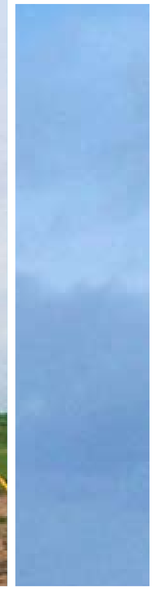
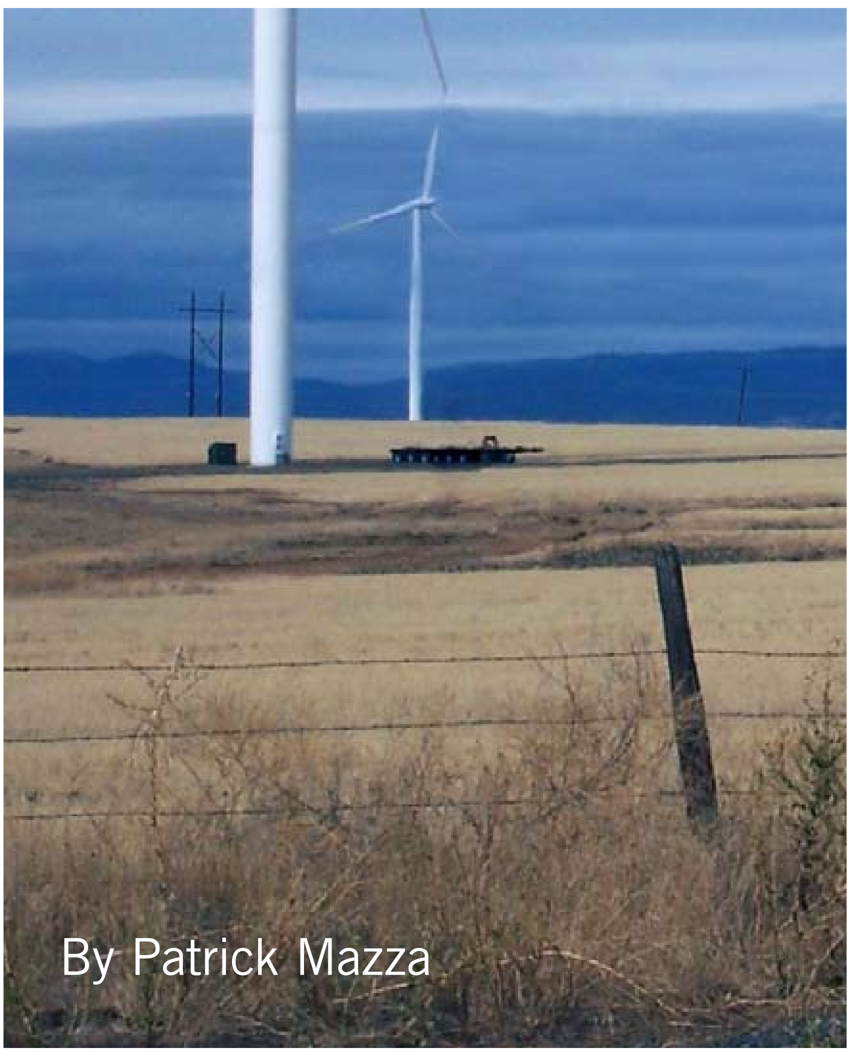
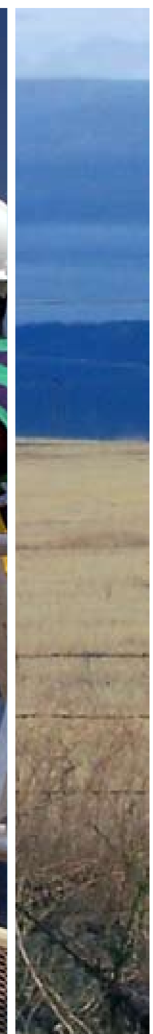




# Community Wind 101: A Primer for Policymakers





By Patrick Mazza

Harvesting Clean Energy
25x'25 America's Energy Future
The Energy Foundation
Toward a sustainable energy future

**Cover Photo:**
Background: White Creek, Washington wind farm; from Klickitat PUD
Top right: Spirit Valley, Iowa schools wind turbine, from Tom Wind
Bottom right: from Warren Gretz, National Renewable Energy Lab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Harvesting Clean Energy: The Harvesting Clean Energy program reaches across the urban/rural divide in the Pacific Northwest. We cultivate common ground with a simple shared goal: to foster rural economic development through clean energy production

The 25x25 vision: By 2025, America's farms, forests and ranches will provide 25 percent of the total energy consumed in the United States, while continuing to produce safe, abundant, and affordable food, feed and fiber.

Energy Foundation: The Energy Foundations mission is to advance energy efficiency and renewable energy — new technologies that are essential components of a clean energy future.

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# Executive Summary

A new model for wind development is emerging – community wind – in which local ownership plays a major role. Rural landowners, consumer-owned utilities, school districts, colleges and native tribes are putting installations on the ground ranging from single turbines to wind plants with hundreds of megawatts of capacity.

*Community Wind 101* is intended as a primer on community wind for policymakers and clean energy advocates, based on a survey and synopsis of the best literature in the field. This paper:

- Looks at community wind examples;
- Overviews wind power economic benefits overall and community wind's enhanced benefits;
- Demonstrates community wind's benefits for the power grid and wind power growth;
- Examines obstacles facing community wind developers and details effective state and federal policies to overcome them;
- Points to ways federal power management authorities and consumer-owned utilities can join to develop wind.

## Community Wind 101's key findings:

**Community wind, though small in the U.S., is beginning to grow through successful local ownership models.**

Community wind was born in Denmark and Germany and retains a significant share there. In the U.S. community wind is only four percent of wind capacity but interest is surging. Many innovative examples are emerging. They include:

- The MinWind partnerships in Luverne, Minnesota pioneering ways for multiple rural landowners to join in wind development;
- Pacific Northwest public utilities building what could become one of the largest wind farms overall;
- Iowa Lakes Community College's turbine which powers the campus and wind technician training program;
- A Rosebud Sioux wind installation on their South Dakota Reservation.

**Wind power is a tremendous economic boon to rural America, and economic benefits from local ownership are multiplied in the range of two to three times or more.**

Wind developed along standard corporate lines is producing economic gains for rural areas across the nation:

- Annual landowner royalties of $2,000-$10,000 per turbine;
- Annual property tax payments of $500,000-$1 million per 100 megawatts (MW);
- 1-2 construction jobs per MW
- Two to five operations and maintenance jobs per 50-100 MW. [1]

Community wind tends to be developed at a smaller scale, but MW for MW the local economic benefits can be several times as great, multiple studies find. Typical is a National Renewable Energy Laboratory study which compares one 40 MW plant owned by outside investors to 20 two MW plants owned locally [2]:

| | Outside | Local |
|---|---|---|
| Local Income | $1.3 million | $4 million |
| Job Creation | 18 | 41 |

**Community wind can play a pioneering role for all wind power by expanding local financial interest and public support.**

Community wind brings a more diverse set of players, places and wind resources into the picture. Individual landowners and local institutions such as schools, towns, counties, consumer-owned utilities and tribes can bring their own assets to the table, both financial and political.

"Community wind projects tap into a latent and potentially lower-cost source of capital to fund utility-scale wind development," a group of leading community wind experts reported to the Energy Trust of Oregon. "With local investment dollars at stake, community wind projects may benefit from increased community support . . . which might translate into a smoother permitting process relative to commercially-owned projects." [3]

Community wind can act in a pioneering role for larger-scale community and corporate development.

"A small-scale community wind project can be a useful tool to gauge whether a site has potential for future expansion," the experts note. "A successful community wind project can be a launch pad for streamlined future expansion of wind development on a given site."

### Diversifying the geographic spread of wind makes the wind resource more reliable and valuable overall.

A growing body of wind integration studies verifies that interconnecting wind projects with greater geographic diversity enhances wind energy production since it increases the probability that wind energy will be generated in different locations at a given point in time.

Wind integration experts recently wrote in *IEEE Power & Energy* that "several investigations of truly high penetrations of wind (up to 25 percent energy and 35 percent capacity) have concluded that the power system can handle these high penetrations without compromising system operation. . . the value of sharing balancing functions over large regions with a diversity of loads, generators and wind resources has been clearly demonstrated." [4]

### Wind energy has a key element in modernizing the power grid to create a more reliable network.

Accessing wind energy resources at all levels will require modernizing and expanding transmission systems to carry power from remote windy areas to cities. In places where transmission is currently limited, community wind with its typically smaller scale can be developed to serve local needs.

### Community wind projects face large financial hurdles that require a favorable policy environment to overcome.

High transaction costs and related diseconomies of smaller scale pose significant obstacles. Lawrence Berkeley National Laboratory analysis of 28 wind projects indicates levelized costs per MW for a 9 MW installation will be six percent higher than for a comparable 50 MW project and 36 percent above a 200 MW wind farm. [5]

### Federal tax incentives including the Production Tax Credit and accelerated depreciation vital to all wind development are not fully usable by many potential community wind projects – This represents a major barrier to local ownership.

The key difficulty facing prospective community wind developers is lack of tax liability sufficient to take full advantage of federal tax incentives. These incentives represent a large portion of the financial return of a wind project and generally are needed to make projects of any size under any ownership model economically feasible. To fully utilize PTC incentives for a two MW project, an investor must owe $125,000 in federal taxes on income from the wind project itself or from "passive income." This is defined as income from a rental property, limited partnership or other business in which they are not actively involved.

### Fixing the PTC to apply to a broader range of income types and levels could generate widespread community wind ownership – A complementary option is producer payments and other incentives targeted specifically at community wind.

Proposals before Congress would allow tax credits to be deducted against income from wages or a business in which the taxpayer is actively engaged. For example, Rep. Tim Walz (D-Minnesota) proposes in H.R. 2691 to allow investors to claim up to $40,000 in tax credits against ordinary income tax liability.

The Center on American Progress and the Institute for Local Self-Reliance propose to make the PTC more usable for community wind projects by:

- Establishing a two-tiered producer payment that provides greater tax credit benefits to community wind owners in the range of a 2.5 cents/kilowatt hour (kWh)
- Providing producer payments for on-site power generation.
- Allowing tax credits to be taken against ordinary wages and business income.

Congress might also consider providing a program offering financial assistance targeted specifically to community wind projects.

Another PTC fix most observers consider vital for steady wind growth in the U.S., both corporate and community, is simply a long-term extension of the existing credit. If the U.S. is serious about building its manufacturing presence in wind, it will put a long-term PTC in place to provide manufacturers with investment certainty.

### Feed-in tariffs are successfully used in Europe to promote community wind. Advanced renewable energy tariffs that guarantee grid access and a high rate could be one of the most powerful tools to promote community wind in the U.S.

Feed-in tariffs are offered by leading wind countries including Germany, Denmark, Spain and 15 other European countries. Because they do not require tax liability such as the PTC, and because payments are guaranteed and stable, feed-in tariffs are generally regarded as a superior tool to drive community-owned wind.

The first contemporary feed-in arrangement in North America was instituted in Ontario province in November 2006. By April 2008 the Standard Offer Program spurred around 1,300 MW in planned new renewables development but practically no community wind. The Ontario Sustainable Energy Association has proposed an Advanced Renewable Tariffs system that more fully mirrors the successful European model. In late June Rep. Jay Inslee (D-Washington) led introduction of perhaps the first feed-in proposal to reach Congress, the Renewable Energy Jobs and Security Act, H.R. 6401, to:

- Guarantee interconnection to the grid and long-term, fixed payments for renewable projects up to 20 MW;
- Minimize the impact on utilities and ratepayers through regional cost-sharing.

**Standardized procedures for interconnection and net metering improve community wind economics, as would net metering that allows larger projects.**

Complex procedures that make it difficult to connect to the grid drive up costs and strangle many community wind projects in the crib. The more the interconnection process can be standardized and made predictable, the higher the chances for putting community wind projects on the ground.

At least 37 states have interconnection standards. The Interstate Renewable Energy Council notes that while evolving national standards are overcoming technical interconnection barriers, "many of the difficulties associated with interconnection now lie in the legal and procedural areas. Interconnection standards adopted by different governments are largely disparate." [6]

Net metering, which lets distributed generators deliver surplus power to the grid and receive a retail or near retail rate in return, is in effect in at least 40 states and the District of Columbia. But as of late 2007 only 11 allow installations larger than one MW, smaller than most utility-scale wind turbines. [7]

Rules for both net metering and interconnection vary from state to state, though more are employing templates such as model standards adopted by New Jersey and Colorado which allow up to two MW in net metered installations. A bill setting forth national interconnection and net metering standards would make a great contribution to removing community wind barriers.

**States have moved to fill policy gaps with production incentives and other supports. Minnesota has developed the most successful model in the U.S.**

Minnesota has at least 320 MW of community wind, over 40 percent of the national total, with hundreds more in the works. "Minnesota provides the best example of a state that has implemented a variety of community wind incentives, making it a leader in community wind development in the United States," Farmers Legal Action Group observes. [8] Minnesota has offered production incentives, guaranteed markets, standardized legal agreements, capital support and other assistance. Through this package the state has developed a supportive business infrastructure that has reduced installation and operating costs.

**Federal power authorities and consumer-owned utilities are natural partners to promote wind power in some of the nation's windiest regions.**

In the 1920s and '30s federal power authorities including Western Area Power Administration and Bonneville Power Administration joined consumer-owned utilities to provide affordable power through hydroelectric generation and transmission. This same array of institutions should be at the forefront of developing the greatest emerging new power source, wind. Repurposing federal authorities to promote wind and the range of renewables through transmission upgrades and power purchases could unleash new community and corporate wind development.

**The benefits of locally-owned projects justify an increased priority on community wind.**

Obstacles to community wind, though formidable, are not insurmountable. With smart policies for community wind based on demonstrated success by leading states and nations, community wind can make significant contributions to energy security and reliability, energy price stability, pollution reduction and rural economic revitalization. Community wind makes for more prosperous rural economies, stronger power grids and the growth of wind power overall.

# Introduction
# The Emergence of Community Wind in the U.S.

From a wind turbine spinning above Boston Harbor's Hull Lighthouse, to a field of turbine clusters arrayed on Minnesota's Buffalo Ridge, to a utility-scale wind farm at the east end of the Columbia River Gorge in Washington state, a new model for wind development is emerging – community wind.

***Community wind in its most essential definition is wind development in which local ownership plays a major role.*** It encompasses a broad range of formats, from private partnerships among rural landowners, to projects by consumer-owned utilities, schools and native tribes, to collaborative structures that engage outside organizations but leave local owners with significant returns. While some definitions bound community wind to small or distributed applications, community projects in reality range from single turbine projects measured in kilowatts to wind plants with hundreds of megawatts of capacity.

***Community wind is not necessarily a competitor with utility-scale development by larger corporate players. In fact it can play a strong complementary role that fuels the overall growth of wind power. Community wind:***

- Vastly diversifies the number of people and institutions that can participate in and benefit from wind power development;
- Broadens the investor base and the political base for wind power;
- Can increase community support for siting new wind projects;
- Fills a market niche for smaller projects that can be less attractive to commercial developers or that can fit on smaller footprints and local distribution grids;
- Can strengthen local power distribution grids by putting supply near the load, and,
- Can be a pathway for collaborations between major wind developers and local communities.

Community wind was born in Denmark and Germany and retains a significant share in those wind power leaders, 83 percent and 45 percent respectively, even as corporate development is expanding. [9] But in the U.S. community wind so far is only a bit player. A July 2008 Windustry survey gives community wind 736 megawatts (MW), four percent of the U.S. installed total. [10]

But, notes Susan Williams Sloan of the American Wind Energy Association, "interest in 'community wind' is surging," with utility-scale wind turbines being deployed by a range of local owners. Achieving a target for a 20 percent wind share of U.S. electricity by 2030 is now validated as feasible by a new U.S. Department of Energy study. But that "will take a combination of projects that are large, small and everywhere in between." [11]

In recognition of this, the AWEA has announced creation of a Community Wind Working Group to generate a vision and roadmap to push community-scale development forward through improved policies, business models, collaboration and transmission access.

***Yet community wind faces obstacles that impede its growth in the U.S. including:***

- Higher costs due to a lack of economies of scale for smaller projects;
- Federal tax and financial incentives that cannot be fully utilized by community-scale players;
- Problems interconnecting with power-grids and finding local markets, and,
- Lack of local support infrastructure.

Even in regions of the U.S. with strong wind resource potential these barriers make the economic proposition of community wind difficult and prevent many projects from happening. But several notable state leaders around the U.S. are putting in place smart policies that blow through the barriers. The recognized leader, Minnesota, has demonstrated what policy can do: Minnesota has at least 320 MW of community wind, over 43 percent of the national total, with hundreds more megawatts in the works.

## This Paper

The purpose of this paper is to act as a primer on community wind, based on a survey and synopsis of the best literature in the field. A number of valuable community wind studies, reports and guides have been developed over the past several years. ***This paper seeks to draw together key community wind findings relevant to policymakers and clean energy advocates. It is intended to provide resources and insights to help inform and shape policies for community wind.*** (It is not a guidebook for community wind development, for which excellent resources now exist. [12])

### Community Wind 101:

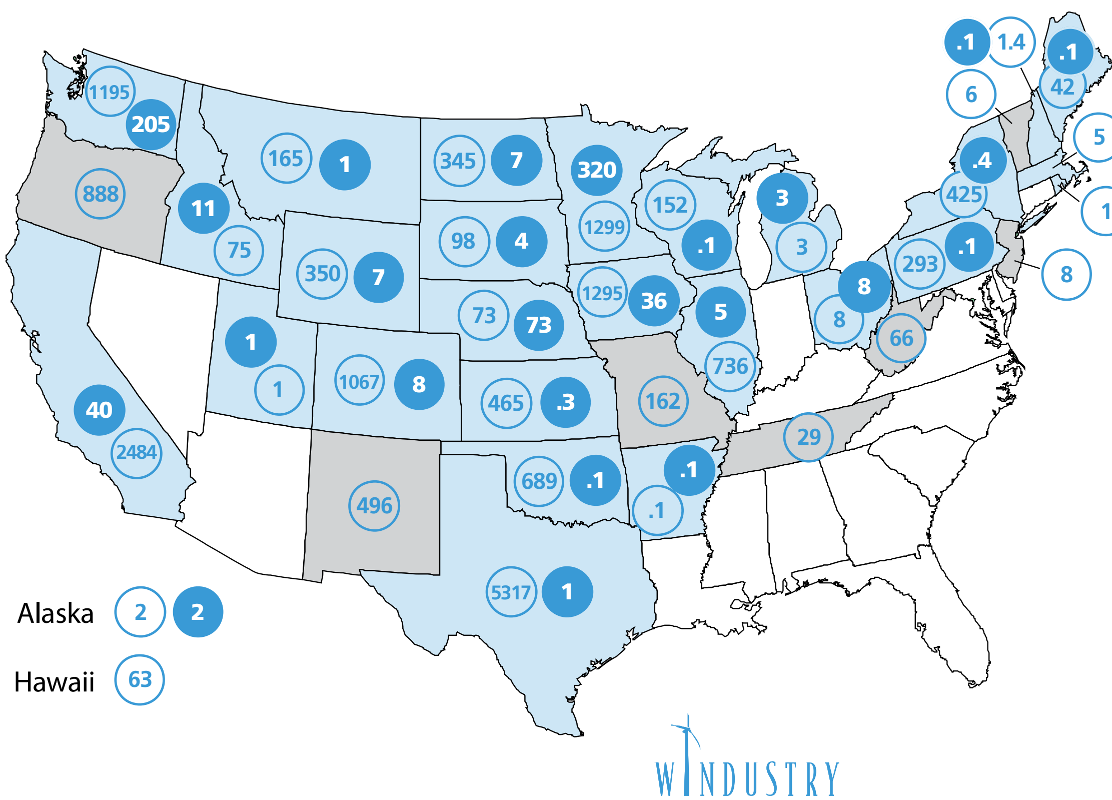
- Looks at some community wind examples;

- Overviews the benefits of wind power in general and community wind in particular for rural communities where wind development centers;
- Cites studies that demonstrate community wind's benefits for the grid and the growth of wind power in general;
- Examines obstacles facing community wind developers, particularly federal tax policies that often prevent people from fully utilizing the most effective policy tool supporting wind power in the U.S., the Production Tax Credit;
- Details effective state and federal policies for growing community wind, with special focus on the Minnesota model, and,
- Looks at ways federal power management authorities and consumer-owned utilities can join to develop wind in some of the gustiest regions of the nation.

Community wind can play a much larger role in the energy picture than it does today. In fact, community wind is a part of a larger trend toward a power grid rich in distributed energy resources that includes generation from solar and biomass, demand response to support the grid, and energy storage. Community wind is a natural complement to these other pieces of the distributed grid, including the expected emergence of plug-in vehicles that exchange power with the grid.

***With smart policies for community wind based on demonstrated success by leading states and nations, community wind can make significant contributions to energy security and reliability, energy price stability, pollution reduction and rural economic revitalization. The goal of this paper is to show how.***

## Installed Community Wind and Wind Capacity in the U.S.




Community Wind States
Wind Farm Only States

275 Community Wind (MW)
895 Total Wind Capacity (MW)

18,281 MW of Wind Installed in the U.S.

736 MW is Community-Owned

July 2008

# The Growth of Community Wind

***Wind power has definitively emerged as a competitive source of electricity in the U.S. and worldwide. So it is not surprising that:***

- 2007 U.S. wind growth of 5,249 MW represented 35 percent of overall U.S. power capacity additions.
- U.S. wind grew 45 percent in 2007 to a total of 16,800 MW. By July 2008 it reached 18,281 MW. [13]

***Ambitious goals are being set for wind.***

- A technical report issued by the U.S. Department of Energy examines a 20 percent wind share by 2030 for more than 300,000 MW of capacity, finding it feasible and affordable. [14]
- The 25x'25 Alliance, led by a diverse group of agricultural, forestry, conservation and environmental interests, aims for a 25 percent share of U.S. energy produced from renewable sources by 2025, with wind occupying a significant share. [15]

While most observers agree that large-scale development on the corporate model will continue as the dominant form in the U.S., ***community wind is already demonstrating its potential to make a far greater contribution than it has. A number of examples and models are emerging in the U.S.*** [16]

## Public Utilities

The **Illinois Rural Electric Cooperative** became the first co-op in Illinois to supply utility-scale wind power. Like many other co-ops, Winchester-based IREC was limited by its power supplier to generating only five percent of its power on its own. That limit helped determine that 1.65 MW was the biggest turbine the co-op could install. It started producing in May 2005 and offsets coal-fired electricity that IREC would otherwise have to purchase. Part of the funding came from Farm Bill Section 9006 (now called the Section 9007 Rural Energy for America Program, or REAP), which supports rural clean energy.

The **Arkansas River Power Authority** in southeastern Colorado draws eight percent of its power from a 7.5 MW project it developed in partnership with a small municipal utility it supplies with power, Lamar Light and Power. The project piggybacked on supply and technical networks created for the nearby 162 MW Colorado Green Project, providing it the economies of scale of the larger project.

The **White Creek Wind Project** on the east end of the Columbia Gorge in Washington state is the largest wind farm initiated by public power agencies. The 205 MW plant was developed by Public Utility Districts in Cowlitz and Klickitat Counties and two smaller co-ops through a nonprofit collaborative known as the Last Mile Electric Co-op. It came on line in late 2007, and could eventually grow to 400 MW, which would make it one of the largest wind farms overall. Energy will go to utility customers. To get around limitations that prevent nontaxable entities from using federal tax incentives vital to wind projects, the utilities have transferred ownership to private investors with an option to buy it back after incentives are exhausted under a "flip" model.[17] (Policy sections below cover the challenge of employing federal tax incentives for community wind and the use of the "flip" model to overcome them.)

## Individual

The **Kas Brothers** signed a traditional lease agreement with a wind developer who sited a wind plant on their Woodstock, Minnesota farm, in 1997. That experience gave brothers Richard and Roger confidence to enter the business themselves. In 2001, teaming up with the same wind developer, they installed two 750 kilowatt (kW) machines on their land, making them America's first farmers with their own utility-scale turbines.

## Landowner Partnership

The **MinWind** partnerships in the wind-rich Buffalo Ridge area around Luverne, Minnesota are viewed as the most prominent example of joint ownership by farmers. Nine LLC partnerships each own wind plants under two MW, in order to remain under a cap to receive a Minnesota production incentive for small wind of 1.5 cents per kilowatt hour (kWh). All ownership is local and 85 percent is set aside for farmers. Equity offerings have been rapidly subscribed, with the first two projects in 2002 drawing $1.1 million from 66 investors in 12 days. In 2004 the next seven rapidly raised $6 million and did not exhaust local appetite – 75 prospective investors were left outside the door. [18]

In a different model, a partnership of 43 farmers around Jackson, Minnesota are the first landowners in the state to develop a commercial-scale wind farm. They took development of the 100-MW **Trimont Wind Farm** up to the point where they won a power supply contract, then leveraged that to bring in corporate developer PPM Energy, now Iberdrola Renewables, to build it. For the company this meant reduced costs and assured local support. The plant came on line in 2005. Not a pure example of local ownership, Trimont is owned by Iberdrola. However, landowners have more potential revenue participation than in a standard project. [19]

Two large Nebraska wind farms under construction are being developed through Community Based Economic Development legislation. Projects developed under the legislation must provide no less than 33 percent of power sales revenues to Nebraska owners. **The Elkhorn Ridge** wind facility, largest in the state, will have 80 MW in capacity when it goes on line later in 2008. Nearby, the 42 MW Crofton Hills wind farm is slated to begin operation in 2009. The power purchaser is Nebraska Public Power District, Nebraska's largest electric utility and a consumer-owned organization providing both wholesale and retail power. Gale Lush, Chairman of the American Corn Growers Foundation, the organization that contracted to develop Crofton Hills, notes, "This locally-owned wind farm model offers Nebraska farmers and landowners the economic structure to deliver another form of competitive, sustainable, renewable energy to Nebraska consumers, without depleting our precious water resources and without using fossil fuels for power generation. This benefits public power, our environment and our rural communities."

## Tribal

The first Native American-owned utility scale turbine spins above the **Rosebud Sioux Reservation** in South Dakota. The 750 kW machine went on line in 2003. [20] The Intertribal Council on Utility Policy views this as the seed for 80 MW in distributed wind across eight reservations on the northern plains.

## Local Government

The West Coast power crisis of 2001 brought power issues to the fore for the Palmdale, California Water District. The district's water treatment plant serves 100,000 residents and treats approximately 9.5 million gallons of wastewater daily. Power reliability and cost are both crucial concerns for the district, so it decided to install wind power at the plant. A 950 kW turbine went on line in August 2004. The installation largely eliminates the need for grid power. When it went on line the turbine was the nation's largest net metered wind power project. Net metering allows a power generator to feed surplus power back to the grid for payment at full or near retail rates. [21]

## Higher Education

The first U.S. higher education institution to harvest the wind blowing across campus is **Carleton College** of Northfield, Minnesota. [22] In 2004 Carleton erected a 1.65 MW turbine capable of average production equaling 40 percent of campus demands. In 2006 nearby St. Olaf College put its own 1.65 MW machine capable of meeting one-third of campus needs into operation. [23]

**Iowa Lakes Community College** in Estherville, Iowa, was faced with a combination of high power costs and great wind resources. To cut costs the college decided to install a wind turbine. That led college officials to a connected opportunity, a need for trained technicians not being filled by other institutions. So the 1.65-MW turbine that went on line in 2005 has become not only a campus power source but the centerpiece of one of the leading wind technician training programs in the U.S. In operation since 2004, the program offers a two-year associate degree covering installation and maintenance.

**Massachusetts Maritime Academy,** the nation's oldest college preparing men and women for careers at sea, is tapping into the power of the wind to generate more than a quarter of campus power needs and reduce power bills more than 27 percent. The Vestas 660 kW machine employs the strong winds that blow over the Buzzards Bay campus at the mouth at Cape Cod Canal. The turbine is also used as an educational resource for students exploring renewable energy as a career. [24]

## Schools

Wind power is helping support public school budgets across the Midwest. In 1997 **Lac qui Parle Valley School** of Madison, Minnesota kicked off school wind development in that state with a 225 kW turbine. By 1999 **Pipestone-Jasper School District** followed up with a 900 kW installation.

At least 10 school districts in Iowa produce wind power. The **Spirit Lake School District** saves over $144,000 each year on power bills with its two turbines. The **Nevada School District** has cut its electrical bills $33,580. The **Forest City District** has saved $55,477 on average since it put a turbine up capable of supplying two-thirds of power use. When the wind is blowing hard the district can save up to $600 each day. [25]

The **Portsmouth Abbey School** in Rhode Island has operated a Vestas 660 kW turbine since March 2006. During the first 12 months total revenues were $222,710, with $129,553 in reduced power purchases, $28,496 for power sent to the grid and $64,661 in renewable energy credits. [26]

# Economic Benefits of Wind

Studies of wind development economics uniformly point to one conclusion: Wind power generates powerful economic benefits for rural areas, and local ownership multiplies those benefits several times.

***Wind developed along standard lines is producing economic gains for rural areas across the nation:***

- Rural landowners are earning $2,000-$10,000 in annual royalties per turbine depending on the level of power production and royalty rate. [27] Each turbine typically requires a half-acre of land, mostly in access roads. Cows might graze and crops grow right next to turbine towers.
- Each 100 MW generates annual property tax payments of $500,000-$1 million. For rural counties, a wind farm represents a fiscal boost that can finance schools and other public services vital to keeping young people in the community and supporting aging rural populations. [28]
- Two to five operations and maintenance jobs are created for each 50-100 MW in capacity, while each megawatt under construction provides 1-2 jobs plus revenues for local businesses. [29] In some areas job creation is exceeding those figures.

Seven utility-scale wind farms with total capacity of 953 MW were brought on line in the windblown interior of the Pacific Northwest in 2005-6. A detailed study verified benefits: [30]

| | Total Benefits | Benefits per MW |
|---|---|---|
| Capital investment | $1.38 billion | $1.45 million |
| New property tax revenues | $5.79-$6.75 million/yr. | $6,083-$7,079/yr. |
| Landowner royalties | $1.98-$3.28 million/yr. | $2,073-$3,283/yr. |
| Construction jobs | 1,172-1,323 | 1.23-1.39 |
| Permanent O&M | 66-72 | 0.07-0.08 |

Researchers noted the impacts on Sherman County, Oregon, previously a "one crop" area relying on dryland wheat farming and last in Oregon per capita income. Wind projects totaling 99 MW increased county tax revenues by around one-third to $1,071,000 and brought nine new permanent jobs to a population of 1,900. While such numbers would be lost in the noise of a metropolitan area, in lightly populated rural counties they represent profound new opportunities to improve economics and overall quality of life.

A study by Northwest Economic Associates took a look at three wind farms in Minnesota, Texas and Oregon and found "the annual income received by households in all of the areas was a significant source of household income and had a significant total effect on local economies. In all cases, the cost of foregone opportunities from farming and livestock grazing was small compared to the revenues obtained from leases for windpower. Tax effects, particularly property taxes that support local entities, were important in all cases . . . there is a redistribution of the local tax burden from residents to outside owners. This, in effect, shows up as an increase in household income, which can directly affect the local economy." [31]

***Wind development creates new markets for existing regional industries,*** by supplying components for wind turbines. Local manufacturers of ball bearings, steel and fiberglass products, wiring, concrete, and many other goods are now able to sell to regional turbine assemblers. This wind power supply chain, quite similar to that of automobiles, has the potential to recapture manufacturing jobs being lost to overseas competitors. [32]

"Constructing a large windpower project with several dozen turbines requires the services of multiple businesses and scores of skilled and unskilled workers, as well as the purchase of equipment and material, such as turbines, towers, asphalt, cement, concrete and electrical cables," the U.S. Government Accountability Office notes. "In these activities, windpower project developers and operators have directly benefited rural communities by hiring local people and purchasing locally some of the goods and services needed to construct and operate a project . . . Furthermore, businesses and individuals directly employed by the wind project are likely to spend part of their income at local businesses . . ." [33]

***Wind development can draw new businesses to an area.*** Wind turbines are growing increasingly large so manufacturers are locating new factories close to markets. Iowa, for example, has attracted three turbine manufacturers, Clipper, Acciona and Siemens, thanks to strong public policy commitment to wind energy. Wind blade maker LM Glasfiber is located in wind-rich North Dakota and Suzlon opened a blade factory in Pipestone, Minnesota in close proximity to the windy Buffalo Ridge. Spanish turbine manufacturer Gamesa has centered its U.S. manufacturing operations in Pennsylvania. Maintenance and service companies are emerging in the regions where a good number of turbines are installed. Energy Maintenance Services based in Gary, South Dakota is an example.

# Community Wind's Economic Benefits

Corporate wind development models are transforming local economies and providing tremendous benefits in windy areas across the U.S. ***Community wind tends to be developed at a smaller scale, but MW for MW the local economic benefits can be several times as great.***

A National Renewable Energy Laboratory (NREL) study for the U.S. Government Accountability Office compared economic impacts of one 40 MW plant owned by outside investors to twenty 2 MW plants owned locally: [34]

| | Outside | Local |
|---|---|---|
| Local Income | $1.3 million | $4 million |
| Job Creation | 18 | 41 |

Tom Wind, an Iowa-based community wind expert, made a similar comparison and found annual benefits on a per MW basis: [35]

| | Large Wind/ Outside Owners | Small Wind/ Local Owners |
|---|---|---|
| Stay in Community | $12,220 | $65,900 |
| Stay in State | $5,100 | $100,300 |
| Leave the State | $148,000 | $21,300 |

An EcoNorthwest study modeled direct and indirect economic impacts of small-scale wind development projects in rural Washington state ranging from 750 kW to nine MW. While construction phase benefits were similar, community wind shot ahead during operations. On a per MW basis annually:

- Impact of power sales under the community model was $161,200, 16 percent higher than under corporate ownership, because "revenue from the power sales is assumed to flow into the county and result in an increase in local spending by wind plant owners." [36]
- Wage impacts were $49,500, 42 percent higher.
- Business income impacts were $4,900, 53 percent higher.
- State and local tax revenue impacts were $17,000, eight percent higher. [37]

University of Minnesota researchers compared direct and indirect local economic benefits for corporate and community operations of a 10.5 MW wind farm in Big Stone County, Minnesota. [38] They found that annually:

- The corporate model provides $249,388 and 4.3 jobs.
- The community model provides $1,259,188 and 14.5 jobs at five percent capital cost.
- The community model provides $639,739 and 8.2 jobs when the capital cost is eight percent (the larger financing burden reduces local cash flow).

They conclude, "An increasing body of empirical evidence indicates that corporate and community wind development structures are not equal in terms of their local economic impacts, not limited to the owners themselves. In particular, ***mounting evidence points to the idea that community wind has greater economic impacts on local economies during the operational phase of the project, due to local spending multiplier effects associated with the higher income streams."*** [39]

The Union of Concerned Scientists (UCS) has modeled wind power benefits with a 20 percent U.S. electric market share for new renewable energy sources by 2020. UCS finds the wind power portion would be 32,000- 48,000 MW added beyond the 2006 level. Under the corporate model rural landowners would cumulatively gain $475 million-$562 million in royalties. [40] Community wind studies indicate that direct landowner revenues would be several times greater under local ownership, as would local economic multiplier effects.

# Pioneering Wind with Local Ownership

"The United States possesses abundant wind resources," the U.S. Department of Energy notes in its *20% Wind Energy by 2030* study. ***"The nation has more than 8,000 GW (gigawatts) of available land-based wind resources that industry estimates can be captured economically."*** [41] A 20 percent wind share of U.S. electricity would require that 300 GW be on-line by 2030.

Today the market is dominated by major wind developers such as Iberdrola, FPL and Horizon who are putting up large wind farms in prime wind areas. These big developers have the financial, logistical, and technical sophistication needed to deliver large amounts of wind power at low cost, which we will need to fight global warming. ***Community wind models have potential to complement corporate development and accelerate wind growth. Community wind brings a more diverse set of players, places and wind resources into the picture.*** Individual farmers, and local institutions such as schools, towns, counties, consumer-owned utilities and tribes can bring their own assets to the table, both financial and political.

"Community wind projects tap into a latent and potentially lower-cost source of capital to fund utility scale wind development," a group of leading community wind experts reported to the Energy Trust of Oregon (ETO). "Community-based investors may settle for a lower return on equity than commercial investors would be willing to accept, thereby improving project economics."

They add, "With local investment dollars at stake, community wind projects may benefit from increased community support (as the Danes say, 'your own pigs don't stink'), which might translate into a smoother permitting process relative to commercially-owned projects." [42]

Wind power coming to a community represents a big change. The prospect of wind installations owned by non-local companies has stirred concerns in some locations. Smaller projects owned by neighbors provide familiarity and experience that can ease the way for further wind development on all scales.

***"Today community support for local wind projects is usually very high once the projects are installed,"*** ETO says. [43]

A *Distributed Wind Power Assessment* done for the National Wind Coordinating Committee notes, "Local financial participation is key to public acceptance and the largest possible market penetration because it enables benefits to accrue to people who bear the localized costs of wind power, according to the majority of European experts interviewed. These experts report that local public perceptions are usually favorable if financial participation is present and often unfavorable when it is not." [44]

Massachusetts launched the Community Wind Collaborative partly to build public support for wind power in an area that has seen little development.

"The collaborative was conceived out of the sharp contrast between the highly politicized debate over the proposed 420 MW offshore Cape Wind Project and the tremendous community support for Hull Municipal Light's single 660 kW turbine on the rim of Boston Harbor," writes Mark Bolinger of Lawrence Berkeley National Laboratory. The collaborative was created "with a goal of not only increasing the capacity of wind power in the state, but at the same time nurturing a positive perception of wind power throughout local communities statewide." [45]

Since community wind projects tend to be small they might also be able to profitably tap local wind pockets that would not justify a corporate-scale wind farm. And community wind can act in a pioneering role for larger-scale community and corporate development.

"A small-scale community wind project can be a useful tool to gauge whether a site has potential for future expansion," notes ETO. "A successful community wind project can be a launch pad for streamlined future expansion of wind development on a given site. The ability to rapidly scale up a site from a few turbines to several hundred is valuable in today's political environment where policies facilitating wind development change dramatically from year to year." [46]

# The Power of Geographic Diversity

Wind power production varying with wind speed and availability is a fact of nature and engineering. ***Interconnecting wind projects with greater geographic diversity enhances wind energy production since it increases the probability that wind energy will be generated in different locations at a given point in time.*** This is one key finding of a Minnesota Legislature-commissioned study completed in 2006 to examine the feasibility of providing up to 25 percent of the state's electricity needs with wind energy.

"This study is groundbreaking in its examination of the highest level of wind energy penetration ever undertaken in an authoritative U.S. power system study," Utility Wind Integration Group Executive Director J. Charles Smith observed. [47]

The study concluded that ***25 percent wind "can be reliably accommodated" with integration costs of less than one-half cent per kilowatt hour.*** [48] Key findings are:

- ". . . a progressive increase in the distribution of wind production, utilizing four widely spaced generation areas, substantially reduces the hourly frequency when little or no power was being produced. . ."
- "As more wind energy is added, the production cost and load payments decline. This is due to the displacement of conventional generation and the resulting reduction in variable (fuel) costs."
- One difficulty faced by wind operators is managing sharp increases in power production known as ramps that happen when wind suddenly picks up. ". . . a progressive increase in the distribution of wind production had a dramatic effect on reducing the frequency of very large ramp rates . . . to values near zero for greatest degrees of geographic dispersion."
- ". . . forecasts for the ensemble of sites were substantially more accurate than for a single site."
- "The expanse of the wind generation scenario, covering Minnesota and the eastern parts of North and South Dakota, provides for substantial 'smoothing' of wind generation variations. . . the number of hours at either very high or very low production are reduced, allowing the aggregate wind generation to behave as a more stable supply of electric energy. . . . The aggregate flexibility of the units on line during any hour is adequate for compensating most of the changes in wind generation." [37]

"Wind integration studies conducted over the last two or three years have contributed important new insights relative to the impacts of wind's variability and uncertainty on system operating costs and electrical integrity," a group of integration experts recently wrote in *IEEE Power & Energy*. "First, ***several investigations of truly high penetrations of wind (up to 25 percent energy and 35 percent capacity) have concluded that the power system can handle these high penetrations without compromising system operation.*** These studies have also shown that system-operating-cost impacts need not be significantly higher than results obtained with lower penetrations. . . the value of sharing balancing functions over large regions with a diversity of loads, generators and wind resources has been clearly demonstrated." [49]

A study by U.S. Department of Energy scientists bears this out. "Increasing the size of balancing areas, or collectively sharing the balancing obligation among a group of balancing areas (much as is now done for contingency events with reserve sharing groups), holds the promise of significantly reducing wind integration costs. The 'hockey stick' pattern of dramatically increasing wind integration cost above some threshold wind penetration may not be as pronounced as expected." [50]

# Modernizing the Grid

***Wind energy is a key element in the deployment of a modernized power grid rich in distributed energy resources.*** A number of initiatives are underway to accomplish this. Nationally the U.S. Department of Energy GridWise Program and GridWise Alliance, a related public-private partnership, are joined to accelerate development of a smart grid that employs digital technologies to link distributed resources. [51] Recently Xcel Energy announced it would stage the largest, concentrated deployment of these technologies in the U.S. to make Boulder, Colorado a "Smart Grid City." [52]

***Accessing wind energy resources will require modernizing and expanding transmission systems to carry power from remote windy areas to cities.*** Renewable Energy Zones are under development to foster this process. Texas grid operator ERCOT and governors of 11 western states are conducting studies to identify wind opportunities and transmission needed to realize them. [53] The U.S. Department of Energy is conducting transmission studies ordered by the Energy Policy Act of 2005 to determine where action is needed to overcome congestion. [54]

University of Minnesota analysts C. Forde Runge and Douglas G. Tiffany make an additional proposal. "In the same way that targets have been developed by states with respect to renewable energy, tax incentives can be developed to reward investment in transmission assets that carry targeted percentages of renewable power." [55]

Wind power development at all scales will benefit from improved transmission. In some areas where transmission capacity is limited, smaller-scale community wind installations can be readily interconnected.

One study notes, "Small community wind projects may be able to utilize existing infrastructure (e.g. roads, distribution lines, etc.), and if interconnected directly to the distribution grid may avoid the need to build a substation. These factors could offset some or all of any diseconomies of scale associated with smaller projects." [56]

The writers point out that while commercial wind developers have already locked down the bulk of sites proximate to high-voltage transmission, "they have in many cases ignored similarly windy sites served by 69 or 34.5 kV distribution lines. Such sites can be perfectly suitable for small (several MW) community wind projects. . . " [57]

This is not to say that interconnecting community wind does not pose challenges. "Improper interconnection has the potential to cause power quality issues while successful interconnections can serve to strengthen the local grid," ETO says. "A large wind turbine interconnected to a distribution line serving just a few customers can lead to flickering lights and, for example, frequent computer crashes. A properly sited community wind project can help to relieve an overloaded sub-transmission line by providing power to the load and supporting the line voltage." [58]

In Europe the widespread use of three-phase lines in local distribution systems has allowed relatively easy interconnection of community wind plants. These highly networked distribution systems diminish power quality issues. Unfortunately most of rural America is served by single-phase lines that do not easily absorb new generators rated above 20 kilowatts, many times smaller than commercial turbines, and so will require upgrades to interconnect substantial community wind projects in some remote locations.

"You can't connect a midsize or large wind turbine to a single-phase line," notes distributed wind integration expert Tom Wind, one of the assessment's principal authors. "If the substation is within a couple of miles from the proposed wind turbine site, it may be economically feasible to upgrade an existing nearby single phase line to three-phase at $40,000 to $60,000 per mile that goes back to the substation. The economics depends on a number of factors, including wind speed, power purchase agreement payment levels and turbine costs."

The existing grid can still carry significant amounts of community wind. The authors of the *Distributed Wind Power Assessment* note, "distributed wind generation could be limited to areas with existing three-phase lines within a few miles of the substation and still achieve substantial penetration in certain rural areas of the United States." [59]

***With national priorities for clean and secure energy, grid modernization might focus on concentrated upgrades in rural areas similar to Boulder Smart Grid City's urban initiative.*** One of the goals of Smart Grid City is to test how customer-end demand response systems can adjust load to track with available wind power. Meshed rural smart grid initiatives focused on areas with good wind potential but poor infrastructure are a sensible complement.

***Researchers raise related possibilities with the emergence of plug-in hybrid vehicles that can charge with grid power as well as on-board systems.*** A smart grid connected to smart vehicles could direct charging to times when surplus power including wind is available. At times when energy is in higher demand, parked plug-ins could supply energy back to the grid, acting as an energy storage resource for the grid. [60] Plug-ins are viewed as a natural partner for systems with large amounts of wind energy, since in many regions wind output tends to be highest at night when cars are parked.

"Plug-in hybrid and other electric vehicles are especially intriguing because they would be charged primarily during low-load nighttime periods," says the *IEEE Power and Energy* wind integration piece.

# Making Community Wind Happen: Overcoming Obstacles

Community wind produces superior economic benefits for rural areas, and has significant potential to promote the overall growth of wind power. So why is it not more common? This section discusses the obstacles facing community wind developers, and how smart policies are helping them overcome barriers and put locally owned wind projects on the ground.

***A good place to start is to inventory the practical challenges prospective community wind owners face even before construction starts:***

- Develop basic agreements to create a local investment group including securities registration.
- Determine the level of financial incentives available to the project.
- Validate whether the prospective site sustains wind speeds high enough and consistent enough to justify investing in wind power.
- Commission an environmental impact statement to assure that turbines will not cause unacceptable impacts.
- Obtain permits for zoning, construction and access road building.
- Strike an interconnection agreement with the local utility, and possibly transmission agencies.
- Find a power customer and sign a Power Purchase Agreement.
- Secure financing at a level that provides acceptable returns on the project.
- Secure construction services and turbines.

A two MW project with eventual costs of $4 million might require expenditures in the area of $200,000 even before it is certain the resource can be developed and marketed, and then that much again to complete agreements. This is all before construction phase. The community wind developer must also secure turbines, towers and transformers, starting from a disadvantage in a market where manufacturers are having a tough time keeping up with demand and prefer larger orders and customers. Deposits up to 20 percent might be required for turbines, and long lead times can be expected. [61]

***High transaction costs and related diseconomies of smaller scale pose significant obstacles.*** Lawrence Berkeley National Laboratory (LBNL) analysis of 28 wind projects indicates levelized costs per MW for a 9 MW installation will be six percent higher than for a comparable 50 MW project and 36 percent above a 200 MW wind farm. [62]

Notes the Farmers Legal Action Group (FLAG), ". . . successfully executing a community wind project can be difficult. It may not always be possible to take full advantage of the economies of scale associated with very large commercial projects, and organizing many smaller investors can create a greater administrative burden. Indeed, most community wind projects are, almost by definition, first-time projects for which significant capacity building is necessary." [63]

# Community Wind's Taxing Difficulties

***On top of these hurdles is piled the biggest dealbreaker of all, the inability of many community wind investors to use the prime wind policy support tools in the U.S.:***

- The **Production Tax Credit** which now provides 2.1 cents per kilowatt hour generated for the first 10 years of operation.
- **Accelerated depreciation** which allows assets to be written off in five rather than 20 years.

Federal tax incentives for wind are an effort to level the playing field for renewable resources, and realize their broader societal values for rural development, cleaner air and energy security. General Electric, one of the largest wind turbine manufacturers, maintains that the PTC is a good deal for taxpayers. GE Energy Financial Services calculates that on a net present value [64] basis wind farms built in 2007 will generate $2.75 million in federal taxes, $250 million more than the cash outflow from the PTC to those farms. [65]

"The Federal Production Tax Credit and favorable depreciation rules are the two key economic drivers for utility-scale wind power developments in the United States," the Environmental Law and Policy Center (ELPC) notes. "The value of these two tax benefits, if fully utilized, represents over 60 percent of the total financial return of a wind project. The PTC alone is worth between $47,000-55,000 (after tax) per year per installed MW of wind generation or as much as 40 percent of the installed project cost using a net present value calculation." [66]

LBNL community wind experts write, ". . . capturing these two incentives is vitally important to the economic viability of any wind power project, and in particular farmer-owned projects, which tend to be too small to benefit from economies of scale." [67]

***Federal tax credits and favorable treatment reflect recognition of wind power's upfront capital disadvantages.*** For wind power the cost of the fuel is free, but making use of the fuel requires an upfront capital investment that can be higher than for comparable fossil-fired generation. Financiers generally look for payment of debt in the first 10 years, and must be assured of cash flow sufficient to meet payments. So all wind projects must carry a heavy financial burden in early years, with community wind facing prospectively higher capital costs to reflect relative risks. The Big Stone County, Minnesota study cited previously (in the economic benefits section) shows how three percent added to interest rates can slice local economic benefits in half.

"A wind project is unlikely to produce significant net income in the first years of operation, when revenue will be used to pay down debt," FLAG explains. "Therefore, a wind project investor will need significant taxable income from other sources to fully utilize the available PTC and to generate a return on the investment . . . to be most useful, the credit needs to be taken advantage of in the early years of the wind project's operation to actually reduce the cost of wind generation – often by about 40 percent – and therefore make the project profitable." [68]

***The key difficulty facing prospective community wind developers is lack of tax liability sufficient to take full advantage of federal tax incentives for wind power, which can make projects economically infeasible.***

"A single two megawatt wind turbine generates around $125,000 in tax credits each year, but only if the investor owes that much in taxes," explains John Farrell of the New Rules Project. "Not many Americans owe $125,000 a year in taxes; that's 2.5 times the median household income." [69]

Community wind investors who are not project operators have further obstacles to overcome. Their income from the project is considered "passive," and tax credits earned this way can only count against "passive" income. This is defined as, "Earnings an individual derives from a rental property, limited partnership or other enterprise in which he or she is involved . . . Passive income does not include earnings from wages or active business participation, nor does it include income from dividends, interest, or capital gains." [70]

Since the wind installation is not making much in early years, owners will need substantial passive income from other investments to fully use the credit. These limitations significantly narrow the field of prospective investors who will be able to fully employ PTC benefits.

The PTC is also limited to power fed into the grid rather than used on-site, which eliminates its usefulness for customers using wind turbines for self-generation.

***Innovative development models seek to overcome PTC limitations:***

- LLC models such as MinWind create partnerships to spread ownership across a large base so some owners can use at least part of the credits.
- As mentioned in this report, a format used in Minnesota and elsewhere for community projects is the "flip" structure, under which landowners financially own only around one percent of their project for early years when the PTC is effective. Investment capital comes from a corporate partner who can use the tax credit. The local owner gains a small management fee. When the corporate partner achieves their target rate of return, the allocation of profits "flips" so that a majority of the profits then go to the local owner. After the flip, the community owner must assume O&M costs which are significant but predictable.

# Overcoming Federal Policy Barriers

Historically the federal government has offered two programs aimed at providing PTC-like incentives to non-taxable entities: the Renewable Energy Production Incentive and Clean Renewable Energy Bonds. But these programs have typically been underfunded compared to demand. They are also not available for projects directly owned by farmers and other private investors.

Other federal financial support for renewables comes in the form of grants, loans and loan guarantees. The 2002 Farm Bill's Section 9006 financing was funded at around $23 million per year. Expenditures of $76 million from 2003-2005 leveraged nearly $800 million in capital investments for rural clean energy projects. [71] Now called the Section 9007 Rural Energy for America Program (REAP) under the 2008 Farm Bill, the program will receive $255 million in required funding of over four years. This is effectively almost three times the annual funding of its predecessor. [72] Even then, REAP funding is expected to fall far short of demand.

In addition, notes Environmental Law and Policy Center, PTC rules reduce the value of the tax credit by up to 50 percent of the REAP grant's value. And since REAP grants already are taxable to the grant recipient (or reduce the project's depreciable basis), grant recipients ultimately lose up to 80 percent of the value of the REAP grant. ELPC suggests that Congress amend Section 45 of the Internal Revenue Code to exempt REAP loans and grants from PTC offsets. LBNL's Mark Bolinger suggests potential fixes including allowing REAP funds to defray operational expenses, and awarding the funds as production payments similar to the PTC. [73]

Another Farm Bill provision, Section 6202 Value-Added Agricultural Producer Market Development Grants, provides $15 million in mandatory funding and up to $40 million in discretionary funding. This can provide planning and working capital for setting up community wind projects. [74] Financial support is also available through several USDA Rural Business Cooperative Service and Small Business Administration programs. [75] Applications exceed funding, sometimes quite significantly.

These financial programs broadly support renewable energy. Congress might consider a REAP carve-out or REAP-like program that targets grants, loans and loan guarantees to community wind installations.

***A higher and more certain level of funding for all these financial programs will be a boon to community wind. But fixing the PTC to make it useful for a broader range of investors and projects would make an even greater contribution. Providing targeted incentives specifically for community wind installations is a complementary option***. A number of ideas are emerging. The Center for American Progress and the Institute for Local Self-Reliance suggest three:

- Establish a two-tiered producer payment that creates a separate track for community-owned projects with greater benefits in the range of a 2.5 cents/kWh.
- Provide producer payments for on-site power generation.
- Allow tax credits to be taken against ordinary "active" income.

John Farrell calls out a proposal by Rep. Tim Walz (D-Minnesota) embodied in H.R. 2691 to allow investors to claim up to $40,000 in tax credits against ordinary income tax liability. He also suggests simplifying Securities and Exchange Commission and state stock registration rules for shared ownership of renewable energy plants.

Farrell envisions community turbines owned by neighboring households that use the power. "The bulk of renewable energy development is still ahead of us, as is the potential for a country of self-reliant owners of renewable energy." [76] He notes that a two MW project owned by 200 investors could spread its $125,000 annual tax benefits in $625 chunks, well within the limits of the Walz bill. Benefits would be potentially available to the one-third of American taxpayers who itemize their returns.

A similar approach was taken in the Wind Power Tax Incentives Act of 2005, introduced by Senators Tom Harkin (D-Iowa) Richard Durbin (D-Illinois) Mark Dayton (D-Minnesota) and Frank Lautenberg (D-New Jersey.) The bill proposed to allow individuals to deduct the PTC from all forms of income. It also proposed to let members of a co-op that owns commercial wind turbines to deduct a portion of resulting co-op Production Tax Credits from their own income. [77]

***Another PTC fix most observers consider vital for steady wind growth in the U.S., both corporate and community, is simply a long-term extension of the existing credit.*** That would provide certainty for long-term planning and growth in the wind industry generally. The on-off switch undermines creation of a full supply chain for wind turbines and equipment in the U.S., because manufacturers are hesitant to invest in plants that suffer downturns anytime the PTC expires. So wind developers have been forced to go overseas to nations where steadier policy environments have built complete supply chains. This is one reason why queues for turbines are long and turbine prices have spiked recently. ***If the U.S. is serious about building its manufacturing presence in wind, it will put a long-term PTC in place.***

# The Feed-In Tariff Option

Some form of production incentive has acted in a crucial role everywhere wind development has prospered, because it provides certainty that enables projects to be financed at favorable rates. The federal PTC is the prime U.S. example. ***Another policy tool central to the successful growth of wind power in Europe is the feed-in tariff, which provides substantial payments for feeding wind energy into the grid.*** Feed-in tariffs are offered by leading wind countries including Germany, Denmark, Spain and 15 other European countries as well as in Washington state and the province of Ontario. [78] Because they do not require tax liability such as the PTC, and because payments are guaranteed and stable, feed-in tariffs are generally regarded as a superior tool to drive community-owned wind.

"Traveling through the Danish countryside, one cannot help but notice the myriad large, utility-scale wind turbines that dot the landscape, either singly or in small clusters of several turbines," notes Mark Bolinger. "This is clearly wind power development on a different scale from what one typically encounters in the United States, where a single wind farm might stretch on for miles and be sited far from load centers. In fact, it is an altogether different type of wind development and ownership model than typically found in the U.S.: most of those Danish wind turbines are owned by one or more local residents, rather than by commercial investors, independent power producers or utilities. And Denmark is not unique in this regard; 'community wind power' has also played a large role in Germany, Sweden, and, to a lesser extent, the Netherlands and the United Kingdom." [79]

Wind expert Paul Gipe notes that the European pattern is different "because homeowners, farmers and investment groups can quickly, easily, and at little cost connect to the grid and sell their electricity for a profit through a system offering fixed prices for a fixed period of time." [80]

A pioneering feed-in arrangement for North America was instituted in Ontario province in November 2006. By April 2008 the Standard Offer Program spurred around 1,300 MW in planned new renewables development. But, notes Gipe, "Practically no community renewables have been contracted . . . The program has failed to encourage significant new development of community renewables." [81]

So the Ontario Sustainable Energy Association, which led the push for the original program, has proposed an Advanced Renewable Tariffs system that more fully mirrors the successful European model. Under the proposal:

- Tariffs would increase from 11 cents to 14.8 cents/kWh (nearly identical to Germany's revised tariff for 2009) with higher rates in less windy areas to diversify development, and an increase in inflation adjustment from 20 to 60 percent;
- The program would not be capped or limited;
- Project size would no longer be limited to 10 MW, and,
- Priority access to the grid would be guaranteed with simplified interconnection procedures. [82]

In the U.S. Washington state passed a far more limited feed-in law in 2006. In early 2008 Minnesota legislators introduced a bill to bring a system of Advanced Renewable Tariffs to the state. Minnesota's proposal would emulate the German and French feed-in systems with tariffs for a host of technologies. Feed-in legislation has also been proposed in Illinois, Michigan, California, Hawaii and Rhode Island.

In late June Rep. Jay Inslee (D-Washington) led introduction of perhaps the first feed-in proposal to reach Congress, the Renewable Energy Jobs and Security Act, H.R. 6401, to:

- Guarantee interconnection to the grid and long-term, fixed payments for renewable projects up to 20 MW, and,
- Minimize the impact on utilities and ratepayers through regional cost-sharing.

"To reap the impressive clean-energy technology adoption rates and economic growth seen in Germany, we need a national standard that provides real investment security for U.S. clean-energy industries," Inslee says." [83]

# Interconnecting Community Wind to the Grid

As above sections underscore, high transaction and upfront costs strangle many community wind projects in the crib. Among challenges driving up those costs are complex procedures that make it difficult to connect to the grid. ***The more the interconnection process can be standardized and made predictable, the higher the chances for putting community wind projects on the ground.***

"Many policymakers have recognized that the need to facilitate the interconnection of clean, customer-sited DG (distributed generation) systems to the electric grid is long past due," the Interstate Renewable Energy Council notes. IREC adds that development of standards including IEEE 1547 and UL 1741 have resolved many of the technical issues associated with DG interconnection. "The value of national codes and standards to the interconnection process is priceless. Without standardized national documents, DG equipment manufacturers would be faced with the nightmare of developing separate devices and protection equipment to satisfy utility interconnection safety requirements." [84]

IREC says, "many of the difficulties associated with interconnection now lie in the legal and procedural areas. Interconnection standards adopted by different governments are largely disparate . . . If not structured properly, utility tariffs, rates and fees, may present major barriers to interconnection."

At least 37 states have adopted interconnection standards. [85] Federal initiatives are pushing states toward standardized interconnection. Federal Energy Regulatory Commission Order 2006 Small Generator Interconnection Procedures standardizes the transmission access process for installations 20 MW and under. The Energy Policy Act of 2005 requires both investor-owned and consumer-owned utilities to consider standards for interconnection and net metering, an arrangement under which generators of a limited size are guaranteed grid access and retail rates of payment.

Net metering is in effect in at least 40 states and the District of Columbia. But as of late 2007 only 11 allow installations larger than one MW, which is smaller than most utility-scale wind turbines. [86] Rules for both net metering and interconnection vary from state to state, though more are employing templates such as the FERC rule or model standards adopted by New Jersey and Colorado. IREC offers detailed guidelines in its *Connecting to the Grid: A Guide to Distributed Generation Interconnection Issues*. [87]

***A uniform national law on net metering and interconnection that applies to utilities across the board would open the doors to community wind and other forms of distributed generation by streamlining the process.*** This should include a national standard that allows community wind developers net metering access for utility-scale installations. The two MW cap set by New Jersey and Colorado provides a good guideline. Another innovation, "virtual net metering," would allow customers to join together to own a wind turbine, and subtract the production from their own bills.

# State Leaders in Community Wind: The Minnesota Model

"Experience with community wind power development in both Europe and the United States demonstrates that community wind is possible if the right combination of policies and conditions exist," wind experts write for Energy Trust of Oregon. "Above all, revenue certainty is paramount to attracting community wind investors." They add, ". . . specific *state* policies that *differentially* support community wind will be necessary to drive this development." Perhaps the most important policy lesson from both sides of the Atlantic is "that community wind has thrived wherever there are long-term, stable policies that enable local investors to earn a reasonable rate of return while incurring minimum transaction costs." [88]

A number of states are taking notable initiative to fill in policy support gaps for community wind, to provide assurance of returns that catalyzes local investment. Commonly cited as models are Wisconsin, Iowa, Illinois, Nebraska, Massachusetts, New York, Oregon and Colorado. Excellent surveys of state actions have been done by LBNL and FLAG. [89] They point to one state that stands above all the rest for putting together a comprehensive set of policies to build the community wind base, Minnesota. With 1,299 MW in wind capacity, Minnesota is the nation's third largest wind state overall. Of those at least 320 MW are under community ownership. [90]

***"Minnesota provides the best example of a state that has implemented a variety of community wind incentives, making it a leader in community wind development in the United States,"*** FLAG observes. [91]

"A combination of favorable state policies specifically targeting 'small' wind projects, a good wind resource, a largely rural agrarian population, motivated local wind developers, and active and well-organized advocacy groups have made Minnesota both the birthplace and current hotbed of community wind power in the United States," comments LBNL's Bolinger. [92]

This section overviews the Minnesota experience as a model for other states as well as federal policy.

## Production Incentives

Minnesota drove its first 200 MW of community wind with a 1.5 cents/kWh production incentive paid to projects capped at two MW over their first 10 years. In 2005 Minnesota enacted Community Based Energy Development (C-BED) tariffs for locally owned wind installations. It required utilities to offer a power purchase rate not more than net present value of 2.7 cents/kWh over a 20-year project life, with higher payments over the first 10 years. This was meant to cover the early years when owners must pay down the debt.

"In other words," says Windustry, "the sooner the project can get its hands on the money, the more it's worth. The increased value of the high payments early on are enough to outweigh the lower payments in the second half of the contract." [93]

Windustry's Lisa Daniels explains, "The net present value 2.7 cents/kWh is important because it means people could negotiate a 20-year contract that would pay something like 5.4 cents/kWh the first 10 years and 4.4 cents/kWh for the second 10 years and it all would equal less than net present value 2.7 cents depending on the discount rate the utility used."

But C-BED so far has not reached expectations, supporting only one community wind project to date. Failure to set a minimum power rate when the legislation was revamped in 2007, plus difficulty in obtaining wind turbines in the midst of the wind boom, have underminded C-BED effectiveness. If Minnesota passes proposed Renewable Energy Payments feed-law legislation, if could supplant C-BED, Daniels says.

## Guaranteed Market

Renewable Energy Standards passed by states including California, Texas and New York are regarded as the prime drivers for wind power growth in the U.S. [94] Minnesota takes its standard a step further by carving out shares for community wind. Leading utility Xcel Energy is required to develop 1,125 MW of wind by 2010, with 160 MW to come from projects of two MW and under. Responding to a non-binding goal set by Gov. Tim Pawlenty for 800 MW of community wind by 2010, Xcel says it will seek to line up 500 MW under C-BED tariffs by then. Minnesota's utility resource planning rules provide an overall favorable framework. They target meeting 50-75 percent of demand growth through renewables and efficiency, and bar new non-renewable sources that do not meet "least-cost" rules including environmental impacts. [95]

## Standardized Utility Agreements or Standard Contracts

Negotiating interconnection and payment agreements on a project-by-project basis can sharply increase transaction costs. The federal Public Utility Regulatory Policies Act (PURPA) seeks to overcome these hurdles by requiring utilities to pay qualifying small generators at "avoided cost," what they would pay themselves to gain the power. States can set terms under PURPA superior to national standards. Minnesota sets standard purchase terms for facilities of 10 MW and under based on rates utilities are actually charging that month for both peak and off-peak use. Utilities must also credit generators for money they save on wires and power plants, as well as for emissions avoidance. [96] Facilities of 40 kW and under are covered by net metering requirements.

## Capital Assistance

Many states support clean energy development through special funds. Minnesota has offered a number of tools in this area, including targeted community wind grants, a Renewable Development Fund managed by Xcel, agricultural loan programs and a loan program for school renewables installations.

## Other Assistance

A series of other measures provide models for other states:

- Permitting – One way to reduce transaction costs is to streamline permitting processes. Minnesota issues zoning permits on a state basis for projects larger than 20 MW.
- Tax exemptions – All wind turbines are sales tax exempt.
- Property rights – A wind easement law guarantees wind access and forbids obstructions. To retain the easement the wind installation must start operation within seven years after the easement is signed.

## A Supportive Community Wind Infrastructure

Smaller-scale wind projects can be disadvantaged compared to larger by a lack of supportive institutional infrastructure. A key to reducing community wind costs is development of such infrastructure in geographically concentrated areas. The *Distributed Wind Power Assessment* provides an inventory, "resource assessment, project development, wind technology, bulk purchases, financing, and operations and maintenance. Without these, capital and O&M costs for most distributed projects are likely to remain well above those for larger farms." [97]

Concentrated policy support for community wind has generated a dense network of professional services and suppliers in Minnesota, note wind experts who reported to Energy Trust of Oregon. ". . . as more and more community wind projects are built, development costs are also declining, due to the emergence of a local network of contractors experienced in wind power project construction, as well as increasing developer experience in managing the development process. This experience, along with that of community wind in Europe, highlights the importance of a long-term policy focus that will allow the emergence of a development infrastructure to cost-effectively support community wind projects." [98]

Lisa Daniels of Windustry says small community wind projects in Minnesota and Iowa generally cost about the same per MW of installed capacity as commercial projects of 10-20 MW.

# The Role of Federal Power Authorities and Consumer-owned Utilities

***Two federal power authorities that market hydropower from Western and Midwestern federal dams and their consumer-owned utility customers could have special roles in community wind development.*** Those two authorities, Bonneville Power Administration (BPA) and Western Area Power Authority market federal hydro power to "preference right customers," notably the consumer-owned utilities that serve much of the rural landscape of the Midwest and West, as well as native tribes and other federal agencies. The half of the continental U.S. served by these U.S. Department of Energy entities boasts most of the nation's land-based wind power potential. [99]

In the 1920s and '30s federal power authorities joined with rural electric co-ops and public utility districts to light up rural areas with affordable power. This same array of federal and local institutions can be at the forefront of developing the greatest emerging new power source, wind. Much of the wind resource is located in rural counties served by co-ops and PUDs, so their participation as engaged and enthusiastic partners in wind development is vital. Innovative public utilities such as Illinois Rural Electric Cooperative, Great River Generation and Transmission Cooperative, Delta-Montrose Rural Electric Cooperative and Lamar Power & Light are already joining in partnerships to develop renewable resources in their service areas. In fact, around 150 co-ops already own wind turbines or buy wind power. [100]

Co-ops are advancing this development with creation of the National Renewables Cooperative Organization (NRCO) in March 2008. NRCO will enable generation & transmission and distribution co-ops to join in wind and other clean energy projects, pooling resources and expertise and sharing access to good sites. By mid-June 2008 24 co-ops representing 23 million members in 26 states had joined NRCO.

National Rural Electric Cooperative Association (NRECA) CEO Glenn English explains the drive behind NRCO. "Since it has become increasingly difficult to build new baseload generation, electric cooperatives recognized we must produce as much power as is technologically and economically possible from renewable sources." [101]

Another effort in the same realm is the Public Renewables Partnership, which includes NRECA, the American Public Power Association and several U.S. Department of Energy agencies. PRP brings together renewable energy stakeholders around research and study efforts to ramp up development by consumer-owned utilities, native tribes and irrigation districts. This includes resource evaluation, market and portfolio analysis, strategic planning and resource planning. [102]

Both BPA and Western have been key players in providing transmission to knit together far-flung power resources and loads of their vast territories, often in partnership with other transmission providers. They can bridge the divide between consumer-owned utilities and investor-owned utilities, which often see their worlds in contrasting rather than cooperative terms. ***As federal agencies, they can bring national policy decisions to bear on regional and local development needs and provide expertise, funds and manpower to transmission planning and investment requirements.***

BPA has played a vital role in commercial-scale Northwest wind development. BPA offers the flexibility of the mighty Columbia River hydropower system as a resource to balance naturally variable wind generation. Its "best in class" wind integration studies indicate capacity to integrate 6,000 MW expected on the regional system by 2024 at low cost. [103] Through its Non-Wires Roundtable, BPA has studied local generation as a resource to avoid or defer transmission upgrades. To move forward on transmission investment in its region, BPA has "open season" [104] transmission subscription drives in process to find customers who are willing to pay for new transmission lines that are needed to develop additional wind resources in the Northwest.

Western is conducting its own wind integration studies with favorable results. [105] Western's Billings, Montana area office has

studied where wind might find access to existing transmission in Eastern Montana and the Dakotas, finding hundreds of megawatts of previously unknown transmission "sweet spots." Western played a key role in resolving Path 15 in California, a classic bottleneck between northern and southern California that was implicated in the state's blackouts in 2000-1. Western also partnered with the Wyoming Infrastructure Authority and Trans-Elect, a private transmission development company, to define the "Wyoming Colorado Intertie" which would unclog a transmission bottleneck between Cheyenne and Denver. An "open season" process will determine by bidding whether there is enough serious financial interest in building a line to access Wyoming's spectacular wind resources.

***Federal power authorities and public power utilities were leaders in developing hydropower resources throughout the western U.S. Today they can build similar partnerships to develop wind and other clean energy resources.*** One first step is to re-charter BPA and Western, giving them the mission to promote development of all renewable resources in their territories, by making markets for clean power and enabling transmission to carry power from remote areas where resources are centered to the growing cities of the West.

In a shift to low-carbon energy sources, "These entities have to be the first movers and prime expressions of national public will," says Ron Lehr, American Wind Energy Association western representative.

Lehr suggests several actions to upgrade Western's renewables development role:

- Lead transmission expansion and provide an institutional bridge between co-ops, located where most wind potential is located, and investor-owned utilities, which serve metropolitan areas where most demand is located.
- Diversify Western's purchases of supplemental power, which is required to meet contractual obligations when drought reduces hydro output and is presently solely from fossil sources, to add wind generation.
- Help native tribes develop wind power by becoming a customer.
- Help preference right customers to analyze the consumer benefits of adding renewables as these utilities consider how they will address climate challenges presented by their heavy reliance on coal.

Along similar lines, the USDA Rural Utility Service, which provides low cost credit to co-ops, should work with them to explore and finance wind and other renewables.

"Full requirements" contracts made between co-ops and power providers pose another obstacle to co-op wind development. They bind the co-op to exclusively secure its power from their generation and transmission power provider. These contracts can be changed by the parties, just like all other contracts. Changing these contracts to allow more diverse power portfolios as a percentage of the total will be necessary as carbon costs are internalized. This can be done under some of these contracts now. For example BPA provides some exemptions that allow local utilities to build local generating projects, both green and otherwise, and declare them for local use or for sale to other parties. Power providers should generally offer such provisions to maximize local wind development and community ownership.

# Summary and Conclusions

***Community Wind 101's key findings are:***

- Community wind, though small in the U.S., is beginning to grow, with successful local ownership models developed for individuals, business partnerships, native tribes, schools and public utilities.
- Wind power is a tremendous economic boon to rural America, and economic benefits from local ownership can be multiplied in the range of two to three times or more.
- Community wind can play a pioneering role for all wind power by expanding local financial interest and public support for wind development.
- Diversifying the geographic spread of wind makes the wind resource more reliable and valuable overall. The more widely separated wind farms are interconnected, the less variable and more predictable overall wind production becomes.
- Wind energy is a key element of modernizing the power grid to create a more reliable network rich in distributed energy resources and serve new demands such as plug-in hybrids. Fully developing wind requires stronger transmission networks. In places where transmission is currently limited, community wind with its typically smaller scale can be developed to serve local needs.
- Community wind projects face large financial hurdles that require a favorable policy environment to overcome.
- Federal tax incentives including the PTC and accelerated depreciation vital to all wind development are not fully usable by many potential community wind projects, and so represent a major barrier to local ownership.
- Federal programs historically designed to fill that gap do not meet the demand. Fixing the PTC to apply to a broader range of income types and levels could generate widespread community wind ownership. A complementary option is programs that target incentives and assistance specifically to community wind projects.
- Feed-in tariffs are an option successfully used in Europe to promote community wind. Advanced renewable energy tariffs that guarantee grid access and a high rate could be one of the most powerful tools to promote community wind in the U.S.
- Standardized procedures for interconnection and net metering improve community wind economics, as would net metering that allows larger projects. While more states are passing standards, a bill setting forth national standards would have a greater effect in removing community wind barriers.
- States have moved to fill policy gaps with production incentives and other supports. Minnesota has developed the most successful model in the U.S.

- Federal power authorities and consumer-owned utilities are natural partners to promote wind power in some of the nation's windiest regions. Federal authorities have developed hydroelectric generation and transmission. Repurposing them to promote wind and the range of renewables could unleash new community and corporate wind development.

The benefits of locally-owned projects, in terms of more prosperous rural economies, stronger power grids and the growth of wind power overall justify an increased priority on community wind. Obstacles to community wind, though formidable, are not insurmountable. Smart policies combined with innovative ownership models are creating community wind projects around the U.S., particularly in notable hotspots where states are taking an active policy lead. They provide demonstrated models for other states, and for the nation as a whole as it charts its way to a secure and clean energy future.

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