was taxed at 3.4 percent. Thus, total taxes in 2001 equaled the value of the property up to $150,000 times 0.024, plus the value of the property above $150,000 times 0.034 (Minnesota Department of Trade and Economic Development 2001). In 2002, the corresponding tax rates will be 1.5 percent and 2.0 percent (Nielson 2002).

The real estate tax collected by each county is distributed among the county, local school districts, and municipalities. In Lincoln County, the county and the local school districts each receive roughly 45 percent of the taxes, and the municipalities receive roughly ten percent. However, in 2002 and beyond, the school portion of the tax to be exempted from the real estate tax of the wind generation facilities will be made up to the county by the state (Nielsen 2002).

The Lake Benton I wind power development resulted in $71,800 in total county property taxes in 1999, $611,200 in 2000, and $621,000 in 2001. The taxes paid in 2000 were an estimated 13 percent of the total taxes collected in the county that year. The estimated taxes for 2002 are $352,600. The tax was re-indexed for the whole state in the 2001 State Legislature for the 2002 tax year. Based on the proportions described above, in 2000 and 2001, the school district and the county received over $275,000 each year, while the local townships received over $61,000 each year from the Lake Benton I development. Assuming that the project did not cause increases in government and school budgets, the tax payments result in local taxpayers paying less taxes than they otherwise would. This has a direct and positive effect on household income equal to the taxes paid by the project owner.

Beginning in 2003, new legislation by the state changes the approach to taxing wind power projects. At that time, operators of wind farms will pay a production-based annual payment to local entities, replacing the current property value tax system. Both industry and local governments supported the change. Local governments will benefit by having a steady tax flow over the life of the project based on production rather than declining revenues tied to depreciating real property. Industry members like the predictability of payments tied to their annual revenues, rather than annual payments fixed by property value regardless of actual annual cash flows.

Landowner Net Revenues

The Lake Benton I wind development includes lands that have been leased, as well as lands where a permanent easement was purchased. We found no documentation of the actual transactions that took place. The following analysis is based upon interviews with local officials, trade association representatives, and wind power industry members. Most of the lands have a permanent easement, which were purchased for an average of $450 per acre for

buffer lands and $1,200 for facilities easements. There was a payment of $5,000 made for turbine sites. It was reported that easements on 17,100 acres and 128 turbines were purchased under this arrangement. It is estimated that a total of $9.669 million was paid out in a one-time payment to landowners (some landowners may have opted to receive this over a period of up to ten years). Assuming an average income tax rate of 15 percent, the after tax amount would have been $8.218 million. We further assumed each of the landowners invested their share (after taxes) of this amount. With a seven percent interest rate and a 15 percent tax rate, the total net annual income to the landowners under the easement purchase arrangement is $489,000.

It was reported that annual royalty payments were made to landowners for the remaining 15 turbines, with estimated payments of $1,500 per turbine per year. The revenue to landowners under the annual royalty payment arrangement is approximately $22,500 per year before taxes and $19,125 after taxes. Considering both types of arrangements, it is estimated that annual payments to landowners was $508,125.

Some farm income is foregone due to site occupancy. The wind site occupies approximately 70 acres, including the roadways. The opportunity cost (lost potential revenues from agricultural production) to the landowner associated with those 70 acres no longer in production is estimated to be $7,000. This results in total net (after tax) annual revenue to landowners of $501,125, which has a direct effect on household income.

Vansycle Ridge (1998, 25 MW): The Economies of Morrow and Umatilla Counties, Oregon

Morrow and Umatilla counties are located in northeast Oregon, bordered by the Columbia River to the north and the Blue Mountains to the south. Morrow County comprises 2,032 square miles of land area, while Umatilla County covers 3,215 square miles. Elevations in the counties range from 200 feet at the Columbia River to over 6,000 feet in the Blue Mountains, with rolling plains and low hills in between. The counties enjoy a temperate, semiarid climate.

These counties have the most diversified economic base of the three case study areas. The area has a strong agricultural base, with dryland wheat farms, irrigated crop farms (supplying potatoes to McDonald's is a major agricultural and manufacturing activity), and ranching the predominant activities. The area is expanding with a large dairy operation and cheese processing plant under development. Timber harvest and wood products manufacturing were important in the past, but activity has declined in this industry in recent years.

There has been rapid expansion in the last decade with a number of new businesses locating in the area. These include a Wal-Mart regional distribution center and a locomotive

maintenance facility for Union Pacific. There has also been expansion in the government sector with a new correctional institution constructed and a chemical weapons incinerator at the Umatilla Army Depot.

The Vansycle Ridge wind power development is the first of two wind power developments located in Umatilla County. It is located five miles north of the town of Helix, 15 miles east of the Columbia River, and approximately ten miles west of the town of Milton-Freewater (CH2M Hill and Stoel Rives 2001, Conweb 2002, and FPL Energy 2001). It consists of 38 Vestas 660 kW turbines in an array of two strings. The site spans 2.5 miles, but the actual footprint of the turbine pads and access roads is 7.8 acres (Conweb 2002). The project's rating is 24.9 MW, and it produces 67.3 million kWh annually. Production started in November 1998. The project is owned by FPL Energy, which sells the power to Portland General Electric (Conweb 2002, FPL Energy 2001).

Industrial Base

The base data for the IMPLAN model covering Morrow and Umatilla counties are presented in Table 6. The total industry output from all sectors is over $3.5 billion for the two counties, supporting over 43,500 jobs and earnings of nearly $1.6 billion. Over one-third of the region's output comes from manufacturing, which produces output valued at nearly $1.2 billion, and employs nearly 6,300. The leading industry in terms of employment is services, with more than 9,500 jobs, followed by trade, with nearly 8,600 jobs.

Table 6
Morrow and Umatilla Counties IMPLAN Model Base Data

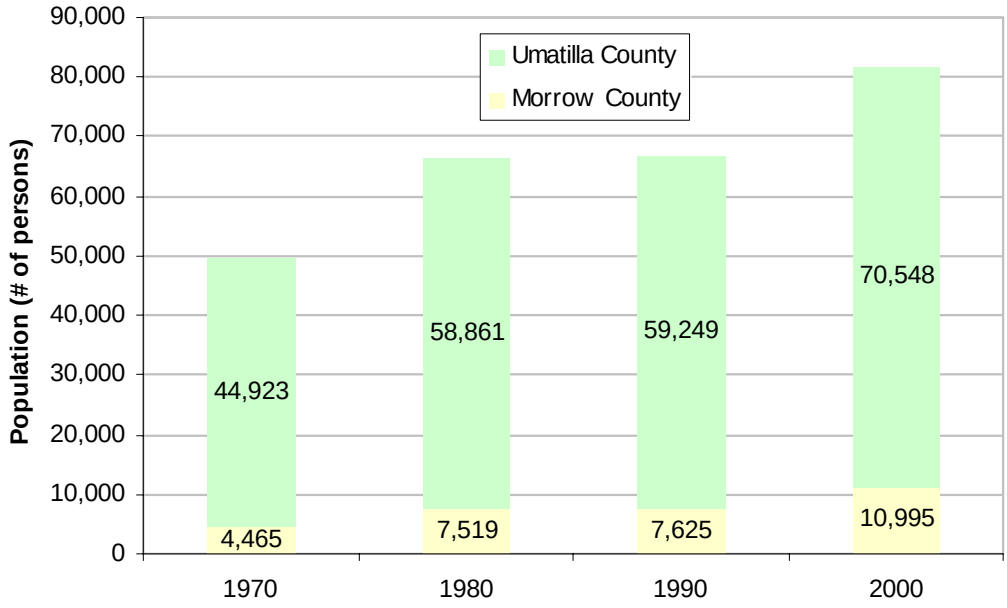
Industry	Output *($millions)*	Income *($millions)*	Employment *(# of jobs)*
Agriculture, Forestry, & Fishing	$428.248	$134.43	6,060
Mining	$0.555	$0.354	9
Construction	$293.626	$125.470	2,610
Manufacturing	$1,169.216	$276.404	6,255
Transportation, Communication, & Public Utilities	$335.784	$186.715	2,110
Trade (Retail & Wholesale)	$372.454	$223.717	8,584
Finance, Insurance, & Real Estate	$213.655	$139.542	1,596
Services	$427.202	$221.026	9,509
Government	$285.911	$264.661	6,526
Other	$10.347	$10.347	1,583
TOTAL	**$3,536.999**	**$1,582.668**	**43,539**

Source: 1998 IMPLAN data from Minnesota IMPLAN Group, Inc., with modifications by NEA.

Population

Morrow and Umatilla counties have both experienced rapid population growth in recent years in response to their expanding economies, as seen in Figure 5. The 2000 Census found that 10,995 people lived in Morrow County, while 70,548 lived in Umatilla County. Morrow is very rural, with a population density of 5.4 persons per square mile, while Umatilla has a greater density of 21.9 persons per square mile. Both counties have a predominantly white population, with 76 percent in Morrow County and 82 percent in Umatilla County. American Indian and Alaska Native persons make up 1.4 percent of the population of Morrow County, and 3.4 percent of Umatilla County's population due to the presence of the Confederated Tribes of the Umatilla Indian Reservation. In Morrow County, 24 percent of the population is of Hispanic or Latino origin, while 16 percent in Umatilla County report such origin.

Figure 5
Morrow and Umatilla Counties, Oregon, 1970-2000 Population



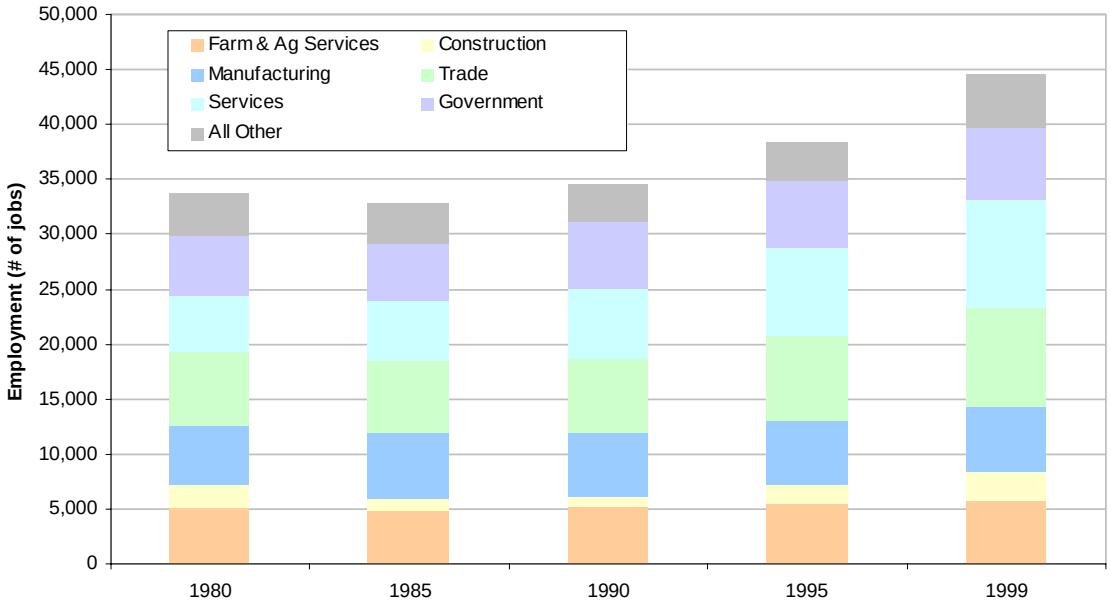
Source: U.S. Census of Population and Housing, relevant years.

The largest cities in this region are situated in Umatilla County and include Pendleton, with 16,354 residents, and Hermiston, with a population of 13,154. Much of the population is also scattered among a number of smaller cities. A third of the residents of the two counties live outside of any city or town, in rural, unincorporated areas. Helix, the closest city to the case study project, is one of the smallest towns in the region, with a population of 183.

Employment

Morrow and Umatilla counties have encountered an increase in total employment over recent years, as can be seen in Figure 6. This growth trend has been led by the expansion of employment in both the services and trade sectors. Construction employment has also increased somewhat, as the recent population growth created a greater need for housing. In 1999, services and trade were the leading industries in terms of employment share, employing 22 and 20 percent of the total in the county, respectively.

Figure 6
Morrow and Umatilla Counties, Oregon, 1980-1999
Full- and Part-Time Employment by Category



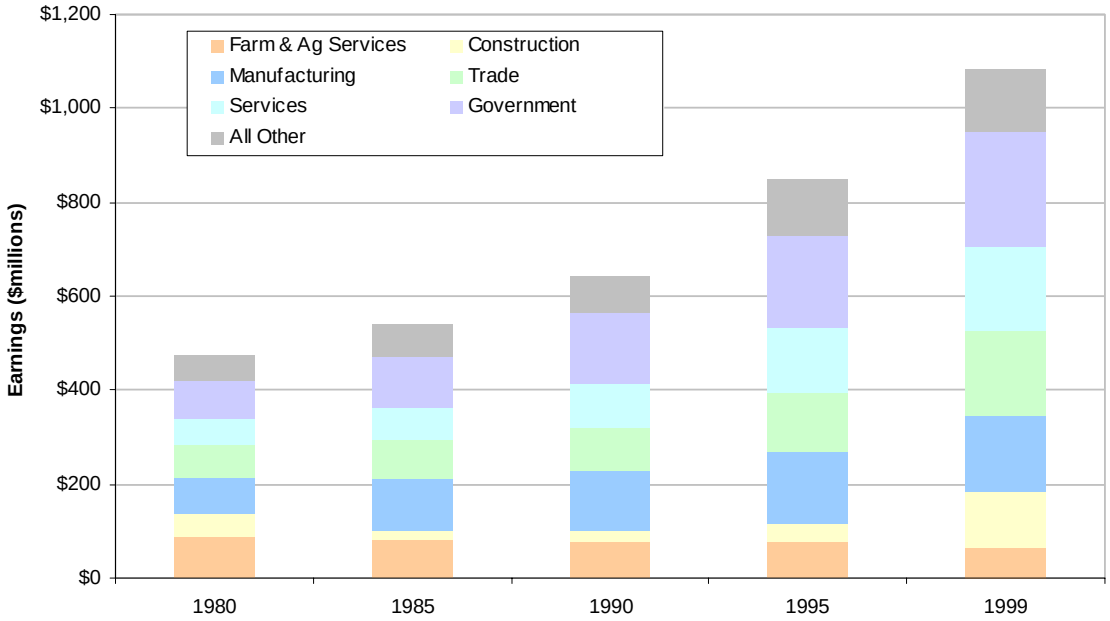
Source: Adapted from U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, *Regional Economic Information System 1969-99*, May 2001.

Recent trends in total earnings by industry are shown in Figure 7, showing a steady increase in total earnings over time. In 1999, while government had only 15 percent of the county's total jobs, earnings were over 22 percent of the total earnings. Earnings in trade and services were each over 16 percent of total, and manufacturing had 15 percent of total earnings. The growth of the construction industry has led to an expansion in its share of total earnings, from four percent in 1995 to over ten percent in 1999.

Recent unemployment rates for the two counties, Oregon, and the United States are shown in Figure 8. While unemployment for the nation has declined steadily in recent years, the rates for Morrow and Umatilla counties have been highly variable. In 2000, the unemployment rate for Morrow County was at its highest point in ten years, 12 percent. The comparable rate for Umatilla County was 6.4 percent in 2000. Both counties have experienced rates over

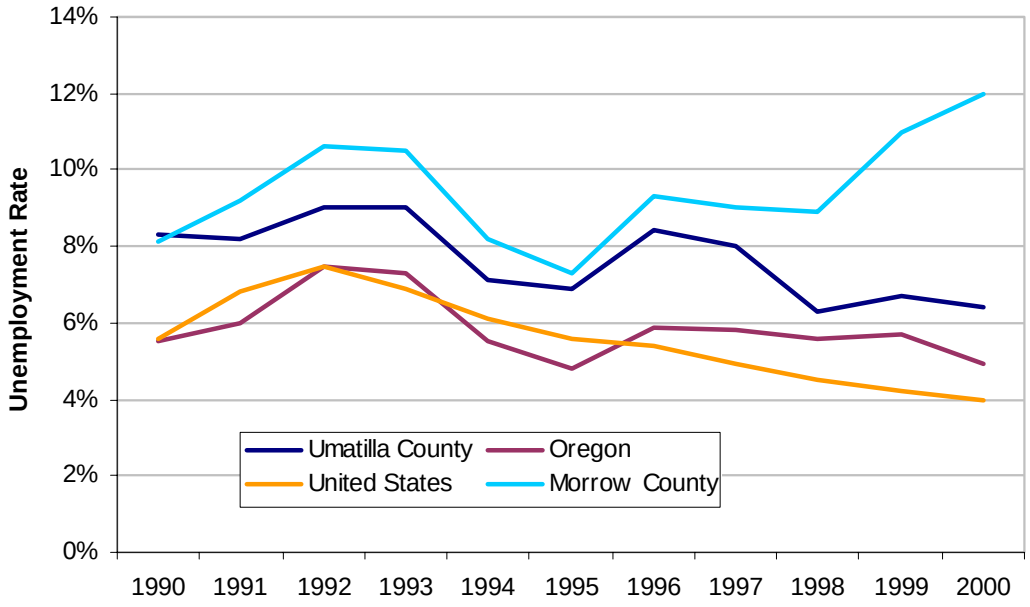
the last ten years that were far higher than those of the state or the nation, primarily due to contraction in the forest products industry.

Figure 7
Morrow and Umatilla Counties, Oregon, 1980-1999
Earnings by Industry



Source: Adapted from U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, *Regional Economic Information System 1969-99*, May 2001.

Figure 8
Annual Average Unemployment Rates, 1990-2000



Source: Oregon Employment Department.

Indicators of Economic Well-Being

In 1999, the per capita income for Morrow County was $16,841, which ranked 33rd of Oregon's 36 counties. This was 62 percent of the state average of $26,958, and 59 percent of the national average of $28,546. Residents of Umatilla County were somewhat better off, with a 1999 per capita income of $22,024, ranking 18th in the state. This was 82 percent of the state average and 77 percent of the national average.

The percentage of persons living below the poverty level was estimated in 1997 to be seven percent for Morrow County and 15.6 percent for Umatilla County, compared to 11.6 percent for the state of Oregon.

Tax Structure

Direct Effects

Oregon categorizes most wind power structures, such as towers, pads, and turbines, as real property. Any equipment and supplies used in an office setting would be subject to personal property assessment. Each year the state assesses the value of all utilities including wind generation plants based on a list of the wind generation property and its depreciation rate filed by the utility (Windlum 2002). Further, under current tax laws, the taxable value of each property in the state is limited by a Maximum Assessed Value (MAV), which cannot increase by more than three percent per year (Oregon Department of Revenue 2002).

Permanent operating tax rate limits were set for most taxing districts in Oregon in 1997-1998. Some bonds and "local option taxes" or temporary increases in taxes may be allowed. Such increases must be approved by receiving a majority of votes with 50 percent plus one of the district's registered voters voting, or a "double majority." The tax rates for the bonds and local option taxes are determined by dividing the total "levy" or tax burden resulting from the bonds and options by the total assessed value of property within the applicable taxing district (Oregon Department of Revenue 2002).

The final tax rates (determined by a combination of the set tax rate and the bond and local option tax rates) are then applied to the total taxable value of each property in the county. However, a 1997-1998 law limits the total tax that may be collected for each property tax account. The law limits the taxes collected for education to 0.5 percent on the lowest selling value or "real market value" of the property, and general government taxes are limited to one percent of the real market value. If taxes in either category exceed the limit for that property, the taxes are reduced or "compressed" until the limit is reached. Local option taxes are "compressed" first. If the local option tax is compressed to zero, and the limit still has not been reached, the other taxes in the category are proportionally reduced. The sum of the

resulting amounts is the tax burden of the owner of the property (Oregon Department of Revenue 2002).

The counties collect the resulting taxes. The taxes are distributed by the counties to the appropriate taxing jurisdictions for various public service districts.

Indirect Effects

As stated previously, there are no sales taxes in Oregon. Excise taxes provide an indirect benefit to Umatilla County through funding the upkeep of Hat Rock State Park, and other state government services such as prisons, highway maintenance, and administration of transfer payments such as welfare, Medicare, and Social Security.

Community Services

County Sheriff's Department and municipal police departments provide police service in the project area. The Umatilla Rural Fire Protection District serves Umatilla County and several rural and municipal fire protection districts serve Morrow County.

A small medical clinic is located in Umatilla. The clinic provides x-ray facilities, day surgery, and lab services (Benkendorf Associates 1998). Good Shepherd Medical Center located in Hermiston serves Western Umatilla County. St. Anthony Hospital in Pendleton also serves the area. Pioneer Memorial Clinic and Pioneer Memorial Hospital provide medical care to south Morrow County residents. North County residents are served by Good Shepherd Medical Center in Hermiston.

The city of Umatilla recently constructed a new high school and middle school to increase student capacity. Hermiston and Stanfield School Districts currently have adequate capacity to accept new students (Benkendorf Associates 1998). Pendleton has eight public schools, three parochial schools, and is home to the Blue Mountain Community College. The Morrow County School District covers over 2,059 square miles, with seven schools and roughly 2,145 students (Morrow County School District).

Several parks are located in Umatilla and Morrow counties. Other recreational opportunities include Umatilla National Forest and the Umatilla National Wildlife Refuge (Oregon Economic and Community Development Department 2001).

Pacific Power and Light (PacifiCorp) and Umatilla Electric Cooperative provide electricity service in western Umatilla County. Umatilla Electric Cooperative serves mainly customers located outside of urban areas throughout Umatilla County and parts of Morrow County.

Columbia Basin Electric Cooperative serves other parts of Morrow County (Oregon Economic and Community Development Department 2001).

Qwest Communications provides telephone service to Umatilla County and parts of Morrow County. In addition, Century Tel provides telephone service to other parts of Morrow County. Microwave, fiberoptic, and satellite communications are all available within Hermiston, Umatilla, and Pendleton. In addition, several Internet service providers operate within the two counties (Oregon Economic and Community Development Department 2001).

Water supply within the city of Umatilla is provided by several wells. The city of Hermiston utilizes a combination of wells and surface water from the Columbia River to meet urban demand. The communities of Boardman, Heppner, Irrigon, and Ione are served by municipal water supplies. The City of Boardman uses ground water from the Columbia River Aquifer.

The cities of Umatilla, Hermiston, Pendleton, Boardman, Heppner, and Irrigon all have wastewater treatment facilities with adequate capacity. Cascade Natural Gas Company provides natural gas to urban areas within Umatilla, Hermiston, and Pendleton in Umatilla County, as well as Boardman and Irrigon in Morrow County (Oregon Economic and Community Development Department 2001).

As the permanent impact of employment from this development is minimal, the community services already in place are adequate to meet the needs arising from the construction and operations and maintenance of the Vansycle Wind Power Project.

Effects on the Economies of Morrow and Umatilla Counties, Oregon

The direct effects on Morrow and Umatilla counties from the construction phase came primarily from purchase of non-labor inputs, primarily concrete. Much of the labor was from non-resident workers who commuted to the job site from nearby counties. Consequently, expenditures made by non-resident workers were not as large as in the other case studies. Also, less labor came from residents and the household income received was consequently lower than for the other case studies.

Local sources reported that two new jobs were added to the local economy to support the operation and maintenance of the project. The Stateline wind power project has recently been completed in the area, and it is likely that more operation and maintenance work force will be located in the local area to service the two projects.

Effects from operation and maintenance were primarily from household income received by resident workers with additional expenditures locally for fuel and some supplies needed for

maintenance. The input-output model was used to estimate the multiplier effects of these direct expenditures on employment and personal income.

Employment

Employment impacts during the construction phase were small, with construction activities supporting a total of about four jobs. The local purchase of concrete supported the most jobs, followed by the services and trade sectors. Table 7 shows the total effect on employment from the construction phase.

Table 7
Total Employment from Construction Phase of Vansycle Ridge

Industry	Total Jobs
Agriculture	0.0
Mining	0.0
Construction	0.0
Manufacturing	1.7
Transportation, Communication, Public Utilities	0.2
Trade	0.9
Finance, Insurance, Real Estate	0.2
Services	1.1
Government	0.0
Other	0.0
Institutions	0.0
Total	**4.2**

It is estimated that the operation and maintenance phase of the project supported a total of about six jobs annually in the two counties. The major sectors affected were the trade and services sectors. Again, this is not unexpected as the primary source of the direct effect was from household income and these are the sectors where much of household income is spent. Table 8 shows the total effect on employment from the operation and maintenance phase.

Personal Income

It is estimated that over $105 thousand in personal income in the economies of Morrow and Umatilla counties were supported by the construction phase of the project. Major sectors affected were the manufacturing, trade, and services sectors. This is not unexpected as the primary source of the direct effect was on manufacturing (concrete) and household income. Table 9 shows the total personal income effect from the construction phase.

Table 8
Total Employment from Operation and Maintenance Phase of Vansycle Ridge

Industry	Total Jobs
Agriculture	0.1
Mining	0.0
Construction	0.1
Manufacturing	0.0
Transportation, Communication, Public Utilities	2.1*
Trade	1.7
Finance, Insurance, Real Estate	0.2
Services	1.6
Government	0.0
Other	0.1
Institutions	0.0
Total	**5.9**

***** Includes 2 jobs estimated from local sources and not estimated using the IMPLAN model.

Table 9
Total Personal Income from Construction Phase of Vansycle Ridge

Industry	Total *($1,000s)*
Agriculture	$0.5
Mining	$0.0
Construction	$2.5
Manufacturing	$50.9
Transportation, Communication, Public Utilities	$9.3
Trade	$16.4
Finance, Insurance, Real Estate	$3.2
Services	$21.0
Government	$1.3
Other	$0.3
Institutions	$0.0
Total	**$105.4**

It is estimated that a total of over $103 thousand in personal income in the economies of Morrow and Umatilla counties were supported annually by the operation and maintenance phase of the project. The major sectors affected were the trade and services sectors. Again, this is not unexpected as the primary source of the direct effect was from household income and these are the sectors where much of household income is spent. Table 10 shows the total effect on personal income from the operation and maintenance phase.

Table 10
Total Personal Income from Operation and Maintenance Phase of Vansycle Ridge

Industry	Total *($1,000s)*
Agriculture	$0.9
Mining	$0.0
Construction	$2.5
Manufacturing	$1.2
Transportation, Communication, Public Utilities	$21.8*
Trade	$30.3
Finance, Insurance, Real Estate	$6.1
Services	$38.2
Government	$1.8
Other	$0.8
Institutions	$0.0
Total	**$103.6**

***** Includes $21,800 in personal income estimated from local contacts and not estimated using the IMPLAN model.

Tax Rates and Levels

The taxing code district in which the project is located in Umatilla County was subject to a tax rate of roughly 1.1 percent in fiscal years 1999-2000, 2000-2001, and 2001-2002. Total taxes were $243,580 in 1999, $241,580 in 2000, and $229,680 in 2001. Taxes paid on the project were about 0.6 percent of the total taxes paid in the county in 1999 and 2000.

Schools get slightly over half of the taxes collected. The county and the townships each receive a little less than 20 percent of the taxes. The fire protection district receives roughly four percent and libraries an additional two percent. The remaining taxes go to the Cemetery District (0.5 percent), the Water Control District (0.149 percent), Parks and Recreation (0.12 percent), Vector Control (0.62 percent), the Port of Umatilla, (0.95 percent), the Urban Renewal District (0.59 percent), and "Miscellaneous" (1.14 percent).

Landowner Net Revenues

Assuming an average royalty payment to landowners of $2,000 per turbine, the estimated average of wind projects in the Pacific Northwest, with the 38 turbines in the Vansycle Ridge wind project, the total gross revenue to landowners is approximately $76,000. FPL, the owners of the Vansycle project, states that the wind site crosses 2.5 miles, and nine acres of farm and range land are lost to production, including roadways (FPL 1998). The annual opportunity cost (lost potential revenues) to the landowner associated with those nine acres no longer in production is assumed to be $356, based on an opportunity cost of $61 per acre for the six acres of wheat and no net loss for the three acres of cattle rangeland. This results in total annual net (after tax) revenue to landowners of $64,300.

Delaware Mountain (1999, 30 MW): The Economy of Culberson County, Texas

Culberson County is located in the Upper Rio Grande region of west Texas, and comprises 3,812 square miles of land. The terrain varies from nearly level to fairly mountainous, with elevations ranging from 3,000 to 8,751 feet. The Guadalupe Mountains National Park, a major tourist attraction, is located in Culberson County. Van Horn, the nearest town to the project site, is the county seat, and other towns include Kent, Lobo, and Pine Springs. Van Horn, located on Interstate 10 about midway between El Paso and Midland-Odessa, accommodates many travelers.

Historically, minerals and oil production have been important to the economy of Culberson County. Ranching and farming also contribute significantly to the local economy.

Delaware Mountain Wind Farm is located on private ranch land northeast of Van Horn (McCoy 2002). It is located on the same site of Kenetech's West Texas Wind Farm Power Project started in 1994. After Kenetech's bankruptcy, National Wind Power Partners took over the site, completed the farm, and began electricity production in July 1999. The entire farm is about 50,000 acres, with the actual footprint of the turbines assumed to be a small fraction of that. It utilizes 40 Zond 750 kW turbines for a capacity rating of 30 MW, and produces approximately 100 million kWh of electricity annually. The power is sold to the Lower Colorado River Authority and Reliant Energy HL&P (National Wind Power 2001).

Industrial Base

Base data from the IMPLAN model for Culberson County, Texas, are presented in Table 11. Total industry output for all sectors is $112 million, and these industries provide nearly 1,800 jobs with earnings of nearly $71 million. Nearly 30 percent of this total output comes from mining, with total output of nearly $34 million, employment of 221, and nearly $25 million in earnings (note that this includes employee compensation, proprietor income, and property income). The leading industry, in terms of jobs, is trade, with 412 jobs, followed by services (345) and government (339). The agriculture, forestry, and fishing sector also employs a fair number, with 295 jobs, many of which are related to cattle raising.

Table 11
Culberson County IMPLAN Model Base Data

Industry	Output *($millions)*	Income *($millions)*	Employment *(# of jobs)*
Agriculture, Forestry, & Fishing	$7.781	$3.680	295
Mining	$33.881	$24.690	221
Construction	$9.695	$4.118	92
Manufacturing:	$5.089	$2.556	33
Transportation, Communication, & Public Utilities	$6.415	$3.096	26
Trade (Retail & Wholesale)	$11.055	$7.063	412
Finance, Insurance, & Real Estate	$5.700	$3.716	19
Services	$15.376	$8.764	345
Government	$16.986	$13.084	339
Other	$0.085	$0.085	2
TOTAL	**$112.063**	**$70.852**	**1,783**

Source: 1998 IMPLAN data from Minnesota IMPLAN Group, Inc., with modifications by NEA.

Population

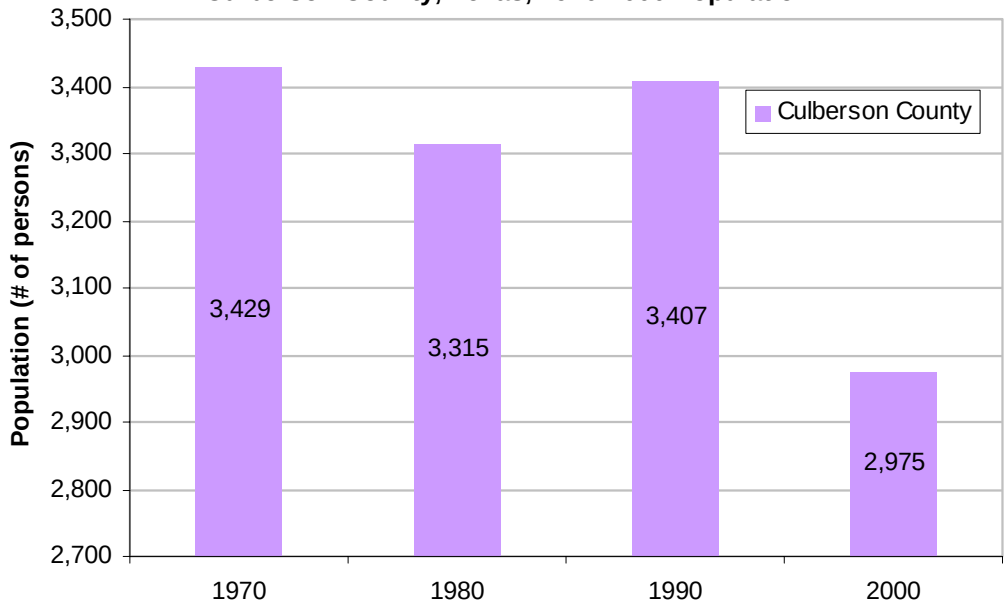
As shown in Figure 9, the population in Culberson County has declined considerably in the last ten years, from a population of 3,407 in 1990 to 2,975 in 2000. There are very few residents relative to the county's land area, as the population density is only 0.8 persons per square mile, compared to 79.6 persons for Texas as a whole. According to the 2000 Census, 69 percent of the population is white, while another 27 percent of county residents identified themselves as "some other race" (not white, black, Native American/Alaska Native, or Hawaiian/Pacific Islander). Over 72 percent of the population reported that they are of Hispanic or Latino origin; most of these are of Mexican descent.

Van Horn is home to 82 percent of the county's population. The rest of the population is distributed sparsely throughout the remainder of the county area, which includes several very small communities, such as Kent, Plateau, Pine Springs, and Nickel Creek.

Employment

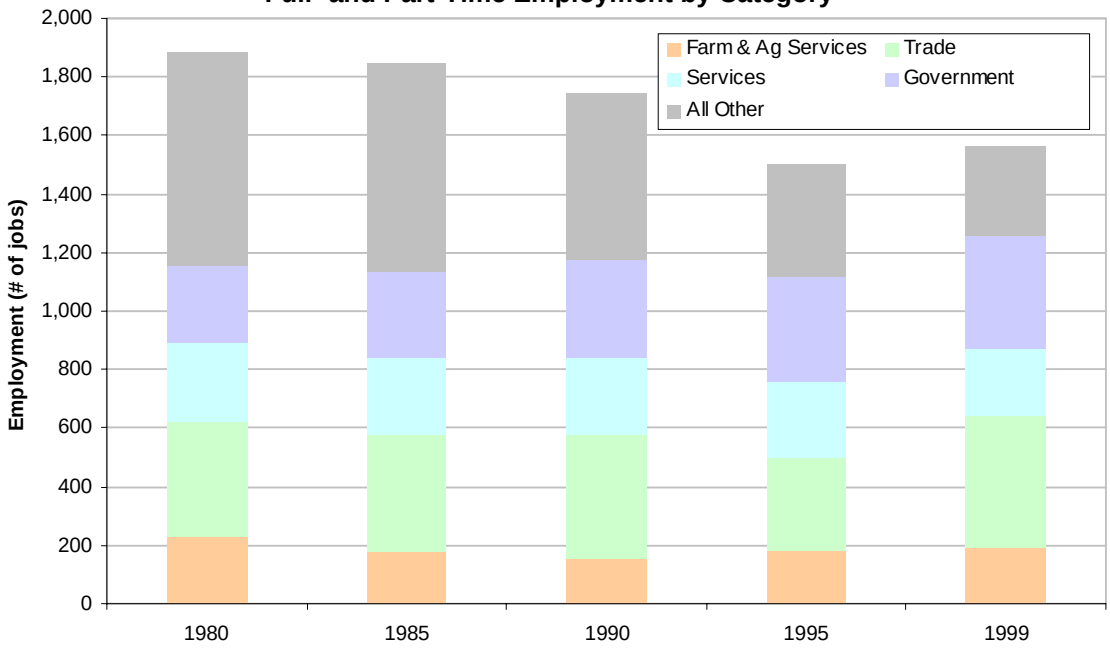
Employment trends for Culberson County from 1980 to 1999 are shown in Figure 10. Total employment has declined over that time period, dropping from nearly 1,900 jobs in 1980 to 1,565 in 1999. The number trade and government jobs have increased in that time period, offset by losses in other sectors, such as services and agriculture. The leading employer in 1999 was trade, with over 440 jobs, accounting for 28 percent of total employment in the county. Government followed, with about 380 jobs, or 24 percent of total employment.

Figure 9
Culberson County, Texas, 1970-2000 Population



Source: U.S. Census of Population and Housing, relevant years.

Figure 10
Culberson County, Texas, 1980-1999
Full- and Part-Time Employment by Category

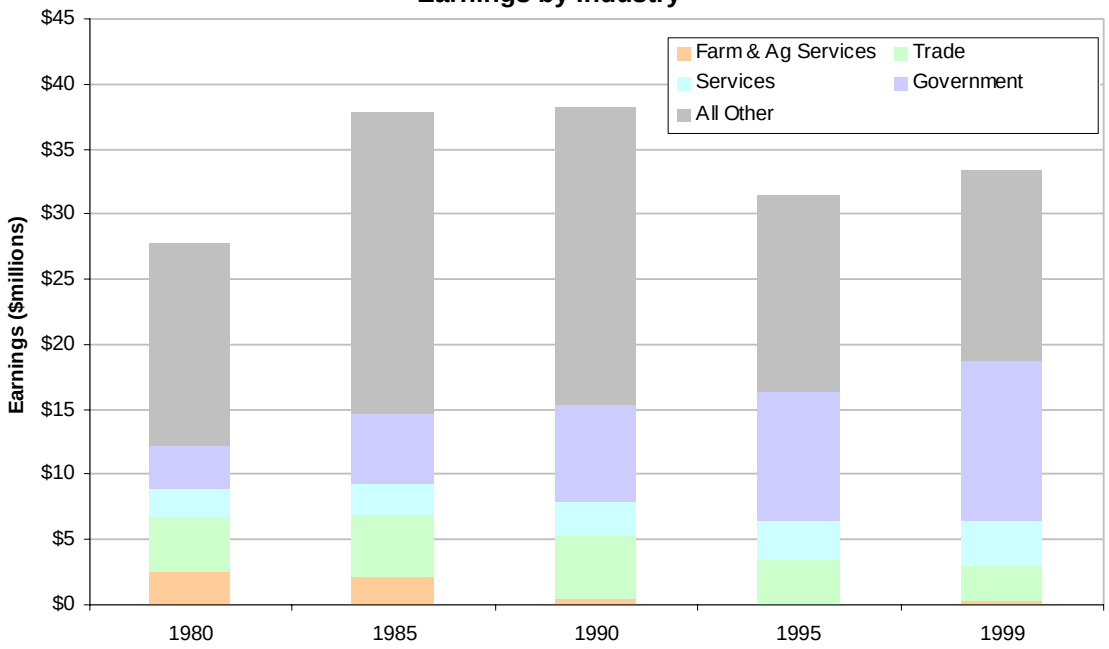


Source: Adapted from U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, *Regional Economic Information System 1969-99*, May 2001.

Recent trends in earnings by industry are shown in Figure 11, which shows that total earnings have declined recently, as might be expected with the decreased number of jobs in the area. Government earnings are the greatest, accounting for 36 percent of total earnings in

the county. The share of earnings contributed by government has also grown greatly over the time period shown. Earnings per job are much lower in other industries. While trade was the leading employer in 1999 with 28 percent of the jobs, earnings were only eight percent of total, and services, with 15 percent of the jobs, contributed only ten percent to total earnings.

Figure 11
Culberson County, Texas, 1980-1999
Earnings by Industry



Source: Adapted from U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, *Regional Economic Information System 1969-99*, May 2001.

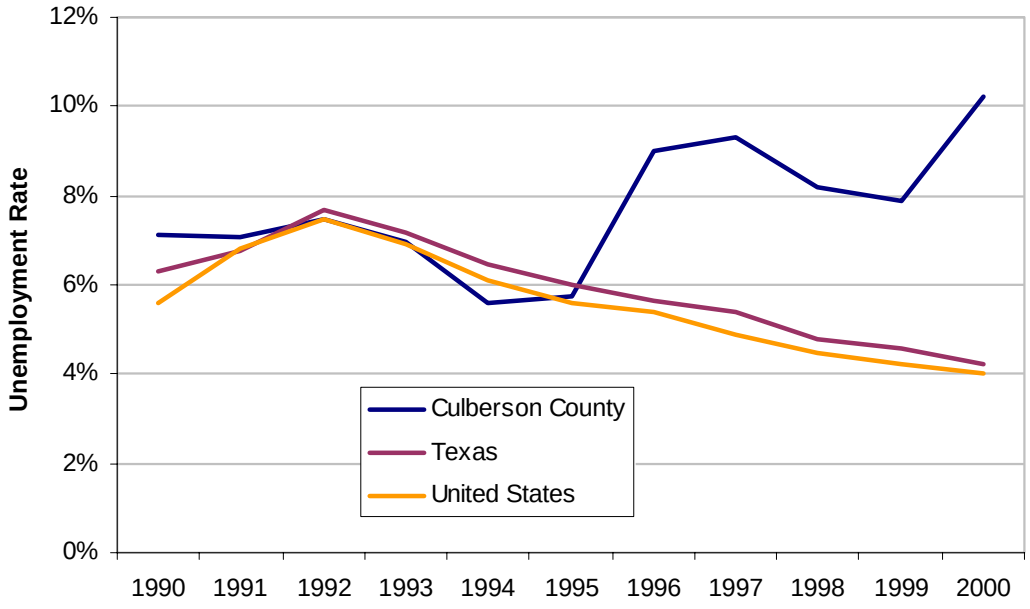
Unemployment rates for Culberson County, Texas, and the United States over the past ten years are shown in Figure 12. In the early 1990s, unemployment rates in the county, state, and nation were very similar. This similarity continued into the later part of the decade for Texas and the United States, but Culberson County has experienced much higher unemployment in those years. In 2000, the rate for Culberson County reached its highest point of the decade, at 10.2 percent, far greater than the 4.2 percent rate for Texas and 4.0 percent for the United States.

Indicators of Economic Well-Being

With a per capita income of $14,803 in 1999, Culberson ranks 232nd of the 254 Texas counties. This was 55 percent of the state average per capita income of $26,834 and 52 percent of the national average.

The percentage of persons living in poverty is quite high for Culberson County, as it was estimated to be 32.6 percent in 1997. This is far greater than the 16.7 percent cited for the state of Texas.

Figure 12
Annual Average Unemployment Rates, 1990-2000



Source: Texas Workforce Commission.

Tax Structure

Direct Effects

A combination of real estate and personal property taxes are assessed to all non-agricultural land and property by local taxing jurisdictions. First, the appropriate appraisal district in each county assesses the value of both the personal and real property. Next, the appraisal district processes applications for exemptions and agricultural land appraisals. Following this, property owners are allowed to protest the assessed value to the appraisal review board which makes the final determination of the taxable value of the property. The final list of taxable properties and values is given to each "taxing unit" which then determines tax rates based on their operating and debt needs (Rylander 2002).

Taxing units include the county and a school district. Other taxing units may exist depending on the needs of the area, such as hospital, junior college, water, and fire (Rylander 2002).

Indirect Effects

As stated above, while there is no income tax in Texas, the state assesses both franchise and sales taxes on businesses. Thus, in 2000, Culberson County received a little over $3 million in transfer payments from the state education agency (Rylander 2000). Culberson County benefits through other services such as road maintenance and state police.

Community Services

The Van Horn Police Department and the Van Horn City Fire Department serve the residents of Van Horn. The Culberson County Hospital in Van Horn provides medical care for community members (Qwestdex.com). Public schools in Culberson County are in the Culberson County Allamoor ISD, which includes three schools: Eagle Elementary School, Van Horn Junior High School, and Van Horn High School.

The Van Horn community has several parks and recreation opportunities. These include Van Horn City Park, which has picnic areas, a swimming pool, and a playground, as well as a scenic overlook, Texas Mountain Trail tours, and Van Horn KOA campground (Van Horn KOA Kampground 2001). Campgrounds are frequently used by temporary workers during construction projects and can be important locally in attracting workers.

El Paso Electric Co. provides electric service and Valor Telecomm provides local telephone service to the Van Horn community (Van Horn 2001). Water, sewer, and garbage services to the community of Van Horn are provided by the Town of Van Horn (Van Horn 2001). U.S. Cable of West Texas provides cable television service, Texas Western Municipal Gas Corp. provides natural gas service, and Van Horn Oil and Propane provides propane service to Van Horn (Van Horn 2001).

As the permanent impact of employment from this development is minimal, the community services already in place are adequate to meet the needs arising from the construction and operations and maintenance of the Delaware Mountain Wind Power Project.

Effects on the Economy of Culberson County, Texas

The direct effects on Culberson County from the construction phase came primarily from employment of non-resident and resident labor. Much of the labor was from non-resident workers who temporarily resided in the area and made purchases from lodging, eating, drinking, and retail establishments. Consequently, expenditures made by non-resident workers were larger than in the other three case studies. More labor also came from

residents and the household income received was consequently higher than for the other case studies.

Local sources declined to provide an estimate of jobs but did provide estimates of the payroll for the employees performing the operation and maintenance. To estimate the number of jobs associated with the estimated payroll, relationships from other projects were used. Using this approach, it was estimated that six jobs were located in Culberson County to perform operations and maintenance. Again, as in Lincoln County, a previous wind power project was in operation and this staff appears to support both projects.

Effects from operation were primarily from household income received by resident workers with additional local expenditures for fuel and some supplies needed for maintenance. The input-output model was used to estimate the multiplier effects of these direct expenditures on employment and personal income.

Employment

Employment impacts during the construction phase were significant, with construction activities supporting a total of about 26 jobs. The spending of household income from both resident and non-resident workers supported the most jobs, with these expenditures concentrated in the services and trade sectors. Table 12 shows the total effect on employment from the construction phase.

Table 12
Total Employment from Construction Phase of Delaware Mountain

Industry	Total Jobs
Agriculture	0.4
Mining	0.0
Construction	0.3
Manufacturing	0.0
Transportation, Communication, Public Utilities	0.1
Trade	14.6
Finance, Insurance, Real Estate	0.5
Services	9.4
Government	0.4
Other	0.1
Institutions	0.0
Total	**25.8**

It is estimated that a total of about 11 jobs in the Culberson County economy were supported annually by the operation and maintenance phase of the project. The major sectors affected were the trade and services sectors. Again, this is not unexpected as the primary source of the direct effect was from household income. Table 13 shows the total effect on employment from the operation and maintenance phase.

Table 13
Total Employment from Operation and Maintenance Phase of Delaware Mountain

Industry	Total Jobs
Agriculture	0.1
Mining	0.0
Construction	0.1
Manufacturing	0.0
Transportation, Communication, Public Utilities	6.1*
Trade	3.3
Finance, Insurance, Real Estate	0.2
Services	1.4
Government	0.1
Other	0.0
Institutions	0.0
Total	**11.3**

***** Includes 6 jobs estimated from local sources and not estimated using the IMPLAN model.

Personal Income

It is estimated that a total of over $391 thousand in personal income in the Culberson County economy was supported by the construction phase of the project. The major sectors affected were the trade and services sectors. This is not unexpected as the primary source of the direct effect was from household income. Table 14 shows the total effect on personal income from the construction phase.

Table 14
Total Personal Income from the Construction Phase of Delaware Mountain

Industry	Total *($1,000s)*
Agriculture	$4.4
Mining	$2.0
Construction	$9.5
Manufacturing	$0.1
Transportation, Communication, Public Utilities	$6.7
Trade	$173.8
Finance, Insurance, Real Estate	$17.2
Services	$162.9
Government	$13.9
Other	$0.8
Institutions	$0.0
Total	**$391.3**

Over $346 thousand of personal income in the Culberson County economy is supported annually by the operation and maintenance phase. The major sectors affected were the trade and services sectors. This is not unexpected as the primary source of the direct effect was from household income and these are the sectors where much of the household income is spent. Table 15 shows the total effect on personal income from this phase.

Table 15
Total Personal Income from the Operation and Maintenance Phase of Delaware Mountain

Industry	Total *($1,000s)*
Agriculture	$1.5
Mining	$0.8
Construction	$3.3
Manufacturing	$0.0
Transportation, Communication, Public Utilities	$252.2*
Trade	$44.3
Finance, Insurance, Real Estate	$6.6
Services	$31.8
Government	$5.2
Other	$0.4
Institutions	$0.0
Total	**$346.1**

***** Includes $250,000 in personal income estimated from local contacts and not estimated using the IMPLAN model.

Tax Rates and Levels

For the location of the Delaware Mountain development, the taxing units in place at the start of the project were county, school, and hospital. A groundwater district taxing unit was added in 1998 (Carrasco 2002).

Culberson County accepted a set yearly payment from the development owners in lieu of the full hospital and county taxes. This payment was estimated to be roughly one-half of the full tax debt. The other two accounts, school and groundwater districts, remained assessed at their full value (Hernandez 2002).

Thus, yearly payments in lieu of county taxes were approximately $104,000 for the county and $39,000 for the hospital district. School taxes were $239,000 in 2000. Groundwater district taxes were $6,962 in 1999, and $5,324 in 2000 (McCoy 2002).

Landowner Net Revenues

Assuming an average royalty payment to landowners of $1,500 per turbine, the estimated average for wind projects in Texas, with the 40 turbines in the Delaware Mountain Wind Project, the total gross revenue to landowners is approximately $60,000. There is no opportunity cost (lost potential revenues) to the landowner associated with those acres no longer in production as they are all private rangeland with a ratio of one head of cattle to two sections of land. This results in total annual net (after tax) revenue to landowners of $51,000.

Summary and Conclusions

The case study areas were chosen to reflect a range of geographic and economic conditions in rural America where suitable conditions exist for wind power development. As such, they share some common characteristics that result in similar experiences among them. Since they also represent a range of conditions, there were some differences in their experiences as a result of the developments. The following highlights some of the similarities and differences and looks at some of the implications for other areas that are considering wind power as an economic development opportunity.

Economic Experiences Common to All Case Study Areas

In all of the case studies, there was a modest to moderate boost in economic activity that was attributed to the construction phase. All of the case study areas also benefited from continuing operation and maintenance activities, with the amount of activity very much related to the size of the development and previous development of wind power and planned future development of wind power. These cumulative effects of multiple projects can be important in the decision to perform operation and maintenance work with a local workforce rather than import these workers from outside the area.

Tax effects, particularly property taxes that support local entities, were important in all cases. If the entities' budgets do not increase as a result of the project, the assessed value of the tax base increases, and there is a redistribution of the local tax burden. This, in effect, shows up as an increase in household income, which can directly affect the local trade and services sectors and to a lesser extent other local economic sectors. Entities may choose to increase budgets to provide more services or invest in infrastructure to take advantage of the increased tax base, which is a choice of increased services and investment over redistributed income.

While there were differences between the study areas in the mix of annual leases and permanent easements and the size and type of payment, ***the annual revenue received by households in the areas was a significant source of household income and had a significant total effect on the economies.*** In all cases, the cost of foregone opportunities from farming and livestock grazing was small compared to the revenues obtained.

The counties represented in the case studies had comparatively few economic sectors; this was expected since they were primarily rural, natural resource based economies. Consequently, sector multipliers are comparatively low and leakages of direct expenditures are comparatively high. Further, the projects themselves have few links to existing sectors from operation and maintenance of the wind projects in the economies other than households (which provide labor) and a few supplies purchased. Thus, long-term effects will be primarily in the trade and services sectors, where household incomes are spent.

Owners from outside the study areas developed all of the case study projects and provided all of the financing for the capital investment. While this is the most common method of developing and financing projects in the United States, in other places, particularly in some European countries, a significant number of projects are developed by local entities and financed with capital from local sources. The return to capital is an important part of the annual revenue generated by wind power projects. When owners of capital reside outside of the study area, the annual income generated by the capital investment leaves the area. If projects were developed and owned by local entities, the income from capital investment would be retained in the local area and would increase the size of local economic impacts.

All of the areas were tied into extensive electric power networks, and consequently, the availability of power for economic expansion was not an issue. In areas where this is not the case, adding to the supply of power locally may result in relieving a constraint on local economic development.

Major Differences between Case Study Areas

The major difference between the case study areas was the current rate of economic expansion. Two of the areas, Lincoln County and Culberson County, have both experienced population declines in the last decade, while the population of Morrow and Umatilla counties has expanded in the past decade. While wind power development was important to the economies of all case study areas, it was relatively more important to the two counties in decline, compared to the growth occurring in Morrow and Umatilla counties from sources other than wind power.

Another significant difference was a range of the number of linkages between sectors in the local economies, with Culberson County having the least and Morrow and Umatilla counties

the most. This affects the size of the multipliers and the amount of leakage that occurs when new money is brought into an area. In addition to the number of linkages between sectors, the degree to which a business can meet the local demand for its goods or services is important. If a business can only supply a portion of what is needed to meet local demand, the remaining amount must be imported, resulting in additional leakage. The relationship between case study areas with respect to imports was much like the number of linkages, with the smaller economies requiring more imports and thus experiencing smaller multipliers and more leakage.

Another difference between areas was the degree of economic diversity in their economies. Economies with higher degrees of diversity are considered more stable and better able to handle fluctuations in the greater economy. IMPLAN calculates a diversity index as an indicator of the degree of economic diversity that exists in the area. An index of 1.0 would indicate that the economy was perfectly diverse (lots of industries of equal size) and an index of 0.0 would indicate a one industry economy. In reality, all economies lie somewhere in between those two extremes. For the Morrow-Umatilla case, the index is 0.65, for Lincoln it is 0.56, and for Culberson it is 0.53. As a point of reference, the index for the State of California is 0.73 and the State of Oregon 0.72.

There were other differences that can be important. Lincoln County was not able to capture as much of the expenditures from non-residents as it lacked accommodations, where Culberson County, located on a major interstate highway, had accommodations and was able to benefit from this. Differences in tax policies, particularly personal property tax, varied between areas and also affected the ability to capture benefits

All projects were analyzed as single economic development events. However, in all case studies there were additional previous or subsequent (or both) wind power projects developed or planned. The cumulative effects of several projects in a locality can be important to the local economy. At some point, a threshold is reached in operation and maintenance workloads where a resident workforce becomes feasible, resulting in locating jobs in the local area rather than periodically bringing them in from outside. Similar thresholds are also likely for the provision of other supplies and services by local businesses.

Implications for Interested Parties

Wind power development can be a modest to moderate source of new economic activity and can provide some new family wage jobs, that is, jobs providing income sufficient to support a family above poverty levels. Important factors in determining the amount of growth are the scale of the project, the existence of previously developed projects in the area, and the potential for future development. At some point, it becomes cost effective to maintain a resident operation and maintenance staff rather than bringing in non-residents periodically to

provide the operation and maintenance servicing. This could happen with an initial development, but has been more likely to occur with a subsequent development.

The leasing of land is an important source of household income for a local economy, provided the land is owned by local residents. The amount of land typically needed has only a small effect on existing uses of the land, and the foregone income is very small compared to the income gain from the lease.

Tax effects are also important. One concern with the location of new industries is that the demand for services such as schools, water supply, and waste disposal associated with population increases will increase more than the tax base that the new industry brings. This has been experienced where large amounts of labor are needed and the capital investment of the new industry is not as large. An example is energy industry development (oil, gas, coal) where boom towns have developed with large influxes of workers and their families. The other extreme are industries that require large upfront capital investments but do not require comparatively large labor forces. An example of this is a high tech firm such as Intel and Hewlett-Packard, with very large capital investments requirements for plant and equipment but comparatively smaller workforce needs. Where such developments have occurred, the tax base has expanded sufficiently to accommodate population driven demand for services, permitting the expansion of services and investment in infrastructure and stable tax rates. Wind power development more closely resembles the high tech example. Wind power development requires substantial on-site capital investments that can be taxed as personal property. This can be an important new source of revenue for local entities.

While not a part of this study, it is important that the quality of the wind resource be documented and that it offers a reasonable chance for a long-term operation in order for benefits to continue over a long time. In the three case studies, all ownership (capital investment) was essentially non-resident. The return on capital is an important component of annual income. Local ownership, where feasible, would retain more of this income in the local area and increase the size of the local economic impact.

In recent years, there has been interest in a value added approach to economic development in rural areas. This generally involves adding additional processing to an existing output or resource, which results in a more valuable product being exported from the area. Wind power development fits this approach by adding value to an existing resource. In this way, it can be a valuable means for adding to the economy.

While not measured in this study, non-market benefits may be important. Wind power is a renewable, non-polluting, low impact, non-extractive source of power. While providing positive benefits to a local economy, wind power has relatively light impacts on communities and their infrastructure, such as schools, roads, and social services. Construction of wind power projects has not involved the “boom and bust” economic and social conditions

associated with some other energy development, and is thus good for places unable to absorb large changes or many temporary workers.

Negative Impacts

We received a number of anecdotal reports from the study areas regarding negative impacts, such as the killing of birds or damages to existing roads from project construction and operation and maintenance activities. While impacts to community services such as schools, police and fire protection, etc. were examined, it was beyond the scope and budget of this study to exhaustively research all possible impacts.

The persistence of these anecdotal reports of negative impacts is an indication that all negative impacted from project development may not have been fully mitigated through the developments permitting process. To avoid these negative impacts, it is important that the nature and extent of such impacts be understood locally. Researching and developing information on the type and extent of such potential impacts would provide a good basis for local interests and entities to develop measures for mitigation and seek their inclusion in the project permitting process.

Land Values

Another area of concern that emerged during the course of the study was the effect of project development on land values, both for lands directly involved in the project and lands in proximity of the project.

According to economic theory and verified by everyday experience, a change in the income produced by an asset will change the value of the asset. This is as true for farmland as it is true for financial instruments such as bonds. This study found that for all case studies only a very minor change in farm income would occur due to land being taken out of agricultural production by site occupancy. Such a reduction would likely result in a very small, perhaps imperceptible, effect on farmland values.

Payments from easements and leases on farmland for the wind power site are an important source of income. How this affects farmland values depends to a large extent on the terms of the contract entered into. If the contracted payment were a one-time lump sum payment, all of the benefit would accrue directly to the landowner at the time of the payment, and there would be no long term income stream associated with the contract. Under these conditions, it would not be expected that land values would be affected. If the contractual arrangement resulted in a potential future income stream, such as a lease payment based on a share of power revenues, and this income stream went to the owner at the time each payment was made, rather than the owner at the time the contract was made, then it would be expected that this future income stream would be capitalized into the value of the farmland.

Where significant up front lump sum payments are made, this can provide new capital to farmland owners. Where there are a number of landowners that receive such payments, where they may be interested in using the new capital to increase their farmland holdings, and where farmland properties infrequently come on the market in the local area, a situation may come about where there is intense competition between those receiving the lump sum payments for purchasing farmland that comes on the market. This could result in some price increases over what had been paid for farmland in the recent past. Some anecdotal evidence has been reported of this occurring.

References

Benkendorf Associates Corporation, February 1998, *HUES Growth Impact Study Western Umatilla County*.

Boardman Rural Fire Protection District, website accessed December 28, 2001, http://users.eoni.com/~scorch/brfpd.htm.

Brown, Matthew, and Johanna Woelfel, April 2000, *Tax and Landowner Revenues from Wind Power Development*, NCSL State Legislative Report, Analysis of State Actions on Important Issues, Volume 25, Number 5.

CH2M Hill and Stoel Rives, January 2001, *Application for Site Certificate: Stateline Wind Project*, FPL Energy Vansycle LLC.

Conweb, website accessed 2001, Conweb 36: Vansycle Ridge Wind Farm, http://www.newsdata.com/enernet/conweb/documents/cw36doc6a.html.

Culberson County–Allamoore ISD, website accessed December 31, 2001, http://www.esc18.net/vanhorn/teachermail.htm.

DanMar and Associates, September 1996, *Economic Impact Analysis of Windpower Development in Southwest Minnesota*, Southwest Regional Development Commission., Slayton, Minnesota.

FPL Energy, 1998, website accessed December 3, 2001, *FPL Energy, State and Local Leaders Join in Vansycle Ridge Wind Farm Ribbon Cutting Ceremony*, http://www.fplenergy.com/newsreleases/1998/129a.htm.

FPL Energy, website accessed December 3, 2001, *FPL Energy Portfolio: Vansycle: Helix, Oregon*, http://www.fplenergy.com/aboutfpl/wind-6.htm.

Minnesota Department of Trade and Economic Development, website accessed December 31, 2001, *Community Profiles for Lake Benton, Ivanhoe, and Hendricks,* http://www.mnpro.com.

MIG, Inc., April 1999, *IMPLAN Professional™ Version 2.0 Social Accounting and Impact Analysis Software: User's Guide, Analysis Guide, and Data Guide*.

Minnesota Statutes, website accessed 2001, Chapter 272.02 Exempt property, Subdivision 22, Wind energy conversion systems, http://www.revisor.legstate.mn.us/stats/272/02.html.

Morrow County Health District, website accessed December 28, 2001, *Emergency Medical Services*, http://www.ucinet.com/~medchd/emergcy.html.

Morrow County School District, website accessed December 28, 2001, *About Morrow County*, http://morrow.k12.or.us/aboutmcsd/aboutmcsd.htm.

National Wind Power, website accessed 2001, *International projects: Delaware Mountain Wind Farm*, http://www.natwindpower.com/delaware.htm.

Oregon Economic and Community Development Department, website accessed December 28, 2001, *Community Profiles,* http://www.econ.state.or.us/toc.htm.

Oregon Employment Department, November 2001, *2002 Regional Economic Profile: Region 12, Morrow and Umatilla Counties*.

Oregon State Department of Revenue, website accessed 2002, *Property Taxes in Oregon*, http://www.dor.state.or.us/property.html.

Qwestdex.com, website accessed December 2001, http://www.qwestdex.com.

Rylander, Carole Keeton, 2000, *Texas 2000 State Expenditures by County: State Agency Expenditures by County: 701 Texas Education Agency*, http://www.window.state.tx.us /taxbud/expbyco00/agency/agy701.html.

Rylander, Carole Keeton, 2002, *Local Property Taxes: Texas property taxes: taxpayer's rights, remedies and responsibilities*, http://www.window.state.tx.us/taxinfo/proptax/remedy02/index.html.

U.S. Department of Commerce, May 2001, Economics and Statistics Administration, Bureau of Economic Analysis, *Regional Economic Information System 1969-99*.

U.S. Department of Energy and Electric Power Research Institute, December 1997, *Renewable Energy Technology Characterizations*, EPRI Topical Report TR-109496.

Van Horn, Texas, website accessed December 31, 2001, *The Town of Van Horn.* http://www.vanhorntx.com/town_of_van_horn.htm.

Appendix A: Technical Appendix

Methodology for Impact Analysis

In order to estimate the economic impacts resulting from wind power development in the case study regions, input-output (I-O) models were developed for each of the regions. These models are used to measure the indirect effects of project development on the regional economy, in terms of additional industry output, employment, and income. The model is based on IMPLAN ("IMpact analysis for PLANning"), a system of software and data used to perform economic impact analysis. Originally developed by the USDA Forest Service, the system is now maintained and marketed by the Minnesota IMPLAN Group, Inc. (MIG). The data is developed by MIG annually, using data collected at the national, state, and county level for all possible elements from a variety of state and federal sources. The models developed for this study were based on 1998 data, the most recently available at the outset of the study.

IMPLAN is a "non-survey" or secondary I-O system, as it does not require primary, survey-based data. It is based on national average technical relationships among industries to which information has been added on regional economic activity. The software allows for national average conditions to be adjusted in order to account for unique regional conditions. IMPLAN is a popular tool to analyze regional impacts of policy changes because of the ease with which specific regional or local information can be incorporated into a model. While such information generally is from secondary sources, primary data, if available, can be incorporated as easily.

Changes to the data are commonly made in order to "fine tune" the model, so that it accurately reflects the region's unique economy. The IMPLAN data were compared with published sources in order to identify any discrepancies and make corrections. Employment and earnings were compared to Regional Economic Information System (REIS, from the U.S. Department of Commerce) data, as well as individual state employment and earnings data.

In most cases, the IMPLAN data was fairly consistent with the other data sources, so few adjustments were made.

The regional purchase coefficients (RPCs), which indicate the portion of locally produced goods and services used to meet local demand, were also evaluated. RPCS are by definition always positive and never larger than one. The supply/demand pool ratio, the ratio of local supply of a commodity to local demand, also serves as an upper limit for the RPCs. The appropriateness of the RPC for a commodity is evaluated based on a number of factors, including the size of the economy and number of economic linkages within the economy, as well as the nature of the commodity itself. Commodities are defined as bundles of goods, and in some cases, this bundle of goods is small (e.g., for Sector 1, dairy farm products, the primary commodity is raw milk, with some livestock sales), while for others the bundle of goods is large (e.g., for Sector 315, screw machine products and bolts, a large number of different commodities are produced). For commodities where the bundle of goods is large, it is more important to know specifically which good(s) are being produced locally, and how much is likely to be used to meet local demand. Adjustment to the RPCs were made based on local trading patterns, determined by identifying the manufacturers of certain goods within the county, knowledge of local conditions, and other data sources.

The IMPLAN models for each of the case study regions were used to estimate the effects on the rest of the local economy of spending related to the construction and operation and maintenance of the wind power developments. Because the businesses within a local economy are linked together through the purchase and sales patterns of goods and services produced in the local area, an action which has a direct impact on one or more local industries is likely to have an indirect impact on many other businesses in the region. For example, a decline in the production of wheat will lead to a reduction in spending in the adjacent area as farms reduce production. Firms providing production inputs and support services to the farms would see a decline in their industry outputs as the demand for their products also declines. These additional effects are known as the indirect economic impacts. As household income is affected by the reductions in regional economic activity, additional impacts occur. The additional effects generated by reduced household spending are known as induced economic impacts. The total impact is the sum of the direct, indirect, and induced economic impacts.

A key element of an input-output model is the measurement of the direct, indirect, and induced linkages within a regional economy. The tool most often used to measure these interrelationships is known as a multiplier. A variety of multipliers are generated by an input-output model and each is associated with a specific industry. A multiplier is a single number which quantifies the total economic effects (for all businesses) which arise from direct changes in the economic activity of a single industry. Multipliers can be generated to measure the total output, income, and employment effects associated with changes in the demand for regional goods and services. For example, an output multiplier of 2.5 for the wheat industry would indicate that a $100,000 decline in sales by this industry would lead to

an overall decline of $250,000 in business sales throughout the economy, including the initial $100,000 loss to the wheat sector. An employment multiplier of 2.0 for the railroad industry would indicate that a loss of ten jobs in this sector would lead to an additional loss of ten jobs in other industries for a total loss of 20 jobs throughout the regional economy.

The IMPLAN models are margined models. That is, the purchase of a commodity such as milk by a household in a grocery store is divided into components reflecting the retail, wholesale, transportation, and insurance margins, as well as the price to the producer, the milk processing industry. Separating out these margins is an important part of estimating the direct effect. For example, if only the grocery sector part of the total cost to the households is located in the impact area (the wholesale, transportation, insurance, and milk processing sectors are not present), then only the retail margin component of the total cost to the household can be counted as a direct effect.

For each of the three case studies, the economic region of influence was defined as the county or counties in which the project is located. For Lake Benton I, this region was Lincoln County, Minnesota. For Vansycle Ridge, the region was defined as Morrow and Umatilla counties, Oregon. These two counties are inter-related economically and a change in one is likely to affect both. For the Delaware Mountain project, the region was Culberson County, Texas. IMPLAN models were constructed for each of the three areas. Detailed base data for the three models (which serve as "snapshots" of local economies described by each model) are displayed on the following pages.

For more information on IMPLAN software and databases, please see the User's Guide, Analysis Guide, and Data Guide, available from MIG, Inc. These three books are compiled into the manual, *IMPLAN Professional™ Version 2.0 Social Accounting and Impact Analysis Software*. This provides a good overview of the software, its applications, and database development and sources.

Limitations of the Methodology

IMPLAN analysis has some limitations which are attributable to the I-O methodology. One of the most important is that of fixed proportions: for any good or service, all inputs are combined in fixed proportions that are invariant with the level of output. Hence, there is no substitution among production inputs and no economies of scale are possible. Second, each production function incorporates fixed, invariant technology. Such an assumption may be questionable in the case of some sectors, such as agriculture, where technological changes occur regularly. This concern is offset in part by the slow, gradual technological changes that are typical in some other sectors. Third, I-O does not model any price effects that might be important to a region. Finally, I-O assumes that resources that become unemployed or employed due to a change in final demand have no alternative employment.

The IMPLAN database contains 528 sectors at the national level. While this is a large number of sectors, some sectors contain a wide range of products or services and the production functions reflect the average or aggregate production technology for the goods or services produced. The wind power industry is contained in the electric services sector, which includes all methods for producing electricity. Because the wind industry is relatively small, the production technologies of other methods of producing electricity are predominate in the production function. However, the system does permit the introduction of additional production functions if the individual production technical relationships can be specified.

The IMPLAN database is developed from national, state, and county level data sets, with the national level used as a control. A disaggregation procedure, which has proven quite reliable, is used to insure that the state data sets add up to the national totals, and that the county data sets add up to their respective state totals. There are occasional instances where apparent anomalies occur, particularly in counties with very small economies and particularly with very small sectors within these counties. Some of these anomalies are the result of the way ES202 and county business patterns data are collected and processed. Some may be attributed to the disaggregation procedure. Since counties with very small economies were included in this study, there were some instances where a sector was expected to be in the county data set, but was not present. A common reason for this occurrence is that the county activity is a part of a larger economic entity and the economic activity is reported in the county where its principal office is located.

IMPLAN Model Output

Model Base Data

Base data for the three IMPLAN models used in this analysis are displayed in detail on the following pages. Table A-1 displays the base data for the Lincoln County IMPLAN model developed for this study. Table A-2 includes the model base data for Morrow and Umatilla counties, and Table A-3 displays base data for the Culberson County model. Because the model data is from 1998, the dollar amounts displayed here are all in 1998 dollars.

The elements included in the tables and other definitions are described below:

Industry Output: Represents the total value of production by industry for the given year. MIG derives these data from a number of sources, including Bureau of Census economic censuses, Bureau of Economic Analysis output estimates, and the Bureau of Labor Statistics employment projections.

Employment: Represents the annual average number of jobs for each industry, and includes both full-time and part-time workers. These employment numbers also include the self-employed. These data come from ES202 employment security data, supplemented by county business patterns and REIS data.

Employee Compensation: Represents the total payroll costs of each industry, and includes the wages and salaries of workers who are paid by employers, as well as benefits, such as health and life insurance, retirement payments, and non-cash compensation. These data are derived from ES202 and REIS data.

Proprietor Income: Represents payments received by the self-employed as income, and includes income received by private business owners, doctors, lawyers, and others self-employed. These data are derived from self-employed income reported on federal tax forms.

Other Property Income: Represents payments to individuals in the form of rents received for property, royalties from contracts, and dividends paid by corporations, as well as profits earned by corporations. These data are derived from U.S. Bureau of Economic Analysis Gross State Product data.

Indirect Business Tax: Represents excise taxes, property taxes, fees, licenses, and sales taxes paid by businesses, or any taxes that occur during the normal operation of a business, except taxes on profit or income. These data are derived from U.S. Bureau of Economic Analysis Gross State Product data.

Total Value Added: Represents the sum of the four sub-components: 1) Employee Compensation, 2) Proprietor Income, 3) Other Property Type Income, and 4) Indirect Business Taxes.

Institutions: Institutions are households, governments, and capital. Together with exports they comprise final demand (consumption).

Personal Income: income from all sources, including employment income, capital income, and transfer payments.

Household Income: Income to households including employment income, capital income, and transfer payments, net of taxes and savings; disposable income.

Table A-1
Lincoln County IMPLAN Model – Detailed Base Data

	Industry	Industry Output ($millions)	Employ-ment (jobs)	Employee Compen-sation ($millions)	Proprietor Income ($millions)	Other Property Income ($millions)	Indirect Business Tax ($millions)	Total Value Added ($millions)
1	Dairy Farm Products	8.599	34	0.633	0.623	0.234	0.016	1.506
3	Ranch Fed Cattle	3.486	38	0.190	0.161	0.082	0.051	0.484
4	Range Fed Cattle	0.176	2	0.009	0.009	0.004	0.002	0.025
5	Cattle Feedlots	6.682	21	0.363	0.347	0.167	0.103	0.981
6	Sheep, Lambs and Goats	0.385	19	0.021	0.024	0.007	0.004	0.057
7	Hogs, Pigs and Swine	13.028	107	0.708	0.327	0.437	0.271	1.742
9	Miscellaneous Livestock	0.062	1	0.007	0.002	0.003	0.000	0.012
11	Food Grains	0.867	14	0.027	0.043	0.088	0.019	0.177
12	Feed Grains	20.163	196	0.542	1.219	2.662	0.761	5.184
13	Hay and Pasture	7.029	215	0.200	0.450	0.655	0.187	1.493
21	Oil Bearing Crops	18.492	242	1.199	1.221	2.722	0.703	5.845
24	Forestry Products	0.241	3	0.007	-0.004	0.039	0.011	0.053
26	Agricultural, Forestry, Fishery Services	0.668	32	0.256	0.083	0.052	0.016	0.407
27	Landscape and Horticultural Services	1.137	39	0.373	0.152	0.172	0.029	0.726
48	New Residential Structures	9.169	74	1.115	0.401	0.213	0.060	1.789
49	New Industrial and Commercial Buildings	5.661	51	1.146	0.402	0.180	0.058	1.786
50	New Utility Structures	1.037	12	0.265	0.093	0.036	0.006	0.400
51	New Highways and Streets	1.345	14	0.304	0.106	0.066	0.011	0.487
52	New Farm Structures	0.570	6	0.144	0.043	0.032	0.004	0.223
53	New Mineral Extraction Facilities	0.357	7	0.144	0.015	0.006	0.009	0.174
54	New Government Facilities	4.819	35	1.052	0.375	0.211	0.036	1.673
55	Maintenance and Repair, Residential	1.737	24	0.472	0.167	0.016	0.002	0.657
56	Maintenance and Repair Other Facilities	5.245	100	2.193	0.772	0.152	0.015	3.132
174	Newspapers	0.971	19	0.195	0.010	0.055	0.006	0.266
195	Drugs	0.172	1	0.017	0.001	0.016	0.001	0.035
197	Polishes and Sanitation Goods	0.070	1	0.011	0.001	0.013	0.000	0.026
199	Toilet Preparations	0.302	1	0.040	0.003	0.054	0.002	0.098
205	Adhesives and Sealants	0.172	1	0.007	0.001	0.004	0.000	0.012
209	Chemical Preparations, N.E.C.	0.226	1	0.011	0.001	0.006	0.000	0.019
243	Concrete Products, N.E.C.	2.199	18	0.616	0.018	0.217	0.032	0.883
309	Farm Machinery and Equipment	1.023	6	0.108	0.004	0.050	0.004	0.165
370	Radio and TV Receiving Sets	2.061	17	0.452	0.010	0.066	0.014	0.542
433	Railroads and Related Services	0.378	2	0.144	0.000	0.063	0.009	0.216
434	Local, Interurban Passenger Transit	0.564	18	0.206	0.032	0.051	0.011	0.301
435	Motor Freight Transport and Warehousing	7.519	82	1.462	0.639	0.620	0.093	2.815
439	Arrangement of Passenger Transportation	0.291	3	0.112	0.029	0.064	0.008	0.213
440	Transportation Services	0.249	4	0.114	0.027	0.022	0.002	0.164
441	Communications, Except Radio and TV	0.675	3	0.140	0.021	0.234	0.041	0.436
443	Electric Services	13.501	46	2.117	0.444	6.852	1.660	11.073
447	Wholesale Trade	8.704	137	2.993	0.374	1.349	1.241	5.958
448	Building Materials & Gardening Supplies	1.432	39	0.718	0.076	0.232	0.237	1.262
449	General Merchandise Stores	0.079	2	0.038	0.000	0.013	0.013	0.063
450	Food Stores	1.285	71	0.665	0.119	0.207	0.212	1.204
451	Automotive Dealers & Service Stations	1.772	81	0.828	0.128	0.286	0.292	1.534
452	Apparel & Accessory Stores	0.077	5	0.029	0.003	0.012	0.013	0.057
453	Furniture & Home Furnishings Stores	0.146	11	0.066	0.012	0.023	0.024	0.125
454	Eating & Drinking	2.828	133	0.680	0.051	0.186	0.133	1.050
455	Miscellaneous Retail	2.447	135	0.970	0.295	0.395	0.404	2.064

Table A-1 (continued)
Lincoln County IMPLAN Model – Detailed Base Data

	Industry	Industry Output ($millions)	Employ-ment (jobs)	Employee Compen-sation ($millions)	Proprietor Income ($millions)	Other Property Income ($millions)	Indirect Business Tax ($millions)	Total Value Added ($millions)
456	Banking	4.804	40	1.158	0.037	2.294	0.094	3.583
457	Credit Agencies	0.106	3	0.062	0.002	0.023	0.004	0.092
458	Security and Commodity Brokers	0.147	2	0.078	0.019	0.001	0.009	0.108
459	Insurance Carriers	0.412	6	0.084	0.000	0.039	0.016	0.139
460	Insurance Agents and Brokers	0.188	9	0.062	0.062	0.020	0.002	0.146
461	Owner-occupied Dwellings	4.360	0	0.000	0.000	2.769	0.569	3.338
462	Real Estate	3.821	59	0.090	0.388	1.752	0.451	2.681
463	Hotels and Lodging Places	0.025	1	0.007	0.002	0.004	0.002	0.014
466	Beauty and Barber Shops	0.097	6	0.034	0.017	0.004	0.001	0.057
467	Funeral Service and Crematories	0.117	3	0.045	0.021	0.011	0.003	0.080
470	Other Business Services	1.290	25	0.285	0.134	0.233	0.019	0.671
479	Automobile Repair and Services	0.406	7	0.088	0.033	0.061	0.018	0.201
482	Miscellaneous Repair Shops	1.183	23	0.163	0.157	0.095	0.025	0.441
485	Bowling Alleys and Pool Halls	0.031	2	0.012	0.001	0.003	0.002	0.018
488	Amusement and Recreation Services, N.E.C.	0.316	12	0.115	0.013	0.066	0.016	0.209
489	Membership Sports and Recreation Clubs	0.040	2	0.015	0.002	0.002	0.001	0.020
490	Doctors and Dentists	2.265	36	1.024	0.142	0.100	0.024	1.289
492	Hospitals	21.345	528	8.986	1.234	0.437	0.057	10.714
493	Other Medical and Health Service	0.369	10	0.108	0.025	0.019	0.005	0.157
494	Legal Services	0.228	5	0.068	0.098	0.012	0.002	0.179
499	Child Day Care Services	0.313	10	0.104	0.000	0.009	0.003	0.116
500	Social Services, N.E.C.	0.786	20	0.294	0.000	0.006	0.001	0.301
501	Residential Care	1.324	57	0.811	0.000	0.012	0.012	0.835
502	Other Nonprofit Organizations	0.094	3	0.049	0.001	0.000	0.001	0.051
504	Labor and Civic Organizations	0.127	12	0.096	0.000	0.000	0.000	0.096
505	Religious Organizations	8.894	72	0.933	0.000	0.000	0.000	0.933
507	Accounting, Auditing and Bookkeeping	2.751	179	0.785	1.539	0.130	0.025	2.480
512	Other State and Local Govt Enterprises	3.179	24	0.556	0.000	0.432	0.000	0.987
513	U.S. Postal Service	1.264	23	0.900	0.000	-0.094	0.000	0.806
519	Federal Government – Military	0.685	26	0.396	0.000	0.289	0.000	0.685
520	Federal Government - Non-Military	0.382	6	0.329	0.000	0.054	0.000	0.382
522	State & Local Government – Education	5.327	149	5.327	0.000	0.000	0.000	5.327
523	State & Local Government - Non-Education	3.828	154	3.003	0.000	0.825	0.000	3.828
528	Inventory Valuation Adjustment	0.163	0	0.000	0.000	0.163	0.000	0.163
	Totals	230.766	3,636	50.177	13.256	29.096	8.189	100.719

Table A-2
Morrow and Umatilla Counties IMPLAN Model – Detailed Base Data

	Industry	Industry Output ($millions)	Employ-ment (jobs)	Employee Compen-sation ($millions)	Proprietor Income ($millions)	Other Property Income ($millions)	Indirect Business Tax ($millions)	Total Value Added ($millions)
1	Dairy Farm Products	1.783	8	0.149	0.165	0.058	0.004	0.377
2	Poultry and Eggs	0.083	1	0.006	0.002	0.003	0.000	0.011
3	Ranch Fed Cattle	25.334	280	1.574	1.129	0.509	0.315	3.528
4	Range Fed Cattle	9.632	114	0.601	0.515	0.174	0.108	1.397
5	Cattle Feedlots	38.222	130	2.350	2.313	0.949	0.588	6.201
6	Sheep, Lambs and Goats	1.724	91	0.106	0.090	0.024	0.015	0.235
7	Hogs, Pigs and Swine	0.207	2	0.013	0.004	0.005	0.003	0.025
8	Other Meat Animal Products	0.193	2	0.011	0.005	0.003	0.002	0.022
9	Miscellaneous Livestock	2.315	61	0.279	0.093	0.098	0.014	0.485
11	Food Grains	80.787	1,339	2.829	5.406	10.582	2.259	21.076
12	Feed Grains	9.731	94	0.287	0.630	1.213	0.347	2.476
13	Hay and Pasture	18.661	569	0.589	1.317	1.761	0.504	4.171
14	Grass Seeds	6.905	406	0.160	0.501	1.309	0.043	2.012
16	Fruits	10.164	115	2.416	0.126	0.625	0.147	3.314
18	Vegetables	128.777	799	24.325	7.803	16.562	1.862	50.552
19	Sugar Crops	0.160	1	0.005	0.007	0.022	0.003	0.037
20	Miscellaneous Crops	11.701	234	0.893	0.829	1.440	0.272	3.434
21	Oil Bearing Crops	0.091	1	0.007	0.005	0.009	0.002	0.023
22	Forest Products	1.900	16	0.063	0.083	0.443	0.030	0.619
23	Greenhouse and Nursery Products	3.243	32	0.916	0.158	0.736	0.023	1.833
24	Forestry Products	40.092	145	1.305	-1.813	15.815	4.494	19.801
25	Commercial Fishing	2.807	35	0.491	0.370	1.616	0.071	2.547
26	Agricultural, Forestry, Fishery Services	30.842	1,476	14.339	2.686	2.575	0.812	20.412
27	Landscape and Horticultural Services	2.893	108	0.975	0.352	0.434	0.073	1.834
40	Dimension Stone	0.555	9	0.165	0.007	0.182	0.017	0.371
48	New Residential Structures	83.922	605	16.383	2.851	2.722	0.773	22.728
49	New Industrial and Commercial Buildings	62.831	475	19.013	3.228	2.609	0.833	25.683
50	New Utility Structures	11.825	106	4.351	0.736	0.521	0.088	5.696
51	New Highways and Streets	10.311	87	3.379	0.572	0.638	0.105	4.694
54	New Government Facilities	38.778	229	12.435	2.150	2.170	0.367	17.122
55	Maintenance and Repair, Residential	26.584	303	10.467	1.794	0.314	0.038	12.613
56	Maintenance and Repair Other Facilities	59.376	805	31.796	5.419	1.924	0.189	39.328
58	Meat Packing Plants	21.880	63	2.865	0.014	0.365	0.227	3.471
59	Sausages and Other Prepared Meats	1.081	4	0.190	0.001	0.046	0.009	0.247
67	Canned Fruits and Vegetables	15.697	86	1.880	0.007	1.475	0.078	3.440
68	Dehydrated Food Products	41.973	266	9.098	0.026	5.714	0.266	15.104
69	Pickles, Sauces, and Salad Dressings	0.894	4	0.074	0.000	0.146	0.004	0.225
70	Frozen Fruits, Juices and Vegetables	627.109	3,148	84.911	0.327	38.874	4.245	128.357
72	Flour and Other Grain Mill Products	30.685	82	3.851	0.026	1.070	0.186	5.132
75	Blended and Prepared Flour	44.379	123	4.565	0.025	1.058	0.304	5.952
76	Wet Corn Milling	7.614	12	0.378	0.003	0.893	0.035	1.309
78	Prepared Feeds, N.E.C.	1.956	4	0.211	0.001	0.070	0.020	0.302
93	Wines, Brandy, and Brandy Spirits	0.458	2	0.040	0.000	0.029	0.052	0.122
99	Roasted Coffee	2.196	3	0.097	0.000	0.221	0.011	0.329
101	Manufactured Ice	0.211	8	0.071	0.000	0.027	0.001	0.099
108	Broadwoven Fabric Mills and Finishing	9.471	77	2.179	0.039	0.556	0.068	2.842
128	Canvas Products	0.185	3	0.041	0.006	0.013	0.001	0.061
133	Logging Camps and Logging Contractors	26.500	131	5.068	0.341	5.868	0.290	11.567

Table A-2 (continued)
Morrow and Umatilla Counties IMPLAN Model – Detailed Base Data

	Industry	Industry Output ($millions)	Employ-ment (jobs)	Employee Compen-sation ($millions)	Proprietor Income ($millions)	Other Property Income ($millions)	Indirect Business Tax ($millions)	Total Value Added ($millions)
134	Sawmills and Planing Mills, General	82.246	469	16.344	1.052	7.073	0.822	25.292
137	Millwork	1.825	20	0.642	0.050	0.078	0.018	0.787
142	Wood Pallets and Skids	0.346	4	0.115	0.008	0.026	0.003	0.153
143	Mobile Homes	65.734	523	17.196	1.377	5.040	0.619	24.233
146	Reconstituted Wood Products	53.206	208	8.629	0.661	9.281	0.527	19.097
174	Newspapers	9.611	149	2.863	0.157	0.812	0.087	3.919
178	Miscellaneous Publishing	0.787	10	0.162	0.010	0.099	0.006	0.276
179	Commercial Printing	3.921	46	0.763	0.053	0.136	0.026	0.978
220	Miscellaneous Plastics Products	23.542	140	5.483	0.038	1.880	0.175	7.577
242	Concrete Block and Brick	0.533	4	0.093	0.012	0.058	0.007	0.169
244	Ready-mixed Concrete	12.600	88	2.370	0.295	1.029	0.145	3.840
286	Architectural Metal Work	1.567	21	0.436	0.024	0.338	0.013	0.812
303	Pipe, Valves, and Pipe Fittings	1.178	12	0.293	0.017	0.071	0.007	0.388
304	Miscellaneous Fabricated Wire Products	1.107	14	0.256	0.017	0.051	0.006	0.330
309	Farm Machinery and Equipment	7.150	39	1.092	0.048	0.507	0.045	1.692
315	Conveyors and Conveying Equipment	0.742	5	0.187	0.008	0.051	0.006	0.252
330	Food Products Machinery	0.772	7	0.282	0.012	0.040	0.006	0.339
354	Industrial Machines N.E.C.	2.085	25	0.736	0.032	0.087	0.015	0.870
359	Relays & Industrial Controls	0.926	6	0.182	0.004	0.125	0.007	0.317
386	Motor Vehicle Parts and Accessories	0.552	3	0.086	0.006	0.027	0.002	0.121
387	Truck Trailers	0.838	6	0.129	0.005	0.047	0.003	0.184
391	Aircraft and Missile Equipment, N.E.C.	0.394	4	0.061	0.010	0.006	0.001	0.079
392	Ship Building and Repairing	0.111	2	0.024	0.006	0.001	0.001	0.032
393	Boat Building and Repairing	0.282	4	0.070	0.005	0.005	0.002	0.082
394	Railroad Equipment	0.262	1	0.021	0.003	0.003	0.001	0.029
395	Motorcycles, Bicycles, and Parts	0.116	1	0.008	0.001	0.001	0.000	0.010
397	Travel Trailers and Campers	63.274	418	12.555	0.698	0.814	0.446	14.512
399	Transportation Equipment, N.E.C.	0.787	3	0.080	0.004	0.034	0.005	0.124
429	Signs and Advertising Displays	0.430	6	0.110	0.006	0.034	0.003	0.154
433	Railroads and Related Services	78.449	438	31.583	0.000	13.845	2.024	47.452
434	Local, Interurban Passenger Transit	5.524	158	2.156	0.273	0.520	0.113	3.062
435	Motor Freight Transport and Warehousing	74.034	734	18.179	4.556	6.754	1.009	30.498
436	Water Transportation	0.535	2	0.110	0.034	0.061	0.017	0.222
437	Air Transportation	16.181	197	6.262	0.252	2.523	1.218	10.254
439	Arrangement of Passenger Transportation	1.269	37	0.457	0.159	0.277	0.033	0.926
440	Transportation Services	0.071	1	0.033	0.006	0.006	0.000	0.045
441	Communications, Except Radio and TV	23.264	132	5.079	0.448	8.066	1.423	15.016
442	Radio and TV Broadcasting	3.785	34	0.920	0.079	0.290	0.049	1.337
443	Electric Services	104.074	243	15.683	4.089	52.797	12.790	85.360
444	Gas Production and Distribution	10.619	18	0.949	0.171	1.331	0.694	3.145
445	Water Supply and Sewerage Systems	0.187	2	0.045	0.009	0.055	0.013	0.121
446	Sanitary Services and Steam Supply	17.792	111	5.416	1.051	2.193	3.243	11.904
447	Wholesale Trade	114.941	1,420	42.164	2.237	17.856	16.418	78.675
448	Building Materials & Gardening Supplies	15.035	327	7.316	1.026	2.430	2.483	13.255
449	General Merchandise Stores	55.479	1,258	26.505	-0.014	8.980	9.177	44.649
450	Food Stores	33.349	1,078	18.227	2.108	5.394	5.512	31.241
451	Automotive Dealers & Service Stations	50.840	986	24.418	3.001	8.215	8.395	44.029
452	Apparel & Accessory Stores	6.146	186	2.270	0.285	0.993	1.015	4.563

Table A-2 (continued)
Morrow and Umatilla Counties IMPLAN Model – Detailed Base Data

	Industry	Industry Output ($millions)	Employ-ment (jobs)	Employee Compen-sation ($millions)	Proprietor Income ($millions)	Other Property Income ($millions)	Indirect Business Tax ($millions)	Total Value Added ($millions)
453	Furniture & Home Furnishings Stores	8.195	208	4.089	0.268	1.325	1.354	7.037
454	Eating & Drinking	70.059	2,190	22.918	2.716	6.489	4.644	36.766
455	Miscellaneous Retail	18.409	930	6.568	2.968	2.965	3.030	15.530
456	Banking	60.154	482	14.387	0.587	28.716	1.179	44.869
457	Credit Agencies	6.861	125	3.904	0.286	1.521	0.281	5.992
458	Security and Commodity Brokers	2.835	21	1.885	0.163	0.030	0.187	2.265
459	Insurance Carriers	7.041	76	1.996	0.000	0.926	0.384	3.307
460	Insurance Agents and Brokers	10.745	324	5.056	2.033	1.141	0.122	8.352
461	Owner-occupied Dwellings	65.621	0	0.000	0.000	41.678	8.559	50.237
462	Real Estate	60.399	569	3.473	3.975	27.784	7.143	42.375
463	Hotels and Lodging Places	14.703	445	5.102	0.691	2.414	1.052	9.260
464	Laundry, Cleaning and Shoe Repair	5.882	273	2.054	1.821	0.404	0.144	4.423
465	Portrait and Photographic Studios	0.087	2	0.015	0.014	0.009	0.002	0.039
466	Beauty and Barber Shops	4.718	297	1.369	1.235	0.225	0.055	2.884
467	Funeral Service and Crematories	3.704	69	1.139	0.971	0.341	0.101	2.552
468	Miscellaneous Personal Services	5.995	97	0.630	0.557	0.601	0.135	1.924
469	Advertising	0.807	19	0.190	0.064	0.059	0.006	0.319
470	Other Business Services	3.815	59	0.998	0.329	0.740	0.060	2.127
471	Photofinishing, Commercial Photography	0.875	14	0.200	0.061	0.135	0.021	0.417
472	Services To Buildings	0.898	37	0.254	0.141	0.123	0.017	0.535
473	Equipment Rental and Leasing	3.997	42	1.103	0.341	0.874	0.131	2.449
474	Personnel Supply Services	19.289	880	12.451	4.358	0.620	0.338	17.768
475	Computer and Data Processing Services	0.619	15	0.208	0.081	0.041	0.008	0.337
476	Detective and Protective Services	0.370	21	0.167	0.057	0.033	0.005	0.262
477	Automobile Rental and Leasing	0.102	2	0.022	0.007	0.028	0.009	0.066
478	Automobile Parking and Car Wash	0.768	28	0.227	0.072	0.235	0.041	0.576
479	Automobile Repair and Services	28.502	375	7.181	2.342	4.821	1.425	15.769
480	Electrical Repair Service	0.479	8	0.088	0.059	0.028	0.013	0.189
481	Watch, Clock, Jewelry and Furniture Repair	0.445	9	0.067	0.044	0.035	0.019	0.165
482	Miscellaneous Repair Shops	16.451	262	3.176	2.068	1.564	0.415	7.223
483	Motion Pictures	6.423	107	0.821	0.301	0.034	0.045	1.202
484	Theatrical Producers, Bands Etc.	0.862	16	0.077	0.007	0.023	0.008	0.115
485	Bowling Alleys and Pool Halls	0.357	27	0.116	0.012	0.028	0.021	0.178
486	Commercial Sports Except Racing	0.526	6	0.198	0.027	0.016	0.021	0.263
488	Amusement and Recreation Services, N.E.C.	36.764	1,054	13.593	1.482	7.784	1.899	24.758
489	Membership Sports and Recreation Clubs	3.120	133	1.161	0.121	0.121	0.096	1.500
490	Doctors and Dentists	54.654	888	22.684	6.612	2.490	0.600	32.387
491	Nursing and Protective Care	11.049	377	5.971	1.491	0.215	0.257	7.935
492	Hospitals	47.300	778	23.242	5.926	1.241	0.161	30.571
493	Other Medical and Health Services	14.081	247	5.556	1.396	1.001	0.248	8.200
494	Legal Services	8.679	162	3.119	3.179	0.441	0.074	6.813
495	Elementary and Secondary Schools	2.373	103	1.019	0.082	0.000	0.000	1.101
496	Colleges, Universities, Schools	0.025	1	0.012	0.001	0.000	0.000	0.013
497	Other Educational Services	0.033	1	0.006	0.000	0.000	0.001	0.007
498	Job Trainings & Related Services	1.229	37	0.379	0.000	0.003	0.002	0.384
499	Child Day Care Services	10.622	272	4.423	0.000	0.378	0.136	4.937
500	Social Services, N.E.C.	4.217	109	1.490	0.000	0.030	0.005	1.525
501	Residential Care	10.301	455	6.244	0.000	0.089	0.096	6.429

Table A-2 (continued)
Morrow and Umatilla Counties IMPLAN Model – Detailed Base Data

	Industry	Industry Output ($millions)	Employ-ment (jobs)	Employee Compen-sation ($millions)	Proprietor Income ($millions)	Other Property Income ($millions)	Indirect Business Tax ($millions)	Total Value Added ($millions)
502	Other Nonprofit Organizations	1.074	33	0.519	0.019	0.000	0.009	0.546
503	Business Associations	1.013	31	0.572	0.000	0.007	0.001	0.580
504	Labor and Civic Organizations	17.994	753	16.007	0.000	0.001	0.003	16.011
505	Religious Organizations	66.633	556	4.747	0.000	0.000	0.000	4.747
506	Engineering, Architectural Services	1.015	15	0.241	0.066	0.023	0.006	0.336
507	Accounting, Auditing and Bookkeeping	4.885	196	2.704	1.418	0.235	0.046	4.403
508	Management and Consulting Services	4.697	120	1.019	0.272	0.138	0.019	1.449
509	Research, Development & Testing Services	4.771	78	2.398	0.600	0.109	0.058	3.165
511	State and Local Electric Utilities	2.863	5	0.348	0.000	0.848	0.000	1.196
512	Other State and Local Govt Enterprises	22.681	141	5.009	0.000	3.892	0.000	8.901
513	U.S. Postal Service	11.426	168	8.696	0.000	-0.695	0.000	8.001
514	Federal Electric Utilities	5.484	10	0.934	0.000	2.171	0.000	3.105
519	Federal Government – Military	8.613	276	4.984	0.000	3.629	0.000	8.613
520	Federal Government - Non-Military	50.353	997	43.270	0.000	7.083	0.000	50.353
522	State & Local Government – Education	113.777	3,323	113.777	0.000	0.000	0.000	113.777
523	State & Local Government - Non-Education	70.714	1,606	55.478	0.000	15.236	0.000	70.714
525	Domestic Services	1.983	279	1.983	0.000	0.000	0.000	1.983
528	Inventory Valuation Adjustment	8.365	0	0.000	0.000	8.365	0.000	8.365
	Totals	3,536.999	43,539	1,000.953	116.061	465.654	123.523	1,706.191

Table A-3
Culberson County IMPLAN Model – Detailed Base Data

	Industry	Industry Output ($millions)	Employ-ment (jobs)	Employee Compen-sation ($millions)	Proprietor Income ($millions)	Other Property Income ($millions)	Indirect Business Tax ($millions)	Total Value Added ($millions)
3	Ranch Fed Cattle	0.171	6	0.011	0.034	0.007	0.004	0.056
4	Range Fed Cattle	3.793	149	0.246	0.915	0.146	0.091	1.399
6	Sheep, Lambs and Goats	0.010	2	0.001	0.002	0.000	0.000	0.003
9	Miscellaneous Livestock	0.016	1	0.002	0.002	0.001	0.000	0.005
10	Cotton	0.267	4	0.039	0.088	0.068	0.016	0.210
13	Hay and Pasture	0.029	3	0.001	0.007	0.004	0.001	0.013
17	Tree Nuts	0.020	1	0.005	0.002	0.002	0.000	0.009
18	Vegetables	1.196	22	0.234	0.290	0.245	0.028	0.796
26	Agricultural, Forestry, Fishery Services	0.857	49	0.301	0.111	0.064	0.020	0.495
27	Landscape and Horticultural Services	1.422	58	0.427	0.217	0.210	0.035	0.889
38	Natural Gas & Crude Petroleum	1.020	4	0.177	0.106	0.347	0.082	0.712
39	Natural Gas Liquids	0.135	1	0.007	0.003	0.037	0.009	0.055
40	Dimension Stone	5.780	52	1.612	0.185	1.888	0.180	3.866
45	Chemical, Fertilizer Mineral Mining, N.E.C.	26.946	164	12.347	2.237	5.744	0.888	21.216
48	New Residential Structures	2.354	18	0.453	0.039	0.070	0.020	0.582
49	New Industrial and Commercial Buildings	1.537	12	0.468	0.040	0.060	0.019	0.586
50	New Utility Structures	0.624	6	0.233	0.020	0.026	0.004	0.284
51	New Highways and Streets	0.369	3	0.123	0.010	0.022	0.004	0.158
53	New Mineral Extraction Facilities	1.343	16	0.757	0.018	0.031	0.045	0.852
54	New Government Facilities	1.555	10	0.505	0.044	0.082	0.014	0.644
55	Maintenance and Repair, Residential	0.540	7	0.214	0.018	0.006	0.001	0.239
56	Maintenance and Repair Other Facilities	1.373	21	0.771	0.066	0.043	0.004	0.884
250	Minerals, Ground Or Treated	5.089	33	1.272	0.122	1.162	0.063	2.619
433	Railroads and Related Services	3.263	13	1.422	0.000	0.623	0.091	2.136
435	Motor Freight Transport and Warehousing	0.350	4	0.085	0.019	0.031	0.005	0.139
437	Air Transportation	0.062	1	0.023	0.001	0.009	0.004	0.037
439	Arrangement of Passenger Transportation	0.074	1	0.014	0.022	0.016	0.002	0.054
440	Transportation Services	0.063	1	0.016	0.022	0.006	0.000	0.045
441	Communications, Except Radio and TV	0.292	2	0.029	0.042	0.100	0.018	0.189
444	Gas Production and Distribution	2.310	4	0.125	0.161	0.331	0.172	0.789
447	Wholesale Trade	0.673	14	0.229	0.031	0.104	0.096	0.460
448	Building Materials & Gardening Supplies	0.098	2	0.048	0.006	0.016	0.016	0.087
449	General Merchandise Stores	0.098	3	0.047	0.000	0.016	0.016	0.079
450	Food Stores	1.450	72	0.701	0.185	0.233	0.239	1.358
451	Automotive Dealers & Service Stations	2.548	76	1.080	0.297	0.410	0.419	2.207
452	Apparel & Accessory Stores	0.002	1	0.000	0.001	0.000	0.000	0.002
453	Furniture & Home Furnishings Stores	0.039	1	0.019	0.001	0.006	0.006	0.033
454	Eating & Drinking	2.168	77	0.661	0.074	0.186	0.133	1.054
455	Miscellaneous Retail	3.979	166	0.878	1.196	0.634	0.648	3.357
456	Banking	1.718	10	0.414	0.014	0.820	0.034	1.281
460	Insurance Agents and Brokers	0.173	2	0.094	0.020	0.018	0.002	0.134
461	Owner-occupied Dwellings	2.209	0	0.000	0.000	1.403	0.288	1.691
462	Real Estate	1.601	7	0.120	0.076	0.738	0.190	1.123
463	Hotels and Lodging Places	4.780	145	1.388	0.569	0.807	0.352	3.116
464	Laundry, Cleaning and Shoe Repair	0.189	12	0.055	0.069	0.013	0.005	0.142
470	Other Business Services	0.147	2	0.045	0.010	0.031	0.002	0.088
472	Services To Buildings	0.056	1	0.023	0.005	0.009	0.001	0.038
473	Equipment Rental and Leasing	0.033	1	0.008	0.002	0.006	0.001	0.017

Table A-3 (continued)
Culberson County IMPLAN Model – Detailed Base Data

	Industry	Industry Output ($millions)	Employ-ment (jobs)	Employee Compen-sation ($millions)	Proprietor Income ($millions)	Other Property Income ($millions)	Indirect Business Tax ($millions)	Total Value Added ($millions)
474	Personnel Supply Services	0.128	3	0.091	0.021	0.004	0.002	0.118
475	Computer and Data Processing Services	0.101	2	0.043	0.012	0.008	0.001	0.064
476	Detective and Protective Services	0.033	1	0.017	0.004	0.003	0.000	0.025
479	Automobile Repair and Services	0.307	6	0.052	0.034	0.043	0.013	0.142
480	Electrical Repair Services	0.248	4	0.068	0.019	0.017	0.008	0.112
481	Watch, Clock, Jewelry and Furniture Repair	0.057	1	0.012	0.003	0.005	0.003	0.024
482	Miscellaneous Repair Shops	0.574	8	0.156	0.042	0.060	0.016	0.274
484	Theatrical Producers, Bands Etc.	0.056	1	0.005	0.001	0.002	0.001	0.009
488	Amusement and Recreation Services, N.E.C.	0.129	4	0.043	0.009	0.027	0.007	0.086
489	Membership Sports and Recreation Clubs	0.043	1	0.017	0.004	0.002	0.002	0.025
490	Doctors and Dentists	2.480	36	1.164	0.239	0.120	0.029	1.551
493	Other Medical and Health Services	1.763	51	0.469	0.154	0.089	0.022	0.734
494	Legal Services	0.207	3	0.071	0.079	0.010	0.002	0.162
502	Other Nonprofit Organizations	0.157	5	0.080	0.000	0.000	0.001	0.081
503	Business Associations	0.181	5	0.108	0.000	0.001	0.000	0.109
504	Labor and Civic Organizations	0.102	5	0.088	0.000	0.000	0.000	0.088
505	Religious Organizations	0.746	6	0.090	0.000	0.000	0.000	0.090
506	Engineering, Architectural Services	0.473	5	0.176	0.029	0.016	0.004	0.225
507	Accounting, Auditing and Bookkeeping	1.657	27	0.388	1.012	0.078	0.015	1.493
508	Management and Consulting Services	0.404	6	0.178	0.028	0.022	0.003	0.231
509	Research, Development & Testing Services	0.325	5	0.177	0.026	0.007	0.004	0.214
512	Other State and Local Govt Enterprises	6.039	40	1.238	0.000	0.962	0.000	2.200
513	U.S. Postal Service	0.242	3	0.192	0.000	-0.013	0.000	0.179
519	Federal Government – Military	0.212	8	0.122	0.000	0.089	0.000	0.212
520	Federal Government - Non-Military	3.719	77	3.196	0.000	0.523	0.000	3.719
522	State & Local Government - Education	4.301	132	4.301	0.000	0.000	0.000	4.301
523	State & Local Government - Non-Education	2.474	79	1.941	0.000	0.533	0.000	2.474
525	Domestic Services	0.015	2	0.015	0.000	0.000	0.000	0.015
528	Inventory Valuation Adjustment	0.070	0	0.000	0.000	0.070	0.000	0.070
	Totals	112.063	1,783	42.228	9.115	19.509	4.402	75.254

Impacts

The following tables display the regional economic impacts for each of the case study regions in more detail than was provided in the main report. Economic effects related to the construction phase of each project are shown separately from those related to the operation and maintenance phase. Lake Benton I effects on the Lincoln County economy are displayed in Tables A-4 and A-5. Impacts on Morrow and Umatilla counties of the Vansycle Ridge project are shown in Tables A-6 and A-7. Table A-8 and A-9 includes the effects of the Delaware Mountain project the Culberson County economy. Output and income effects are all given in 1998 dollars, corresponding to the data year of the IMPLAN models.

Effects on three different economic measures are presented here. "Output" (also known as Total Industry Output) is the first measure, and represents the value of production of goods and services by businesses in the local economy. This can serve as an overall measure of the local economy, and is useful for comparing regions and looking at impacts.

The second measure is "Income" (also known as Labor Income), which is the sum of employee compensation and proprietor income. Employee compensation represents total payroll costs, including wages and salaries paid to workers plus benefits such as health insurance, as well as retirement payments and non-cash compensation. Proprietor income includes payments received by self-employed individuals as income, such as income received by private business owners, doctors, or lawyers. This measure is useful to show how the employees and proprietors of businesses producing the output share in the fortunes of those businesses.

The third measure is "Employment." This represents the annual average number of employees, whether full- or part-time, of the businesses producing the output. Self-employed workers are included in this measure.

In the output section of the tables, the direct column is the direct changes that occurred to the local economy as a result of the construction phase or the operation and maintenance phase. The direct change is also referred to as "change in final demand." The direct effect on institutions (which includes households) is the effect of the personal income earned by workers directly employed in either construction or operation and maintenance.

The indirect column in the output section of each table is the round by round spending effects of the direct output. The induced column in the output section is the round by round effect of spending household income earned in the direct and indirect effects. The total column sums each row in the tables.

The relationships between output and income and employment at the individual industry level (528 sector level) are linear. This linearity or fixed proportions assumption is a key assumption in Input-Output methodology. These relationships are established in the base data. For example, in Table A-1 for Sector 1, Dairy Farm Products, the ratio between industry output and employment is 252,912 to 1, or for every $252,912 of output produced there is one job.

While industry ratios are used for the individual industry to make the initial calculations, Tables A-4 through A-9 have been aggregated for display purposes, and when aggregated, the basis relationships may not appear the same due to different industries being affected differently.

Estimating Final Demand

Impacts are generated within the models by estimating how final demand in the study areas will change as a result of some new economic activity. Estimating how this new economic activity results in a change to final demand is a key step in impact analysis.

In some situations it is relatively straightforward to estimate a change in final demand; in other situations this can be a very complex task. An example of a relatively straightforward situation would be where a single industry is involved, the industry already exists in the study area, and the value of the new or additional output can be measured. For instance, consider a county that has an existing forest products industry (a sawmill) and it expands lumber exports from the county. If the quantity of new lumber output can be measured and the value per unit of the lumber export is known, the total value of the additional exports (change in final demand) can be calculated. This change is entered into the model as a change in final demand to the sawmill industry and the impact of the change on the rest of the economy can be estimated with the model. The direct change is the change in final demand. The indirect change in output occurs from the increase in sales of other industries in the county, such as logging contractors, forestry products, wholesale and retail trade, and electric services, which includes further round by round sales. This is called the output multiplier effect. The induced change in output results from the increased household income expenditures generated by the direct and indirect output effects.

The situation becomes more complex when the industry affected does not exist in the study area, or when the business is contained in an industry that has an average production technology that is aggregated from dissimilar production technologies, or when the economic activity comes from what may commonly be considered an “industry,” but is not defined as such in the input-output industry structure (for example, the tourism “industry”). Wind power is included in the electric services industry, along with hydropower, coal and gas fired power generation, and nuclear power production. While we do not have a specific production function for wind power generation, it is likely that it is significantly different

than the average production technology of the various means of generating electricity represented in the IMPLAN electric services industry. Even if the value of wind power output from a project could be estimated, entering this value as a change in final demand in the IMPLAN electric services industry could lead to misleading impact estimates. Thus, it is appropriate to use other means of portraying the changes in final demand associated with wind power construction and operation and maintenance that may be expected to occur in a study area.

The approach used in estimating tourism impacts provides a way of measuring final demand when an appropriate industry does not exist in an IMPLAN model. There is no defined tourism industry in an IMPLAN model. The tourism "industry" is actually represented by expenditures in a number of IMPLAN sectors, such as lodging, eating and drinking, or retail trade. Final demand is measured as money spent in the study area within these industries.

This same process was followed in estimating the final demand values associated with wind power construction and operation and maintenance. For construction, the estimates of final demand are made the same way as for tourism with local expenditures made in IMPLAN industries estimated. These estimates are entered as a change in final demand in the corresponding IMPLAN industries in the study area model (direct output column in Tables A-4 through A-9) and the effects on output, income, and employment are estimated.

For operation and maintenance, essentially the same process was followed. The exception is that jobs in the electric services industry are located permanently in the study area. By entering an expenditure pattern for local operation and maintenance expenditures in the same manner as for construction these jobs are not picked up in the effects measured by the model. To adjust for this, these jobs in the electric services industry are estimated outside the model and added to the results estimated by the model.

Table A-4
Lake Benton I– Regional Economic Effects of Construction Phase

	Direct	Indirect	Induced	Total
Output (1998 dollars):				
Agriculture	$3,514	$1,163	$659	$5,336
Mining	$0	$0	$0	$0
Construction	$0	$5,652	$730	$6,382
Manufacturing	$1,452	$2,352	$481	$4,285
Transportation, Communication, Public Utilities	$13,100	$5,369	$2,748	$21,217
Trade	$66,704	$3,122	$7,149	$76,975
Finance, Insurance, Real Estate	$40,219	$4,460	$6,339	$51,018
Services	$93,565	$4,844	$9,000	$107,409
Government	$6,579	$2,158	$1,328	$10,064
Other	$0	$0	$0	$0
Institutions	$355,068	$0	$0	$355,068
Total	**$580,200**	**$29,122**	**$28,433**	**$637,755**
Income (1998 dollars):				
Agriculture	$404	$352	$101	$858
Mining	$0	$0	$0	$0
Construction	$0	$2,854	$363	$3,217
Manufacturing	$260	$464	$89	$813
Transportation, Communication, Public Utilities	$3,241	$1,484	$696	$5,422
Trade	$27,643	$1,150	$3,178	$31,970
Finance, Insurance, Real Estate	$4,695	$1,228	$827	$6,750
Services	$40,118	$2,251	$4,143	$46,511
Government	$1,396	$1,014	$357	$2,768
Other	$0	$0	$0	$0
Institutions	$0	$0	$0	$0
Total	**$77,758**	**$10,798**	**$9,753**	**$98,307**
Employment (jobs):				
Agriculture	0.0	0.0	0.0	0.1
Mining	0.0	0.0	0.0	0.0
Construction	0.0	0.1	0.0	0.1
Manufacturing	0.0	0.0	0.0	0.0
Transportation, Communication, Public Utilities	0.1	0.0	0.0	0.2
Trade	2.9	0.1	0.3	3.3
Finance, Insurance, Real Estate	0.2	0.1	0.0	0.3
Services	3.1	0.1	0.3	3.5
Government	0.1	0.0	0.0	0.1
Other	0.0	0.0	0.0	0.0
Institutions	0.0	0.0	0.0	0.0
Total	**6.5**	**0.5**	**0.6**	**7.6**

Table A-5
Lake Benton I– Regional Economic Effects of Operations and Maintenance Phase

	Direct	Indirect	Induced	Total
Output (1998 dollars):				
Agriculture	$7,970	$2,240	$1,220	$11,431
Mining	$0	$0	$0	$0
Construction	$0	$10,860	$1,350	$12,211
Manufacturing	$3,300	$3,980	$890	$8,170
Transportation, Communication, Public Utilities	$29,733	$7,959	$5,087	$42,779
Trade	$120,535	$5,284	$13,238	$139,056
Finance, Insurance, Real Estate	$91,135	$7,620	$11,738	$110,495
Services	$144,211	$8,251	$16,664	$169,125
Government	$14,923	$3,901	$2,458	$21,283
Other	$0	$0	$0	$0
Institutions	$805,579	$0	$0	$805,579
Total	**$1,217,386**	**$50,096**	**$52,648**	**$1,320,130**
Income (1998 dollars):				
Agriculture	$917	$659	$187	$1,763
Mining	$0	$0	$0	$0
Construction	$0	$5,374	$672	$6,045
Manufacturing	$592	$770	$164	$1,526
Transportation, Communication, Public Utilities	$7,357	$2,112	$1,290	$10,759
Trade	$55,422	$1,952	$5,884	$63,258
Finance, Insurance, Real Estate	$10,629	$2,203	$1,532	$14,364
Services	$67,027	$3,879	$7,671	$78,576
Government	$3,166	$1,913	$662	$5,740
Other	$0	$0	$0	$0
Institutions	$0	$0	$0	$0
Total	**$145,110**	**$18,863**	**$18,059**	**$182,033**
Employment (jobs):				
Agriculture	0.1	0.1	0.0	0.1
Mining	0.0	0.0	0.0	0.0
Construction	0.0	0.2	0.0	0.2
Manufacturing	0.0	0.1	0.0	0.1
Transportation, Communication, Public Utilities	0.2	0.1	0.0	0.3
Trade	5.1	0.1	0.5	5.9
Finance, Insurance, Real Estate	0.5	0.1	0.1	0.7
Services	3.6	0.3	0.4	4.2
Government	0.1	0.1	0.0	0.2
Other	0.0	0.0	0.0	0.0
Institutions	0.0	0.0	0.0	0.0
Total	**9.6**	**0.9**	**1.2**	**11.8**

Table A-6
Vansycle Ridge – Regional Economic Effects of Construction Phase

	Direct	Indirect	Induced	Total
Output (1998 dollars):				
Agriculture	$374	$938	$958	$2,271
Mining	$0	$17	$0	$17
Construction	$0	$3,335	$881	$4,216
Manufacturing	$233,078	$7,386	$1,497	$241,960
Transportation, Communication, Public Utilities	$2,760	$25,416	$3,660	$31,836
Trade	$16,978	$7,944	$11,765	$36,687
Finance, Insurance, Real Estate	$8,073	$4,236	$8,727	$21,037
Services	$21,002	$7,685	$13,555	$42,242
Government	$900	$2,020	$1,197	$4,116
Other	$158	$0	$117	$276
Institutions	$47,933	$0	$0	$47,933
Total	**$331,256**	**$58,978**	**$42,356**	**$432,591**
Income (1998 dollars):				
Agriculture	$81	$220	$198	$498
Mining	$0	$5	$0	$5
Construction	$0	$2,021	$497	$2,518
Manufacturing	$49,235	$1,451	$244	$50,930
Transportation, Communication, Public Utilities	$675	$7,672	$911	$9,256
Trade	$7,777	$3,094	$5,561	$16,432
Finance, Insurance, Real Estate	$951	$1,108	$1,175	$3,234
Services	$10,113	$3,869	$7,025	$21,007
Government	$227	$668	$381	$1,276
Other	$158	$0	$117	$276
Institutions	$0	$0	$0	$0
Total	**$69,218**	**$20,108**	**$16,107**	**$105,433**
Employment (jobs):				
Agriculture	0.0	0.0	0.0	0.0
Mining	0.0	0.0	0.0	0.0
Construction	0.0	0.0	0.0	0.0
Manufacturing	1.6	0.0	0.0	1.7
Transportation, Communication, Public Utilities	0.0	0.2	0.0	0.2
Trade	0.5	0.1	0.4	0.9
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.2
Services	0.5	0.2	0.3	1.1
Government	0.0	0.0	0.0	0.0
Other	0.0	0.0	0.0	0.0
Institutions	0.0	0.0	0.0	0.0
Total	**2.7**	**0.7**	**0.7**	**4.2**

Table A-7
Vansycle Ridge – Regional Economic Effects of Operations and Maintenance Phase

	Direct	Indirect	Induced	Total
Output (1998 dollars):				
Agriculture	$1,562	$2,347	$785	$4,694
Mining	$0	$0	$0	$0
Construction	$0	$3,672	$721	$4,393
Manufacturing	$4,514	$1,577	$1,225	$7,316
Transportation, Communication, Public Utilities	$11,665	$3,298	$2,998	$17,962
Trade	$51,845	$1,876	$9,636	$63,357
Finance, Insurance, Real Estate	$33,568	$4,245	$7,148	$44,961
Services	$56,659	$4,586	$11,103	$72,347
Government	$3,771	$1,090	$980	$5,842
Other	$663	$0	$96	$760
Institutions	$201,414	$0	$0	$201,414
Total	**$365,662**	**$22,691**	**$34,693**	**$423,046**
Income (1998 dollars):				
Agriculture	$337	$472	$162	$971
Mining	$0	$0	$0	$0
Construction	$0	$2,066	$407	$2,473
Manufacturing	$673	$328	$200	$1,201
Transportation, Communication, Public Utilities	$2,848	$854	$746	$4,447
Trade	$25,031	$735	$4,554	$30,319
Finance, Insurance, Real Estate	$3,934	$1,204	$962	$6,100
Services	$30,039	$2,446	$5,754	$38,239
Government	$951	$582	$312	$1,845
Other	$663	$0	$96	$760
Institutions	$0	$0	$0	$0
Total	**$64,476**	**$8,687**	**$13,193**	**$86,356**
Employment (jobs):				
Agriculture	0.0	0.0	0.0	0.1
Mining	0.0	0.0	0.0	0.0
Construction	0.0	0.0	0.0	0.1
Manufacturing	0.0	0.0	0.0	0.0
Transportation, Communication, Public Utilities	0.1	0.0	0.0	0.1
Trade	1.4	0.0	0.3	1.7
Finance, Insurance, Real Estate	0.2	0.0	0.0	0.2
Services	1.2	0.1	0.2	1.6
Government	0.0	0.0	0.0	0.0
Other	0.1	0.0	0.0	0.1
Institutions	0.0	0.0	0.0	0.0
Total	**3.1**	**0.3**	**0.6**	**4.0**

Table A-8
Delaware Mtn. – Regional Economic Effects of Construction Phase

	Direct	Indirect	Induced	Total
Output (1998 dollars):				
Agriculture	$4,738	$4,588	$1,640	$10,966
Mining	$1,157	$4,295	$1,142	$6,594
Construction	$0	$15,645	$2,740	$18,386
Manufacturing	$142	$51	$35	$228
Transportation, Communication, Public Utilities	$15,368	$8,091	$4,385	$27,843
Trade	$366,527	$6,518	$33,027	$406,072
Finance, Insurance, Real Estate	$139,693	$18,283	$30,452	$188,428
Services	$303,656	$30,540	$27,472	$361,670
Government	$34,963	$12,546	$9,503	$57,014
Other	$765	$0	$111	$876
Institutions	$956,997	$0	$0	$956,997
Total	**$1,824,006**	**$100,558**	**$110,508**	**$2,035,072**
Income (1998 dollars):				
Agriculture	$1,772	$1,976	$650	$4,399
Mining	$329	$1,345	$347	$2,022
Construction	$0	$8,104	$1,388	$9,491
Manufacturing	$39	$14	$10	$63
Transportation, Communication, Public Utilities	$3,521	$2,233	$951	$6,705
Trade	$155,387	$2,474	$15,958	$173,818
Finance, Insurance, Real Estate	$11,432	$3,038	$2,692	$17,163
Services	$133,007	$16,387	$13,547	$162,941
Government	$7,689	$3,910	$2,287	$13,887
Other	$765	$0	$111	$876
Institutions	$0	$0	$0	$0
Total	**$313,942**	**$39,482**	**$37,940**	**$391,363**
Employment (jobs):				
Agriculture	0.2	0.2	0.0	0.4
Mining	0.0	0.0	0.0	0.0
Construction	0.0	0.2	0.0	0.3
Manufacturing	0.0	0.0	0.0	0.0
Transportation, Communication, Public Utilities	0.1	0.0	0.0	0.1
Trade	13.2	0.2	1.2	14.6
Finance, Insurance, Real Estate	0.3	0.0	0.0	0.5
Services	8.2	0.6	0.6	9.4
Government	0.2	0.1	0.0	0.4
Other	0.1	0.0	0.0	0.1
Institutions	0.0	0.0	0.0	0.0
Total	**22.2**	**1.5**	**2.1**	**25.8**

Table A-9
Delaware Mtn. – Regional Economic Effects of Operations and Maintenance Phase

	Direct	Indirect	Induced	Total
Output (1998 dollars):				
Agriculture	$2,172	$1,330	$403	$3,905
Mining	$530	$1,728	$281	$2,538
Construction	$0	$5,912	$674	$6,586
Manufacturing	$65	$14	$9	$88
Transportation, Communication, Public Utilities	$7,044	$1,701	$1,078	$9,822
Trade	$81,647	$1,175	$8,116	$90,937
Finance, Insurance, Real Estate	$64,030	$4,469	$7,482	$75,982
Services	$50,657	$6,943	$6,751	$64,350
Government	$16,026	$3,402	$2,336	$21,763
Other	$351	$0	$28	$378
Institutions	$438,654	$0	$0	$438,654
Total	**$661,176**	**$26,673**	**$27,154**	**$715,003**
Income (1998 dollars):				
Agriculture	$812	$571	$159	$1,542
Mining	$151	$541	$85	$777
Construction	$0	$2,974	$341	$3,314
Manufacturing	$18	$4	$2	$24
Transportation, Communication, Public Utilities	$1,614	$378	$234	$2,225
Trade	$39,896	$462	$3,921	$44,281
Finance, Insurance, Real Estate	$5,240	$717	$661	$6,619
Services	$24,745	$3,743	$3,329	$31,816
Government	$3,524	$1,104	$562	$5,190
Other	$351	$0	$28	$378
Institutions	$0	$0	$0	$0
Total	**$76,351**	**$10,493**	**$9,323**	**$96,167**
Employment (jobs):				
Agriculture	0.1	0.1	0.0	0.1
Mining	0.0	0.0	0.0	0.0
Construction	0.0	0.1	0.0	0.1
Manufacturing	0.0	0.0	0.0	0.0
Transportation, Communication, Public Utilities	0.0	0.0	0.0	0.1
Trade	2.9	0.0	0.3	3.3
Finance, Insurance, Real Estate	0.1	0.0	0.0	0.2
Services	1.1	0.1	0.1	1.4
Government	0.1	0.0	0.0	0.1
Other	0.0	0.0	0.0	0.0
Institutions	0.0	0.0	0.0	0.0
Total	**4.4**	**0.4**	**0.5**	**5.3**