SUPERVISOR OF ASSESSMENTS AND PLANNING
& ZONING COMMITTEE
of the
OGLE COUNTY BOARD

SUPERVISOR OF ASSESSMENTS AND
PLANNING & ZONING COMMITTEE REPORT
NOVEMBER 10, 2010

The regular monthly meeting of the Supervisor of Assessments and Planning & Zoning Committee of the Ogle County Board was held on November 10, 2010 at the Old Ogle County Courthouse, Third Floor County Board Room #317, 105 S. Fifth St., Oregon, IL.

The Order of Business is as follows:

1. ROLL CALL AND DECLARATION OF A QUORUM

   Chairman Lyle Hopkins called the meeting to order at 1:00 P.M. Roll call indicated five members of the Committee were present; Chairman Hopkins, Jim Barnes, Marcia Heuer, Larry Boes, and Dennis Williams. Ben Diehl and Mel Messer were absent. Mr. Hopkins declared a quorum present. Ben Diehl arrived at 1:04.

2. READING AND APPROVAL OF REPORT OF OCTOBER 13, 2010 MEETING AS MINUTES

   Mrs. Heuer made a motion to approve the report of October 13, 2010 as minutes; seconded by Mr. Williams. The motion carried by a voice vote.

SUPERVISOR OF ASSESSMENTS PORTION OF MEETING:

3. CONSIDERATION OF MONTHLY BILLS OF SUPERVISOR OF ASSESSMENTS, AND ACTION

   Monthly bills of the Supervisor of Assessments were presented to the Committee for consideration. The bills totaled $2,214.86 . Mr. Barnes made a motion to approve the payment of the bills in the amount of $2,214.86; seconded by Mr. Boes. The motion carried by a voice vote.

4. OLD BUSINESS

   There was no “Old Business” for consideration.

5. NEW BUSINESS

Mr Harrison stated that since assessment changes were published on October 7th, the deadline to file appeals was 30 days after that or November 8th. Approximately 90 appeals have been logged, which is not inconsistent with prior years. The Board of Review will consider these appeals.

Mr. Harrison stated that the Supervisor of Assessments budget for the current year will likely end with a small surplus.

Mrs. Heuer stated I heard that if a person replaces a house that was burnt down, they do not have to pay taxes for four years. Mr. Harrison explained a person can apply for a home improvement exemption up to $25,000 of the assessed value of the home for any improvements and would also apply to rebuilding after a fire. Basically if you rebuilt a $150,000 home the assessed value would be $50,000, but because of the exemption, the assessed value would be at $25,000 for four years. After four years the value goes back to norm. This applies to owner occupied property only. Mrs. Heuer asked you need to apply for this. It is not automatic. Mr. Harrison answered yes.

Mr. Harrison stated I would like to thank Mr. Diehl for his participation on this Committee. I appreciate his hard work.

PLANNING & ZONING PORTION OF MEETING:

6. UNFINISHED BUSINESS (CONSIDERATION AND POSSIBLE ACTION)

No unfinished business for consideration.

7. NEW BUSINESS

A. DECISIONS (CONSIDERATION AND POSSIBLE ACTION)

#8-10 SPECIAL USE -- Jeannette Richmond Trust #92, % Jeannette Richmond, Trustee, 1469 Farington Dr., Naperville, IL and Brian Harms, 2830 Lynnville Ct., Lindenwood, IL for a Special Use Permit to allow a Single-Family Dwelling in the AG-1 Agricultural District on property described as follows, owned by Jeannette Richmond Trust #92 and being purchased by Brian Harms:

Part of the NE1/4 of the SE1/4 of Section 26 Lynnville Township 41N, R2E of the 3rd P.M., Ogle County, IL, 3.0 acres, more or less
Property Identification Number: Part of 19-26-400-001
Common Location: 1612 S. Woodlawn Rd.

Mr. Hopkins stated this is an old farmstead; the house burned down several years ago. Mr. Harms wants to purchase the site and build a home.

Mrs. Heuer made a motion to approve #8-10 Special Use for Jeannette Richmond Trust #92 and Brian Harms. She noted that this petition was unanimously approved by the Regional Planning Commission and Zoning Board of Appeals; seconded by Mr. Barnes. The motion carried unanimously by a roll call vote of 6-0.

#9-10 SPECIAL USE -- Francis J. Drew, Jr., 6994 S. IL Rte. 2, Oregon, IL and Steven T. & Amy K. Drew, 519 Long Hill Rd., Gurnee, IL for a Special Use

Permit in the AG-1 Agricultural District to allow a Single-Family Dwelling for the son of the farm owner on property described as follows, owned by Francis Drew, Jr. and being purchased by Steven T. & Amy K. Drew:

Part of G.L. 1 and G.L. 2 of the NW1/4 Fractional Section 7 Grand Detour Township 22N, R9E of the 4th P.M., Ogle County, IL, 5.20 acres, more or less
Property Identification Number: Part of 21-07-100-005
Common Location: 8500 Block of W. Woosung Rd.

Mr. Reibel stated that the petitioner has requested that the one-year period for commencement of a special use be extended to a 10 year period. This request is allowed under the ordinance.

Mr. Boes stated that the petitioners are not planning to build for 8 to 12 years, but do plan on making improvements to the property in preparation for building a house. They are waiting for their son to graduate from high school. Mr. Hopkins stated they want to construct a driveway, install electric service, etc. These are good people and have a good track record for taking care of things.

Mr. Boes made a motion to approve #9-10 Special Use for Francis J. Drew and Steven T. & Amy K. Drew with the one-year period for commencement of a special use extended to a 10 year period as requested; seconded by Mr. Williams. The motion carried unanimously by a roll call vote of 6-0.

B. MOBILE HOME APPLICATIONS - (CONSIDERATION AND POSSIBLE ACTION)

No mobile home applications for consideration.

8. SUBDIVISION PLATS (CONSIDERATION AND POSSIBLE ACTION)

No subdivision plats for consideration.

9. CONSIDERATION OF MONTHLY BILLS OF PLANNING & ZONING DEPARTMENT, AND ACTION

Monthly bills of the Planning & Zoning Department were presented to the Committee for consideration. The bills totaled $1,379.93. Mr. Diehl made a motion to approve the payment of the bills in the amount of $1,379.93; seconded by Mr. Barnes. The motion carried by a voice vote.

10. REFERRAL OF NEW PETITIONS TO THE ZONING BOARD OF APPEALS FOR PUBLIC HEARING

#10-10 SPECIAL USE -- Chris A. Ames, 15930 E. Rachel Lane, Davis Junction, IL for a Special Use Permit to allow a Conference and Retreat facility in the AG-1 Agricultural District on property described as follows and owned by petitioner:

Part of G.L.1 & G.L.2 of the NW1/4 and part of the NE1/4 of Fractional Section 18 Monroe Township 42N, R2E of the 3rd P.M., Ogle County, IL, 179.38 acres, more or less
Property Identification Number: 12-18-100-001, -003, -005, & -006
Common Location: 6752 N. Kilbuck Rd.

#11-10 SPECIAL USE -- Terry Myers, 8580 N. Limestone Rd., Rockford, IL for a Special Use Permit to allow a Small Rural Business (classic & antique auto restoration) in the AG-1 Agricultural District on property described as follows and owned by petitioner:

Part of G.L.1 in the NE1/4 Fractional Section 5 Monroe Township 42N, R2E of the 3rd P.M., Ogle County, IL, 14.18 acres, more or less
Property Identification Number: 12-05-200-022
Common Location: 8580 N. Limestone Rd.

Mrs. Heuer made a motion to refer the above new requests to the Zoning Board of Appeals for public hearing; seconded by Mr. Barnes. The motion carried by a voice vote.

11. A. DISCUSSION OF WECS SUBCOMMITTEE PERFORMANCE STANDARDS REPORT AND POSSIBLE ACTION

Mr. Hopkins asked Mr. Barnes if he has any more information regarding the State of Wisconsin's state-wide wind energy siting standards from the Wisconsin Public Service Commission, based on the letter you forwarded to me. Mr. Barnes answered no; they felt it was not done properly and have put it on hold.

Mr. Hopkins asked for any further discussion. Mr. Barnes stated I believe before we make any decisions, we should wait for new county board to be seated. Mr. Boes stated I agree. It would be in the best interest for all. Mrs. Heuer stated and because WI is not finalized, we can't hang our hats on that. Mr. Hopkins agreed.

B. MARCIA HEUER REPORT REGARDING IACZO SEMINAR OF OCTOBER 28, 2010

Mrs. Heuer stated Mr. Reibel and I as well as Lloyd Funk, Tom Smith, and Jason Sword attend the recent IAZCO seminar and gathered lots of documented information regarding wind development in Illinois. Mrs. Heuer provide copies to the Committee members of various documents referenced at the IACZO seminar (attached to this report). All of this material can be authenticated and reviewed at the websites listed. All the credentials and how this data was developed is there. Mrs. Heuer reviewed the information with the Committee and discussion ensued.

County Board member Lynn Kilker asked if it would be possible to get this information to the County Board members for them to review. Mr. Barnes stated the new members should receive it, as well. The Committee directed Mr. Reibel to provide copies to the County Board members, including incoming members.

Mr. Boes asked if there was any discussion on moratoriums in other Illinois counties. Mr. Reibel answered no. Many counties in the State looking at us for direction.

Mr. Williams stated I was new to this Committee four years ago and I can honestly say this is a complicated committee. I hope that when creating the new County Board committees, a persons experienced with zoning is considered and weighed highly. Creating a whole new committee could be detrimental. I volunteer to remain on this committee. We don't want to re-invent the wheel. Mr. Hopkins agreed.

Mrs. Heuer stated I would like copies of the Baileyville Wind Farms conditions to be given the to the County Board for review. Mr. Hopkins stated that the WECS Subcommittee recommendations should be included, as well.

12. OTHER BUSINESS

Mr. Diehl asked Mr. Reibel if his budget has enough money for this year. Mr. Reibel answered yes; we should have a small surplus. Mr. Diehl asked can you live with next year's budget. Mr. Reibel answered we will make it work.

13. PUBLIC COMMENT

Mr. Szoula of the Operating Engineers handed out a document titled "The Wind Energy Supply Chain In Illinois" for the Committee to review (copy attached to this report). He stated right now there are 140 companies in Illinois involved with wind development. All Illinois Senators and Representatives also have a copy of this document.

14. ADJOURN

The regular monthly meeting of the Supervisor of Assessments and Planning & Zoning Committee of the Ogle County Board adjourned at 1:37 P.M. The next meeting of the Supervisor of Assessments and Planning & Zoning Committee is scheduled for Wednesday, December 15, 2010 at 1:00 P.M. at the Old Ogle County Courthouse, Third Floor County Board Room #317, 105 S. Fifth St. Oregon, IL.

Respectfully submitted,

Michael Reibel
Planning & Zoning Administrator

Wind Energy: What Lies Ahead for Illinois?

David G. Loomis, Ph.D.
Associate Professor of Economics
Illinois State University

Advancing Wind Power in Illinois 2008
June 25-26, 2008

Outline

- About Illinois State University and Wind Energy
- Wind Energy Development in Illinois
- WWG Activities
- Where is the State of Illinois Headed with Wind Energy?

ILLINOIS STATE UNIVERSITY ACTIVITIES

Illinois State University Activities

- Bachelor's Degree in Renewable Energy
- State Wind Working Group
- Center for Renewable Energy

ISU “Wind Team”

- David Kennell, Department of Technology
- David Loomis, Department of Economics
- Randy Winter, Department of Agriculture

Renewable Energy Major

- First interdisciplinary Bachelor of Science in Renewable Energy in the nation
- Approved by IBHE in October, 2007
- Thirty students enrolled for Fall, 2008; long-term capacity of sixty

Il Wind Working Group

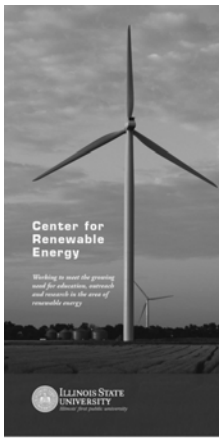
The IL WWG is an organization whose purposes are to communicate wind opportunities honestly and objectively, to interact with various stakeholders at the local, state, regional and national levels, and to promote economic development of wind energy in the state of Illinois.

Illinois Wind Working Group

- Website: www.wind.ilstu.edu
- Events:
- Siting Conference, Peoria, December 13
- Second Annual Conference, Bloomington, June 25-26, 2008

Center for Renewable Energy

- ...works to meet the growing need for education, outreach and research in the area of renewable energy.
- Three major functional areas:
  - to enhance of the renewable energy major at Illinois State University;
  - to serve the Illinois renewable energy community by providing information to the public;
  - to encourage applied research concerning renewable energy at Illinois State University and through collaborations with other universities.



Memberships

- Corporate Memberships available
- Horizon Wind Energy is the first Founding Member of the Center

Horizon Wind Energy
An EDP Renewables Company

WIND ENERGY DEVELOPMENT IN ILLINOIS

Illinois Wind Farm Database

- Special thanks to Bill Haas, IL DCEO for the initial database and Bill Poole and Chris Pikar, NRC for mapping assistance

Current Generating Capacity

- 10 projects with 734.4 MW of generating capacity in 9 counties
- Mendota Hills, Manlius (Bureau Valley School Dist), Illinois Rural Electric Coop, Crescent Ridge, Twin Groves I, Twin Groves II, Rock Island, Camp Grove Wind Farm, GSG Wind Farm, "Adam" = GSG 3 LLC

Under Construction

- 13 projects with 2,464.5 MW of generating capacity in 14 counties
- GSG Wind, GSG3 Wind, White Oak Wind Project, Grand Ridge Wind Project, Bishop Hill Wind Project, Pilot Knob Wind Projec,t Pleasant Ridge Wind Project, EcoGrove Windfarm Phase II, EcoGrove Windfarm Phase III, EcoBryn Windfarm, EcoLark Wind, EcoChelle Windfarm, Providence Heights

Planning/Permitting

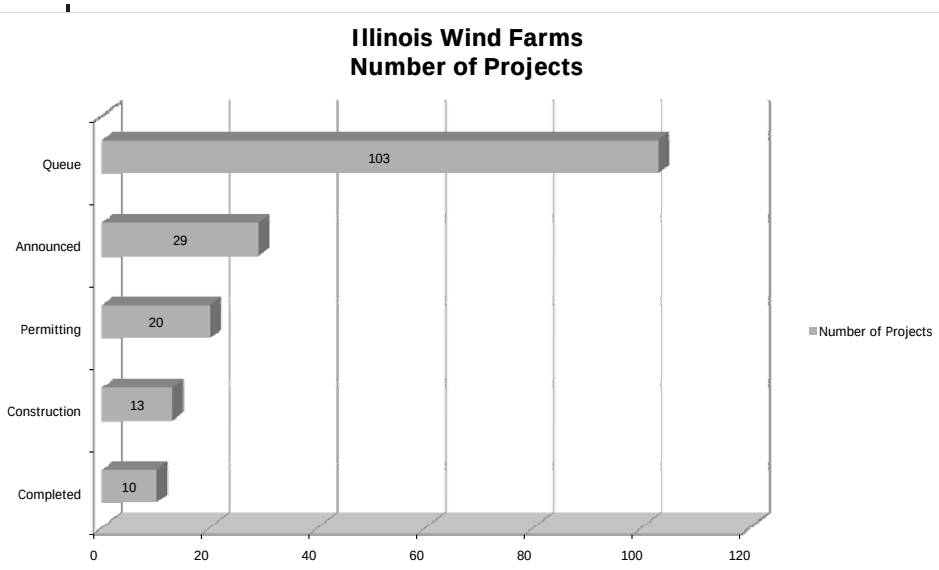
- 20 projects with 2,906 MW of generating capacity in 11 counties
- Baileyville Wind Farm, Eurus Crescent Ridge II, Lancaster Farm, Oak Prairie Wind Farm, Big Sky Wind Farm, EcoGrove Wind LLC, Genesco, Illinois, Mendota Township, Sherrard School District, Big Sky Wind Farm, Macoupin County Wind, Blackstone Wind Farm, Top Crop Wind Farm, EcoGrove Wind Farm Phase I ,Agriwind LLC, Agriwind II, Crescent Ridge II, Cayuga Ridge, Iberdrola – Unnamed, GSG 6, LLC

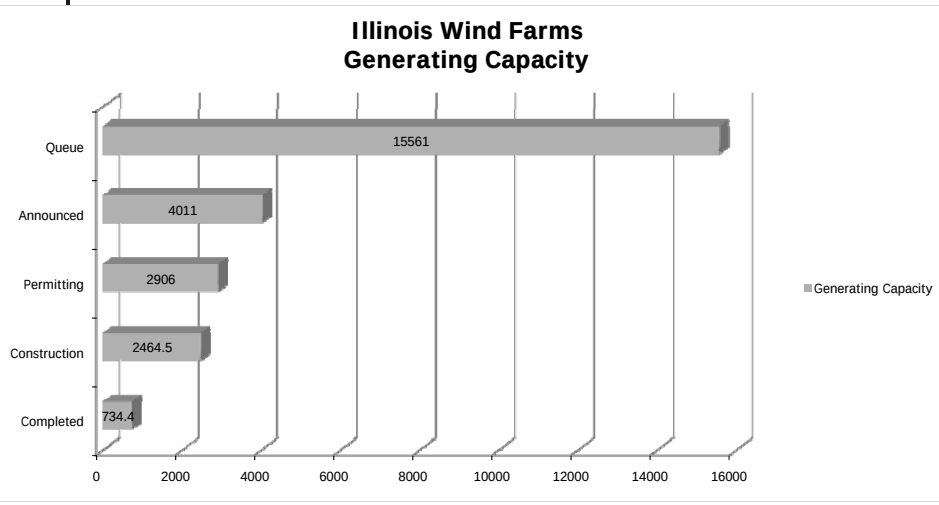
Permitting Process Database

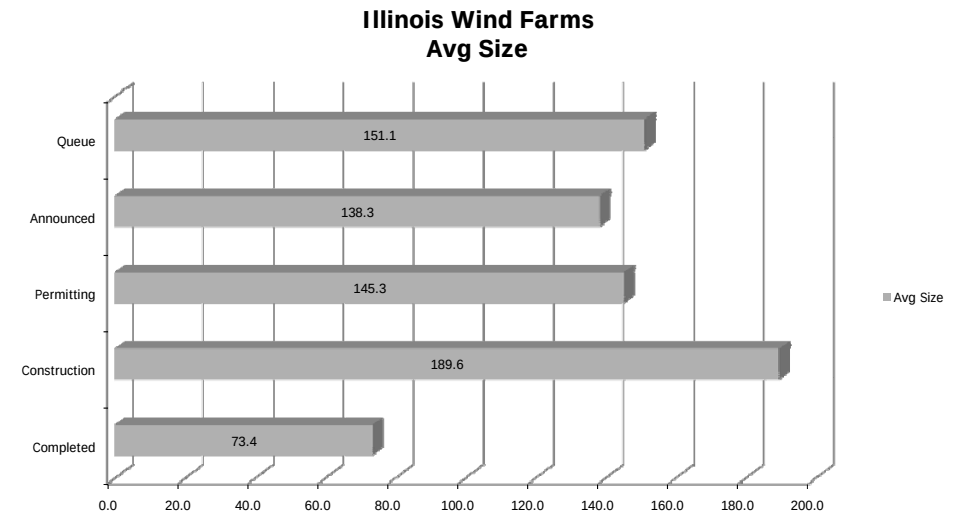
			Zoning Approval Process	
Wind Farm	Developer	County	Board	Meeting Date
AgriWind	AgriWind	Bureau County Board		Tuesday, June 10, 2008
Rail Splitter Wind Farm	Horizon Wind Energy	Tazewell County Board	Tazewell County Zoning Board of Appeals	Wednesday, June 04, 2008
El Paso wind farm	Navitas Energy Inc.	Woodford County Board		Thursday, May 29, 2008
Rail Splitter Wind Farm	Horizon Wind Energy	Tazewell County Board	Tazewell County Zoning Board of Appeals	Tuesday, May 27, 2008
Rail Splitter Wind Farm	Horizon Wind Energy	Tazewell County Board	Tazewell County Zoning Board of Appeals	Tuesday, May 20, 2008
Cayuga Ridge South Wind Farm	PPM Energy(Iberdrola Renewables)	Livingston County Board	Livingston County Zoning Board of App	Tuesday, May 20, 2008
Rail Splitter Wind Farm	Houston-based Horizon Wind Energy LLC	Tazewell County Board	Tazewell County Zoning Board of Appeals	Tuesday, May 20, 2008
Cayuga Ridge South Wind Farm	PPM Energy(Iberdrola Renewables)	Livingston County Board	Livingston County Zoning Board of Appeals	Tuesday, May 20, 2008
El Paso wind farm	Navitas Energy Inc.	Woodford County Board		Tuesday, May 20, 2008

In the Queue

- 29 projects with 4,011 MW of generating capacity announced
- 103 projects with 15,561 MW of generating capacity in the transmission queue


Illinois Wind Farms
Number of Projects
Queue
Announced
Permitting
Construction
Completed
103
29
20
13
10
0
20
40
60
80
100
120
Number of Projects


Illinois Wind Farms
Generating Capacity
Queue
Announced
Permitting
Construction
Completed
15561
4011
2906
2464.5
734.4
0
2000
4000
6000
8000
10000
12000
14000
16000
Generating Capacity



WIND WORKING GROUP ACTIVITIES

Events

- Annual Conference
- Topical Conferences
- Landowner Forums

Data

- Wind Farm Database
- Permitting Database
- Wind Maps (IIRA)
- Special Studies

Services

- Help Desk
- Speakers Bureau
- Small Wind Guide

WHAT LIES AHEAD?

Renewable Portfolio Standard Goals

- at least 2% by June 1, 2008;
- at least 4% by June 1, 2009;
- at least 5% by June 1, 2010;
- at least 6% by June 1, 2011;
- at least 7% by June 1, 2012;
- at least 8% by June 1, 2013;
- at least 9% by June 1, 2014;
- at least 10% by June 1, 2015;
- and increasing by at least 1.5% each year thereafter to at least 25% by June 1, 2025"

Wind Component

- A minimum of 75% of the above percentages is required from wind power.

Wind Energy Demand (Allen 2007)

Year	Demand	RPS Percentage	Wind Percentage	RPS Demand	Wind Demand
2008	108248	0.02	0.75	2165	1623
2009	105584	0.04	0.75	4223	3168
2010	117040	0.05	0.75	5852	4389
2011	109748	0.06	0.75	6585	4939
2012	110256	0.07	0.75	7718	5788
2013	111512	0.08	0.75	8921	6691
2014	112655	0.09	0.75	10139	7604
2015	113799	0.1	0.75	11380	8535

Existing/Planned Supply

- Existing and proposed supply may not be sufficient to meet RPS goals
- Delays in zoning and permitting will only heighten the problem

Note on Pricing

- If required RPS demand for Illinois Wind is near capacity, the price for wind energy could be relatively high in the short run.
- Consumer protections are in place to prevent the price of electricity from getting too high.

For More Information, Contact

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Campus Box 4200
Normal, IL 61790
309-438-7979
dloomis@ilstu.edu

Wind Energy: Is it Right for Illinois?

David G. Loomis, Ph.D.
Professor of Economics
Illinois State University

DeKalb County Farm Bureau
October 10th, 2007

Outline

- About Illinois State University and Wind Energy
- Wind Energy Development: Types of Projects and Types of Ownership
- Arguments from Opponents of Wind Energy

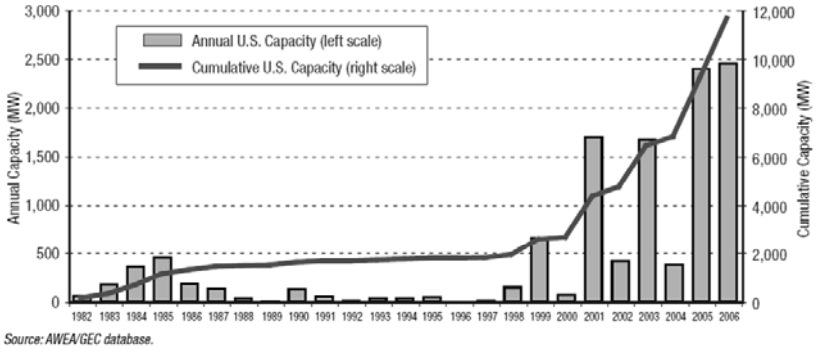
Illinois State University

- First B.S. in Renewable Energy in the nation
- Leading Illinois' Wind Working Group
  - www.wind.ilstu.edu
  - Siting Conference, Peoria, December 13
  - Annual Conference, Bloomington, June 25-26, 2008

Why Wind Energy

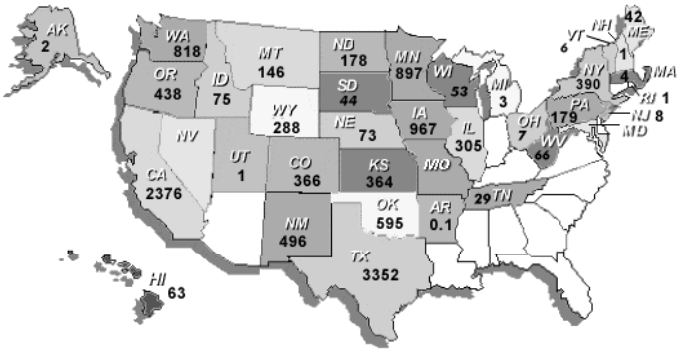
- **Benefits of Wind Projects**
  - Revitalizes Rural Economies
  - Creates Jobs
  - Promotes Cost-Effective Energy Production
  - Supports Agriculture
  - Reduces Air Pollution and Global Warming
  - Clean, Domestic Energy
  - Ensures a Sustainable Energy Future

Growth in the U.S. Wind Industry



Source: US Department of Energy: Annual Report of U.S. Wind Power Installation, Cost and Performance Trends:2006
http://www.nrel.gov/docs/fy07osti/41435.pdf

Wind Capacity in the US **(June 2007)**



12,634 MW installed to date

Enough energy for over 3 million homes

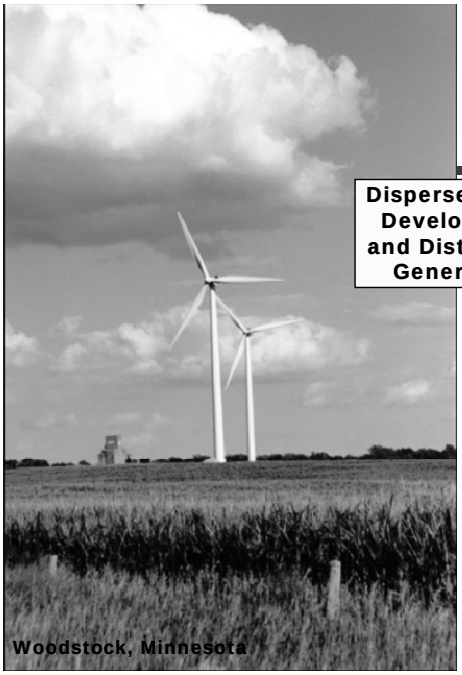
Source: American Wind Energy Association

Types of Wind Projects

Wind is a modular technology:

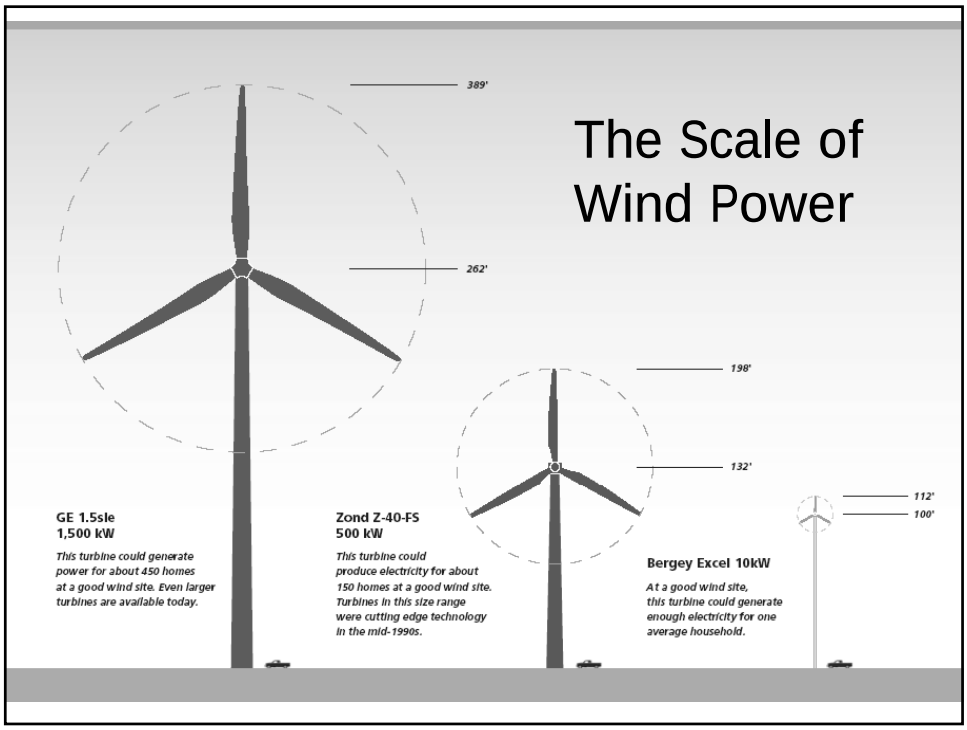
- Large Wind Farms-
  large number of large-scale turbines
- Dispersed Wind Projects-
  one or a few large-scale turbines
- Small wind turbines-
  residential or farm use

Large Wind Farm, Southwest Minnesota



Dispersed Wind Development and Distributed Generation

Small Wind Turbines



Personal vs. Utility Scale

Home and Farm-Scale

- Offset your own electricity consumption
- Costs thousands of dollars
- Motivations are not necessarily economic

Commercial-Scale

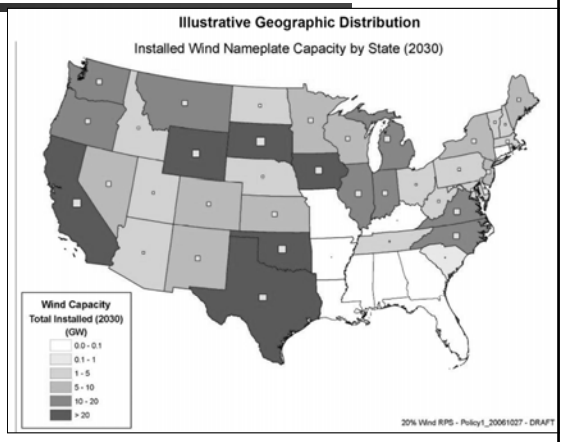
- Bulk power sales to utility company
- Costs millions of dollars
- Require 3-5 years of planning, hard work, patience, and perseverance

Small Wind Turbine Projects

- Stand alone/off-grid or net metered
- For personal use
- Money is not the motivator in most cases
  - Lower environmental footprint
  - Energy independence
  - Like to tinker with machines
  - Like to watch things spin
- Simpler permitting
- Easier interconnection
- Lower installed cost

Wind Energy Potential
20% Plan From the U.S. DOE

- 20% of the nation's electrical needs can be provided by wind!



Currently the US supplies just under 1% of it's electrical energy needs from wind

Wind Energy:

Arguments from Opponents

Potential Problems with Wind Power

- Radar
- Property Values/Aesthetics
- Sound
- Safety
- Bird Kills
- Cost

Radar and Wind Turbines

At Dyess Air Force Base near Abilene, Texas, wind turbines are compatible with military operations.

Photo credit: Abigail Vander Hamm

Fact

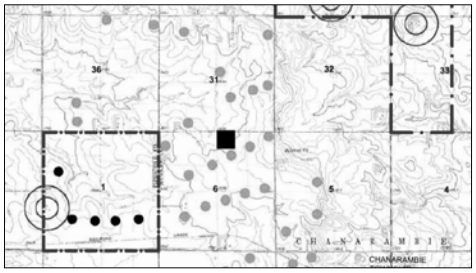
- Interference is rare and easily avoided through technology improvements and proper siting

Wind Energy and Ascetics/Property Values

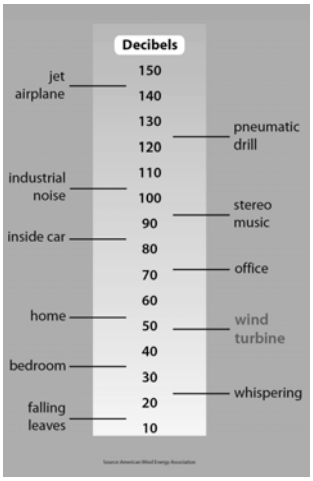
- Concerns brought up at public hearings
  - Important to understand the underlying issues:
    - property values,
    - perceived public health risks,
    - visual nuisance,
    - or money
- Land use plays a large factor
  - Agriculture – traditionally low opposition
  - Forested – wildlife impacts
  - Mountain top – strong visual concerns
  - Recreational – property values and visual concerns
- Beauty is in the eye of the beholder!

Proper Siting Can Balance a Wind Projects Visual Impact

- Communities can develop policies to safely and appropriately site projects based on community values and appropriate use of wind systems



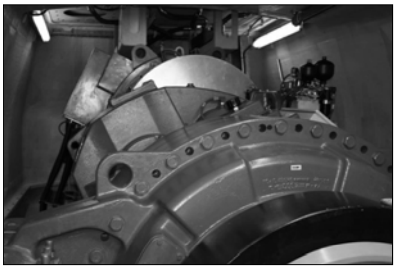
Wind Energy and Sound



- Wind systems are typically sited in windy areas where the sound of the wind generally masks noise from the machines.

Chart shows noise from wind turbine at approximately 1,000 feet from the machine.

Wind Energy and Sound



Gearbox and generator in a 1.65 MW wind turbine owned by Iowa Lakes Community College in Estherville, Iowa.

Today's turbines are much quieter than older technology.

- Sound proofing of nacelle
- More efficient blades
- Quieter gear boxes
- Slower moving rotors

Wind Turbines and Safety

- Epileptic Seizures:

  Modern wind turbine blades generally **rotate between 10-22 rpm**, which is slow. Epileptic seizures for photosensitive people are **triggered by rates of 5 to 30 flashes per *second***. The blades of today's wind turbines do not spin quickly enough to cause seizures. At maximum rotational speed, there would be a little more than 1 flash per second.

For more information about photosensitivity and epilepsy visit the Epilepsy Foundation's website:
http://www.epilepsyfoundation.org/about/types/triggers/photosensitivity.cfm

Wind Turbines and Safety

- Ice Throw:

  "Ice throw, while it can occur under certain conditions, is of little danger. Setbacks typically used to minimize noise are sufficient to protect against danger to the public. In addition, ice buildup slows a turbine's rotation and will be sensed by a turbine's control system, causing the turbine to shut down."

Source: American Wind Energy Association – Wind Energy Myths vs. Facts
http://www.awea.org/pubs/factsheets/050629_Myths_vs_Facts_Fact_Sheet.pdf

Wind Turbines and Safety

- Blade Throw:

  "Blade throws were common in the industry's early years, but are unheard-of today because of better turbine design and engineering.... There are thousands of turbines installed in Europe and...in the U.S. - wind turbine standards ensure a high level of operational reliability and safety in the U.S. and worldwide."

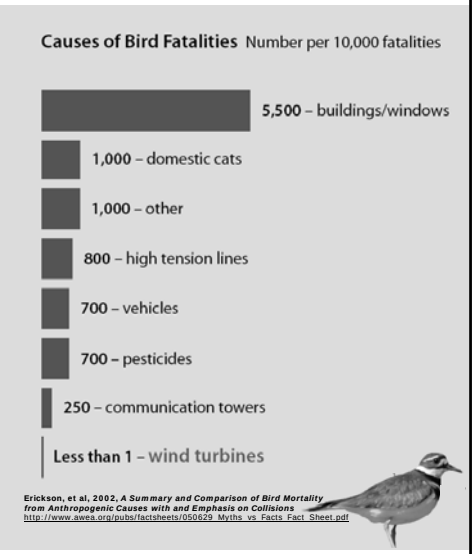
Spirit Lake, Iowa

Source: American Wind Energy Association – Wind Energy Myths vs. Facts
http://www.awea.org/pubs/factsheets/050629_Myths_vs_Facts_Fact_Sheet.pdf

Wind Energy Avian Impacts

"Significant expansion of renewable energy sources such as wind power is needed to reduce pollution from fossil fuels and address global warming...[t]o protect birds, wildlife, and habitat from global warming[.] Fossil fuel power plants account for more than one third of the carbon dioxide emitted by the United States."

Mike Daulton
Director of Conservation Policy,
National Audubon Society



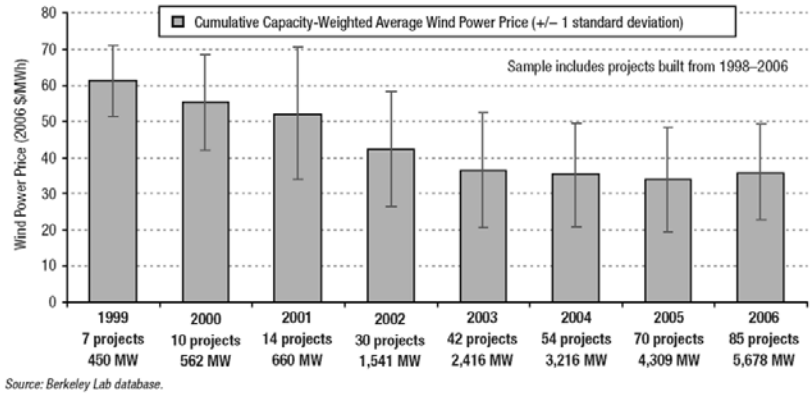
Cost of Wind Energy

- Wind energy typically offsets higher cost natural gas fired peaking plants.
- Large penetrations of wind complement hydro electric dams in the NW very well.

"By purchasing wind power, Xcel Energy saved its Colorado customers an estimated $9.75 million in 2005."

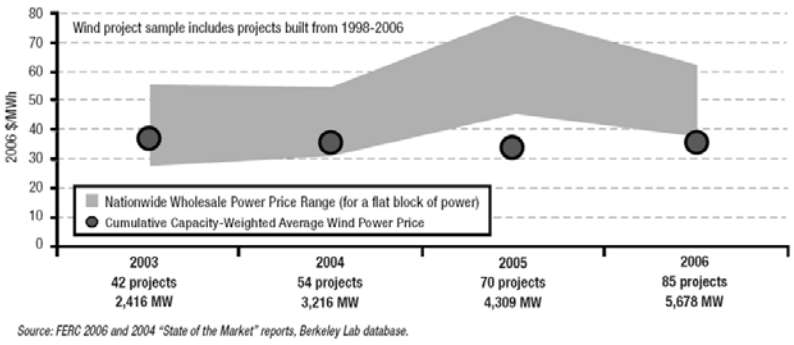
Bill Grant, Xcel Energy
Windpower Monthly May 2006

Cost of Wind Energy



Source: US Department of Energy: Annual Report of U.S. Wind Power Installation, Cost and Performance Trends:2006
http://www.nrel.gov/docs/fy07osti/41435.pdf

Cost of Wind Energy



Source: U.S. Department of Energy, *Annual Report of U.S. Wind Power Installation, Cost and Performance Trends:2006*
http://www.nrel.gov/docs/fy07osti/41435.pdf

Wind Energy and Subsidies

- **Every energy technology is subsidized.** Wind energy is no exception. Wind receives a tax credit that provides an inflation-adjusted 1.5 cents for each kilowatt-hour generated, over the first ten years of the project. This credit reduces the tax liability of a wind farm, but is not a subsidy of public money flowing to the wind farm owner.

- **Subsidies that other energy sources receive:**
  - tax deductions
  - loan guarantees
  - liability insurance
  - leasing of public lands at below market prices.

- Additional indirect subsidies include federal money for research and development programs and policy provisions in federal legislation.

Source: American Wind Energy Association – Wind Energy Myths vs. Facts
http://www.awea.org/pubs/factsheets/050629_Myths_vs_Facts_Fact_Sheet.pdf

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WIND FARM PROXIMITY AND PROPERTY VALUES: A POOLED HEDONIC REGRESSION ANALYSIS OF PROPERTY VALUES IN CENTRAL ILLINOIS

Jennifer L. Hinman

In partial fulfillment of the requirements for the degree of

Master of Science in Applied Economics

Electricity, Natural Gas, and Telecommunications Economics Regulatory Sequence

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May 2010

Abstract
The objectives of this study are to examine whether proximity to the 240-turbine, Twin Groves wind farm (Phases I and II) in eastern McLean County, Illinois, has impacted nearby residential property values and whether any impact on nearby property values remains constant over different stages of wind farm development with the different stages corresponding to different levels of risk as perceived by nearby property owners. This study uses 3,851 residential property transactions from January 1, 2001 through December 1, 2009 from McLean and Ford Counties, Illinois. This is the first wind farm proximity and property value study to adopt pooled hedonic regression analysis with difference-in-differences estimators. This methodology significantly improves upon many of the methodologies found in the wind farm proximity and property value literature. This study finds some evidence that supports wind farm anticipation stigma theory and the results strongly reject the existence of wind farm area stigma theory.

About the Author

Jennifer L. Hinman

In 2010, Jennifer earned her Master of Science degree in Applied Economics with a specialization in the Electricity, Natural Gas, and Telecommunications Economics Regulatory sequence at Illinois State University in Normal, Illinois. Some research areas pursued during her graduate studies include short-term electricity load forecasting[1] and economic impact estimation. In 2008, Jennifer earned her Bachelor of Arts degree in Economics with a Financial Certificate and graduated Summa Cum Laude from the University Honors Program at Armstrong Atlantic State University in Savannah, Georgia. As an undergraduate, Jennifer presented a study she completed regarding the impact of oil price shocks on the U.S. inflation rate at the *35th Annual Meeting of the Academy of Economics and Finance* in Nashville, Tennessee, and she has the article published in the *Academy of Economics and Finance Papers and Proceedings, Volume 32, 2008.* Jennifer has recently accepted a position as an Economist in the Policy Department of the Energy Division under the Bureau of Public Utilities at the Illinois Commerce Commission in Springfield, Illinois. Jennifer completed this report in an unbiased manner while earning her Master's degree. She is available to answer any legitimate questions via e-mail HinmanJenL@gmail.com.

[1] Available online <http://www.irps.ilstu.edu/research/documents/LoadForecastingHinman-HickeyFall2009.pdf>

Executive Summary

The objectives of this study are to examine whether proximity to the 240-turbine, Twin Groves wind farm (Phases I and II) in eastern McLean County, Illinois, has impacted nearby residential property values and whether any impact on nearby property values changes over the different stages of wind farm development. This study uses 3,851 residential property transactions from January 1, 2001 through December 1, 2009 from McLean and Ford Counties, Illinois. This is the first wind farm proximity and property value study to adopt pooled hedonic regression analysis with difference-in-differences estimators. This methodology significantly improves upon many of the previous methodologies found in the wind farm proximity and property value literature.

The estimation results provide evidence that a "location effect" exists such that before the wind farm was even approved, properties located near the eventual wind farm area were devalued in comparison to other areas. Additionally, the results show that property value impacts vary based on the different stages of wind farm development. These stages of wind farm development roughly correspond to the different levels of risk as perceived by local residents and potential homebuyers. Some of the estimation results support the existence of "wind farm anticipation stigma theory," meaning that property values may have diminished in "anticipation" of the wind farm after the wind farm project was approved by the McLean County Board. Wind farm anticipation stigma is likely due to the impact associated with a fear of the unknown, a general uncertainty surrounding a proposed wind farm project regarding the aesthetic impacts on the landscape, the actual noise impacts from the wind turbines, and just how disruptive the wind farm will be. However, during the operational stage of the wind farm project, as surrounding property owners living close to the wind turbines acquired additional information on the aesthetic impacts on the landscape and actual noise impacts of the wind turbines to see if any of their concerns materialized, property values rebounded and soared higher in real terms than they were prior to wind farm approval. Thus, this study presents evidence that demonstrates close proximity to an operating wind farm does not necessarily negatively influence property values or property value appreciation rates. The estimation results strongly reject the existence of "wind farm area stigma theory" for the area surrounding Twin Groves I and II.

I. INTRODUCTION

A home is generally the largest investment that a family will make in their lifetime. Thus, factors that impact the value of one's home are of prime importance to homeowners. Over the past few years, all across the United States, wind farms have been sprouting up. Many homeowners have expressed concern at public zoning hearings for proposed wind farms that their homes may be devalued because of the close proximity to a proposed wind turbine. Although over 35 studies have examined this issue of whether a negative relationship exists between property values and those homes in close proximity to wind turbines, there does not exist a general consensus in the literature. This lack of a consensus may be likely due to various degrees of rigor that the studies have demonstrated along with the various methodologies adopted. Many of the studies have been funded by wind energy companies as well as wind farm opponents. Thus, an unbiased analysis of this very important issue is difficult to come by. Hence, this study proposes an improved methodology to examine these issues going forward.

Is there a stigma associated with properties located in close proximity to a proposed or operating wind farm? Does a negative relationship exist between property values and homes closer to wind turbines? Does the impact of a wind farm on nearby property values change over different stages of development[2]? This study uses pooled hedonic regression analysis to examine whether Twin Groves wind farm (Twin Groves Phase I and Phase II[3]) located in eastern McLean County, Illinois, has had an impact on local property values. The hedonic pricing model is based on the microeconomic theoretical framework developed by Lancaster (1966) and Rosen (1974) that decomposes the price of a good into its component attributes.

Residential property sales were obtained from the Supervisors of Assessments Offices in McLean and Ford Counties for the 2001 through 2009 study period. It is important to obtain data both before and after construction of the wind facility and not just for the target and control areas, because there likely exists a *location effect,* which when properly controlled for takes into account any housing price differential between properties near the wind farm and far from the wind farm before wind farm operations. Thus, any devaluation found using only data from after construction may not be telling the whole story.

A difference-in-differences estimator[4] is utilized to examine whether a *wind farm anticipation stigma*[5] developed after the approval of the wind farm and during the construction stage of the wind farm development. In addition, a difference-in-differences estimator is utilized to examine whether a *wind farm area stigma* developed due to the presence of the wind farm. This study examines the appreciation in real property values near the wind farm site in relation to surrounding areas over the different stages of wind farm development, which are thought to roughly correspond to the different levels of risk as perceived by local residents and homebuyers.

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[2] The different stages of the adjustment process correspond to different levels of risk as perceived by local residents and prospective homebuyers surrounding a wind farm project proposal, and these stages of the adjustment process are thought to correspond to the stages of wind farm development.

[3] Twin Groves I and II will be denoted as "TG I and II" or "wind farm(s)" throughout this article.

[4] Difference-in-differences estimators are popular estimation techniques utilized in the policy evaluation literature.

[5] *Wind farm anticipation stigma theory* is a concern surrounding a proposed or approved wind farm project that is primarily due to factors stemming from a fear of the unknown: a general uncertainty surrounding a wind farm project regarding the aesthetic impacts on the landscape, the actual noise impacts from the wind turbines, and just how disruptive the wind farm will actually be.

In addition, real property value levels in percentage terms are examined over the different stages of wind farm development. A few local real estate experts were interviewed and a local wind farm zoning hearing was attended, such that the author gained a better understanding of the local housing market and the attitudes of residents of the community.

The estimation results provide evidence that a *location effect* exists such that before the wind farm was even approved, properties located near the eventual wind farm area were devalued in comparison to other areas. Additionally, the results show that property value impacts vary based on the different stages of wind farm development. Some of the estimation results support the existence of *wind farm anticipation stigma theory*, meaning that property values may have diminished in *anticipation* of the wind farm, possibly because of the impact associated with a *fear of the unknown*: a general uncertainty surrounding a wind farm project regarding the aesthetic impacts on the landscape, the actual noise impacts from the wind turbines, and just how disruptive the wind farm will be. However, during the operational stage of the wind farm project, as surrounding property owners living close to the wind turbines acquired additional information on the aesthetic impacts on the landscape and actual noise impacts of the wind turbines to see if any of their concerns materialized, property values rebounded and soared higher in real terms than they were prior to wind farm approval. The author does not believe that property values near the wind farm rose strictly because of the wind farm locating there. However, it does seem to imply that property values in this particular area of McLean County do not necessarily decline because of a wind farm locating in the area near the properties, which is a common assumption and is often voiced during the wind farm permitting process. Thus, this study presents evidence that demonstrates close proximity to an operating wind farm does not necessarily negatively influence property values or property value appreciation rates and these results strongly reject the existence of *wind farm area stigma theory* for the area surrounding Twin Groves I and II. The results are consistent with views of some local real estate experts.

The rest of the paper is organized as follows. Section II contains a review of the wind farm proximity and property value literature. Section III provides the theoretical basis for the model. Section IV provides an overview of the methodology. Section V contains an overview of the project location and data. Section VI presents the estimation results. Section VII provides recommendations for further research and some general conclusions. Appendix A describes community attitudes and survey results. Appendix B provides a detailed description of the data and estimation assumptions. Appendix C provides descriptive statistics including summary statistics of the variables by stage of the wind farm project. Appendix D provides a review of the difference-in-differences estimator as well as several simple estimations and explanations of the proper interpretation of the estimated coefficients. Appendix E provides the full estimation results.

II. LITERATURE REVIEW

This section provides a brief overview of the wind farm proximity and property value literature. For those readers interested in reviewing literature relevant to the wind farm proximity and property value topic, a comprehensive list of the studies reviewed (author, publication date, and type of study are listed) as part of this project appears in Table 1. Sample size, study type, property value impact, and location of the wind farms for the regional and national studies

involving actual wind farms are presented in Table 2. The localized analyses are presented in Table 3[6] along with detailed statistics regarding the wind farm size, study dates, number of observations, study area location, and property value impact. This section proceeds as follows: a comparison of the national and regional property value studies is undertaken followed by a discussion of how this study contributes to and compares with the existing wind farm proximity and property value literature involving hedonic regression analysis.

Table 2 contains a summary of the regional and national property value studies that involved actual wind farms (as opposed to studies based on proposed wind farms[7]). Two studies conclude that properties are stigmatized surrounding wind farms: one based on an expert survey of realtors in Scotland, Wales, and England (Khatri, 2004), and the other study was based on a statistical model based on survey responses from homeowners in Denmark (Jordal-Jørgensen et al., 1996). The estimation results from the Denmark study could not be obtained, thus the statistical significance and details regarding the data utilized were not able to be scrutinized.

There have been a couple studies involving wind farms across the United States and they all found no impact on property values as a result of the wind farms. Hoen et al. (2009) completed the most comprehensive and rigorous study by far that involved examining residential home sales surrounding 24 wind farms across the United States[8]. Hoen et al. (2009) utilized ten different estimation models, including a repeat sales model and a sales volume model, to determine whether an area stigma, a scenic vista stigma, or a nuisance stigma existed in relation to properties located near wind farms. Hoen et al. (2009) found that none of the models uncovered any conclusive evidence of the presence of any of the property value stigmas surrounding the wind farms.

Table 3 contains a summary of the literature regarding localized property value impact studies involving actual wind farms (as opposed to proposed wind farms). All of the multiple linear regression analyses have been completed within the past four years, and so far there have not been any that specifically address the impact on property values for a wind farm located in the Midwest. In general, there have been quite a few studies addressing the impact of wind farms on property values in the Midwest; however, none of them involved rigorous statistical analysis[9]. The studies using the hedonic housing price model that focused on the impact of one particular wind farm on property values involve wind farms with less than 21 turbines. Therefore, this analysis involving 240 wind turbines is important because of the recent expansion of large wind projects.

As indicated by the asterisks in Table 3, only two studies have actually been published in academic, peer-reviewed journals. Both published studies utilized multiple regression analysis which provides support of that method in the present study. The two published studies analyzed

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[6] The only strong correlations associated with the results across studies have to do with who funds the study, i.e., those funded by wind farm developers or wind energy proponents generally do not find a negative impact, while those studies funded by wind farm opponents generally find a negative impact on property values. Also, some correlation exists between the timing of the study and the results. For example, many of the studies conducted in areas where a wind farm is proposed involve surveys posed to local real estate experts. These studies find that there is an expectation that property values will decline if the wind farm is permitted and becomes operational. Thus, this gives rise to what this author terms, wind farm anticipation stigma theory.

[7] Several studies involved interviewing local residents and real estate experts regarding their opinion of the impact that a proposed wind farm would have on local property values if the wind farm was built. The results of these studies are consistent with wind farm anticipation stigma theory.

[8] The residential homes sales were collected from nine different states (ten different study areas).

property values in the United Kingdom and the data available[10] were "limited to house type and selling price, and therefore not sufficiently detailed to highlight any small changes in value" (Sims and Dent, 2007, 626). All previous multiple regression analyses, except one, use the log-linear functional form. Sims and Dent (2007) use the linear form and include yearly dummy variables to capture inflation. Both of the published studies use property transactions that occurred after the wind farms were constructed. After Sims and Dent (2007) found a negative relationship between distance to the wind farm and property values, they spoke with local realtors and found out that before the wind farm was constructed, properties close to the eventual wind farm site were valued less than properties farther away. Thus, the present study contributes to the existing literature by taking into consideration the time period prior to wind farm operations explicitly in the model and controlling for an extensive list of housing characteristics.

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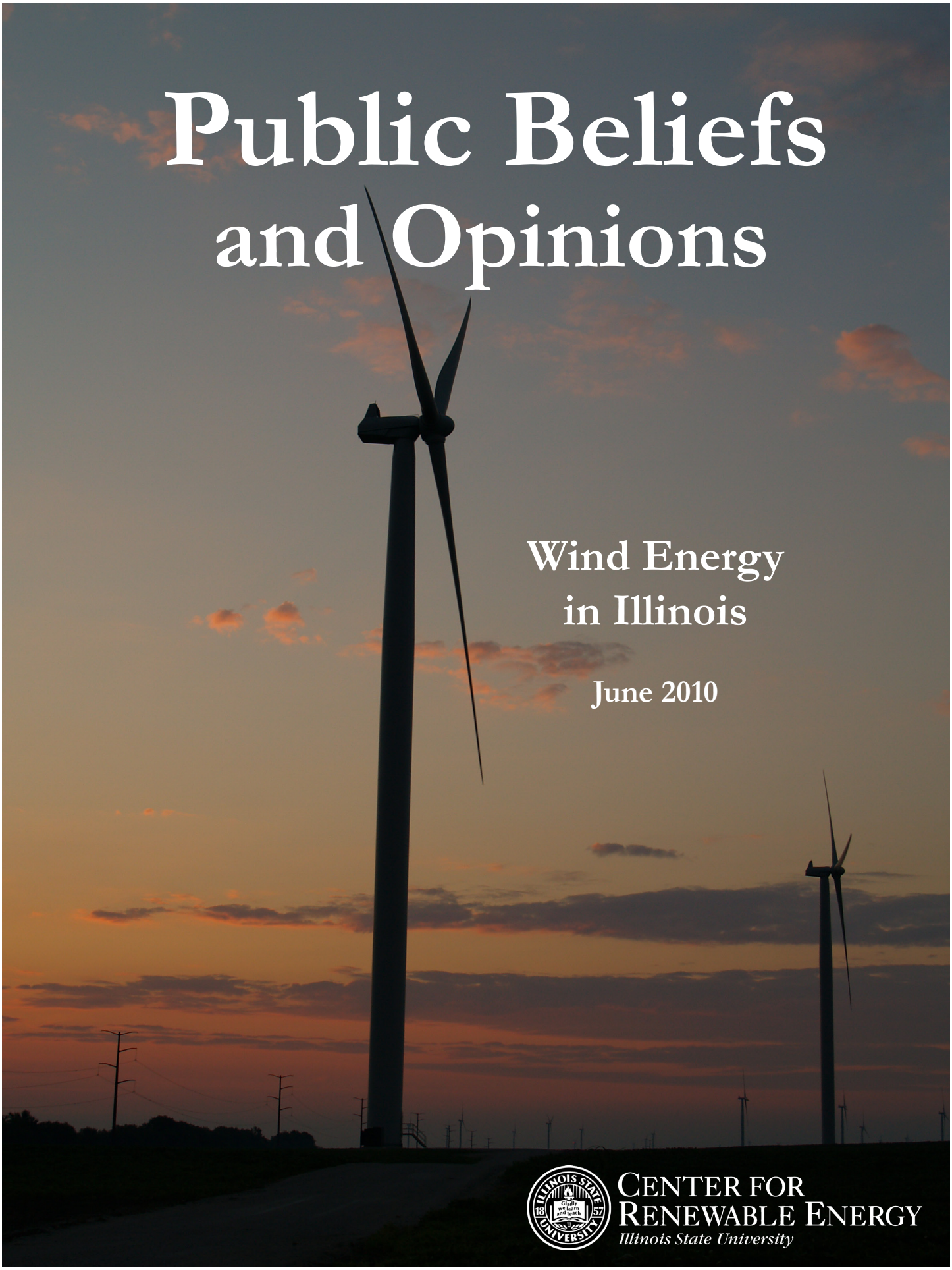
[9] Rigorous statistical analysis is an important factor because the results of a study are essentially meaningless without this factor.

[10] The explanatory variables included in their models were limited to dummy variables. Though Malpezzi et al. (1980) point out that using mostly dummy variables allows maximum flexibility in estimation.

Public Beliefs and Opinions

Wind Energy in Illinois

June 2010



CENTER FOR RENEWABLE ENERGY
Illinois State University

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This report is also available as a PDF on www.RenewableEnergy.ilstu.edu.

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Illinois Wind Working Group (IWWG)

The Illinois Wind Working Group (IWWG) is affiliated with the Department of Energy's Wind Powering America's State Wind Working Groups. The group is administered by the Center for Renewable Energy at Illinois State University, including David Kennell (Technology), Dr. David Loomis (Economics) and Dr. J. Randy Winter (Agriculture).

Wind Powering America (WPA) is a regionally-based collaborative initiative to increase the nation's domestic energy supply by promoting the use of Wind Energy Technology, such as low wind speed technology, to increase rural economic development, protect the environment, and enhance the nation's energy security. WPA provides technical support and educational and outreach materials about utility-scale development and small wind electric systems to utilities, rural cooperatives, federal property managers, rural landowners, Native Americans, and the general public.

IWWG is an organization whose purposes are to communicate wind opportunities honestly and objectively, to interact with various stakeholders at the local, state, regional and national levels, and to promote economic development of wind energy in the state of Illinois. The organization is hosted by Illinois State University through a grant from the U.S. Department of Energy. The Illinois Wind Working Group is comprised of 175 key wind energy stakeholders from the state of Illinois.

IWWG is part of Illinois State University's Center for Renewable Energy and hosts an annual Advancing Wind Power in Illinois Conference that covers many aspects of wind energy; an annual Siting, Zoning and Taxing Wind Farms in Illinois Conference; and Landowner Forums throughout the state.

www.RenewableEnergy.ilstu.edu/wind/

Center for Renewable Energy

Illinois State University established the Center for Renewable Energy, and it received Illinois Board of Higher Education approval in 2008. The Center was initially funded by a $990,000 grant from the U.S. Department of Energy (US DOE) to research renewable energy, to establish a major in renewable energy at Illinois State and to administer the Illinois Wind Working Group (IWWG). The Center also received a grant from the Illinois Clean Energy Community Foundation to help complete its state-of-the-art renewable energy laboratory.

The Center has three major functional areas:

- Supporting the renewable energy major at Illinois State University
- Serving the Illinois renewable energy community by providing information to the public
- Encouraging applied research on renewable energy at Illinis State University and through collaborations with other universities.

Founding Members:

Founding members include Horizon Wind Energy LLC, State Farm Insurance, Suzlon Wind Energy Corp., and Iberdrola Renewables.

Support of the Renewable Energy Major:

Many new workers will be needed in the renewable energy industry. To meet the growing demand for trained and educated workers, we have developed an interdisciplinary renewable energy major at Illinois State University. Graduates of the renewable energy program are well-positioned to compete for new and existing jobs.

The Center supports the renewable energy major through:

- Creation of an advisory board of outside experts,
- Establishing a renewable energy internship program,
- Bringing renewable energy experts to campus for seminars for faculty and students,
- Funding scholarships to ensure high quality students in the major
- Providing ongoing financial support for the major.

For more information about the Renewable Energy Undergraduate Major, please visit www.RenewableEnergy.ilstu.edu/major/.

Executive Summary

Energy consumption in the United Sates has been increasing and the cost of fossil fuels has been unstable in recent years. Expanding investment in renewable energy is one way to reduce the nation's dependence on fossil fuels. The Not-In-My-Back-Yard (NIMBY) opposition and various concerns raised at public hearings, however, may inhibit the expansion of wind energy in Illinois. This study aims to characterize the public beliefs and opinions toward wind energy in central Illinois. A survey was sent to random samples selected from four areas of the state: an area with an operating wind farm, an area with a proposed wind farm, an area with wind resource potential but no wind farm proposal yet, and an area with limited wind resource.

The main results are:

- Few differences in attitudes among the areas were found, indicating that opinions tend to be the same whether the community is in the middle of a wind project or not.

- More than 80% of the respondents support the development of wind farms in their community. Respondents agree that wind farms are good for the environment, for job creation, and for rural economic development.

- Wind farms were identified as the preferred resource for expanding U.S. electricity production.

- Respondents support wind energy but households surveyed are reluctant to pay a substantial premium (more than a 5% price increase) for green energy.

- The major positive attributes of wind energy perceived by the population are the absence of greenhouse gas emission and the reduction of the dependence on foreign energy sources.

- Concerns that need to be addressed include interference with telecommunications, the perceived high cost of power generated, and the loss of farmland that is taken out of production for the installation of the turbines.

- The support for wind farms is greater than the support for ethanol plants.

- Respondents who agree that human activity impacts global warming are also more likely to support a policy to reduce U.S. greenhouse gas, support a federal mandate for renewable energy, and support the development of wind farms.

I. Introduction

Energy consumption in the United Sates has been increasing due to overall population and economic growth. In addition, fossil fuels prices have been unstable in recent years causing significant pressure on the economy. Expanding investment in renewable energy is one way to reduce the nation's dependence on oil (American Wind Energy Association, 2009). Today, the wind energy sector is part of the country's energy portfolio, but its contribution is still very low in comparison to oil, coal, or nuclear energy. However, development of wind farms is expanding rapidly and in 2008 the United States became the number one producer of wind energy in the world (American Wind Energy Association, 2009). Witnessing such growth of commercial wind farms has caused the population to develop opinions about the wind farm phenomenon. In this context, this study aims to identify the public beliefs and attitudes toward wind energy with a specific focus on central Illinois. Some public opinion has been studied before in this state in the form of a case study and personal interviews (Casey, 2007). That study found that concerns come from the lack of public participation in the decision making process, the mistrust of the wind developers by the public, and the inequitable distribution of project burdens and benefits. This study aims to identify the general attitudes about large wind farms in central Illinois, through a survey of residents.

The primary objective of this survey is to determine the population's beliefs, whether positive or negative, about commercial wind energy. Indeed, in some local hearings the opposition and support groups are fairly balanced in number. Thus, we wish to determine if the opposition or support at the hearings is representative of the overall population's opinions. The second objective is to make comparisons between different groups of the population to analyze any similarities or disparities in their attitudes and opinions. The survey was sent to four distinctly different communities: one with a wind farm, one with a proposed wind farm, one with no proposal but with good wind potential, and one with limited wind potential. The final objective is to identify ideas that developers can use to go forward with projects which could help promote rural economic development in support of a healthy rural community.

II. Wind Energy: Focus on Illinois

Current Situation

The production of electricity in Illinois comes primarily from coal and nuclear power. Renewable energy accounts for 0.72 million MWh in the production mix (Energy Information Administration, 2009). The wind energy resource in Illinois ranks sixteenth in terms of wind potential in the United States with 61 billion potential kWhs annually (AWEA, 2009). However, Illinois is currently in the top ten states for installed wind energy. As of September, 2009, Illinois had nineteen wind projects online, ranking seventh in the United States and two more projects under construction. The largest wind farm site in Illinois is the Twin Groves Wind Farm I and II located in McLean County with a capacity of 396 MW. The developer, Horizon, plans to expand this wind farm with an additional 500 MW, which would make it the largest wind farm in the United States. In 2007, the state of Illinois passed legislation that includes a Renewable Electricity Standard (RES) mandating that 25% of its electricity will be produced from renewable energy by 2025 (Illinois General Assembly, 2007). This means around 7,500 to 8,000 MW of renewable energy must be built and 75% of it must come from wind energy (AWEA, 2009). Therefore, in sixteen years, the state must install at least an additional 4,453 MW of wind energy if all the renewable energy is to be produced within the state.

Siting and Zoning Process

The process of developing a wind farm may span several years. Prior to construction, a special use permit must be obtained from the county board where the project is to be built. (Exceptions exist. For example, Winnebago County has a permitted use for wind farms and some counties have no zoning whatsoever.) Although wind ordinances vary from county to county, most counties require environmental studies and agency approvals prior to granting a special use permit. Wind developers must adhere to any municipal codes and must have their project reviewed through a public hearing process (Pebbles, 2010). Working with local officials rather than state officials may be advantageous; local boards may understand the issues and the interests for a project in their community (Del Franco, 2009). The development process is comprised of several steps. First, the developer finds a location with sufficient wind resources using meteorological data and then makes initial contact with landowners as well as local government officials. Then, they use a meteorological test tower (met tower) to gather actual wind speed data. During this period, a check of existing transmission lines is necessary. If the interest in the location is maintained, the developer engages in negotiations with landowners to lease their land for wind turbines, access roads, power lines and substations. The draft of the site plan can then be developed. Negotiations for the payment of the lease are finalized while studies such as environmental impacts are conducted. If the project overcomes all of these hurdles and is approved by the county board, construction can begin resulting in a fully functioning wind farm.

Enterprise Zones and High Impact Businesses

Enterprise zones are geographic areas where new businesses can benefit from state incentives, usually tax exemptions, in order to boost the economic development of the area. The concept was enacted in 1982 to revitalize manufacturing and create jobs. There are 95 enterprise zones in Illinois viewed as highly attractive for new businesses. Wind developers were targeting these areas as well, but on July 1, 2009, the Illinois General Assembly passed a bill that identifies wind power facilities as "high impact businesses" that qualify for sales and use tax exemptions without being located in an enterprise zone. This new law opens many new areas of the state as potential sites for wind farms.

III. Methodology

The study assessed public opinion about large wind farms and related energy issues at one point in time. The population of interest includes individuals living in central Illinois between Interstate 64 and Interstate 80. These central counties have a total population of about 2.8 million people (U.S. Census estimate for 2007). Four specific areas in central Illinois were identified for the study based on their status with respect to large wind farms:

1. An area with a wind farm already in operation
2. An area with a proposed wind farm
3. An area with the potential of a wind farm but no active proposal
4. An area with limited potential of wind farm construction

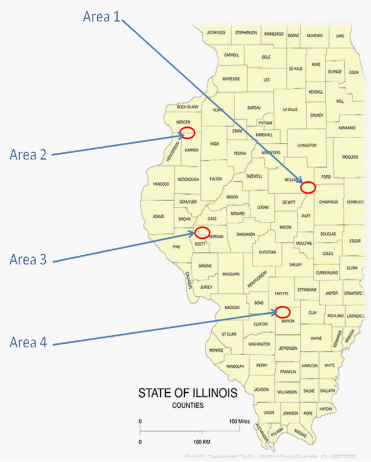

Figure 1: Areas Studied in Illinois

Area 1 is located in the villages of Saybrook, Arrowsmith and Ellsworth in McLean County, close to the Twin Groves Wind Farm. Area 2 spans Mercer and Warren counties; and contains the communities of Alexis, Seaton and Little York. Area 3 spans Morgan and Scott counties, and contains the villages of Bluffs, Concord and Chapin. Area 4 is located in Marion County and contains Patoka, Vernon and Alma municipalities.

Eight hundred surveys were sent (200 to each area) based on an anticipated minimum response rate of 15%, yielding at least 30 responses from each area. This response rate allows us to conduct appropriate statistical analyses. A randomly generated list of addressees was obtained from a publicly available listing from whitepages.com. A potential problem with this approach is the possibility that there are missing addresses from people who are not listed. According to Iannacchione et al. (2003), an evaluation of coverage of mailing addresses conducted in Texas found a total of 46 missing addresses (1.9 percent) among the 2,380 randomly selected addresses.

Roughly 1,000 addresses from three different but adjacent zip codes was the basis for each sample. From these 1,000 addresses, 1 out of 5 was randomly picked to obtain our sample size of 200. This process was repeated for each area.

The final survey included the cover letter explaining the objectives of the survey and directions for the participants. Then, 28 questions were presented in four pages. The questionnaire consisted of a demographics section, an opinion section, and a comment section. The questionnaires and the cover letters were sent by mail, and the respondents had 60 days to complete and return the survey. After two weeks, a reminder postcard was sent to the addresses where surveys had not yet been returned, and after a month a second mailing of the questionnaire was sent as well to non-respondents. Surveys were mailed twice in order to increase the survey response rate. The full survey is contained in Appendix A.

IV. Results

Table 1: Delivered questionnaires per area

Area	Accurately Delivered Questionnaires
1	194
2	201
3	195
4	195
Total	785

As of September 1st, 2009, 785 mailed surveys arrived to correct destinations. At this point, 313 answers have been returned, representing a 39.9% return rate. However, some of the surveys returned were blank so the final number of usable answers is 277. This yields an overall response rate of 35.3%.

Demographics

Results are reported as percentages since some respondents chose to not answer some items. The majority of respondents are male (63%). Also, respondents are 99% white Caucasian, 51% are 56 years of age or older, and 73% of the respondents are married. In addition, 69% of the households contain two or fewer occupants. The majority of respondents (51%) are full time employees but there is also a relatively high representation of retired persons (35%). Furthermore, 41 respondents noted their occupation as related to farming which represents 14.8% of the sample population and was the most common occupation. Household income was fairly diverse. Twenty percent of households earn $25,000 or less, 32% earn between $25,001 and $50,000, 24% earn between $50,001 and $75,000 and finally 24% earn more than $75,001. Most of the respondents stated that they live in a rural community (87%). The inhabitants of the surveyed households have been in their residence for roughly 20 years on average. However, answers vary widely from less than one year to 70 years. In addition, 34% reported that the highest level of education completed is high school, while 25% of the people had attended some college. Furthermore, the three main sources of news information were: 47% from television, 23% from newspapers, and 12% from radio. The majority of the population (65%) uses gas as heating fuel which is followed by electricity (18%). Three percent of the respondents have a hybrid car and 19% own a flexible fuel car. The number of vehicles in each household varies from zero to six with an average between two and three (2.4). Also, 88% of the respondents who are currently employed usually drive a car, truck, or van to get to work. The participants were also asked if their county had an operating or a proposed wind farm. Responses are presented in Table 2.

Table 2: Community awareness of operating and proposed wind farms in county.

	Is there an operating wind farm in your county?	Is there a proposed wind farm in your county?
AREA 1	0.0% Do not know 100.0% Yes 0.0% No	19.0% Do not know 77.8% Yes 3.2% No
AREA 2	18.1% Do not know 11.1% Yes 70.8% No	38.9% Do not know 45.8% Yes 15.3% No
AREA 3	19.1% Do not know 1.5% Yes 79.4% No	56.7% Do not know 10.5% Yes 32.8% No
AREA 4	16.4% Do not know 0.0% Yes 83.6% No	44.3% Do not know 3.3% Yes 52.4% No

The majority of respondents recognized whether or not their area has a wind farm and/or an active proposal at the time of the survey. They correctly stated that Area 1 had an operating wind farm (Twin Groves Wind Farm) and a proposed one (in Chenoa and Carlock communities).

For Area 2, the majority recognized that there was no operating wind farm but a proposal was in place (Alexis community). In Area 3, which has good wind potential but no current proposal, respondents correctly answered that there is not an operating wind farm. Furthermore, more respondents (32.8%) recognized there was no proposal than the ones who said there was (10.4%). Finally, Area 4 stated correctly that they had no operating or proposed wind farm. The most significant observation from the data in this table is that a considerable portion of the respondents answered "do not know," which demonstrates a lack of information concerning wind farm proposals in their counties.

Opinions

Respondents' opinions about general energy statements were evaluated using Likert-type scale. The statement that generated the most unfavorable response addresses the respondents' support for the construction of an ethanol plant in their community. Twenty-two percent either disagree or strongly disagree which is the most disagreement with any statement but still not a majority. On the other hand, when asked if they support the construction of a wind farm in their community, respondents express the highest level of support with 82% either agreeing or strongly agreeing as shown in Figure 2.

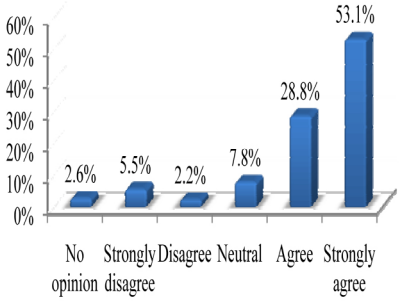

Figure 2: Distribution of responses to the statement: I support the development of a wind farm in my community.

Finally, the item that displays the highest neutrality or lack of opinion is the question regarding the availability of ethanol produced from cellulosic materials. Seventeen percent of respondents were neutral and 26% had no opinion. This may be due to cellulosic ethanol being an emerging technology that may be unfamiliar to most people outside of the bio-energy industry. Table 3 shows the response distribution for all statements.

Table 3: Responses to general energy statements.

Item:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No opinion
Human activity has a major impact on global warming.	9.5%	7.3%	11.7%	34.7%	32.8%	4.0%
Global warming presents a serious risk to our future well-being.	8.0%	9.5%	15.3%	29.2%	35.1%	2.9%
The U.S. should drill more oil wells in the Gulf of Mexico.	6.3%	10.1%	22.8%	29.5%	25.0%	6.3%
The U.S. should drill more oil wells in Alaska.	8.8%	11.4%	19.1%	27.9%	27.9%	4.8%
I support the development of a wind farm in my community.	5.5%	2.2%	7.8%	28.8%	53.1%	2.6%
Wind farms are good for the environment.	4.7%	1.8%	11.3%	31.3%	46.9%	4.0%
Wind farms are good for agriculture.	6.6%	6.9%	21.5%	23.0%	33.2%	8.8%
Wind farms are good for job creation.	4.4%	4.7%	13.9%	38.0%	34.3%	4.7%
Wind farms are good for rural economic development.	6.3%	4.1%	14.9%	36.6%	33.6%	4.5%
I support the construction of an ethanol plant in my community.	10.1%	12.0%	25.4%	28.3%	19.9%	4.3%
Compared to gasoline, the use of ethanol is good for the environment.	5.8%	8.7%	22.9%	35.3%	22.2%	5.1%
Ethanol production is good for agriculture.	4.0%	6.5%	11.3%	42.2%	33.8%	2.2%
Ethanol production is good for job creation.	3.3%	5.5%	18.5%	45.1%	25.1%	2.5%
Ethanol production is good for rural economic development.	4.4%	6.3%	19.6%	41.3%	24.0%	4.4%
Ethanol produced from cellulosic materials will be competitively available within two years.	5.5%	12.1%	33.3%	17.2%	5.9%	26.0%
Technological advancements will help solve the energy crisis.	5.8%	4.7%	15.0%	42.0%	25.9%	6.6%

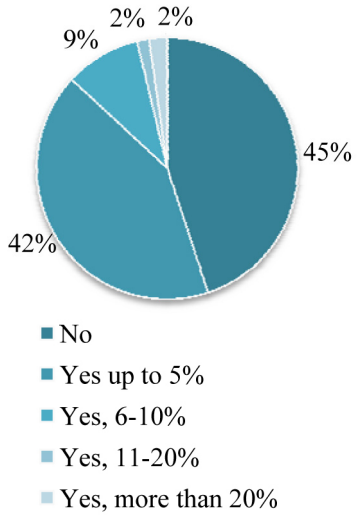

Figure 3: Respondents' willingness to pay more for wind energy

Questions 20 and 21 asked respondents to express their opinions concerning the importance or concern regarding some attributes of wind energy. The three positive characteristics that respondents identified as most important were: wind energy reduces dependence on foreign energy sources (judged very important by 87.9% of respondents); wind energy represents an alternative source of energy (judged very important by 81.9% of respondents); and there is no emission of greenhouse gases (judged very important by 78.1% of respondents). The three items that concerned respondents most about wind farms were wind energy interferes with telecommunications: Radio/TV/Internet service/Cell phone (20.7% of respondents feel very concerned); the cost of power generated is expensive (19.3% of respondents feel very concerned); and wind farms take farmland out of production (18.1% of respondents feel very concerned).

Question 22 pertains to state and federal mandates for renewable energy. Fifty-one percent of respondents support a state mandate and 55% support a federal mandate. The opposition for both questions is about 20%, while 26% and 30%, respectively, answered that they are unsure.

Table 4: Responses on wind energy statements

	Strongly Oppose	Somewhat Oppose	Neither support nor oppose	Somewhat Support	Strongly Support
Do you support…					
further development of wind farms in the state of Illinois?	**4.0%**	**2.9%**	**13.0%**	**31.2%**	**48.9%**
the idea that the state government should provide tax incentives to support the development of renewable energy in Illinois?	10.5%	5.5%	13.5%	40.7%	29.8%
the idea that the federal government should provide tax incentives to support the development of renewable energy?	11.2%	5.1%	10.1%	40.2%	33.3%
the idea of building more high voltage transmission lines as a way to increase wind energy production?	8.9%	13.4%	28.6%	29.4%	19.7%
the idea that rural electric cooperatives should promote wind energy?	5.5%	2.6%	17.6%	38.8%	35.5%
the idea that utility companies should be required to accept electricity generated by wind farms?	5.1%	3.3%	13.5%	24.8%	53.3%
the idea that the federal government should implement a program to reduce U.S greenhouse gas emission (a "carbon tax" or a carbon "cap and trade" system)?	19.6%	10.5%	28.0%	20.4%	21.5%

An essential aspect of renewable energy is the price to the consumer. Question 23 addresses the willingness of the respondents' to pay a premium for various forms of renewable energy. The majority of the respondents are generally supportive of renewable energy technologies, but most are not willing to pay a substantial premium (>5%) for renewable energy as shown in Figure 3.

Table 4 shows the level of support or opposition of respondents concerning various wind energy issues. The strongest level of opposition is associated with a potential program from the federal government to reduce U.S. greenhouse gas emission. On the other hand, the strongest support is expressed for the idea that utility companies should be required to accept electricity generated by wind farms. Mixed opinions exist for expanding transmission lines (28.6% neither support nor oppose). Finally, 80.1 % of respondents somewhat or strongly support further development of wind farms in the state of Illinois.

To conclude the opinion questions, respondents were asked to rank their preferences of sources for expanding electricity production in the U.S. (Table 5). The most preferred source was wind energy followed by solar energy. Building more dams ranks third. Constructing more biomass burning plants came in fourth, and building more natural gas burning plants followed in fifth. The lowest ranked options were building additional coal burning plants and nuclear plants to expand electricity production.

Table 5: Rank for expanding US electricity

Item	Rank
Build more wind farms	1
Build more solar panels	2
Build more dams	3
Build more biomass burning plants	4
Build more natural gas burning plants	5
Build more coal burning plant	6
Build more nuclear plants	7

Area Comparison

In order to test if the proximity of a wind farm impacts the residents' opinions, answers were compared by area on every item of the survey. The following items appear significantly different:

- Concern that cost of power generated by wind energy is expensive (Question 21): differences were found between Areas 2 and 3 and between 2 and 4. The calculated values of the means show that people from Area 2 feel less concerned by the cost of power generated by wind than people in Areas 3 and 4.

- Importance of low cost as an attribute of wind energy (Question 20): Area 1 is statistically different from Areas 2 and 4 in that respondents from Area 1 believe that the low cost of energy generated is less important that respondents in Area 2 and 4.

- Regarding the idea that utility companies should be required to accept electricity generated by wind farms (Question 24): a statistical difference was found between Area 1 and Area 2. Respondents from Area 2 appear to be more supportive of this idea than respondents from Area 1.

- Finally, the four areas differ when ranking their choices by source to expand electricity in the United States (Question 25). Area 2 is statistically different from Areas 3 and 4 on the item "Build more coal-burning electrical power plants." Respondents from Area 2 put this source in a lower rank than the other areas. In addition, Areas 1 and 2 ranked "Build more biomass-burning electrical power plants" higher than Areas 3 and 4.

Chi-square tests were used in order to compare distributions of frequencies between different questions. The first test compared responses to two statements about respondents' beliefs concerning general energy statements. Distributions of the support for wind farm versus the support for ethanol plants are compared in Table 6.

Table 6: Wind and ethanol distributions comparison using Chi-square

		I support the construction of an ethanol plant in my community			
		Strongly disagree and disagree	Neutral	Agree and strongly agree	*Total*
I support the development of a wind farm in my community	Strongly disagree and disagree: Count	9	3	9	
	Expected count	4.6	5.3	10.1	
	Chi-square component	4.21	1.00	0.12	5.33
	Neutral: Count	7	7	6	
	Expected count	4.6	5.3	10.2	
	Chi-square component	1.25	0.55	1.73	3.53
	Agree and Strongly agree: Count	41	58	113	
	Expected count	48.3	56.6	107.3	
	Chi-square component	1.10	0.03	0.30	1.44
			Calculated Chi- square		**10.29**

Note: table constructed from respondents who expressed their opinion

For this test, the critical value of the Chi-square criterion is 9.48. The calculated Chi-square is greater than the critical value; therefore, the distributions are not the same, and we can conclude that respondents have broader support for wind farms than for ethanol plants (for more details, see Theron, 2010).

The second test was performed comparing the distribution of the support for wind farm and the distribution for the belief that human activity has a major impact on global warming.

Again, the critical value of the Chi-square is 9.48. The calculated Chi-square exceeds the critical value which implies that the distributions are significantly different. This result can be interpreted as following: support for wind farms is greater for respondents who agree that human activity impacts on global warming than those who disagree. In the group of respondents who disagree that human activity impacts on global warming, 25% of the respondents do not support wind farm development in their community. In the group who believes that human activity impacts global warming, only 4% of the respondents do not support wind farm in their community. Thus, it can be concluded that respondents who agree that human activity impacts on global warming are more likely to support the development of a wind farm in their community.

Table 7: Wind and global warming distributions comparison using Chi-square

		I support the development of a wind farm in my community			
		Strongly disagree and disagree	Neutral	Agree and strongly agree	*Total*
Human activity has a major impact on global warming	Strongly disagree and disagree: Count	11	8	25	
	Expected count	3.5	3.5	36.9	
	Chi-square component	16.07	5.79	3.84	25.69
	Neutral: Count	2	1	27	
	Expected count	2.5	2.5	26.1	
	Chi-square component	0.10	0.90	0.03	1.03
	Agree and strongly agree	7	11	162	
	Expected count	14.3	14.2	149.9	
	Chi-square component	3.73	0.72	0.98	5.42
				Calculated Chi-square	**32.15**

Note: table constructed from respondents who expressed their opinion

Similar tests were conducted and conclusions can be drawn that respondents who support a program to reduce U.S. greenhouse gas emissions and those who support a state or a federal mandate for renewable energy are also more likely to support the development of wind farms in their community and in the state of Illinois (for details, see Theron, 2010).

V. Conclusion

This research revealed a predominance of positive attitudes and opinions about wind energy. The survey revealed that about 80% of respondents support the development of a wind farm in their community. The support expressed by respondents was proven to be significantly different from the opposition. In addition, most respondents agree that wind farms are good for the environment, job creation, and rural economic development. Respondents identify the potential for reduction of dependence on foreign energy sources as the most important attribute of wind energy.

Respondents who agree that human activity has a major impact on global warming are also more likely to support wind energy. In addition, these individuals support a government program that would reduce greenhouse gas emissions and support federal and state mandates for renewable energy. However, respondents are still reluctant to pay a substantial premium for renewable energy.

The survey also found that in general, there was no significant difference in opinions concerning wind energy between the different areas. The proximity of the respondents to a wind farm does not impact their opinions.

One last objective of the study was to identify issues that developers should be prepared to address at public hearings. The last section of the questionnaire allowed respondents to express any comment they would like. Respondents felt that they needed more information from wind developers pertaining to cost of construction, cost of electricity generated, operating characteristics of wind farms (life span, maintenance, decommissioning), and the positive and negative features of wind energy.

Respondents were not indifferent to the survey since many comments sections were filled with comments such as:

"I am in favor of alternative energy if it is also cost effective."
"I would like to see the production of energy stay closer to the source."
"I have windmills all around me and they are not as bad as I thought."
"Everyone would be happier with windmills if the area would get a reduced electric bill."
"Let's use the land in Illinois that is not food productive for wind farms."

Appendix

APPEDNIX A: SURVEY

ILLINOIS STATE UNIVERSITY
Illinois' first public university

Public Beliefs and Attitudes Concerning Wind Farms in Central Illinois

We are attempting to identify public beliefs and attitudes concerning renewable energy in Illinois with special emphasis on wind energy. Your name was randomly selected from members of your community and we are writing to ask for your participation in the enclosed survey. If you are less than 18 years old, please disregard this request.

We will be using a questionnaire that should take less than fifteen minutes of your time. The questions solicit your point of view on renewable energy in general and wind power in particular. As a limited number of community members have been selected for this survey, each response is important in order to fairly represent the beliefs and attitudes of the community. We would appreciate your participation by completing the questionnaire and returning it to us in the prepaid envelope enclosed.

We want to assure you that the information you provide is strictly confidential. Your responses will be combined with those of other participants and only grouped data and summary will be released. The number on your questionnaire is for tracking purpose only so that you will not be sent a reminder notice if you respond to this questionnaire by June 30, 2009. Your participation is voluntary and there is no penalty if you choose not to participate.

The community will benefit from this survey because the results will be used by wind energy developers to **address the concerns of the public** and **lead to a better working relationship** between companies and the communities in which they operate. Results of the study will also be used by community and government officials to **help understand and address concerns of citizens** in dealing with wind energy companies and proposals. In addition to publication and presentation in appropriate professional outlets, the results of this project will be shared through the popular press as there is tremendous interest in all aspects of renewable energy within the media and population.

If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Research Ethics and Compliance Office at Illinois State University at (309) 438-2520. We would appreciate your help with this research project. Please complete and return the questionnaire by **June 30, 2009**.

If you have questions about the research, you may contact Dr. Randy Winter by phone (309) 438-3563 or by email at rwinter@ilstu.edu.

Thank you.
Sincerely,

J. Randy Winter,
Professor
Illinois State University
Department of Agriculture

Sophie Theron,
Graduate Research Assistant
Illinois State University
Department of Agriculture

department of Agriculture
illinois state university

Appendix

DEMOGRAPHICS

1. What is your gender?
□ Male □ Female

2. What is your age?
□ Under 25 □ 26-30 □ 31-35 □ 36-40 □ 41-45 □ 46-50
□ 51-55 □ 56-60 □ 61-65 □ 66 and over

3. What is your ethnicity?
□ White/Caucasian □ Asian □ Hispanic
□ Black/African-American □ Indian-American □ Other (please specify) _____

4. What is your marital status?
□ Married □ Engaged □ Divorced
□ Widowed □ Partner □ Separated
□ Never married / Single

5. What is your household income?
□ $25,000 or less □ $50,001 to $75,000 □ More than $100,000
□ $25,001 to $50,000 □ $75,001 to $100,000

6. How many people currently live at your residence?
□ 1 (you) □ 3 □ 5 □ 7
□ 2 □ 4 □ 6 □ 8 and more

7. How long have you lived at your current residence? _____ years

8. What is your current employment status?
□ Student □ Full time employee □ Unemployed
□ Retired □ Part time employee □ Other (please specify) _____

9. What is your current occupation? _____

10. What is the highest level of education you have completed?
□ Less than High School
□ Some High School
□ High School Degree
□ Some College
□ 2-Year College Degree (Associate degree)
□ 4-Year College Degree (Bachelor's degree: BA, BS)
□ Some Graduate or Professional School
□ Master's Degree (M.S., MBA)
□ Professional Degree (M.D., J.D.)
□ Doctorate Degree (Ph.D.)

11. What is your **main source** of information for current news/events? (**Check only one**)
□ Television □ Friends □Magazines
□ Radio □ E-mail □ Newspapers
□ Internet □ Family □ Other (please specify) _____

12. Which fuels do you use the **most** for heating your residence? (**Check only one**)
□ Gas □ Coal □ Wind
□ Electricity □ Wood □ Other (please specify) _____
□ Oil/kerosene □ Solar

13. Does your household have…?
…a flexible fuel car □ Yes □ No
…a hybrid car □ Yes □ No

14. How many automobiles/vans/trucks (1 ton capacity or less) does your household have?
□ 1 □ 3 □ 5
□ 2 □ 4 □ 6 and more

15. How do you usually get to work? (**Check only one**)
□ Do not work □ Bicycle □ Walk
□ Bus □ Work at home □ Car/ truck/ van

16. Which of the following describes the area you live in?
□ Rural □ Urban □ Suburban

17. Is there an operating wind farm in your county?
□ Yes □ No □ Do not know

18. Is there a proposed wind farm in your county?
□ Yes □ No □ Do not know

OPINIONS

19. How much do you agree /disagree with the following statements. Scale: 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4- Agree, 5-Strongly agree, 6-No opinion.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No opinion
Human activity has a major impact on global warming.	1	2	3	4	5	6
Global warming presents a serious risk to our future well-being.	1	2	3	4	5	6
The U.S. should drill more oil wells in the Gulf of Mexico.	1	2	3	4	5	6
The U.S. should drill more oil wells in Alaska.	1	2	3	4	5	6
I support the development of a wind farm in my community.	1	2	3	4	5	6
Wind farms are good for the environment.	1	2	3	4	5	6
Wind farms are good for agriculture.	1	2	3	4	5	6
Wind farms are good for job creation.	1	2	3	4	5	6
Wind farms are good for rural economic development.	1	2	3	4	5	6
I support the construction of an ethanol plant in my community.	1	2	3	4	5	6
Compared to gasoline, the use of ethanol is good for the environment.	1	2	3	4	5	6
Ethanol production is good for agriculture.	1	2	3	4	5	6
Ethanol production is good for job creation.	1	2	3	4	5	6
Ethanol production is good for rural economic development.	1	2	3	4	5	6
Ethanol produced from cellulosic materials will be competitively available within two years.	1	2	3	4	5	6
Technological advancements will help solve the energy crisis.	1	2	3	4	5	6

20. How important are the following attributes of wind energy? Scale: 1-Not important, 2-Somewhat important, 3-Very important, 4-Unsure.

	Not Important	Somewhat Important	Very Important	Unsure
Low cost of energy generated	1	2	3	4
No emission of greenhouse gases	1	2	3	4
No water usage to produce energy	1	2	3	4
Creates construction jobs	1	2	3	4
Creates permanent jobs on site	1	2	3	4
Adds economy activity in the community	1	2	3	4
Source of income for landowners	1	2	3	4
Source of local tax revenue	1	2	3	4
Represents an alternative source of energy	1	2	3	4
Reduce dependence on foreign energy sources	1	2	3	4

21. Please rate the level of concern you have for the following attributes of wind farms. Scale: 1-Not Concerned at all, 2-Not very Concerned, 3-Somewhat Concerned, 4-Very Concerned, 5-Unsure.

	Not Concerned at all	Not very Concerned	Somewhat Concerned	Very Concerned	Unsure
Noise from wind farm	1	2	3	4	5
Negative impact on the view / landscape	1	2	3	4	5
Potential for killing birds	1	2	3	4	5
Potential for killing bats	1	2	3	4	5
Potential for damaging roads	1	2	3	4	5
Negative impact on local property values	1	2	3	4	5
Wind is an unreliable source of power	1	2	3	4	5
Potential for "shadow flicker" (shadow from rotor blades)	1	2	3	4	5
Takes farmland out of production	1	2	3	4	5
Cost of power generated is expensive	1	2	3	4	5
Interferes with telecommunications (Radio/TV/Internet service/Cell phone)	1	2	3	4	5
Interferes with radar signals	1	2	3	4	5
Interferes with aerial spraying	1	2	3	4	5

22. Do you think …	Yes	No	Unsure
…the **State** government should have a mandate of renewable energy? (for example 25% of green energy by 2025)	□	□	□
…the **Federal** government should have a mandate of renewable energy? (for example 15% coming from renewable resources by 2020)	□	□	□

23. Would you be willing to pay more for renewable energy?

	No	Yes, up to 5% more	Yes, 6 to 10% more	Yes, 11 to 20% more	Yes, more than 20% more
Wind power	◻	◻	◻	◻	◻
Ethanol	◻	◻	◻	◻	◻
Solar	◻	◻	◻	◻	◻
Hydropower	◻	◻	◻	◻	◻

24. Please indicate your level of support. Scale: 1-Strongly Oppose, 2-Somewhat Oppose, 3-Neither support nor oppose, 4-Somewhat Support, 5-Strongly Support.

Do you support…	Strongly Oppose	Somewhat Oppose	Neither support nor oppose	Somewhat Support	Strongly Support
…further development of wind energy farms in the state of Illinois?	1	2	3	4	5
…the idea that the **state** government should provide tax incentives to support the development of renewable energy in Illinois?	1	2	3	4	5
…the idea that the **federal** government should provide tax incentives to support the development of renewable energy?	1	2	3	4	5
…the idea of building more high voltage transmission lines as a way to increase wind energy production?	1	2	3	4	5
… the idea that rural electric cooperatives should promote wind energy?	1	2	3	4	5
… idea that utility companies should be required to accept electricity generated by wind farms?	1	2	3	4	5
… the idea that the federal government should implement a program to reduce U.S greenhouse gas emission (a "carbon tax" or a carbon "cap and trade" system)?	1	2	3	4	5

25. Please rank the following, according to your preferences, as a source for expanding electricity production in the U.S. (#1 is most preferred, #7 is least preferred). Please use each number **only once.**

Build more dams (hydropower)	
Build more nuclear electrical power plants	
Build more coal-burning electrical power plants	
Build more wind farms	
Utilize more solar panels	
Build more biomass-burning electrical power plants	
Build more natural gas burning electrical plants	

COMMENTS

26. What aspects of wind production do you think the public needs to know more about?

27. Do you have any comments about renewable energy in Illinois?

28. Do you have any comments about this survey?

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Updated for 2010

Economic Impact

Wind Energy Development in Illinois

June 2010

Center for Renewable Energy
Illinois State University

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Jennifer L. Hinman completed this report while working as a Graduate Assistant to Dr. Loomis in the Economics Department at Illinois State University (ISU). In May of 2010, Jennifer earned her Master of Science degree in Applied Economics with a specialization in the Electricity, Natural Gas, and Telecommunications Economics Regulatory sequence at ISU in Normal, Illinois. Jennifer analyzed whether proximity to an operating wind farm influences the values of surrounding residential properties (and whether any impact changes over the different stages of wind farm development) as part of her Master's Capstone Project at ISU. Some other research areas pursued during her graduate studies include short-term electricity load forecasting and the short- and long-run relationships among real electricity prices, interest rates, natural gas prices, and coal prices. In 2008, Jennifer earned her Bachelor of Arts degree in Economics with a Financial Certificate and graduated Summa Cum Laude from the University Honors Program at Armstrong Atlantic State University in Savannah, Georgia. As an undergraduate, Jennifer presented a study she completed regarding the impact of oil price shocks on the U.S. inflation rate at the 35th Annual Meeting of the Academy of Economics and Finance in Nashville, Tennessee, and she has an article published in the *Academy of Economics and Finance Papers and Proceedings,* Volume 32, 2008. Jennifer has recently accepted a position as an Economist in the Policy Department of the Energy Division under the Bureau of Public Utilities at the Illinois Commerce Commission in Springfield, Illinois.

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Illinois Wind Working Group (IWWG)

The Illinois Wind Working Group (IWWG) is affiliated with the Department of Energy's Wind Powering America's State Wind Working Groups. The group is administered by the Center for Renewable Energy at Illinois State University, including David Kennell (Technology), Dr. David Loomis (Economics) and Dr. J. Randy Winter (Agriculture).

Wind Powering America (WPA) is a regionally-based collaborative initiative to increase the nation's domestic energy supply by promoting the use of Wind Energy Technology, such as low wind speed technology, to increase rural economic development, protect the environment, and enhance the nation's energy security. WPA provides technical support and educational and outreach materials about utility-scale development and small wind electric systems to utilities, rural cooperatives, federal property managers, rural landowners, Native Americans, and the general public.

IWWG is an organization whose purposes are to communicate wind opportunities honestly and objectively, to interact with various stakeholders at the local, state, regional and national levels, and to promote economic development of wind energy in the state of Illinois. The organization is hosted by Illinois State University through a grant from the U.S. Department of Energy. The Illinois Wind Working Group is comprised of 175 key wind energy stakeholders from the state of Illinois.

IWWG is part of Illinois State University's Center for Renewable Energy and hosts an annual Advancing Wind Power in Illinois Conference that covers many aspects of wind energy; an annual Siting, Zoning and Taxing Wind Farms in Illinois Conference; and Landowner Forums throughout the state.

www.RenewableEnergy.ilstu.edu/wind/

Center for Renewable Energy

Illinois State University established the Center for Renewable Energy, and it received Illinois Board of Higher Education approval in 2008. The Center was initially funded by a $990,000 grant from the U.S. Department of Energy (US DOE) to research renewable energy, to establish a major in renewable energy at Illinois State and to administer the Illinois Wind Working Group (IWWG). The Center also received a grant from the Illinois Clean Energy Community Foundation to help complete its state-of-the-art renewable energy laboratory.

The Center has three major functional areas:

- Supporting the renewable energy major at Illinois State University
- Serving the Illinois renewable energy community by providing information to the public
- Encouraging applied research on renewable energy at Illinois State University and through collaborations with other universities.

Founding Members:

Founding members include Horizon Wind Energy LLC, State Farm Insurance, Suzlon Wind Energy Corp., and Iberdrola Renewables.

Support of the Renewable Energy Major:

Many new workers will be needed in the renewable energy industry. To meet the growing demand for trained and educated workers, we have developed an interdisciplinary renewable energy major at Illinois State University. Graduates of the renewable energy program are well-positioned to compete for new and existing jobs.

The Center supports the renewable energy major through:

- Creation of an advisory board of outside experts,
- Establishing a renewable energy internship program,
- Bringing renewable energy experts to campus for seminars for faculty and students,
- Funding scholarships to ensure high quality students in the major,
- Providing ongoing financial support for the major.

For more information about the Renewable Energy Undergraduate Major, please visit www.RenewableEnergy.ilstu.edu/major/.

Executive Summary

A number of factors have contributed to the rapid growth of wind power capacity in Illinois from 50 MW in 2003 to 1,847.76 MW in 2010, including federal and state policies, energy security, energy costs, environmental benefits, and economic development opportunities. One key policy driver in Illinois was the passage of the Illinois Power Agency Act in 2007 which included a Renewable Portfolio Standard of 25% by 2025, of which 75% of the renewable energy resources must come from wind.

As of April, 2010, Illinois ranked 6th in the United States in existing wind-powered generating capacity and ranked 16th in the United States in potential capacity (AWEA, 2010b). Illinois was responsible for over half of the 539 megawatts of new generating capacity installed by the U.S. wind industry in the first quarter of 2010 (AWEA, 2010b). Illinois currently has 21 wind projects online, which account for 1,847.76 MW of wind generating capacity (see Table 1). Although project specific data were used in this report, proprietary information about the wind farms will not be released. It is very important that stakeholders and decision makers are educated about the economic development impact wind energy has brought to the state and local communities so that informed decisions regarding future adoption of wind energy projects can be made. By analyzing the impacts of Illinois' wind energy, this report supplies interested parties with information concerning the economic development benefits of wind energy.

According to this economic analysis (see Figure 1), 1,847.76 MW of wind generating capacity in the state of Illinois:

- Created approximately 9,968 full-time equivalent jobs[1] during construction periods with a total payroll of over $509 million
- Supports approximately 494 permanent jobs in rural Illinois areas with a total annual payroll of over $25 million
- Supports local economies by generating $18 million in annual property taxes[2]
- Generates $8.3 million annually in extra income for Illinois landowners who lease their land to the wind farm developer
- Will generate a total economic benefit of $3.2 billion over the life of the projects[3].

[1] Job calculations are based on a full time equivalent (FTE) basis for a year. In other words, 1 job = 1 FTE = 2,080 hours worked in a year. A part time or temporary job would constitute only a fraction of a job according to the JEDI model. For example, the JEDI model results show 1,473 new jobs during construction; though the construction of the wind farms may have actually involved hiring closer to 3,000 workers. Thus, due to the short-term nature of construction projects, the JEDI model significantly understates the number of people actually hired to work on the project. It is important to keep this fact in mind when looking at the numbers or when reporting the numbers.

[2] Property tax revenue is listed for the first year (where there are property tax abatements during the first few years of the wind farm project or Payments in Lieu of Taxes (PILOT), an average figure over the first ten years is utilized). This figure will change over time due to several factors: (1) whether the county increases/decreases the local property tax rate; (2) depreciation over the life of the project; and (3) if the state law regarding wind farm valuation changes in the future.

[3] The project life of the wind farm is assumed to be approximately 25 years in this calculation, although many landowner contracts may extend as long as 30 years.

Table 1.—Illinois Wind Farm Projects

Wind Farm	Location (County)	Capacity (MW)
Streator Cayuga Ridge South Wind Farm	Livingston	300.00
Lee-DeKalb Wind Energy Center	DeKalb and Lee	217.50
Twin Groves Wind Farm Phase I	McLean	198.00
Twin Groves Wind Farm Phase II	McLean	198.00
Camp Grove Wind Farm	Marshall and Stark	150.00
Grand Ridge Energy Center Phases II, III, and IV	LaSalle	111.00
EcoGrove Wind Farm	Stephenson	100.50
Rail Splitter Wind Farm	Logan and Tazewell	100.50
Top Crop Wind Farm Phase I	LaSalle	100.50
Grand Ridge Energy Center Phase I	LaSalle	99.00
GSG Wind Farm	Lee and LaSalle	80.00
Providence Heights Wind Farm	Bureau	72.00
Crescent Ridge Wind Farm	Bureau	54.45
Mendota Hills Wind Farm	Lee	50.40
AgriWind	Bureau	8.40
Turbine Adam	Lee	2.50
Illinois Rural Electric Cooperative	Pike	1.65
Erie CUSD #1 Wind Turbine	Whiteside	1.20
Gob Nob Wind Turbine	Montgomery	0.90
Bureau Valley School District Wind Turbine	Bureau	0.66
Sherrard High School Wind Turbine	Rock Island	0.60

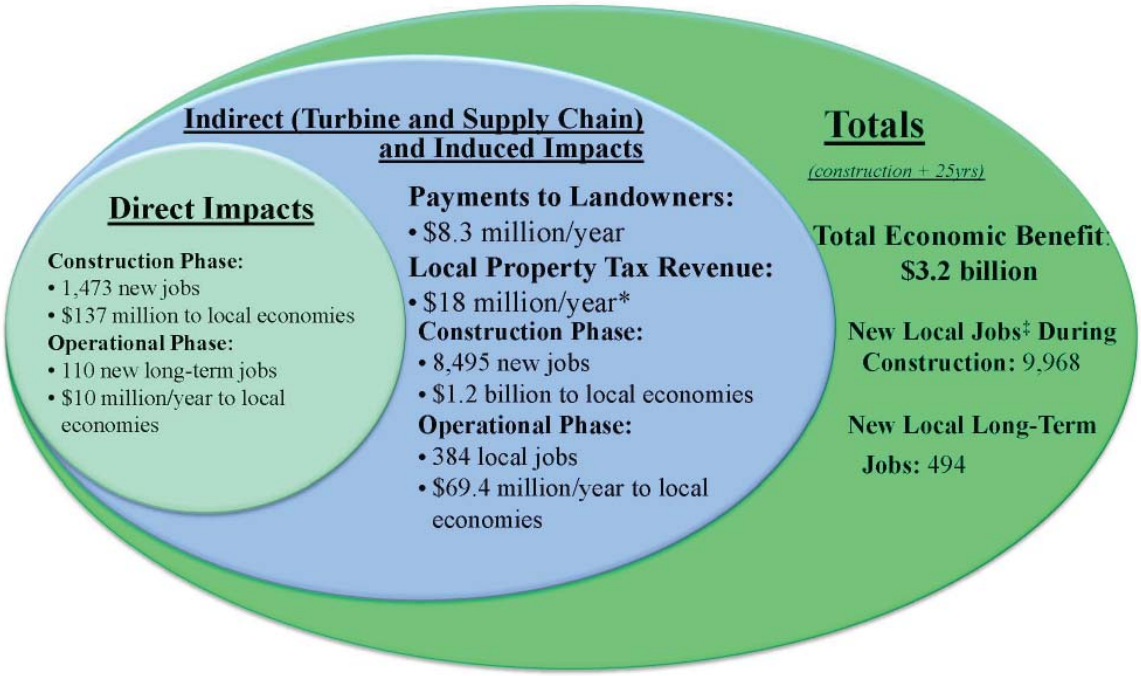

Figure 1.—Economic Impacts from 1,847.76 MW of Wind Energy Development in Illinois

Notes: All dollar values have been converted to 2008 dollars. JEDI versions 1.09.03b and 1.09.03e were utilized.
* Property tax revenue is listed for the first year. Property tax revenues will change over time due to several factors: (1) whether the county increases/decreases the local property tax rate; (2) depreciation over the life of the project; and (3) if the state law regarding wind farm assessed valuation changes in the future.
‡ Job calculations are based on a full time equivalent (FTE) basis for a year. In other words, 1 job = 1 FTE = 2,080 hours worked in a year. A part time or temporary job would constitute only a fraction of a job according to the JEDI model. For example, the JEDI model results show 1,473 new jobs during construction; though the construction of the wind farms may have actually involved hiring closer to 3,000 workers. It is important to keep this fact in mind when looking at the numbers or when reporting the numbers.

I. Introduction

According to the American Wind Energy Association (AWEA), the wind energy industry had its strongest year yet in 2009 in which it brought close to 10,000 MW of new generating capacity online. These additions in installed capacity in 2009 brought the total installed capacity in the United States to over 35,000 MW and "America's wind power fleet will avoid an estimated 62 million tons of carbon dioxide annually, equivalent to 10.5 million cars off the road, and will conserve approximately 20 billion gallons of water annually, which would otherwise be withdrawn for steam or cooling in conventional power plants" (AWEA, 2010a, 2). This tremendous growth in 2009 is in addition to a great year in 2008 when wind generating capacity grew by 50% and the United States wind energy industry surpassed all previous records by installing 8,545 megawatts (MW) of new generating capacity, which can power over two million households. In total, at the beginning of 2009, the United States wind energy generating capacity was 25,170 MW (AWEA, 2009a).

Regarding job creation in the United States, AWEA claimed that there has been tremendous growth in manufacturing and that the share of domestically manufactured wind turbine components has grown from less than 30% in 2005 to about 50% in 2008. Over 55 new facilities that manufacture wind turbine components were announced, added, or expanded in 2008 and these new facilities created 13,000 new jobs (AWEA, 2009b). Unfortunately, "the continuing lack of a long-term policy and market signal allowed total investment in the manufacturing sector to drop compared to 2008, with one-third fewer online, announced and expanded wind power manufacturing facilities in 2009. The result was net job losses in the manufacturing sector, which were compounded by low orders due to high inventory" (AWEA, 2010a, 2). Thirty-eight manufacturing facilities were brought online, announced or expanded in 2009 (AWEA, 2010a).

As of April, 2010, Illinois ranked 6th in the United States in existing wind-powered generating capacity and ranked 16th in the United States in potential capacity (AWEA, 2010b). Illinois currently has 21 wind projects online, which account for 1,847.76 MW of wind generating rated capacity. It is very important that stakeholders and decision makers are educated about the economic development impact wind energy has brought to the state and local communities so that informed decisions regarding future adoption of wind energy projects can be made. By analyzing the impacts of Illinois' first 1,847.76 MW of wind energy, this report supplies interested parties with information concerning the economic development benefits of wind energy. It can also be used as a resource by communities to identify the economic development opportunities a wind project may create.

This report focuses on the benefits of wind energy to Illinois' economy. Section II provides an overview of some of the factors driving wind energy growth. Section III provides a brief literature review of the impacts of wind farm development. Section IV discusses the analytical method used in this analysis. Section V presents the results and economic impacts in Illinois. Section VI discusses Illinois' future in the wind power industry. Section VII provides some concluding remarks.

II. Wind Energy Growth Factors

A number of factors have caused the rapid growth of wind power capacity in the United States in recent years including federal and state policies, concerns regarding energy security and energy costs, environmental benefits, and economic development opportunities. Federal and state policies are huge drivers of wind power development (Bird et al., 2005). For example, the American Recovery and Reinvestment Act of 2009 (ARRA, 2009) provides more than $40 billion for clean energy initiatives, and new and modified tax incentives for clean energy are estimated to contribute an additional $20 billion. In particular, federal renewable energy production tax credits (PTC) along with state renewable electricity standards (RES) have been the biggest drivers.

Federal and State Policies

The federal renewable energy production tax credit is an inflation-adjusted per-kWh credit that is applied to the output of a qualifying facility during the first ten years of operation (Bird et al., 2005). As Figure 2 illustrates, wind energy installations have peaked in years that the PTC was set to expire as wind farm developers rushed to complete construction of the wind farm projects in time to take advantage of the tax credit (Bird et al., 2005). The credit expired at the end of 1999, 2001, and 2003, and the results were huge reductions in new wind power installations in 2000, 2002, and 2004 (AWEA, 2009b). ARRA extends the PTC for wind energy through 2012 (ARRA, 2009).

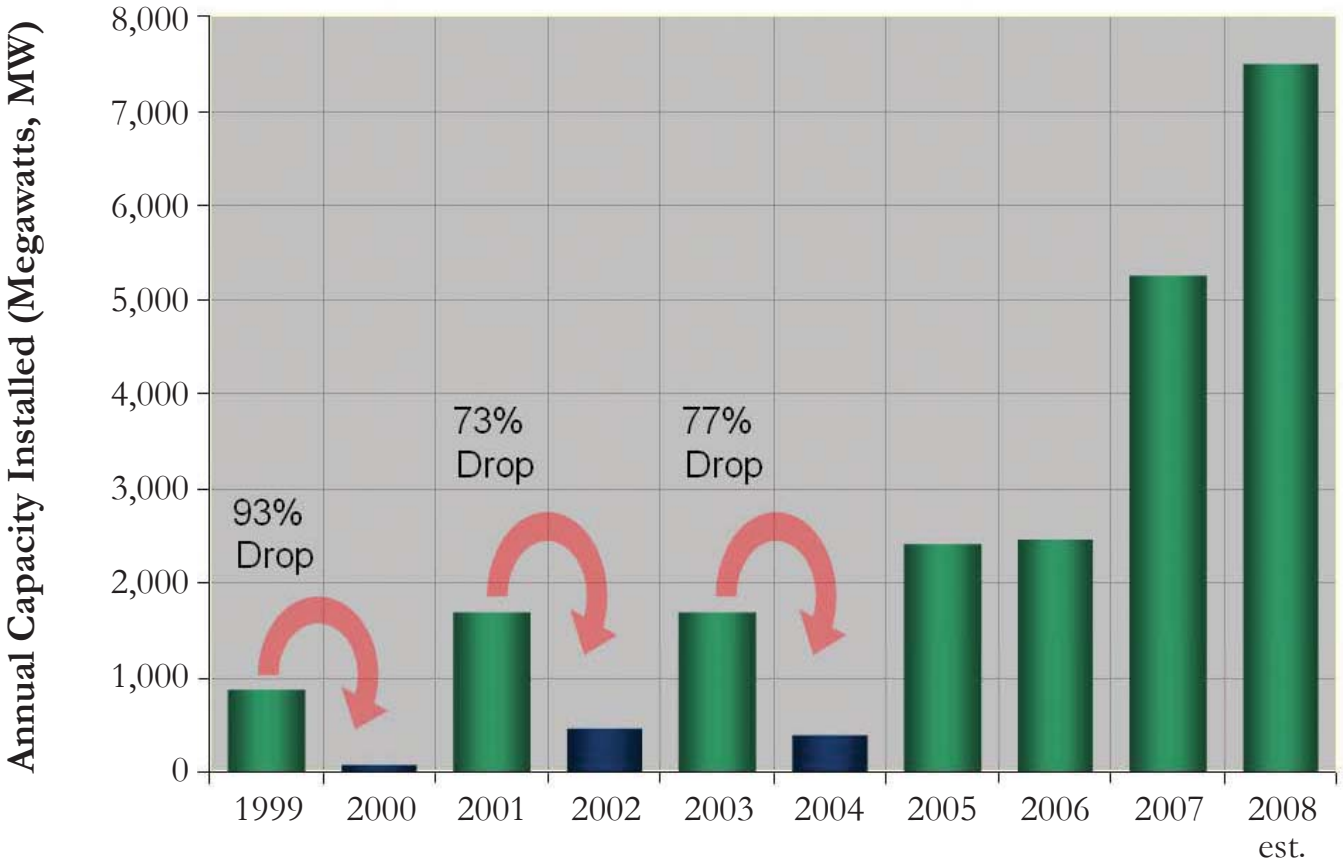

Figure 2.—Impact of PTC Expiration on Annual Installation of Wind Capacity. Source: AWEA

Energy Security and Energy Costs

A state renewable electricity standard (RES)[4] which is often referred to as a renewable portfolio standard (RPS) mandates that a percent of the state's overall electricity generation (percent of installed capacity (MW) or percent of energy sales (MWh)) must come from renewable energy[5]. The percent of energy sales or installed capacity that are required to come from renewable resources usually increases incrementally from a base year to an ultimate target. Each utility in the state is required to invest in renewable energy systems in order to meet their percentage requirements[6]. When a state adopts a renewable electricity standard, this increases the demand for renewable energy in the state. The certainty that arises from the RPS and the permanently increased demand induces developers of renewable energy projects into the market[7]. These suppliers of renewable energy (developers of renewable energy projects) are related to the natural resource endowments of each state as well as the cost competitiveness of the renewable energy generation[8]. In the case of a state with an abundant wind resource and in-state renewable energy preference, wind developers are incentivized to enter. As of November, 2009, 29 states and Washington D.C. have an RPS and six states have state renewable portfolio goals (IREC, 2009).

Wind is an inexhaustible energy source and it is free from fuel price volatility, which can contribute to the nation's energy security. Because of fuel price uncertainty, electricity supply portfolios need to be diversified. Wind power can help diversify electricity supply portfolios, which can then lead to relatively more stable energy prices, which benefits ratepayers in the long run. If wind power is used on a large scale, and energy storage becomes economically and scientifically feasible, the demand for fuel used in electricity generation falls, which puts downward pressure on fuel prices[9]. Over the past 20 years, wind energy costs have declined significantly; however, the cost of constructing a new coal plant has continued to rise. The wind energy cost decline is primarily due to technological advances in turbine design, as larger more efficient wind turbines that generate proportionally more power have put downward pressure on wind power costs (Bird et al., 2005). In addition, unlike fossil fuel-fired power plants, wind power is not subject to the uncertainty surrounding future carbon taxes, thus increasing its cost-competitiveness.

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[4]Renewable portfolio standards across the country vary considerably in policy objectives and design. Carley (2009) states that the "majority of policy objectives aim to facilitate the diversification of electricity generation mixes, increase renewable energy deployment, reduce state reliance on fossil fuels, help renewable energy sources become cost competitive with conventional energy sources, reduce carbon emissions, or various combinations thereof" (3071-2). The features related to policy design vary in structure, size, application, eligibility, and administration (Carley, 2009; Wiser et al., 2007).

[5]Definitions of what constitutes "renewable energy" varies from state to state. In Illinois, renewable resources include wind, solar, landfill gas, and existing hydroelectric. More specifically, "renewable energy resources" includes energy and its associated renewable energy credit or renewable energy credits from wind, solar thermal energy, photovoltaic cells and panels, biodiesel, crops and untreated and unadulterated organic waste biomass, trees and tree waste trimmings, hydropower that does not involve new construction or significant expansion of hydropower dams, and other alternative sources of environmentally preferable energy. Landfill gas produced in the State is considered a renewable energy resource. "Renewable energy resources" does not include the incineration or burning of tires, garbage, general household, institutional, and commercial waste, industrial lunchroom or office waste, landscape waste other than trees and tree waste trimmings, railroad crossties, utility poles, or construction or demolition debris, other than untreated and unadulterated waste wood (IPA Act, 2007). For more background information on the Illinois RPS, see Loomis and Ohler (2010).

[6]Many states allow utilities to exchange renewable energy credits (RECs) to help utilities comply with the mandates. RECs are tradable wholesale electricity commodities representing one MWh of renewable energy generation. Thus, many utilities purchase RECs in lieu of deploying one MWh of their own renewable energy (Carley, 2009).

[7]This certainty also helps the projects get financed.

[8]The policy specifics regarding in-state versus out-of-state renewable resources that are able to be utilized to comply with the law are also important.

[9]And some would argue that the following should also be in place: a smarter electricity grid ("smart grid"); expansion of high voltage transmission lines from states with significant wind resources to states with significant load centers; and deployment of wind speed measurement devices to improve the accuracy of wind speed forecasts.

Environmental Benefits

Wind power does not contaminate water with pollutants, such as mercury and it generates electricity without emitting gases that may contribute to climate change. According to AWEA, "wind power is one of the cleanest and most environmentally benign energy sources in the world today" (2009b, 6). Based on average EPA-generated 2004 emissions rates, a 396 MW wind farm such as Twin Groves displaces roughly 3,579 tons of NOx, 6,541 tons of SO2, 1,467,615 tons of CO2, 102 pounds of mercury, 62,231 pounds of volatile organic compounds, and 185,397 pounds of particulate matter annually (Horizon, 2008). In addition, when a coal plant opens up near a neighborhood, not only do the housing values closest to the coal plant decline in value, but over time as the pollution from the plant becomes a problem for residents, housing values continue to decline along with residents' health. As the public becomes more concerned with the potential impact that CO2 emissions have on the environment, the demand for carbon-neutral electricity generation increases, thus positively influencing the growth of wind energy. Wind energy can help reduce greenhouse gas emissions such as CO2 (of which a large percentage of CO2 emissions are polluted from automobiles) in the future to the extent that plug-in electric vehicles are widely adopted in the United States and charged at night (which is typically the time of day when the wind blows most often). As mentioned previously, if energy storage becomes economically and scientifically feasible, and if wind power is used on a large scale, the demand for coal used in electricity generation falls, and this can significantly reduce greenhouse gas emissions. Wind power is a clean energy resource, and unlike coal plants, which generate a great deal of pollution and CO2, when electricity is generated from wind turbines, there are not the negative externalities from pollutants in the air that contribute to acid rain, smog, and negative health-related impacts. "Almost half of all Americans live in counties where unhealthy levels of smog place them at risk for decreased lung function and aggravation of respiratory illness, according to the American Lung Association" (AWEA, 2009b, 6).

Economic Development Opportunities

Finally, wind power provides economic development opportunities that can revitalize rural communities around the United States. Despite the economic downturn, 35,000 new wind power related jobs were created in 2008 (AWEA, 2009b). Wind farm installations can create jobs in rural communities where local economies are often dependent on agriculture. Local jobs include construction-related jobs, operation and maintenance of the facility after it is constructed, and jobs induced by the additional money the workers spend in the local economy. Development of related in-state businesses and trained labor are crucial to maximizing the economic benefits of wind energy development within a state. Wind projects benefit rural economies by providing local jobs during construction and boosting activity at local businesses that can provide some of the needed materials and services for construction of the wind farm. Wind turbines raise the property tax base of a county, creating a new revenue source for education, fire departments, and other local government services. To the extent that governmental bodies want to promote the economic benefits from wind farm developments, appropriate incentives are put in place that contribute to the growth of wind energy development.

Illinois' Unique Attributes

Wind Resource, Transmission, and Demand

A number of state specific factors have contributed to the rapid growth of wind power capacity in Illinois from 50 MW in 2003 to over 1,800 MW in 2010 including the wind resource, access to unconstrained transmission, electricity demand, and policies promoting renewable energy.

The quality of the wind resource is an important consideration in developing a wind farm (Bird et al., 2005). As a result of technological advances, turbines have become much larger, and the capacity of wind turbines has steadily risen over time (see Figure 3). New turbines have allowed states with lower wind speeds to be economically viable places to develop a wind farm. In addition, the increased heights of towers have enabled states such as Illinois to take advantage of and utilize the wind energy that blows stronger the higher up one goes. In fact, an area with twice the wind speed will produce eight times the amount of electricity all else equal. This increase in wind resources the higher up one goes is illustrated in Figure 4 by the Illinois wind maps that compare the wind resource at different heights (IIRA, 2009)[10]. These new technological developments in turbines have positioned Illinois as a state with the opportunity to take advantage of its wind resources to generate electricity to power many of Illinois' homes and businesses. In fact, Illinois has one of the most robust wind resources in the PJM market[11].

While there are other states that have gustier winds, Illinois has the advantage of nearby load and relatively unconstrained transmission. Access to unconstrained transmission lines is required for wind farm development (Bird et al., 2005). Illinois has a relatively large population, and large population centers, combined with other factors such as weather, keep the demand for electricity relatively high. The fact that load centers are relatively close to rural areas creates excellent wind farm development opportunities.

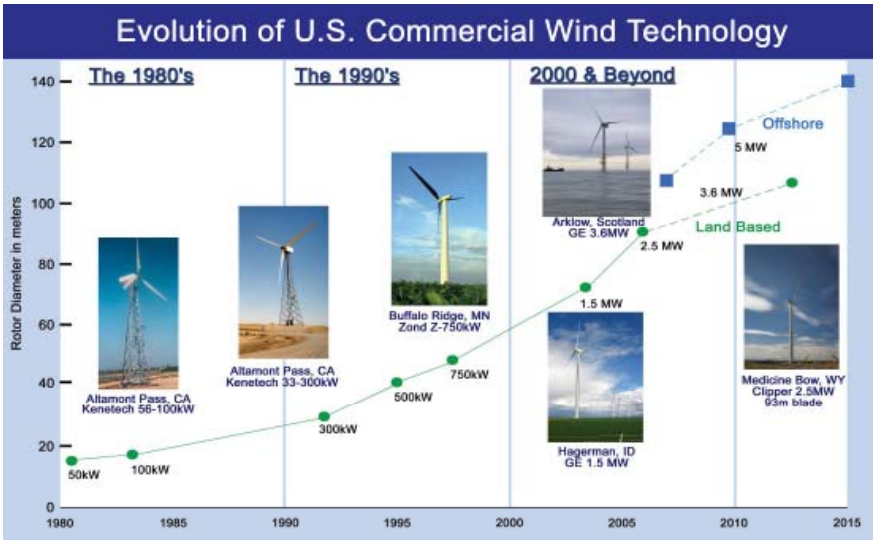

Figure 3.—Evolution of U.S. Commercial Wind Technology

[10]More wind map resources are available from the Illinois Institute for Rural Affairs website at: www.illinoiswind.org.

[11]"PJM Interconnection is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia" (PJM, 2010).

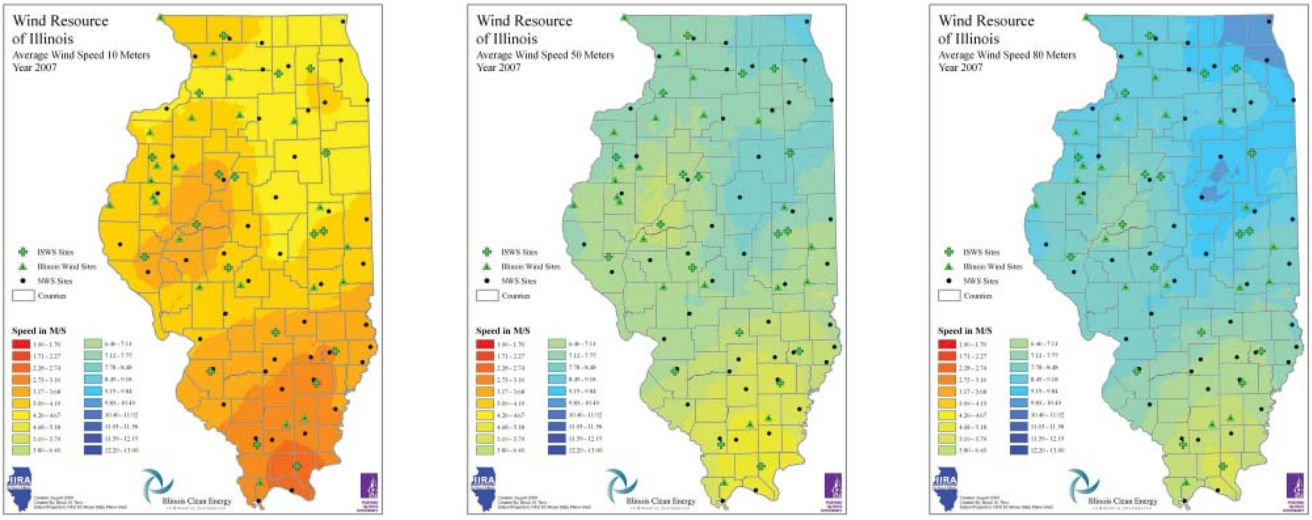

Figure 4.—Wind Resource of Illinois

Overview of Illinois' Current Policies

Renewable Portfolio Standard

A large driver of wind power development is the renewable portfolio standard (RPS) (Bird et al., 2005; Brown and Busche, 2008). Illinois has an RPS of 25% by 2025 and this can be reached largely by utilizing the wind resources Illinois has. In fact, the Illinois Power Agency Act (P.A. 95-481, eff. 8-28-07) states, "To the extent that it is available, at least 75% of the renewable energy resources used to meet these standards shall come from wind generation" (20 ILCS 3855/1-75(c)(1)). Through June 1, 2011, renewable energy resources can be counted for the purpose of meeting the renewable energy standards only if they are generated from in-state facilities and provided that cost-effective renewable energy resources are available from those facilities (20 ILCS 3855/1-75(c)(3)). By June 1, 2010 at least 5% of each utility's total supply to serve the load of eligible retail customers must be generated from cost-effective renewable energy resources (20 ILCS 3855/1-75(c)(1)). The percentage increases annually until the mandated 25% is reached by June 1, 2025. The act also protects ratepayers by requiring that the renewable energy resources cannot cause rates to increase by more than a certain percentage each year. On December 28, 2009, the Illinois Commerce Commission approved a plan to allow the state's utilities to purchase a portion of wind and other renewable energy through long-term contracts. This move has the potential to accelerate the development of wind projects in the state and should help create a more robust REC market.

Enterprise Zones

As an enterprise zone incentive in Illinois, both an investment tax credit and a jobs tax credit are available. The investment tax credit entitles a developer to a 0.5% income tax credit for investments in qualified property; for example, building, structures, and other tangible property. The jobs tax credit entitles an employer to a $500 tax credit for hiring individuals certified as economically disadvantaged. The more important benefit to wind developers from an enterprise zone in Illinois is the sales-and-use tax exemption for building materials. Nearly 40 other states, including all adjacent states, automatically exempt wind energy generation equipment from any sales-and-use tax. If Illinois had not offered enterprise zone benefits, Illinois wind projects would have been at a competitive

disadvantage, which is why every major wind project in Illinois has been located in an enterprise zone. Fortunately, Senate Bill 1923 (P.A. 96-28, eff. 7-1-09) amended the Illinois Enterprise Zone Act, to provide that businesses that intend to establish a new wind power facility in Illinois may be considered "high impact businesses" allowing them to claim a full exemption from sales-and-use tax without having to apply for enterprise zone status, which has been a cumbersome tax-exemption process used until the passage. More importantly, enterprise zones are completely unavailable in some counties in Illinois that have good wind resources. This new piece of legislation puts Illinois on more equal footing with its neighboring states, which all exempt wind energy generation equipment from sales-and-use taxes as previously mentioned.

Property Tax Legislation

As wind energy facilities were first being proposed in different counties in Illinois, local tax assessors were faced with the challenge of how the value of these new wind energy devices should be assessed. The wind energy devices in Illinois ended up being assessed differently in each county, which meant identical turbines could have vastly different taxable values across the state. Fortunately, in 2007, legislation was passed setting a state standard for valuation of wind energy devices for at least five years (P.A. 95-644, eff. 10-12-07). The wind energy property assessment division of the Illinois Property Tax Code specified that wind energy devices larger than 500 kilowatts (kW) and producing power for commercial sale be valued at $360,000/megawatt (MW) of capacity, annually adjusted for inflation according to the U.S. Consumer Price Index (35 ILCS 200/Art. 10 Div. 18 heading). The depreciation allowance may not exceed 70% (Ryerson, 2009). Although wind developers have criticized the taxes from this legislation as too high, the certainty the law provides is a net benefit to wind development in the state of Illinois. Whether the current standard is renewed when the sunset date (end of 2011) for the legislation arrives will have a significant impact on the siting and zoning of wind farms at the county level, and thus the future wind farm development in the state[12]. Fortunately, the Wind Property Tax Extension Bill (H.B. 4797 which amends 35 ILCS 200/10-610) passed both Houses April 27, 2010, and it was sent to the Governor May 26, 2010, where it awaits his signature. If the Governor signs the bill, it would extend the current property tax valuation law for wind turbines in Illinois until the end of 2016, providing greater certainty for developers, banks, and local officials, which will help Illinois wind projects move forward.

[12]Under the current legislation, school districts and local governments benefit significantly. Any reduction in this benefit may negatively impact county board (as well as the siting and zoning board) approval of proposed wind projects. Current law governing wind farm taxation contains a sunset provision for the end of 2011, which creates an uncertainty for lenders and makes wind project finance more difficult. The uncertainty also makes local officials hesitant to approve projects, causing additional delays.

III. Economic Impacts of Wind Farm Development

Wind Energy Creates Skilled, High Paying Green Jobs

Wind farm installations can create jobs in rural parts of Illinois where local economies are often dependent on agriculture. Local jobs include construction-related jobs, operation and maintenance of the facility after it is constructed, and jobs induced by the additional money the workers spend in the local economy. This section reviews some of the published studies of the economic benefits of wind energy.

Lantz and Tegen (2008) conducted an analysis pertaining to variables affecting economic development of wind energy. Lantz and Tegen (2008) assert that "creating policies to ensure maintenance materials are supplied by in-state business and that the local labor force is trained to perform wind turbine maintenance is also likely to have a large impact for wind power plants operating for 20 or more years" (15). Development of related in-state businesses and trained labor are crucial to maximizing the economic benefits of wind energy development in Illinois.

Building Trades, Construction and Installation

Wind projects benefit rural economies by providing local jobs during construction and boosting activity at local businesses that can provide some of the needed materials and services for construction of the wind farm. Lantz and Tegen (2008) point out that "wind farms rely heavily on non-turbine construction materials like sand, gravel, asphalt, and concrete for construction of roads and foundations" (10). Because these materials are prevalent in conventional construction industries, "most regions are capable of supplying a high level" of the materials to wind projects (Lantz and Tegen, 2008, 10). Many developers try to hire local construction companies. Pedden (2006) notes that "some local governments offer incentives to developers in return for the developer agreeing to hire local labor" (7).

Operation and Maintenance

The operation and maintenance needs of a wind farm create permanent, high-quality local jobs ranging from field technicians who service the turbines to accountants and managers. Wind farms need staff to operate and regularly service the turbines throughout their roughly 20- to 30-year lifetimes.

Landowner Benefits

Landowners who lease their land to wind developers benefit from having a stable source of income. On a per acre basis, the revenue landowners receive from leasing their land is usually greater than that from ranching or farming and it does not require any work from the landowners. Landowners can be compensated in a variety of ways: option payments, construction disturbance or installation payments, land leases/easements, and/or royalties. While royalty payments represent a percentage of gross income received by the wind farm owner from the sale of power, land easements represent a specific amount paid to the landowner each year and are typically adjusted for inflation.

Pedden (2006) conducted a comparative analysis on the economic impact of wind farms in rural communities across the country and concluded that more direct benefits are found in rural communities, especially those with few industries and those primarily with farming. He explains that the supplementary income paid to farmers and the local taxes greatly contribute to the economic development impacts of these communities.

The Twin Groves Wind Farm, developed by Horizon Wind Energy in McLean County, signed option and land lease agreements with property owners. In total, 130 different landowners leased land to Horizon for the wind turbines, more than 30 different landowners granted overhead transmission easements, more than 50 different landowners granted underground distribution easements, more than 70 different landowners granted ROW (Right-of-Way) easements for road improvements, and more than 50 different landowners signed to neighbor agreements (Whitlock, 2008).

Increased Tax Revenues

Local governments receive significant amounts of revenue from permitting fees. For example, Logan County received $245,000 for wind farm zoning fees and permits from the 29 turbines that are located in the county for the Rail Splitter Wind Farm (Niziolkiewicz, 2010). In addition, the EcoGrove project has provided more than $750,000 in revenue for Stephenson County through enterprise zone fees, zoning application fees, and turbine permit fees (Morse, 2008).

Wind turbines raise the property tax base of a county, creating a new revenue source for education and other local government services. In his comparative analysis, Pedden (2006) points out that taxes collected by state and local governments can support many sectors of the economy such as schools, road improvements, hospitals, and fire and rescue. Lantz and Tegen (2008) point out that property tax payments "can increase the local tax base allowing for budget increases or a lowering of the taxing district's general tax rate" (6).

School District Benefits

School districts can also benefit from wind farms located in their property tax base. Typically when new economic development occurs in an area, the school district receives an increase in its property tax revenue, accompanied by an increase in population, and thus costs associated with new students relocating in their district. However, when a wind farm moves to the area, the school district benefits from a large increase in revenue, with no concomitant increase in costs. The new revenues can then be used to enhance the education provided by the school to existing students.

Road Improvements

The construction of wind farms frequently requires public road upgrades. The developers strengthen the roads, then widen them to put in the private access roads that lead to the turbines. Following road upgrades, developers then can begin construction. A road use agreement between the county and the developer is usually passed and typically pays for upgrading roads that will be used during construction.

IV. Analytical Method

The JEDI Model

The economic analysis of wind power development presented here utilizes the National Renewable Energy Laboratory's (NREL's) latest Jobs and Economic Development Impacts (JEDI) Wind Energy Model[13]. The JEDI Wind Energy Model[14] is an input-output model that measures the spending patterns and location-specific economic structures that reflect expenditures supporting varying levels of employment, income, and output. Essentially, JEDI is an input-output model, which takes into account the fact that the output of one industry can be used as an input for another. For example, when a wind farm developer purchases turbines to build a wind farm, those wind turbines are made of components such as fiberglass, aluminum, steel, copper, etcetera. Therefore, purchases of wind turbines impact the demand for these components. In addition, when a wind farm developer purchases a wind turbine from a manufacturing facility, the manufacturer uses some of that money to pay employees, and then the employees spend that money to purchase goods and services within their community. In essence, JEDI reveals how purchases of wind project materials not only benefit local turbine manufacturers but also the local industries that supply the concrete, rebar, and other materials (Reategui et al., 2009). The JEDI model uses construction cost data, operating cost data, and data relating to the percentage of goods and services acquired in the state to calculate jobs, earnings, and economic activities that are associated with this information. The results are broken down into the construction period and the operation period of the wind project. Within each period, impacts are further divided into direct, turbine and supply chain (indirect), and induced impacts.

The Jobs and Economic Development Impacts (JEDI) Model was developed in 2002 to demonstrate the economic benefits associated with developing wind farms in the United States. The model was developed by Marshall Goldberg of MRG & Associates, under contract with the National Renewable Energy Laboratory. The JEDI model utilizes state-specific industry multipliers obtained from IMPLAN (IMpact Analysis for PLANning). IMPLAN software and data are managed and updated by the Minnesota IMPLAN Group, Inc., using data collected at federal, state, and local levels. The JEDI model considers 14 aggregated industries that are impacted by the construction and operation of a wind farm: agriculture, construction, electrical equipment, fabricated metals, finance/insurance/real estate, government, machinery, mining, other manufacturing, other services, professional service, retail trade, transportation/communication/public utilities, and wholesale trade (Reategui et al., 2009). This study does not analyze net jobs. It analyzes the gross jobs that the new wind farm development supports.

[13] The economic development impacts from the first 1,118.76 MW of wind energy in Illinois were estimated using JEDI release number W1.09.03b. The economic development impacts from the following 729 MW of wind energy in Illinois were estimated using JEDI release number W1.09.03e. The JEDI model can be downloaded at http://www.nrel.gov/analysis/jedi/.

[14] The JEDI model has been used throughout the wind energy economic development literature (see Lantz and Tegen, 2008, 2009ab; Lantz, 2009; NREL, 2008a-k, 2009; Reategui and Tegen, 2008; Reategui et al., 2009; Williams et al., 2008).

Direct Impacts

Direct impacts during the construction period refer to the changes that occur in the onsite construction industries in which the direct final demand (i.e., spending on construction labor and services) change is made. Final demands are goods and services purchased for their ultimate use by the end user. Onsite construction-related services include engineering, design, and other professional services. Direct impacts during operating years refer to the final demand changes that occur in the onsite spending for wind farm workers.

Direct jobs consist primarily of onsite construction and project development labor such as the following:

- o Utility and Power Engineers
- o Geophysical/Structural Engineers
- o Site/Civil Engineers
- o Concrete-Pouring Companies
- o Wind Energy Project Developers
- o Developer's Construction Management
- o Clerical and Bookkeeping Support
- o Developer's Legal Team
- o Road Builders/Contractors
- o Site Safety Coordinator
- o Environmental and Permitting Specialists
- o Microelectronic/Computer Programmers
- o Operations and Maintenance Personnel
- o Truck Drivers
- o Tower Erection Crews
- o Crane Operators
- o Backhoe Operators
- o Interconnection Labor
- o Earthmovers
- o Excavation Service Labor
- o Electricians
- o Wind Farm Operators
- o Site Administrators
- o Maintenance Mechanics
- o Field Technicians
- o Construction Crews

Turbine and Supply Chain (Indirect) Impacts

The initial spending on the construction and operation of the wind farm creates a second layer of impacts, referred to as "turbine and supply chain impacts" or "indirect impacts." Indirect impacts during construction period consist of the changes in inter-industry purchases resulting from the direct final demand changes, and include construction spending on materials and wind farm equipment and other purchases of goods and offsite services. Essentially, these impacts result from "spending related to project development and on-site labor such as equipment costs (turbines, blades, towers, transportation), manufacturing of components and supply chain inputs, materials (transformer, electrical, HV line extension, HV sub-interconnection materials), and the supply chain of inputs required to produce these materials" (JEDI Support Team, 2009, 2). Concrete that is used in turbine foundations, increases the demand for gravel, sand, and cement. As a result of an expenditure for concrete there is increased economic activity at quarries and cement factories and these changes are indirect impacts. The accountant for the construction firm and the banker who finances the contractor are both considered indirect impacts. All supply chain component impacts/manufacturing-related activities are included under indirect impacts; therefore, the late stage turbine assembly process, which includes gearbox assembly, blade production, and steel rolling are all included under the construction period indirect impacts category.

Indirect impacts during operating years refer to the changes in inter-industry purchases resulting from the direct final demand changes. Essentially, these impacts result from "expenditures related to on-site labor, materials, and services needed to operate the wind farms (e.g., vehicles, site maintenance, fees, permits, licenses, utilities, insurance, fuel, tools and supplies, replacement parts/equipment); the supply chain of inputs required to produce these goods and services; and project revenues that flow to the local economy in the form of land lease revenue, property tax revenue, and revenue to equity investors" (JEDI Support Team, 2009, 3). All land lease payments and property taxes show up in the operating-years portion of the results because these payments do not support the day-to-day operations and maintenance of the wind farm but instead are more of a latent effect that results from the wind farm being present (Eric Lantz, February 25, 2009, e-mail message to author).

Examples of jobs, services and turbine-related components in this category include[15]:

- o Steel Producers
- o Gear Producers
- o Gearbox Assemblers
- o Manufacturing Engineers
- o Material Engineers
- o Manufacturing Managers
- o Welders
- o Turbine Manufacturers
- o Blade Manufacturers
- o Tower Manufacturers
- o Turbine Suppliers
- o Blade Suppliers
- o Tower Suppliers
- o Gravel Workers
- o Rebar Manufacturers
- o Wood Products Suppliers
- o Epoxy and Resin Manufacturers
- o Generator Manufacturers
- o Cement Producers
- o Lumber and Building Materials
- o Hardware and Supplies
- o Bearing Manufacturers
- o Speed Changers
- o Cable Manufacturers
- o Local Utilities
- o Banks
- o Attorneys
- o Industrial Control Manufacturers
- o Transmission Line Manufacturers
- o Glass Fiber Manufacturers
- o Rolled Steel Shape Manufacturers
- o Electrical Equipment Wholesalers
- o Metal Fabricators
- o Heavy Equipment Rental Companies
- o Transportation Service Providers
- o Bookkeepers
- o Accountants
- o Motor Vehicle Retailers
- o Hardware and Tool Retailers
- o Tool Manufacturers
- o Maintenance Providers
- o Material Suppliers
- o Insurance Agents
- o Gas Station Attendants
- o Local Government Employees
- o Turbine, Blade, and Tower Component Suppliers
- o Computer-Controlled Machine Tool Operators
- o Engine and Other Machine Assemblers
- o Electronic Controls and Equipment Manufacturers

[15] Much of this section is adapted from http://www.nrel.gov/analysis/jedi/results.html and http://www.nrel.gov/analysis/jedi/pdfs/jedi_update_2009.pdf (JEDI Support Team, 2009).

Induced Impacts

Induced impacts during construction refer to the changes that occur in household spending as household income increases or decreases as a result of the direct and indirect effects of final demand changes. Local spending by employees working directly or indirectly on the wind farm project who receive their paychecks and then spend money in the community is included. Additional local jobs and economic activity are supported by these purchases of goods and services. Thus, for example, the increased economic activity at quarries and cement factories results in increased revenues for the affected firms and raises individual incomes. Individuals employed by these companies then spend more money in the local economy, e.g., as workers receive income, they may decide to purchase more expensive clothes, or higher quality food along with other goods and services from local businesses. This increased economic activity may result from "construction workers who spend a portion of their income on lodging, groceries, clothing, medicine, a local movie" theater, restaurant, or bowling alley; or a "steel mill worker who provides the inputs for turbine production and spends his money in a similar fashion, thus supporting jobs and economic activities in different sectors of the economy" (JEDI Support Team, 2009, 2).

Induced impacts during operating years refer to the changes that occur in household spending as household income increases or decreases as a result of the direct and indirect effects from final demand changes. Some examples include a "wind farm technician who spends income from working at the wind farm on buying a car, a house, groceries, gasoline," or movie tickets; or a "worker at a hardware store who provides spare parts and materials needed at the wind farm and who spends money in a similar fashion, thus supporting jobs and economic activities in different sectors of the economy" (JEDI Support Team, 2009, 3).

Some examples of induced jobs, services, activities, materials, and spending can be associated with the following types of businesses:

o Grocery Stores
o Child Care
o Clothing Stores
o Retail Stores
o New Cars
o Restaurants
o Medical Services
o Hotels
o Gas Stations
o Movie Theaters

Research Data

Lists of Illinois' wind power projects were obtained from the American Wind Energy Association[16] and the Illinois Wind Working Group[17] databases (AWEA, 2010c; IWWG, 2010). The project lists contained information regarding wind project name, developer, owner/operator, power purchaser, location, capacity (MW), project status, year online, turbine manufacturer, number of turbines, and turbine size. Data collected for the first 21 wind projects in Illinois (see Table 2 and Figure 5), which amounts to 1,847.76 MW of wind generating capacity, were used in this analysis. Project-specific information on each wind project was entered into the JEDI model to estimate the income, economic activity, and number of job opportunities accruing to the state from the project.

The data collection process consisted of background research being conducted for each of the projects. Research consisted of collecting all published information including that obtained from the following sources: e-mails from developers; media information; presentations that developers, attorneys, county board members, and members of the communities presented at wind conferences; corporate press releases; information from the websites of school districts, project developers, county boards, and electric cooperatives; news releases from the Illinois state government; and information from the Illinois Department of Revenue website. For projects lacking published input specific information, NREL's expertise for average Illinois values was used. Following the extensive data collection, an e-mail with the project specific input data was sent to each project developer to allow them to provide feedback confirming the accuracy of the specific input numbers and in those cases where inaccuracies were found, they were able to correct the numbers prior to the input-output analysis. JEDI model inputs consist of detailed information, which many developers consider proprietary, thus information about individual wind farms will not be released.

Table 2.—Illinois Wind Farm Projects with Project Details

Wind Farm	Developer/Owner/Operator	Location (County)	Capacity (MW)	Turbines	Units	Year Online
Streator Cayuga Ridge South	Iberdrola Renewables	Livingston	300.00	Gamesa	150	2010
EcoGrove	Acciona Windpower	Stephenson	100.50	Acciona Windpower	67	2009
Gob Nob Wind Turbine	Rural Electric Convenience Coop	Montgomery	0.90	Emergya	1	2009
Grand Ridge II, III and IV	Invenergy	LaSalle	111.00	GE Energy	74	2009
Lee-DeKalb	NextEra Energy Resources	DeKalb, Lee	217.50	GE Energy	145	2009
Rail Splitter	Horizon Wind Energy	Logan, Tazewell	100.50	GE Energy	67	2009
Sherrard High School Turbine	Sherrard CUSD #200, Ameresco	Rock Island	0.60	Vestas	1	2009
Top Crop I	Horizon Wind Energy	LaSalle	100.50	GE Energy	67	2009
Erie CUSD #1 Wind Turbine	Erie CUSD #1, Johnson Controls	Whiteside	1.20	Vensys	1	2008
Grand Ridge 1	Invenergy	LaSalle	99.00	GE Energy	66	2008
Providence Heights	Iberdrola Renewables	Bureau	72.00	Gamesa	36	2008
Twin Groves II	Horizon Wind Energy	McLean	198.00	Vestas	120	2008
AgriWind	John Deere Wind	Bureau	8.40	Suzlon	4	2007
Camp Grove	Orion Energy Group, enXco	Marshall, Stark	150.00	GE Energy	100	2007
GSG	Infigen Energy	Lee, LaSalle	80.00	Gamesa	40	2007
Turbine Adam	FPC Services/GSG Wind	Lee	2.50	Clipper	1	2007
Twin Groves I	Horizon Wind Energy	McLean	198.00	Vestas	120	2007
Crescent Ridge	Infigen Energy	Bureau	54.45	Vestas	33	2005
Illinois Rural Electric Coop	Illinois Rural Electric Coop	Pike	1.65	Vestas	1	2005
Bureau Valley SD Turbine	Bureau Valley School District	Bureau	0.66	Vestas	1	2004
Mendota Hills	Infigen Energy	Lee	50.40	Gamesa	63	2003

[16] http://www.awea.org/projects/Projects.aspx?s=Illinois
[17] http://renewableenergy.illinoisstate.edu/wind/databases/

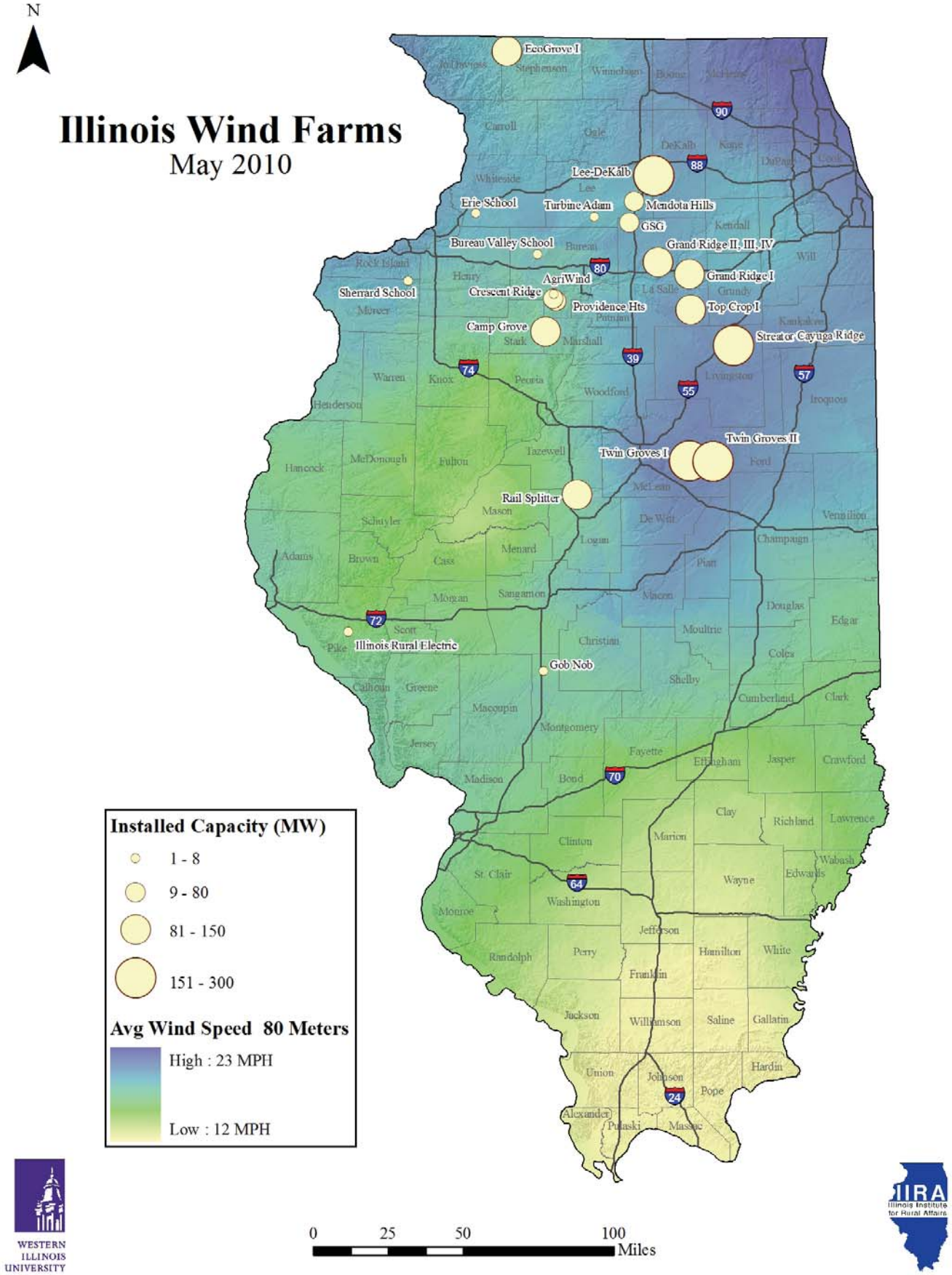

Figure 5.—Illinois Wind Farms

V. Analysis and Results

The results from the JEDI model show significant economic impacts from the first 1,847.76 MW of wind energy development in the state of Illinois (see Figure 6 and Table 3). Job creation and local economic activity impacts during the construction and operational periods of the wind farm projects are presented in Figure 6 and Table 3.

Employment Impacts

Employment impacts can be broken down into several different components. Direct jobs created during the construction phase typically last anywhere from 6 months to over a year depending on the size of the project; however, the direct job numbers present in Figure 6 and Table 3 from the JEDI model are based on a full time equivalent (FTE) basis for a year. In other words, 1 job = 1 FTE = 2,080 hours worked in a year. A part time or temporary job would constitute only a fraction of a job according to the JEDI model. For example, the JEDI model results show 1,473 new jobs during construction; though the construction of the wind farms may have actually involved hiring closer to 3,000 workers. Thus, due to the short-term nature of construction projects, the JEDI model significantly understates the number of people actually hired to work on the project. It is important to keep this fact in mind when looking at the numbers or when reporting the numbers. Direct jobs created during the operational phase last the life of the wind farm, typically 20-30 years. Direct construction jobs, and operations and maintenance jobs both require highly-skilled workers in the fields of construction, management, and engineering. These well-paid professionals boost economic development in rural communities where new employment opportunities are welcome due to economic downturns (Reategui and Tegen, 2008). Based on the model's results, the first 1,847.76 MW of wind power development in Illinois created approximately 9,968 full-time equivalent jobs during construction periods with a total payroll of over $509 million, and is supporting approximately 494 permanent jobs in rural Illinois areas with a total annual payroll of over $25 million. These 494 jobs make a significant impact because the wind farms are located in rural areas, where populations are much smaller.

Property Tax Revenue Impacts

Wind power projects increase the property tax base of a county, creating a new revenue source for education and other local government services. Illinois actually has higher property tax rates than most of the surrounding states. Thus, the property tax revenue impacts are substantial. According to the model's results, the first 1,847.76 MW of wind power development in Illinois supports local economies by generating over $18 million in annual property taxes[18].

[18] Property tax revenue is listed for the first year (where there are property tax abatements during the first few years of the wind farm project or Payments in Lieu of Taxes (PILOT), an average figure over the first ten years is utilized). This figure will change over time due to several factors: (1) whether the county increases/decreases the local property tax rate; (2) depreciation over the life of the project; and (3) if the state law regarding wind farm valuation changes in the future.

Landowner Revenue Impacts

Landowners benefit when they lease their land to wind developers because of the stabilized income stream. According to the model's results, the first 1,847.76 MW of wind power development in Illinois is generating more than $8.3 million annually[20] in extra income for Illinois residents who lease their land to wind farm developers.

Economic Activities Impacts

Output refers to economic activity or the value of production in the state or local economy. According to the model's results, the first 1,847.76 MW of wind power development in Illinois will generate a total economic benefit of $3.2 billion over the life of the projects (construction plus 25 years of operations was assumed in this calculation).

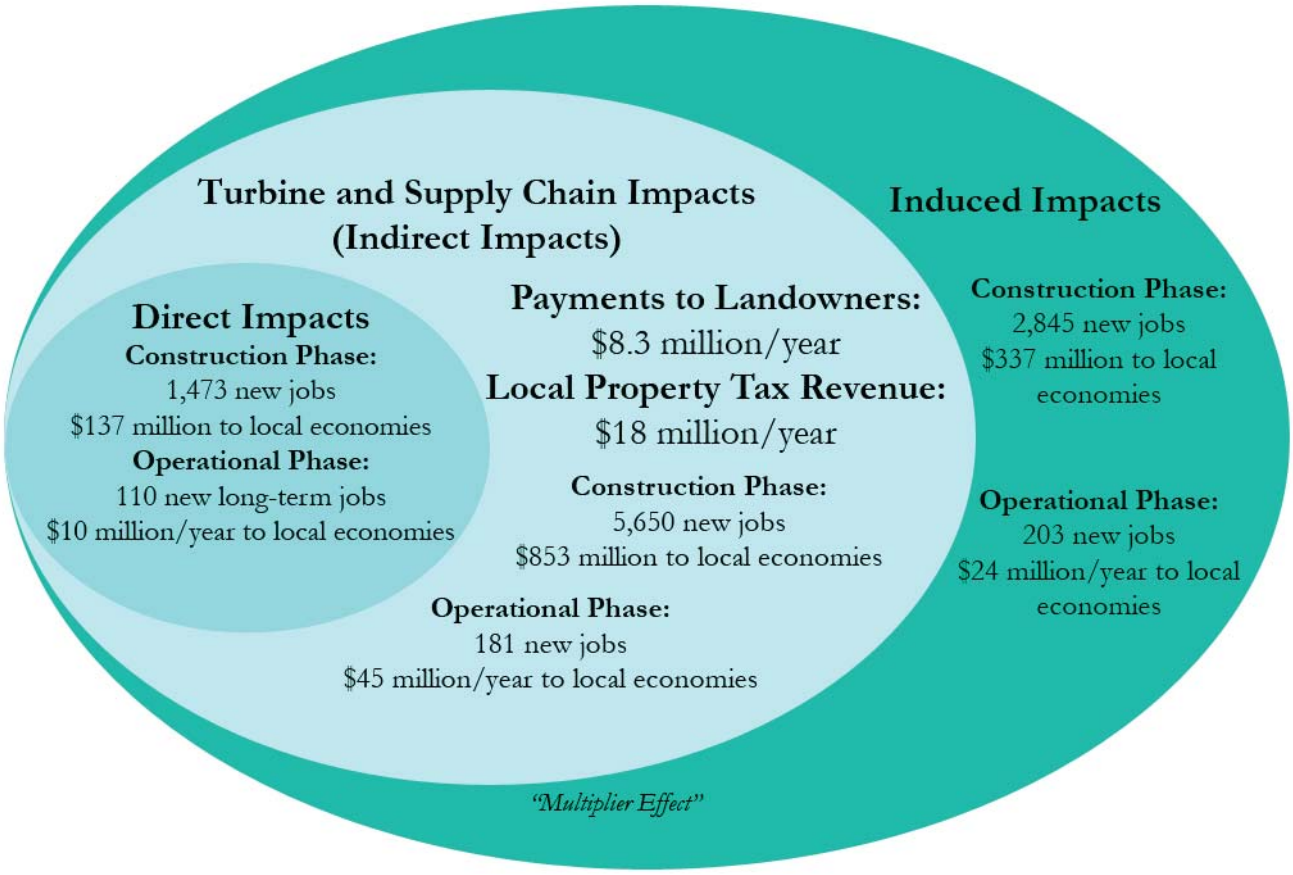

Figure 6.—Direct, Indirect and Induced Impacts from 1,847.76 MW of Wind Energy Development in Illinois

[20] The landowner payments are adjusted for inflation throughout the contract life (thus this amount will increase over time).

Table 3.—Local Economic Impacts from 1,847.76 MW of Wind Energy Development in Illinois

	Total Jobs‡	Total Output
Construction		
Project Development and Onsite Labor Impacts	1,473	$137 million
Turbine and Supply Chain Impacts	5,650	$853 million
Induced Impacts	2,845	$337 million
New Local Jobs during Construction	**9,968**	
Operations		
Onsite Labor Impacts	110	$10 million/year
Local Revenue and Supply Chain Impacts	181	$45 million/year
Induced Impacts	203	$24 million/year
New Local Long-Term Jobs	**494**	
Total Economic Benefit	**$3.2 billion**	
Payments to Landowners	**$8.3 million/year**	
Local Property Tax Revenue*	**$18 million/year**	

Notes: All dollar values have been converted to 2008 dollars. JEDI versions 1.09.03b and 1.09.03e were utilized. Visit http://www.nrel.gov/analysis/jedi/ to download the model. Project specific costs and local share inputs were obtained from the wind farm developers for use in the JEDI model to improve accuracy of the estimated economic impacts. Totals assume construction plus 25 years operations.

* Property tax revenue is listed for the first year (where there are property tax abatements during the first few years of the wind farm project or Payments in Lieu of Taxes (PILOT), an average figure over the first ten years is utilized). This figure will change over time due to several factors: (1) whether the county increases/decreases the local property tax rate; (2) depreciation over the life of the project; and (3) if the state law regarding wind farm assessed valuation changes in the future.

‡ Job calculations are based on a full time equivalent (FTE) basis for a year. In other words, 1 job = 1 FTE = 2,080 hours worked in a year. A part time or temporary job would constitute only a fraction of a job according to the JEDI model. For example, the JEDI model results show 1,473 new jobs during construction; though the construction of the wind farms may have actually involved hiring closer to 3,000 workers. Thus, due to the short-term nature of construction projects, the JEDI model significantly understates the number of people actually hired to work on the project. It is important to keep this fact in mind when looking at the numbers or when reporting the numbers.

VI. Illinois' Future

Manufacturing Impact

Lantz and Tegen (2008) argue that "the single largest potential driver of economic development benefits is local manufacturing. Policymakers seeking to maximize economic development benefits from wind power are likely to gain the greatest increased benefit by attracting new wind power manufacturing to their state" (11-2). Wind energy requires highly skilled manufacturing workers who take part in designing, building, and assembling wind turbines. A report developed by the Renewable Energy Policy Project concluded that as many as 31,522 new jobs could be created by manufacturing wind power components in Illinois. This could help revitalize more than 457 manufacturing firms in Illinois (Blue Green Alliance, 2007).

Some economic benefits from the wind turbine supply chain have already been experienced in Illinois. For example, Trinity Structural Towers in Clinton manufactures towers, and Siemens Energy and Automation facility (Winergy Turbine Drives) in Elgin produces wind turbine gear drivers; both of these manufacturers have created local jobs in their respective communities. Finkl and Sons in Chicago supplies wind turbine components. Thanks to a Federal Stimulus Grant, Ingersoll Machine Tools plans to retrofit their existing Rockford facility to manufacture wind turbine components that will allow the company to retain nearly 70 existing jobs and create over 80 new jobs. There are also several small wind turbine vendors in Illinois. These facilities produce goods that help their customers meet the growing demand for sustainable energy resources. For more information about the economic impacts of the wind turbine supply chain, see the Center for Renewable Energy's report titled, "Economic Impact of Wind Turbine Supply Chain" by Loomis, Carlson, and Payne (2010).

Workforce Development and Technical Training

The skill sets of residents in the community largely determine whether the wind farm developer hires local labor for the construction and operation and maintenance stages of the wind farm development. Highland Community College in Freeport, Illinois received accreditation for Illinois' first associate degree program for wind turbine technicians in 2008. The two-year program requires students to take courses in subjects including electronics, meteorology, math, business, speech, and physical education. EcoEnergy is involved with the main focus of the program, teaching students how to assemble, maintain, and repair wind turbines. EcoEnergy is also planning to offer scholarships for the program. As the United States continues to develop and build more wind energy facilities, the demand for well-trained turbine technicians will keep increasing, which provides more stable and reliable jobs for communities (EcoEnergy, 2008).

Illinois State University in Normal, Illinois, has a Renewable Energy interdisciplinary undergraduate major as of fall 2008. The curriculum includes courses in technology, economics, and agriculture. Students in the program may choose between a technology track or an economics/public policy track. Renewable energy experts and potential employers who comprise the program advisory committee reviewed the curriculum to ensure that its scope and depth will result in graduates that are highly trained and knowledgeable. Graduates are expected to be conversant in diverse disciplines, including technical, managerial, political, and economic issues important to renewable energy.

Illinois Valley Community College is developing a curriculum that would train students to become wind turbine mechanics. The Illinois Institute of Technology (IIT) won a major US Department of Energy grant in 2009 to lead a consortium studying pioneering wind energy technologies. Members will perform focused research on critical wind energy challenges including wind technology challenge, grid system integration, and workforce challenge[21].

Wind Energy Businesses

Besides manufacturing industries, other wind energy businesses have opened up around the state. They have either brought new employees to the state who contribute to total spending in the local economy, or they have created new jobs for people in that community. There are close to ten wind energy companies with U.S. headquarters in Chicago. There are numerous other wind energy-related industries in the state, but far too many to name.

[21] The IIT-led consortium's research and development plan includes advanced concepts for rotor control and drive train control, robust sensors for blades, and improved aero elastic models to improve wind turbine performance and reliability. http://windforillinois.blogspot.com/2009/10/illinois-institute-of-technology-to.html

VII. Conclusion

The economic impact from Illinois' first 1,847.76 MW of wind energy supports jobs, generates landowner revenue, increases tax revenue, increases economic activity, and has numerous environmental benefits. In order for Illinois to take advantage of all the economic benefits from wind energy, more supply-chain manufacturing should be established in the state, which can definitely help revitalize Illinois' manufacturing industry. More wind turbine technician training facilities are needed to prepare the workforce in Illinois. An extension of the in-state renewable energy resource preference to meet the state RPS would spur development of more wind farm projects in the state. Overall, wind power development in Illinois indicates a positive future for the state in helping to preserve the environment and contributing to a more secure energy future.

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The Wind Energy Supply Chain in Illinois

Good for Manufacturing Jobs • Good for Economic Growth
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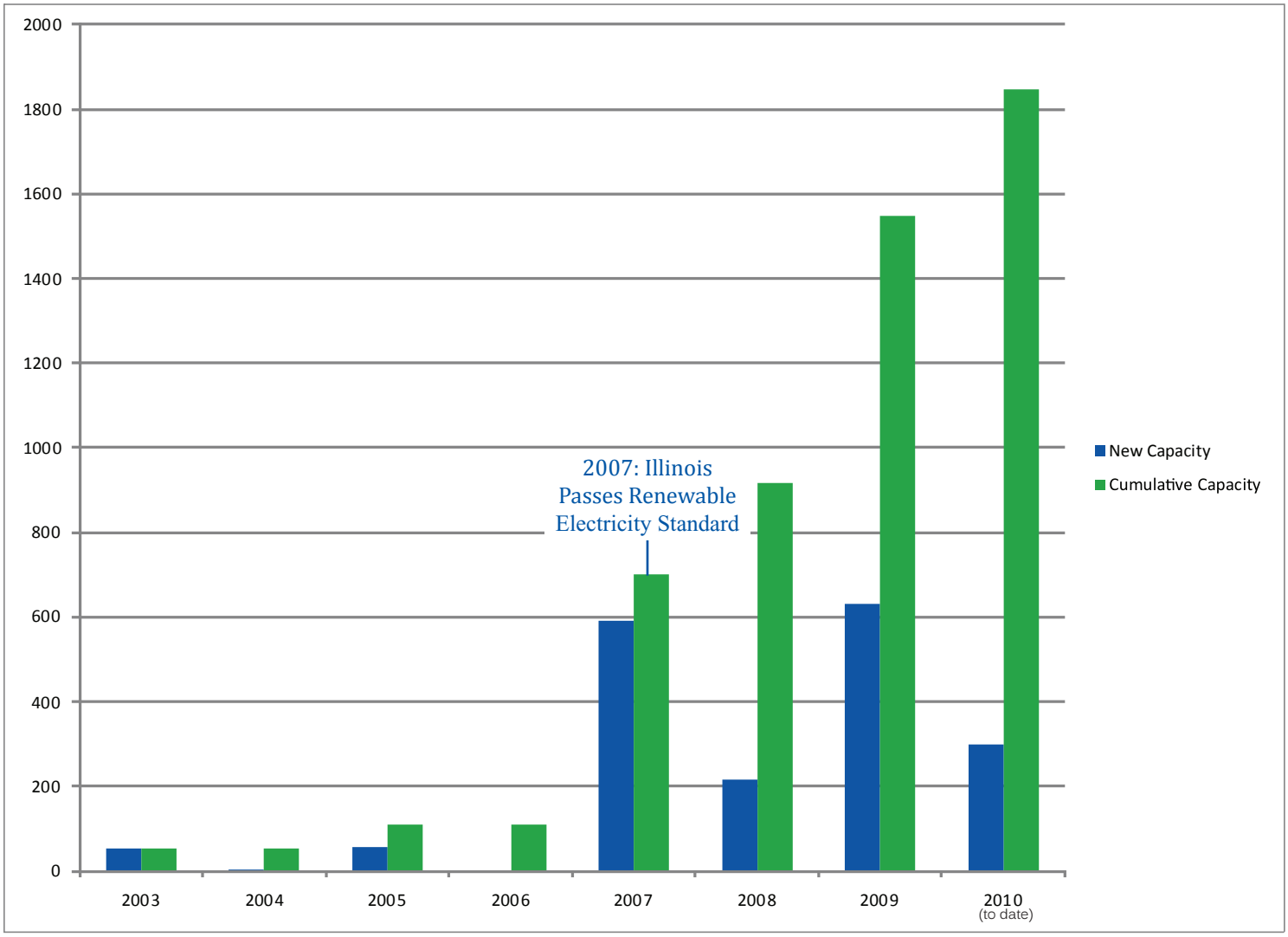
Growth in Illinois Wind Power Capacity (Megawatts)



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Powering Manufacturing Jobs and Economic Growth in Illinois

The wind industry means real business for Illinois. The state's wind power supply chain comprises over 100 companies with more than 15,000 employees. About 17 manufacturing jobs are created for every megawatt of power developed, translating into over 2,500 jobs for a 150 megawatt utility-scale wind farm. Illinois is now home to 25 wind farms that generate more than 1,800 megawatts of power annually. The Chicago region is also home to 13 headquarters of major wind power companies. The growth in the wind sector in Illinois is, in part, attributable to policies such as the Illinois Renewable Electricity Standard (RES), which has helped boost manufacturing sector and corporate headquarters jobs in the state.

High paying jobs are created both at construction and during the life of the wind farm. A wind turbine has as many as 8,000 components and subcomponents, which can be categorized into four main parts: towers, blades, rotor and nacelle. Towers and blades, the largest two parts (making up approximately 75% of the turbines' weight), are typically manufactured domestically. The rotor and nacelle are comprised of thousands of components and subcomponents, and provide a growth opportunity for domestic manufacturers.

The majority of nacelles in the U.S. are assembled domestically, but since small components are much easier to ship, they are often imported. However, as an indicator of the opportunity for U.S. and Illinois manufacturers, domestic production of subcomponents such as bearings, electrical components and hydraulic systems enjoyed the highest growth rate of any turbine segment in 2009.

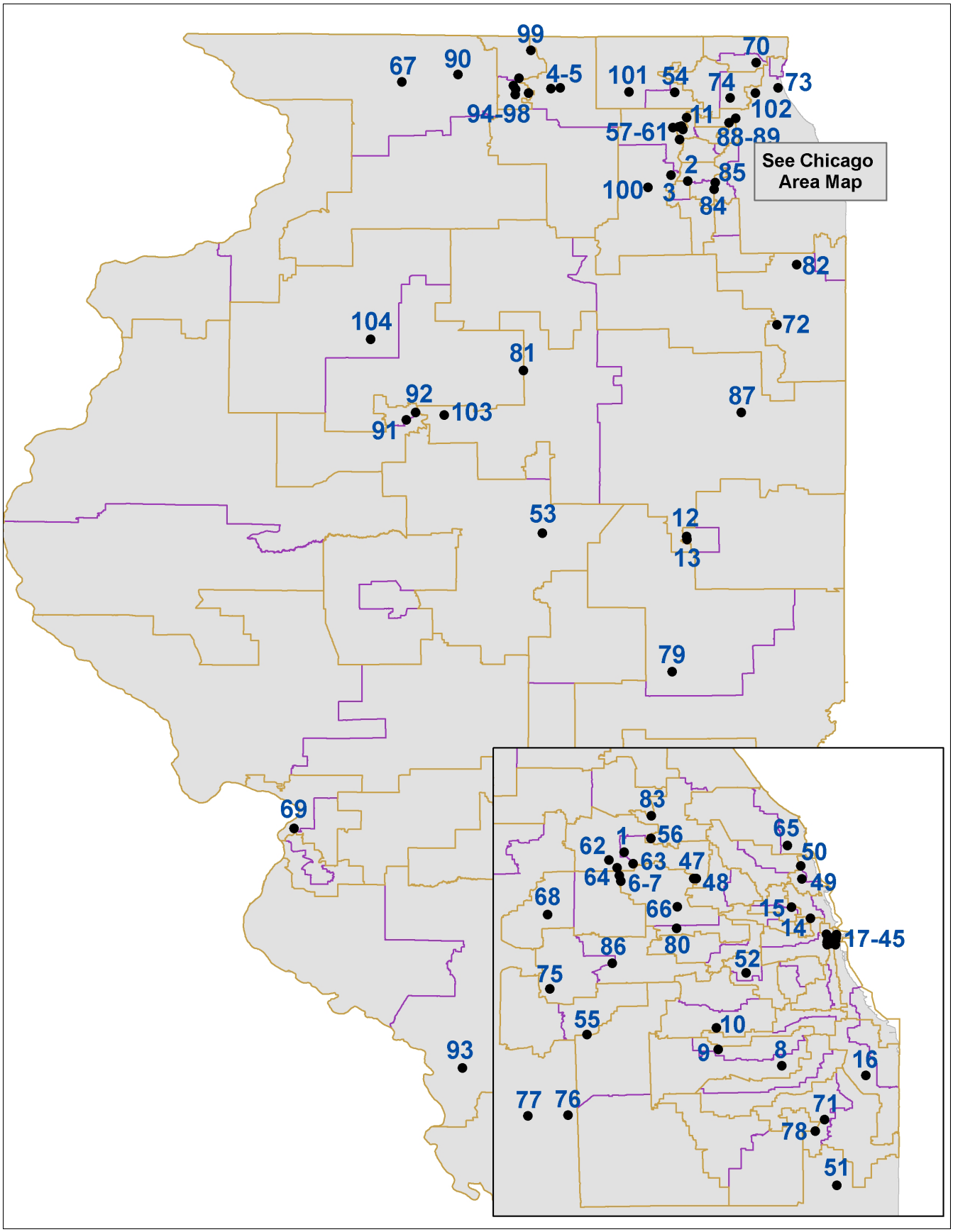
> **"About 17 manufacturing jobs are created for every megawatt of power developed, translating into over 2,500 jobs for a 150 megawatt wind farm."**

All of this means jobs for Illinois. The Environmental Law & Policy Center's (ELPC) analysis shows that most of Illinois' wind development jobs are created at small to medium-sized companies. Small firms (with fewer than 500 employees) represent 99.7% of all employer firms, employ over half of all private sector employees and create more than half of the nonfarm, private GDP. Of the more than 140 current and prospective Illinois companies in the wind industry supply chain, more than 80% are small businesses – machine shops, welders and metal fabricators. Wind farms also increase the property tax base of their host communities, which benefits schools and other public services.

ELPC created this report to explain the broad reach and depth of the wind industry supply chain in Illinois. This industry is about more than just wind farms and clean energy. It is also about jobs for turbine component manufacturers, tower manufacturers, cement mixers and the support services all of these industries need, from legal and banking, to engineering and accounting professionals. Wind means real business for Illinois.

Illinois Wind Industry Supply Chain

	Company Name	City
1.	RESTechnologies	Arlington Heights
2.	CENTA	Aurora
3.	Acterra Group	Batavia
4.	Ipsen International	Belvidere
5.	Orbital Tool Technologies	Belvidere
6.	Egetrans	Bensenville
7.	R&W America, LP	Bensenville
8.	G&W Electric	Blue Island
9.	Imperial Crane	Bridgeview
10.	Prairie Materials (52 locations in Illinois)	Bridgeview
11.	Stanley Machining and Tool	Carpentersville
12.	HL Precision Machining	Champaign
13.	Midstate Renewable Energy Services	Champaign
14.	A. Finkl & Sons	Chicago
15.	Acciona	Chicago
16.	Aerotecture International	Chicago
17.	Atlas Tube	Chicago
18.	Baker Mckenzie	Chicago
19.	Blue Star Energy Solutions	Chicago
20.	Bridge Strategy Group	Chicago
21.	DLA Piper	Chicago
22.	E.On Climate & Renewables	Chicago
23.	Enablon	Chicago
24.	EWS Consulting	Chicago
25.	Fleming Energy	Chicago
26.	Foley & Lardner LLP	Chicago
27.	Gaelectric North America, Inc.	Chicago
28.	Gamesa Energy	Chicago
29.	Goldwind	Chicago
30.	Horizon Wind Energy	Chicago
31.	Invenergy	Chicago
32.	Jenner & Block	Chicago
33.	JP Morgan Tax Equity	Chicago
34.	Latham & Watkins	Chicago
35.	Lincoln Renewable Energy	Chicago
36.	Lucas Group	Chicago
37.	Mayer Brown LLP	Chicago
38.	Midwest Wind Energy	Chicago
39.	Navigant Consulting	Chicago
40.	Nordex	Chicago
41.	Plante & Moran	Chicago
42.	PNE Wind	Chicago
43.	Winston & Strawn LLP	Chicago
44.	Scott Balice Strategies	Chicago
45.	Suzlon	Chicago
46.	Tempel Steel	Chicago
47.	US Mainstream Renewable Power	Chicago
48.	Vestas AG	Chicago
49.	Wind Capital	Chicago
50.	S&C Electric	Chicago
51.	Funk Linko	Chicago Heights
52.	Brad Foote Gear Works	Cicero
53.	Trinity Structural Towers	Clinton
54.	Snap-on Industrial	Crystal Lake
55.	Leeco Steel	Darien
56.	Parker Hannifin	Des Plaines
57.	Harting	Elgin
58.	Siemens-Winergy	Elgin
59.	SKF Seals America	Elgin
60.	Usach Technologies	Elgin
61.	Villares Metals/ Bohler Uddeholm Corp	Elgin
62.	Bley LLC	Elk Grove
63.	Fluitecnik	Elk Grove
64.	Acme Industries	Elk Grove Village
65.	American Renewable Energy	Evanston
66.	Ammentorp Tool	Franklin Park
67.	Elspec	Freeport
68.	Hydac	Glendale Heights
69.	Heidtman Steel Products	Granite City
70.	DriveCon/R&M Materials Handling	Gurnee
71.	LB Steel	Harvey
72.	Gordon Electric	Kankakee
73.	Notus US	Lake Forest
74.	Randack Fasteners	Lake Zurich
75.	SmartSignal	Lisle
76.	Lockport Steel	Lockport
77.	Walco Tool & Engineering	Lockport
78.	CN Worldwide	Markham
79.	S&K Air Power Tool and Supply Corp.	Mattoon
80.	Power Plant Services	Melrose Park
81.	SMF Inc.	Minonk
82.	Triton Manufacturing	Monee
83.	NTN Bearing Corporation	Mt. Prospect
84.	Broadwind	Naperville
85.	Ryan Companies	Naperville
86.	ProductSpace Solutions	Oak Brook
87.	Angel Wind Energy	Onarga
88.	Iberdrola Renewables US	Palatine
89.	Schneider Electric	Palatine
90.	Anpec Industries	Pecatonica
91.	A. Lucas & Sons	Peoria
92.	Rohn	Peoria
93.	Advanced Energy Solution	Pomona
94.	Clinkenbeard & Associates, Inc.	Rockford
95.	Elite Tool & Wire	Rockford
96.	Ingersoll Machine Tools	Rockford
97.	Rockford Bolt and Steel	Rockford
98.	Rogers Brothers Galvanizing	Rockford
99.	Forest City Gear	Roscoe
100.	Chicago Industrial Fasteners	Sugar Grove
101.	INTREN	Union
102.	Hwacheon	Vernon Hills
103.	Miller Welding & Iron Works	Washington
104.	Orion Energy Group	Wyoming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Chicago: Wind Industry Corporate Headquarters

Chicago is home to at least 13 global or U.S. headquarters of major wind power companies. That may well be more headquarters than any other city in the United States. Access to transatlantic flights, a central U.S. location, and the availability of a multi-disciplinary workforce and professional services have all combined to make Chicago a natural choice for many wind companies' headquarters.

The City benefits from the additional demand for legal, financial and other corporate infrastructure-related services that business headquarters draw on, creating high-paying, high-skilled professional jobs. Some of the wind industry and supply chain companies with global and U.S. headquarters in the Chicago area include:

Acciona, a $7 billion Spanish-based multinational corporation, develops and manages clean energy projects, operates a turbine assembly and has its North American headquarters in Chicago. Acciona has ownership interests in seven North American wind farms.

Broadwind Energy, based in Naperville, is a wind industry holding company with four businesses: turbine tower construction, precision gearing systems manufacturing, logistics, as well as technical and engineering services. Brad Foote Gear Works, a subsidiary company, is headquartered in Cicero.

E.On Climate and Renewables has its U.S. headquarters in Chicago and is one of the world's largest developers and owners of renewable power projects. E.On has developed over 1,700 megawatts of wind projects in the U.S.

Fleming Energy, an Irish company with its U.S. headquarters in Chicago, is currently exploring wind investment opportunities here.

Goldwind, a Chinese turbine original equipment manufacturer, is the latest company to select Chicago as its corporate headquarters in the Americas. The company is one of the largest turbine manufacturers in the world and is committed to growing its North American presence. Goldwind plans to build nacelle assembly facilities in the U.S.

Invenergy has its global headquarters in Chicago and it develops, owns and operates large scale renewable energy facilities in North America and Europe. The company has developed twenty U.S. wind farms, two of which are in Illinois, making it one of the nation's largest independent wind energy producers.

Lincoln Renewable Energy has its headquarters in Chicago. It is a wind and solar developer with projects in active development in 11 states.

Mainstream Renewable Power, an Irish company with its U.S. headquarters in Chicago, plans to invest $1.6 billion over the next four years in three Illinois wind farm developments.

The company expects to generate enough clean energy from these projects to power 200,000 homes by 2013.

Midwest Wind Energy, headquartered in Chicago, is a utility-scale wind farm developer, with a current project portfolio of over 5,000 megawatts of power in Illinois and the Midwest.

Nordex is a German wind turbine manufacturer. The company's U.S. headquarters is in Chicago, and Nordex is building a domestic manufacturing facility in Arkansas.

NTN Bearing is one of the world's largest bearing producers, and its American headquarters is in Mt. Prospect. NTN manufactures bearings for wind turbine manufacturers, as well as for operations and maintenance providers.

PNE Wind is a German onshore and offshore wind developer with its U.S. headquarters in Chicago. PNE signed a joint venture agreement with Renewable Solutions to develop more than 300 megawatts of wind projects in Minnesota, North Dakota and South Dakota.

Suzlon, an Indian multinational company with 14,000 employees in 21 countries, is an integrated wind turbine manufacturer with its North American headquarters in Chicago. Suzlon manufactures turbine nose cones and rotor blades at its two Minnesota plants.

Wind Supply Chain: Manufacturing and Professional Services Jobs

The Illinois wind industry includes turbine and tower makers; manufacturers of couplings, bearings and fasteners; legal, financial, engineering and consulting firms; and diagnostic software designers. The companies featured below illustrate the breadth of wind power businesses in Illinois.

Manufacturing Jobs:

A. Finkl & Sons is one of the world's leading suppliers of specialty steels and custom open die forgings. The company is currently constructing a new manufacturing facility on Chicago's south side that will triple its current capacity. Wind energy is currently a small industrial sector for Finkl, but: "The new facility will allow the company to economically produce grades of steel that will meet the strict quality standards adopted by the wind energy industry," commented Joe Curci, President, A. Finkl & Sons. "The company can then compete at a global level for wind energy related components."

A. Lucas & Sons Steel is the oldest continually operating steel fabricator in the U.S. and the oldest business in Peoria. The company employs 22 people and expects wind industry work will comprise 25% of its business in the next few years.

Lucas received an American Recovery and Reinvestment Act (ARRA) grant and, as a result, hopes to add up to eight manufacturing and sales employees. According to company President Margaret A. Hanley: "This grant will transform a marvelous old company into one of America's leading green manufacturers. The American people have put their faith in us to succeed and that is what we intend to do."

Brad Foote Gear Works, located in Cicero, is a national leader in large gearing systems for industrial markets, including steel mills, transportation and renewable energy. Brad Foote has been in business since 1924, operates at three locations (two in Cicero, IL, one in Pittsburgh, PA) and employs a total of 260 people. Wind turbine gears have accounted for anywhere from 40% to 70% of the company's business since 2006. "A national Renewable Energy Standard would be very helpful to the industry," said VP of Human Resources Dennis Taggart. "Creating a climate that is conducive to the wind industry is key to increasing demand and green jobs in Illinois."

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Brad Foote is prepared for an increase in demand. With funds from an ARRA grant, the company was able to purchase another large measuring machine this past year, which will enable it to double its wind business. Brad Foote is now a subsidiary of Broadwind Energy in Naperville.

S&C Electric Company, located in the Rogers Park neighborhood of Chicago, has 100 years of experience in designing and manufacturing electric power switching and protection equipment and power quality

products, primarily for application at high voltage. S&C offers wind turbine switchgear, VAR compensation systems that help wind farms meet grid interconnection requirements, substation transformer protective devices, stored energy management systems, and related design, engineering and construction services.

LB Steel is one of the largest processors of strip mill plate in North America. The company is headquartered in Harvey, with manufacturing facilities in Chicago Heights. The company plans to expand its wind power business by taking a "Field of Dreams approach," according to John Faletti, Vice President of Sales. "We are building it in expectation of the business growing for us." LB Steel is expanding its Chicago Heights plant, hoping to grow from 20 employees to 35.

Stanley Machining and Tool Corp., has about 100 employees at plants in Carpentersville and Hampshire. The company has been manufacturing large- scale components for the wind industry for the past two decades. Stanley not only supplies to the wind industry, but also sources 60% of its energy from renewable resources.

Winergy Drive Systems, a division of Siemens, is the largest producer of gearboxes in the wind industry. Winergy recently opened its second turbine production facility in Elgin, one of the first LEED certified plants in Illinois. The expansion involves an investment of $20 million by Siemens and $5.7 million through the Illinois Department of Commerce and Economic Opportunity's business investment package. The new plant employs 350 people, for a total of 500 Winergy employees in Illinois.

Professional Services Jobs:

JP Morgan Capital Corporation Energy Investments is the leader in tax equity financing with its office in Chicago. The group consists of 30 to 40 professionals and has been involved in most of the $2 billion in wind tax equity deals completed so far in 2010.

Navigant Consulting is an international consulting firm and the 270 employees in its Energy Practice focus on issues across the energy value chain. Navigant Consulting is headquartered in Chicago with more than 40 offices around the world.

SmartSignal, headquartered in Lisle, designs diagnostic software that helps improve turbine reliability and reduces maintenance costs. SmartSignal employs 100 people and has a dedicated wind industry group.

Untapped Potential for Job Growth

In addition to the 100-plus companies currently in the supply chain, many others are targeting the wind industry as a prospective new market. ELPC identified 50 Illinois companies that could supply the industry if demand increased. For example:

Advanced Machine & Engineering, located in Rockford, is a manufacturer and distributor of precision machine tool components and metal cutting solutions. Advanced Machine supplies components and subcomponents to the aerospace, automotive, mining, food processing and medical industries, among others. The company has the capability to supply components and services to the wind industry, including a precision contract machine shop that can do turning and boring work, the expertise to compile inspection reports for small and large parts, and a grinding room for shafting work for precision spindles.

Cloos Robotic Welding is the U.S. subsidiary of Carl CLOOS Schweisstechnik GmbH with 40 worldwide sales and service locations, including its U.S. sales/engineering/manufacturing facility in Schaumburg. CLOOS united its two core businesses - arc welding and robot technology - and has the capability to provide manufacturing solutions to wind turbine manufacturers and sub-suppliers.

Dynomax, a machine shop in Wheeling, has the capability to be a "Tier 2" wind supplier to the turbine equipment manufacturers. Dynomax manufactures and designs high-precision machined components, as well as specialty machines and machine tool spindles. The company serves the aerospace, defense, mining, energy, construction and transportation industries. Dynomax hopes to be a significant wind industry supplier by 2012.

Exact Machine, in Rockford, is a precision metalworking and machining service company that specializes in high precision boring and milling of large components and gearboxes. Exact's components could be supplied to a wind turbine assembly facility. The company currently serves gearbox manufacturing, machine tool, construction and mining equipment, and food machinery businesses.

Grot Tool and Manufacturing in Skokie is a precision CNC (computer numerical controlled) machining facility with the capability to do contract precision work, including milling and turning. Grot is positioned to supply the wind industry and has experience in machining forgings, castings and fabrications.

Policy Makes the Difference

Growth in the wind industry, like all of the energy sector, relates strongly to regulatory and tax policies. Federal and state policies are key to encouraging investment that can grow the many parts of the wind industry. Both federal and state renewable electricity standards are crucial to creating a stable market to support wind industry growth.

Federal Policies

Federal Renewable Electricity Standard: This proposed federal legislation would require all electric utilities, which act as collective power purchasing agents for consumers, to buy a growing percentage of their electricity from renewable energy resources. Creating a federal renewable electricity standard floor — which states like Illinois can exceed — would drive more national demand for wind generated electricity. That would increase export opportunities for Illinois wind power and spur the market for Illinois-manufactured wind turbine components and professional services. Illinois would benefit through more job creation and economic growth.

Production Tax Credit (PTC) and Investment Tax Credit (ITC): The PTC is an intermittent (i.e. not permanent) tax incentive that offers a credit of 2.1 cents per kilowatt hour. In February 2009, through ARRA, Congress extended the PTC for three years through 2012. Wind developers can also opt to take a 30% ITC in lieu of the PTC for facilities placed into service before 2013, so long as construction begins before the end of 2010. The ITC can be converted to a grant that helps developers who do not have enough tax liability to effectively utilitize the tax credit.

Accelerated Depreciation: Allowing wind generation assets to be depreciated over six years (rather than the typical 20 years) can create additional value. Again, the depreciation credit may be hard for some developers to use unless they can offset it with significant income.

Illinois Policies

Illinois Renewable Electricity Standard: Illinois' electric utilities are required to purchase a percentage of their electricity from renewable energy sources. The percentage increases annually from 5% in 2010 to reach 25% by 2025. Of that total, 75% of the renewable energy must come from wind power.

Sales Tax Incentive: A business establishing a new wind power facility in Illinois may be eligible for designation as a "High Impact Business," which exempts the wind equipment owner from paying state and local sales taxes for building materials.

State Bond Program: The Illinois Finance Authority can issue tax-exempt bonds and credit enhancements to renewable energy projects that meet eligibility criteria and provide significant public benefits for the citizens of Illinois.

Property Tax Certainty: The Illinois property tax code provides enhanced tax certainty for wind farms by keeping the property tax assessment of wind energy devices uniform in counties across the state. Previously, property tax assessments for wind farms varied widely across the state.

Environmental Law & Policy Center

The Environmental Law & Policy Center is the Midwest's leading public interest environmental legal advocacy and eco-business innovation organization. We develop and lead successful strategic advocacy campaigns to improve environmental quality and protect our natural resources. We are public interest environmental entrepreneurs who engage in creative business dealmaking with diverse interests to put into practice our belief that environmental progress and economic development can be achieved together. ELPC's multidisciplinary staff of talented and experienced public interest attorneys, environmental business specialists, public policy advocates and communications specialists brings a strong and effective combination of skills to solve environmental problems.

ELPC's vision embraces both smart, persuasive advocacy and sustainable development principles to win the most important environmental cases and create positive solutions to protect the environment. ELPC's teamwork approach uses legal, economic and public policy analysis, and communications advocacy tools to produce successes. ELPC's strategic advocacy and business dealmaking involves proposing solutions when we oppose threats to the Midwest environment. We say "yes" to better solutions; we don't just say "no."

ELPC was founded in 1993 and has achieved a strong track record of successes on national and regional clean energy development and pollution reduction, transportation and land use reform, and natural resources protection issues. ELPC's creative public advocacy effectively links environmental progress and economic development together and improves the quality of life in our Midwestern communities.

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