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Wealth Creation in Rural America

This report is part of the Wealth Creation in Rural America initiative, funded by the Ford Foundation. The aim of the initiative is to help low-wealth rural areas overcome their isolation and integrate into regional economies in ways that increase their own-ership and influence over various kinds of wealth. The initiative has produced nine previous papers, which can be found at http://www.yellowwood.org/wealthcreation.aspx. The goal of this report is to advance the initiative’s broad aim of creating a comprehensive framework of community ownership and wealth control models that enhance the social, ecological, and economic well-being of rural areas.

Author

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Wind farms, unseen and unthinkable just a few years ago, now dot the U.S. landscape from California to Maine. The very sight of these technological behemoths stirs awe and amazement at first, followed by confidence in America’s ability to actively participate in renewable energy development. Wind energy is now a primary component of the U.S.’s renewable energy activities. In fact, capturing the energy resident in wind has gained worldwide appeal in recent years. According to University of California at Berkeley researchers:

... in a growing number of settings in industrialized nations, wind energy is now the least expensive option among all energy technologies—with the added benefit of being modular and quick to install and bring on-line. In fact, some farmers, notably in the U.S. Midwest, have found that they can generate more income per hectare from the electricity generated by a wind turbine than from their crop or ranching proceeds.¹

Despite these developments, wind power is still a new and emerging technological sector, with turbine and transmission systems being developed and perfected. Concerns about ecological impacts and aesthetics have largely kept wind energy from gaining the momentum necessary for widespread installation in the U.S. In fact, in 2007 wind energy comprised only 5% of the U.S.’s total renewable energy supply (see Figure 1),² while all renewable energy resources accounted for 7% of its total energy supply. Fossil fuel and other energy costs and concerns point to the need for more active and significant strides towards increasing wind energy’s share in the U.S. renewable energy portfolio.

Figure 1. U.S. Energy Supply by Source, Department of Energy, 2007

² From http://www.eia.doe.gov/cneaf/alternate/page/renew_energy_consump/rea_prereport.html
Harnessing the Power of Wind

From a technical standpoint, capturing the energy in wind is a complex process that requires investment, planning, construction, and maintenance; assume a variety of scales and scopes; and serve a number of purposes. According to the U.S. Department of Energy:

Wind energy uses the energy in the wind for practical purposes like generating electricity, charging batteries, pumping water, or grinding grain. Wind turbines convert the kinetic energy of the wind into other forms of energy. Large, modern wind turbines operate together in wind farms to produce electricity for utilities. Small turbines are used by homeowners and remote villages to help meet energy needs.³

Turbine technology has evolved both practically and technically. Modern wind turbines stand approximately 30–50 meters (100–160 feet) tall, not including the rotor, which is attached at the top of the tower. Rotors may stretch up to 40 feet in diameter (see Figure 2)⁴. By design, oncoming wind will spin the rotors, thus powering the turbine mechanism connected to a generator. The kinetic energy is then harnessed, stored, and transmitted via local infrastructure.

![Figure 2. Modern Wind Turbine System Diagram, Department of Energy, 2008](image)

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As the physical size of wind turbines has increased over the past several decades, so has the production capacity (measured in watts). In the early 1980s, small unreliable turbines were able to produce 50kW of energy at maximum output. Since then, land-based and offshore wind turbines have broken 2.5MW and 3.6MW, respectively (see Figure 3). Energy generation is expected to increase as technology evolves in the years to come.6

![Figure 3. Evolution of Wind Turbine Capacity, 1980–2015](image)

While many of the most publicized wind production facilities are larger “wind farms” where a sizeable group of turbines are strategically placed in a high-density arrangement, smaller-scale wind projects are also becoming more prevalent. Schools, local government buildings, municipal services facilities, farms, and private residences have all seen small-scale wind turbines that can provide a wide array of benefits on top of basic electricity generation. In addition to traditional land-based wind projects, offshore wind has also aroused interest in the U.S. Offshore wind has especially high appeal in states with shallow coastal areas and has a host of benefits that rival land-based turbines. While offshore projects are in their veritable infancy, small small-scale marine outlets have been installed in European waters.7 More research is necessary to determine the long-range cost of maintenance in comparison to land systems.

In addition to the turbines, a complete wind energy facility requires a certain degree of infrastructure for maintenance and to distribute electricity (see Figure 4). According to the New York State Energy Research and Development Authority

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6. DOE Report, p. 29.
(NYSERDA), for example, the following facilities are required, “in addition to wind turbines and towers”:

- Electrical Power Collection System
- Substation and Interconnection
- Concrete Foundations
- Control and Communications System
- Access Roads
- Operation and Maintenance Facility

The degree of facilities construction necessary, in addition to the availability of transmission, can substantially increase the cost of wind projects and must be considered when siting and developing turbine locations.

Figure 4. Typical Wind Energy Project Components and Layout—NYSERDA (2005)

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Wind Energy vs. Traditional Non-Renewables

Wind energy offers a clean and viable alternative to traditional fossil fuel-based non-renewable energy sources. The U.S. Department of Energy considers wind power to be:

...one of the cleanest and most environmentally neutral energy sources in the world today. Compared to conventional fossil fuel energy sources, wind energy generation does not degrade the quality of our air and water and can make important contributions to reducing climate change effects and meeting national energy security goals. In addition, it avoids environmental effects from the mining, drilling, and hazardous waste storage associated with using fossil fuels.9

Despite the fact that the benefits of wind are both well known and well researched, traditional non-renewable power facilities are much more connected to the nation’s power distribution system and have long-standing technology in place. For instance, more than half of the electricity consumed in the U.S. is comes from coal-fired plants.10 Further, more than 841,000MW (78%) of the nation’s 1.075 million MW energy capacity is derived from coal, petroleum, or natural gas-based facilities. By contrast, only 26,000MW (2.4%) come from non-hydro renewables (including wind).11

Given the proven environmental benefits of wind technology, the major task for investors, consumers, and landowners is implementing this technology in small- and large-scale applications. While wind energy enjoys widespread public support, there is a general “Not In My Backyard” mentality when it comes to installing turbines in local communities. The challenge is overcoming these obstacles to produce clean energy for the future.

Hopes for the Future

NATIONAL ENERGY DIVERSIFICATION

In recent years, there has been a comprehensive push to broaden the scope of primary energy sources in the United States. Researchers and government officials cite several reasons—including global climate change, reliance on foreign oil, and national security—for this proposed diversification. The U.S. Department of Energy (DOE) reinforces this notion, citing a need for stability and security:

There is broad and growing recognition that the nation should diversify its energy portfolio so that a supply disruption affecting a single energy source will not significantly disrupt the national economy. Developing

domestic energy sources with known and stable costs would significantly improve U.S. energy stability and security.\textsuperscript{12}

Wind energy is an integral piece of this national policy strategy as evidenced by a recent DOE report that explores the possibility of garnering 20% of total U.S. energy supply from wind power by the year 2030. The successful implementation of this strategy, according to the report’s authors, includes nationwide energy security, local economic development, environmental preservation, and a reduction in water consumption.\textsuperscript{13} However, challenges that could prevent the widespread development of wind energy provide sizeable obstacles to success. DOE cites issues with electrical transmission, capital cost of production and materials, and concerns about siting and environmental impacts.\textsuperscript{14} These factors, cumulatively, could render the fulfillment of the 20% goal difficult given the time frame. Obstacles notwithstanding, the development of new wind technology on a large scale requires significant investment in the renewable energy sector.

**Wind Energy Potential in the U.S.**

The U.S. possesses rich territory for potential wind power generation. Geographic areas with high wind energy potential include the Midwest (from Montana and the Dakotas through Texas), the Appalachian Highlands, and shallow waters just off the East and West coasts (see Figure 5). More specifically, North Dakota, Texas, Kansas, South Dakota, and Montana have the highest wind resource potential in the U.S.\textsuperscript{15} Generally, areas with the highest wind potential are away from manmade and geographic obstruction, often in rural flatlands. This makes a potential partnership between wind energy and agricultural markets quite appealing.

\textsuperscript{12} DOE Report, p. 17.
\textsuperscript{13} DOE Report, p. 13.
\textsuperscript{14} DOE Report, p. 14.
\textsuperscript{15} GAO Report, p. 19.
Potential wind power density is measured using a seven-class system that is calculated to determine the wind power density (W/m²) of a certain area. Generally, class four is the minimum for large-scale wind plants. This classification translates into an annual average wind speed of at least 11 miles per hour.17

In comparison to foreign counterparts, the U.S. has higher wind energy potential than many of its leading competitors. Even further, DOE suggests that, “...current U.S. land-based and offshore wind resources are estimated to be sufficient to supply the electrical energy needs of the entire country several times over.”18

POTENTIAL BENEFITS OF WIND FOR RURAL COMMUNITIES

Since much of the land with the greatest wind energy potential lies in rural areas with agriculturally based economies, farmers can stand to benefit greatly from wind energy technology. Prevailing research suggests that wind projects on agricultural land can provide a more stable income to farmers than is derived from crop and/or livestock production.19 For example, a 250-acre farm could see an increase of more than $14,000 per year upon installation of properly spaced wind turbines.20

Due to the fact that turbines have a small footprint, farmers can continue to work the land while turbines operate overhead. There are also opportunities for community-owned projects on public land (i.e., schools, municipal offices, etc.).

19. GAO Report, p. 35.
Both of these options have the potential to create jobs, supplement income, and stimulate the economy in rural areas across the country. Private wind projects that are carried out by utility companies can also produce valuable tax revenue that can be used for community improvement and infrastructure maintenance. Due to the fact that wind projects can be more costly than conventional facilities, resulting taxes can be two to three times higher than traditional power plants.

The potential benefits to rural communities as a result of wind power are great and could eventually lead to greater economic health and employment. Since many rural areas are ideal for the installation of wind turbines, it is essential that farmers and local officials become informed about wind energy in their communities.

Wind Power Today

**GEOGRAPHY OF CURRENT PRODUCTION**

The United States has seen great strides in wind energy production since the early 1980s. According to the American Wind Energy Association, 16,596MW of energy capacity came from wind through 2007 (see Figure 6). Mainly, these projects are land-based and correspond to (1) states with the richest endowment of wind resources, or (2) states in which wind policy has been supported and development encouraged by policymakers and local governments. Texas leads states with over 4,200 MW installed capacity. Despite these great strides, the potential for turbine installation is much greater than the current installed capacity. Opportunities abound for farmers and local landowners to take advantage of the benefits that wind energy is known to provide communities in terms of energy and financial security.
Although wind energy has seen great strides over the past decades, issues continue to preclude the widespread installation of turbines in some of the most wind-rich areas. Some prominent environmental groups, including the Wildlife Society (TWS) and the Sierra Club have raised serious ecological concerns surrounding turbine installation. In a recent TWS position statement, members accused wind developers of a lack of transparency to policy makers, planners, and the public regarding the environmental impacts of wind energy. On the other hand, the National Wind Coordinating Collaborative (NWCC) suggested that conscientious research and frequent consultation and collaboration, potential issues can be minimized. In general, the most common issues cited with wind power are land use, habitat disturbance, impacts on birds/bats, soil erosion, visual impacts, and noise:

- **Land Use**—As with any energy extraction endeavor, land disturbance is inevitable. Land is required not only for the turbines themselves, but also for infrastructure and other facilities (see Figure 4). Different from typical facilities, however, is the amount of land used for energy generation and related operations. The U.S. Department of Energy estimates that 61,000 square kilometers (50,000km² land-based and 11,000km² offshore) would be necessary to achieve the goal of 20% wind energy by the year 2030. Despite this, a mere 2–5% this land—much less than with

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traditional facilities—would be occupied by actual turbine footprint and related facilities.24

While the possibility for dual use exists on land that features wind turbines, this coexistence is not universally supported. Land uses that require undisturbed airspace and have aesthetic value, including housing developments, airport approaches, radar installations, flight training routes, etc., are not ideal sites for turbine installation.25

• **Habitat Disturbance**—The possibility of disruption of the natural ecosystem in a wind development area is another issue that arises regularly. In particular, impacts from construction (i.e., turbines, substations, buildings, etc.) can displace native species. In fact, according to the National Wind Coordinating Collaborative (NWCC), “Some studies have shown that birds and other animals tend to avoid nesting or hunting for food in the immediate vicinity of wind turbines.” Even further, the construction of secondary facilities, coupled with the fact that wind sites are often located in remote, mountainous areas with diverse species of plants and animals, makes habitat concerns especially poignant.26

It is important to note, however, that wind energy occupies the same amount of land each year, while mineral extraction-based utilities (i.e. coal plants) require a successive increase in land area required once the resource has been exhausted.27 Rather than a continuous impact on natural habitat, wind energy allows for a single disruption that is often more accommodating than traditional facilities. Mitigation strategies have been developed to combat habitat destruction from wind energy and any ultimate solution requires a site-specific plan.

• **Impacts on Birds/Bats**—One of the oldest issues for wind developers is bird death resulting from turbines and/or high-voltage transmission lines. While the impact and scale of the bird issue remains largely unclear, cases of bird death have been reported at wind facilities across the globe. According to some researchers, this may be due to the attractiveness of potential wind energy sites for bird migration. According to the NWCC, “…some of the traits that characterize a good wind site also happen to be attractive to birds.”28

Initially, concern was raised in the early 1980s after a number of large raptors (some on the endangered species list) were killed in a relatively new, large wind project at Altamont Pass, California. Since then research has indicated that while some projects are more deadly to avian creatures

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25. DOE Report, p. 111.
27. DOE Report, p. 111.
than others, wind energy accounts for less than one in 10,000 bird deaths per year.29

Recently, the issue of bats being killed by turbines has also come to light. While there has been limited research conducted on the subject, the NWCC suggests that:

Bats appear to investigate turbines, perhaps for a number of reasons – acoustic and/or visual response to blade movement, sound attraction, and possible investigation of turbines as roosts, seem plausible given the findings and current state of knowledge. As such, further investigations are needed to determine causes of behavioral response to turbines and how to best mitigate or eliminate factors that put animals at risk of collision.30

• **Soil Erosion**—Another component of habitat destruction is soil erosion in areas surrounding wind turbines and access facilities. Erosion is largely common with any new development that involves paving or removal of natural soils. At wind sites, turbine bases are especially prone to erosion if placed on a slope. Erosion can produce deep gullies created by rainwater and runoff in these areas. Despite these concerns, erosion is easily controlled if care is taken at the time of construction to minimize natural impacts and design the placement of turbines in accordance with natural topography.

• **Visual Impacts**—Due to the fact that wind turbines are highly visible and can be seen from a considerable distance, in many cases, aesthetic concerns have been expressed by local communities and land owners. In particular, since ideal sites for wind turbines are often in areas prized for their scenic vistas and open space, wind projects can be seen as intrusive to the natural beauty of a landscape.31 Overall, visual impact is one of the major factors contributing to local support of wind energy projects.

Public opinion about visual impacts is often a relatively considerable obstacle to wind development, despite general widespread support for energy diversification on a large scale. In one group of cases, homeowners and real estate developers in California quashed numerous prime location wind projects due to concerns about scenic disruption.32 While support for wind energy among Americans is extremely high, this affirmation can wane once a site is chosen. Strong local opposition can take root in communities facing the installation of turbines. This mindset, called “Not In My Backyard” (or NIMBY-ism), is characterized by prominent energy attitudes researcher Marteen Wolsink as, “positive attitudes towards something (wind power) until they [local residents] are actually

29. DOE Report, p. 112.
30. NWCC, p. 6.
confronted with it, and that they then oppose it for selfish reasons.”33 This is certainly not meant to indicate that all opposition is self-centered; rather, there is a clear distinction among public attitudes based on project scale. Support level depends upon each individual project and location.

- **Noise**—Turbine noise is also a concern to many local residents near proposed or existing wind farms. Although early turbines were much noisier than their modern-day counterparts, sound generated from turbines can pose issues to those nearby. Primarily, noise is generated as the rotor blades pass the tower. This sound typically ranges from 35–40 decibels (dB)—the sound of a kitchen refrigerator running.34 This noise level pales in comparison to a typical vacuum cleaner (70dB), a freight train (70dB), or even a jet engine (120dB).35

Many organizations agree that turbine noise is a minor concern to developers but should be taken into account when siting projects. In addition, mitigation strategies have been developed and applied to large wind installments to control sound output to surrounding communities.

**FINANCING AND OWNERSHIP**

Proper financial input is, like with any other major energy construction project, an essential part of developing a successful wind energy facility. As turbines have been installed across the globe, different methods have been employed to finance the construction and maintenance of this equipment and the requisite facilities. In the U.S., commercial financing is the most prevalent financing model. In this arrangement, large companies use profit or borrow against projected profits to install turbines at given locations. Thus, utility companies are the major stakeholders in terms of control and profit with many wind projects.36 By contrast, many projects in Europe employ a form of community financing. Mark Bolinger of the Lawrence Berkeley National Laboratory described this arrangement:

> …Europe has traditionally relied on a system of community ownership and financing of wind projects, in which individual citizens, or groups of citizens, invest the necessary equity to purchase and install one or more turbines, and then sell the electricity to the local utility at a profit. Because the amount of capital that can be raised in this manner is typically modest, and many of these projects have been intended to offset personal electricity consumption, project size has typically been small, usually only a few MW. As a result, parts of the European landscape, and much of Denmark’s in particular, are dotted with small wind clusters, as

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34. DOE Report, p. 117.
opposed to the United States, where wind farms tend to be quite large and concentrated in only a few areas.37

In addition to the distinction between ownership structures, it is important to distinguish the types of communities relevant to wind ownership. Common in the UK, communities of both interest and locality are common in wind development. Communities of locality are comprised of individuals living in the same geographic space. On the other hand, communities of interest are individuals, regardless of their spatial arrangement, who claim a common goal or interest. Throughout the world, both community types can provide the financial basis for wind projects.38

Monetary capital also plays an important part in the development of a wind project. Although an ownership scheme might be in-place, financing the project and structuring debt are formidable issues. In the U.S., most utility-scale wind projects are designed with 40–70% debt. Loans and financing options are available from banks at a number of different scales. Some small agricultural lenders (e.g., AgStar Financial) have developed specialized lending programs for wind power and other renewable energy projects. In addition, commercial finance firms (especially those that specialize in energy investment) can provide lending packages, but often require a minimum project size that exceeds the scope of many community-based projects. Finally, many foreign commercial banks will offer loans at market rates for wind projects. Although many large U.S. banks have been wary of wind development, some mid-size regional banks may provide financing.39 A number of legislative and monetary support structures also are in place for wind development.

TRADITIONAL COMMUNITY OWNERSHIP MODELS

A community can go about financing, constructing, and owning a wind project in several ways. Whether there is one turbine on the grounds of a firehouse, or one hundred strewn on a local farm, finding the right arrangement between the community and its governing body is crucial to the success of any wind energy project. The Environmental Law and Policy Center provided the following information on the structure of wind ownership:40

- **Municipal Ownership**—Municipal governments and/or utilities, often through respective Departments of Public Works, can install turbines on community-owned land. Although these projects are not eligible for many tax credits (due to the fact that they are not tax-paying entities),

CASE STUDY: MOORHEAD PUBLIC SERVICE

Moorhead (MN) Public Service’s twin 750 kW turbines went on line on June 24, 1999 and August 25, 2001. Moorhead was one of the first municipal utilities in the country to install wind turbines. Moorhead Public Service (MPS) established a voluntary green power subscription program (“Capture the Wind”) to cover the incremental cost between conventional coal-fired generation and wind power. Approximately 900 community residents signed up for the program, purchasing all of the available green tags from these turbines, and paying a premium of no more than ½-cent per kWh. MPS has the most successful green power marketing program in the nation measured by share of customers.41

40. Ownership models adapted from Kubert, ELPC, pp. 2–8.
41. ELPC Handbook, p. 3.
development costs can be lowered by accessing low-cost financing rates with public monies. Often times, power that is generated by turbines is sold at a premium to customers through a special renewable power program. Despite the fact that tax revenue cannot be generated by this arrangement, these projects can pave the way for future wind power development in the area and consolidate control within an already-established bureaucratic hierarchy.

- **School Ownership**—Many school districts throughout the country have installed turbines on school grounds to offset their own high electricity consumption. Although input costs can be high, the turbines can offer educational opportunities, lower district taxes, and take advantage of net metering where applicable.

- **Rural Electric Cooperatives (RECs)**—Utility cooperatives have been in existence since the early 1930s, in response to the push to ‘electrify’ rural areas by President Franklin D. Roosevelt. Since then, RECs have enjoyed considerable expansion to local consumers. According to the National Rural Electric Cooperative Association (NRECA), “Electric cooperatives are private, independent utilities, owned by the members they serve.”43 One major advantage of an REC is that a democratically elected board of directors set utility rates, thus state oversight is unnecessary.44 When applied to wind energy, co-ops can benefit their members through payments for wind turbine easements and many are eligible to borrow at low premium from the USDA.

- **Sole Ownership**—For individuals or small businesses that desire more complete control over wind projects, sole ownership may be the best model. In many cases, individuals that have the input capital can form limited liability corporations (LLC) to protect financial liability for the project. Depending on the level of investment, varying levels of tax credit can be applied to the owner.

- **Multiple Local Investors**—The risk involved in a sole ownership situation can be partially alleviated with a grouping of local investors. Operated similarly to a cooperative, these projects are often smaller and investors form LLCs to insulate liability. By only allowing local investors and limiting the investment amounts, rules and goals can be designed to meet the needs of the specific project. As the Environmental Law and Policy Center noted, “An LLC with multiple investors will require an offering prospectus and may be subject to state and federal securities

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42. Lahd, CERT, pp. 1–2.
44. NW REC, Retrieved July 21, 2008 from http://www.nwrec.com/about/about_rec.php
registration.”

To determine the best corporate structure for a multiple-investor project, it is advisable to contact the division of the applicable state government that deals with local energy projects and/or small business creation.

- **Involving Corporate Investors**—Bundling, leasing, loan-to-own, sweat equity—Since local investment is often not sufficient to overcome the input cost of installing turbines, transmission systems, and facilities, the involvement of a large utility company can help local groups set projects in motion. A joint model allows community organizations to achieve ownership in the long term and secure tax benefits. While most of the initial pre-development and marketing work must be completed by local investors, the corporate entity would, in most cases, supply the equity needed for construction. After a period of time, the majority ownership share transfers from the corporate to the local entity.

Strategies have been utilized by many communities to attract corporate investment in local wind projects. Among them are “loan to own” programs, bundling smaller projects together into a larger undertaking, leasing ownership rights to corporate firms, and “sweat equity” models which sell construction-ready projects to outside developers. It is important to explore all of the ownership options to determine which is the most suitable for the interested community.

**ADVANTAGES OF COMMUNITY OWNERSHIP FOR AGRICULTURAL ECONOMIES**

In many agricultural communities across the United States, wind energy provides a new stream of tax revenue, employment, and economic growth. To ensure that local communities reap the benefits of turbines within their borders, it is important for interested investors and officials to consider local financing and ownership. In short, community wind project ownership provides numerous benefits directly to rural communities. According to Berkeley National Lab Researcher Mark Bollinger\(^47\), these benefits include:

- New privately invested capital into rural development
- Low cost of capital when compared to commercial investment
- Increased public support for wind energy, as opposed to commercial development
- Less conflict in the planning/permitting process due to smaller project size

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• Reduction in transmission cost/construction due to increased possibility of distributed generation (installation of turbines to power local or on-site equipment that requires little or no connection to grid)
• Possibility of fixed-rate or stable electricity pricing

While these benefits have been cited in a number of wind projects, they are not wholly consistent. New projects may encounter issues associated with project scaling and the greater administrative burden exacerbated by the increasing size of the involved ‘community’. Researchers suggest, however, the generalized benefits of increased public acceptance, reduction in transmission costs, and an increase in turbine construction facilities often outweigh the few potential stumbling blocks found in some projects.48

GOVERNMENT FINANCIAL SUPPORT

Federal, state, and local governments provide various means of assistance and support to those looking to develop wind turbines. While legislation is variegated and financial programs are available from a number of different agencies, the policy framework can provide help to wind projects of all scales.

Production Tax Credit (PTC)

One of the most important and influential forms of support provided by the federal government is the Production Tax Credit (PTC). The PTC was created under the Energy Policy Act of 1992 (H.R. 776 Sec. 1212) and allows utility-scale turbine projects to receive an income tax credit of 2.0 cents per kilowatt-hour. While the credit applies only to the first ten years of production, it is annually adjusted for inflation. In addition, the PTC (which applies to other renewables) has proved to be a major driving force in wind energy development. In three years where the PTC was allowed to expire (2000, 2002, and 2004), turbine installation saw drops of 93%, 73%, and 77%, respectively, when compared to the previous year. The Production Tax Credit expired on December 31, 2008.49

Clean Renewable Energy Bonds (CREBs)

Since the PTC is only applicable to utility-scale wind projects, Congress made Clean Renewable Energy Bonds (CREBs) available to electric cooperatives and government entities through the Energy Policy Act of 2005 (Pub.L. 109-058). A number of state and local governments as well as some government agencies can issue CREBs to any mutual or cooperative electric company or governmental body. According to Windustry, the publicity center for the Great Plains Windustry Project:

CREBs are tax credit bonds with an interest-free finance rate. The entire interest on the bond is paid by the U.S. Treasury in the form of a tax credit. $800 million have been allocated by the Secretary of the

CASE STUDY: “OUR WIND CO-OP”

Farmers, ranchers, and residents of rural Montana and Washington have reaped the benefits of a groundbreaking program called “Our Wind Co-op.” Developed by Northwest Sustainable Energy for Economic Development (SEED), the cooperative structure allows residents to invest in and install small wind turbines on their own property. Turbines are then connected to wind monitoring equipment that records physical data to pass on to wind industry leaders. This unique situation has allowed members to reduce electricity costs by as much as $1,000 per year. While each member has an installed turbine and must pay the input costs, net metering is in place and easily offsets the power needs of single users and financial incentives have allowed one turbine owner to recoup his $23,000 investment in one year.48

49. AWEA, Wind Energy Production Tax Credit, pp. 1–2.
Treasury to the program for the time period between January 1, 2006 and December 31, 2007. $300 million of that has been designated for rural electric cooperatives. The borrower has five years to spend 95% of the proceeds. The tax credit rate is posted daily by the U.S. Treasury. The discount rate is designed to provide for the maximum term equal to produce 50% of the face amount of the bond (approximately 11 years).50

**Renewable Energy Production Incentive (REPI)**

Also created from the Energy Policy Act of 2005, the Renewable Energy Production Incentive (REPI) provides incentive payments of 1.5 cents per kilowatt-hour for renewable energy generation facilities. Wind facilities owned by state and local governments and not-for-profit electric cooperatives are eligible to receive money in the first ten years of operation.51

**Value-Added Producer Grants (VAPG)**

As part of the U.S. Department of Agriculture’s (USDA) Rural Business Cooperative Service, grants are provided to assist farms and ranchers who desire to make capital investments to add value to their enterprises. As the Center for Rural Affairs noted:

> These innovative initiatives have strengthened the viability of small and mid-sized farms and ranches and have allowed farms and ranches to grow businesses around production practices that benefit the environment and our natural resources.52

Within the program, eligible producers, farmers, cooperatives, and others can apply for funding to assist with developing site and marking plans and/or for working capital to operate a business venture. In relation to wind energy, grant money can be applied to engineering and feasibility studies, marketing project details to the community or to potential investors, and planning and permitting expenses.

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USDA Farm Bill
Dubbed the “Farm Bill”, the Food, Conservation, and Energy Act of 2008 provides wide-ranging support to rural development efforts. A summary table of applicable funds appears below.

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<td>Local government, non-profit, tribes, cooperatives</td>
<td>Loan funds or direct grants</td>
<td>Grants to intermediaries for use as seed grants or loans</td>
<td>$40.8 million*</td>
</tr>
</tbody>
</table>

*Denotes fiscal year 2007 appropriations

Figure 7. Summary of USDA Rural Development Grant and Loan Program, ELPC53

53. Adapted from Kubert, ELPC, p. 14.
The farm bill follows a long line of agricultural policy and subsidy measures passed by U.S. lawmakers for over 80 years. As an extension of the 2002 farm bill, this legislation provides a five-year policy course for rural and agricultural America. With specific relevance to renewable energy, the bill provides funding to the USDA for loans, guarantees, and grants to farmers and ranchers to install renewable energy systems and make improvements under section 9006.54

**State Clean Energy Funds**
Sixteen states across the U.S. have established funds to promote renewables and enhance clean energy technology55:

- Arizona
- California
- Connecticut
- Illinois
- Maryland
- Massachusetts
- Minnesota
- New Jersey
- New Mexico
- New York
- Ohio
- Oregon
- Pennsylvania
- Rhode Island
- Vermont
- Wisconsin

**State Tax Incentives for Wind**
Many states offer property and sales tax incentives for wind energy installation. A complete listing of each state’s funds can be found at the Database of State Incentives for Renewables and Efficiency (DSIRE) online at www.dsireusa.org.56

**Renewable Portfolio Standards**
In addition to the monetary support that many states provide for wind power, several states have introduced targets for renewable energy production by a certain date. These goals are called Renewable Portfolio Standards (RPS) and often require a minimum percentage of power production to come from renewable source(s).57 While states have set variegated standards, goals are lofty and require significant backing from both public and private sectors.

**The Future: Potential of Wind Energy in America and Associated Benefits**

**ECONOMIC POTENTIAL**
Wind energy has the potential to be a transformative force on many struggling rural economies in the United States. Turbine facilities cannot only offset energy costs for a single farmer or rancher, but can also provide municipalities with much-needed tax revenue from large wind farms. Furthermore, wind energy

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brings long-lasting jobs and corporate investment that can bring improved services and infrastructure to agricultural America.

The U.S. Department of Energy sees a regional economic “ripple effect” that cites direct, indirect, and induced impacts of increasing wind turbine installation (see Figure 8).

Figure 8. Wind’s economic ripple effect58

**JOB CREATION**

One of the most highly touted benefits of wind energy in America is the creation of both temporary and permanent employment opportunities in areas that need them most. According to the U.S. Department of Energy, “Labor is often used for project construction, like building roads and erecting turbines. Once the projects are complete, jobs are created in the operation and maintenance of the projects.”59 Even further, research has suggested that more new jobs are created as a result of wind energy projects than with both coal and natural gas-based facilities.

The Renewable Energy Policy Project (REPP) reported in a 2001 study that, on average, 4.8 jobs are necessary for each MW of wind energy. Data were compiled from surveys of leading turbine manufacturers and site managers, and included manufacturing, sales, and servicing for ten years of operation. Considering these data, approximately 180 jobs would be created on an average 37.5 MW wind farm.60 Many of these jobs would be grounded in the local community and require proximity to the wind facility. Thus, a majority would remain in rural areas where wind power is most lucrative and jobs are needed most.

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59. DOE, Wind Energy for Rural Development, p. 3.
60. REPP, pp. 14–16.
RURAL DEVELOPMENT

In many agricultural areas, economies are struggling due to lower commodity prices and higher production costs. In fact, according to the USDA, off-farm jobs are exceedingly necessary for American farming families to make ends meet. Wind energy, according to the American Corn Growers Association, “provides a source of income and fosters economic development in rural communities.”

Overcoming Issues

In order for communities to effectively integrate wind energy into their greater energy portfolio, planners must educate the public, farmers and landowners must recognize the benefits, and a strategic plan must be developed. Any issues that may involve aesthetics or the wildlife population must be mitigated before the project begins. These situations are often encountered and several examples exist where communities have become models for local, community-owned wind development.

SITING

Choosing an appropriate site for a wind turbine or group of turbines is one of the most important aspects of a wind project. In addition to the specific issues described earlier, siting concerns are often the paramount obstacles to turbine construction. Despite the length and complexity of the permitting and siting process, much of the most profound opposition to wind projects comes from local political concerns and the formation of ad hoc associations, according to IEEE.

CASE STUDY: KAS BROTHERS’ WIND FARM

The first farmer-owned commercial wind project in the United States was built in Pipestone, Minnesota in 2001. Two 750 kW wind turbines were installed by developer Dan Juhl. Local banks provided project financing and Xcel Energy contracted to purchase the power. Revenue, which ranges from $30,000-$40,000 per year for the first ten years and could reach as high as $130,000 in the future, supplements the income of the farm and keeps electricity investment cash circulating within the local community.

CASE STUDY: DEVELOPMENT WITHOUT REGULATION

In a recent article in The New York Times, issues of corruption and conflict were raised in rural communities in upstate New York. Specifically, in Burke, NY members of the local government and large utilities are under investigation for corruption and intimidation. There, several rural farming communities are being torn apart over the siting of wind turbines by large wind development firms. While New York provides lucrative incentives for wind development, the state offers no firm policy regarding turbine location or size. As a result, siting decisions are left to local governments that, as the Times suggests, are prone to corruption and acquiescence to the will of large corporations that promise development and much-needed tax revenue to local communities. In this respect, large wind development firms embody similar characteristics to other large utilities. In fact, in New York a class/wage gap also exists in turbine placement. Wealthy and influential Long Island landowners were able to suppress offshore wind turbines in their wind-rich backyards, leaving turbines to be constructed in the less-wind-rich upstate region. While wind projects can undoubtedly provide benefits to rural communities, this case offers a crude look into the politics of division that can leave rural landowners disempowered. Regulation is clearly needed to upstage local politics and ensure equitable land use to support the financial support provided by the state government.

“It’s hard when change is for the common good but some people suffer more than others”
—Dawn Sweredoski, lives in proximity to turbines

CASE STUDY: MIXED FEELINGS ABOUT WIND ENERGY

In Lowville, New York farmer’s son John Yancey despises the wind turbines his father agreed to have installed on the family farm. In an area where animals have traditionally outnumbered people, wind energy has pitted family members against one another in a feud that sets the landscape against the need for financial survival. Amidst the family squabble, however, wind energy has provided the sorely needed income farmers needed to survive in the harsh physical and economic climate. The Yanceys live near a 195-turbine wind farm (New York’s largest) that provides subsidies of approximately $6,600 per turbine to landowners who allow turbines on their farms. Five hundred to $1000 per year is provided to neighboring landowners for the trouble of dealing with the sound, shadow, and view of the turbines from the utility company. Local municipalities, initially opposed to wind energy, were able to negotiate terms with the utility providers that include fixed payments to municipal governments and school districts in lieu of taxes. While the much

of the community was able to overcome the ideological and aesthetic hurdles in favor of much-needed income, several holdouts like John Yancey look upon the turbines with disgust and resentment and question the future of the turbines once purchase agreements expire in 15 years.\(^66\)

In the cases above, issues were largely present due to the following conditions:

- Ownership of turbines was retained by large utility companies
- While landowners were compensated, they received no break on their electricity bills nor were they enrolled in a net metering or other credit program
- Siting decisions were made mostly by individual landowners, not as a community (turbines were on private, not public land)
- Local ordinances and zoning regulations were ineffective and did not firmly apply to wind projects.

To minimize cases where local opposition to turbines has been intensified by large-scale projects, several measures can be taken by local communities interested in wind development to help alleviate the potential for conflict. In fact, many communities have successfully welcomed turbines and reaped the economic benefits for years.

**CASE STUDY: LEADING THE WAY – HULL, MA**

In 2001, the Boston suburb of Hull, Massachusetts installed a new 660 kW turbine at the tip of the harbor-bordering town. Just miles away from the city center and Logan International Airport, this resort town encountered many of the traditional issues that face many communities grappling with the installation of turbines. This town, however, was able to overcome these obstacles due to a strategic combination of ownership structure, community involvement, and previous experience. One of the most important factors contributing to the support of the Hull turbine is the fact that there is congruency between energy beneficiaries and impacted local landowners. That is, the local residents of Hull, who are most affected by the turbine itself, see a direct reduction in their utility bills as a result of the turbine. The local municipal-owned utility provided a pre-determined market for the energy in the form of a Power Purchase Agreement. The town owns the land for the project and, thus, the permitting process was simplified. Rather than looking at a single landowner with resentment, residents feel a community pride in the project and are able to directly reap its benefits.\(^67\)

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In communities where wind energy is successful, there is a sense of collective endorsement and pride around turbines. Residents see past potential aesthetic disruption and choose a sight where this possibility will be minimized. In addition, public land is used for siting wind facilities. The first step, however, to positive wind development is creating a congruent relationship between the beneficiaries of the produced wind energy and the individuals impacted most by its presence in a particular location.

STATEWIDE SITING POLICY

At the statewide level, many state governments have developed siting policies to standardize guidelines relating to the size, siting, and permitting of new wind turbines. It is inconsistent across states, however, which level of government (state or local) has jurisdiction over the siting of wind projects. The National
Wind Coordinating Committee has identified five main categories that siting approvals and/or processes usually fall into:

1. Mandatory, state-level wind siting statutes;
2. Voluntary guidelines for siting within states;
3. Model ordinances for local governments to apply and use;
4. Local government siting rules; and
5. Voluntary checklists and resources for local governments to recommend.

Many of these guidelines address issues of consultation between government agencies, post-construction monitoring, and/or consultation with local planning ordinances. In addition to state and local scale regulations, the Federal Aviation Administration requires lights to be placed on utility-scale towers reaching more than 200 feet.

**SAMPLE GUIDELINES: MINNESOTA**

The Minnesota Public Utilities Commission regulates wind systems of more than 5 MW and has laid out a clear permitting process. Permitting is contingent upon an environmental review and a public review (in the form of an open meeting). In addition, states can place conditions on turbine size, layout, noise, wildlife impact, etc. Applicants must also obtain a power purchase agreement to secure the project. Due to the fact that projects less than 5 MW are not regulated, many small communities, landowners, and municipalities have installed single turbines without the necessary regulations applied.

**MODEL ORDINANCES**

Due to the fact that there is discrepancy between government agencies, many local governments in areas that are ideal for wind development have developed model ordinances. These documents are designed by communities or other organizations in order to aid municipalities in crafting regulations that are both consistent and comprehensive. In Minnesota, the Minnesota Association of County Planning and Zoning Administrators developed a model ordinance in the 1990s to rectify zoning issues and promote smart growth in the wind energy sector. The Minnesota ordinance includes the following elements:

1. Distinguishing between commercial and non-commercial turbines
2. Necessary Permits
3. Setbacks
4. Safety Standards
5. Design Standards
6. Applicable Standards (noise, electrical codes, etc.)
7. Infrastructure Impacts

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CASE STUDY: WHEN ORDINANCES ARE INEFFECTIVE

In the posh, resort communities that exist on Long Beach Island, New Jersey, one man has decided to install a home-based wind turbine at the objection of his neighbors. The 40 ft. turbine that produces approximately 2 kW of power helps offset one quarter of Michael Mercurio’s utility bill each month. Originally, the local government granted a building permit to Mr. Mercurio for the turbine, despite the fact that the building code bans structures larger than 32 ft. Now, Mercurio’s neighbors, who are in severe opposition to the relatively small turbine, have taken him to court and the turbine has been de-commissioned in the interim. Even though the township did have a building code in place, the applicability of the guidelines to wind turbines is in question.71

HABITAT MITIGATION

As wildlife-related issues abound and are seen across wind projects, new strategies to ensure habitat preservation and/or protection are being enacted throughout the United States and abroad. In many cases, the development of a habitat mitigation plan is part of the preliminary siting and permitting process for a new turbine. Prominent environmental groups, including The Wildlife Society have encouraged the implementation of habitat mitigation plans.

As early as 1998, a habitat mitigation plan was in place for one of America’s first wind farms in Altamont Pass, California. From research conducted at the site, the plan includes eliminating the use of lattice-type towers, managing ground squirrels (i.e. removing prey), utilizing perch guards, and more.72 Other mitigation plans include planting procedures to minimize erosion and enhance natural plant life displaced by the turbine footprint. Additionally, some form of post construction monitoring is often enacted in order to monitor and minimize environmental impacts. In many cases, state and local regulations require such measures.

Final Thoughts

Wind energy in the United States is still in its relative infancy. Sources of funding, internal capital investment, and sufficient community support are all necessary for wind to take hold as a competitive and viable source of energy in the country’s wider power portfolio. For rural communities, turbines must be accepted on an ideological level and not just for fiscal reasons.

Since the early 1980s, turbine technology has developed at an astounding pace. However, due to long standing issues like habitat disturbance and visual impacts, broader implementation has been rather sluggish despite various sources of government support. In order to overcome these issues, communities must recognize the myriad benefits of renewable energy on their respective economies, environments, and citizens.

Rural America has exceptional potential for revitalization as a result of wind power. Turbines can provide employment opportunities, re-use of defunct manufacturing centers, and much-needed tax revenue. Most of all, the multi-step process of building, assembling, installing, and maintaining turbines can serve as a long-term beacon of fiscal hope for struggling agricultural economies. Additionally, the twofold land use that is possible when turbines are placed on farms allows additional income to flow directly to those who, in many cases, need it most.

The development process, however, is a complicated and multi-faceted one. Without education programs, proper ordinances, and a modern distribution system, wind turbines can tear rural communities (even families) apart. The key to surmounting these potential problems lies in proper planning and ownership. When examining cases where wind turbines have been at the center of controversy, the community has largely been excluded from the siting and planning process. The most successful rural turbine development examples come with the following conditions:

1. Turbines are owned by a group of individuals, a municipal utility, or an energy cooperative.
2. A direct compensation program (i.e. net metering) exists for landowners receiving power from the turbines and those who lease land for turbine construction. There is congruency between those directly impacted by the turbines and those reaping the energy benefits.
3. Zoning and land-use ordinance and guidelines are clearly applicable to wind turbines (not just general building limits) and are derived from proven model ordinances.
4. The community as a whole, not by a single landowner or large corporation makes siting decisions.

If these terms are followed, many of the potential issues that often result from rural turbine installation can be minimized. Of course there will still be ideological and aesthetic foes to renewable energy, but these measures will help ensure that proper input is heard from the outset.

For the sake of the future, global citizens must posit their energy consumption and use of resources. If renewable energy is truly a national goal, then there must be widespread alignment between national policy and local practice. Lawmakers must reinforce a national agenda with sound policy that empowers citizens and provides support for communities on the cutting edge. This energy metamorphosis will not take place without this support.
Finally, Americans must think introspectively about their collective future. Globalization has taken root and helped to build unique, worldwide relationships. In part due to this, energy security and price stability are at the mercy of the global marketplace. Thus, future economic security and energy independence may lie in the hands of local economies looking to re-emerge as the signature of America. This time, it may not be agricultural windmills that help America grow, but sleek steel turbines that dance gracefully to bring clean energy to cities and towns across the country.

References


