



SMALL WIND ENERGY GUIDE:
Kandiyohi County, Minnesota

Compiled August, 2007, by:

> [AGRIBUSINESS/RENEWABLE](#)
[ENERGY DEVELOPMENT COMMITTEE](#)

Kandiyohi County and City of Willmar

Economic Development Commission

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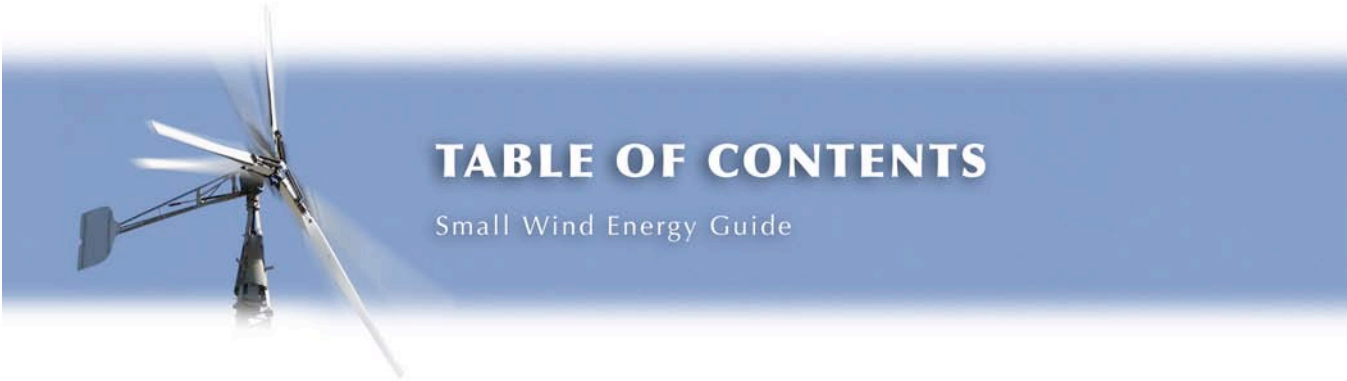


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NOTE: This manual will be updated on a regular basis. To be sure this is the newest version, go to <http://www.kandiyohi.com>

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WELCOME!

Part I | Small Wind Energy Guide

Those of us who have become involved with small wind generation have felt like pioneers. While there was plenty of information, there seemed to be no road map to take us where we wanted to go. Some of us are sporting arrows in our back representing the mistakes made and surprises encountered along the way. Since we believe in the importance of wind as a clean and renewable source of energy, we thought it a good idea to provide the following information to help those who wish to follow in our path.

The information presented is a best-efforts collaboration. We don't have all the answers. Conditions such as equipment, the players and taxes can all be as variable as the wind itself. So we welcome your response and ideas for improving this guide. We anticipate updating the information on an as-needed basis. To accomplish that, we need the continued support of the Agribusiness/Renewable Energy Development Committee of the Kandiyohi County and City of Willmar Economic Development Commission, which partially funded this effort. That organization, in turn, receives its money from the Kandiyohi County Board of Commissioners. Of course, the ultimate source is you, the taxpayer. Thanks to everyone who has seen the need and supports our efforts.

The Definition of Small Wind Installation

For purposes of this guide, "small wind" refers to an installation having a nameplate capacity of less than 40 Kilowatts. For an installation of this size, a utility customer is able to take advantage of the Minnesota law that requires the customer's host utility to pay the customer what they charge if the wind generator makes more electricity than the customer uses. This is called "net metering" and is an arrangement that the customer works out with the local utility.

The Cost of Not Investing in Clean, Renewable Wind Power

Each day we send money out of Kandiyohi County for energy that could be produced locally. Wind farming in Kandiyohi County generates dollars as well as electricity that will circulate in our local economy, unlike some of the checks you write every month for power.

Wind power can help avoid huge hidden costs associated with coal and nuclear power, which currently provides the vast majority of our electricity. Global climate change, mercury pollution and nuclear waste will present major challenges and health concerns for generations to come. A wind turbine will generate clean power for decades and leave no harmful footprint on our health and environment when it is decommissioned. Now that's "good" business.



SITE SELECTION

Part II | Small Wind Energy Guide

Determine Your Wind Potential

You need wind. Seems logical, but sometimes it is overlooked. The best way to find out how much wind you have at your site is to install a wind recording device for at least a year to get a good picture of the wind regime at that particular site. Wind strength is very localized due to trees, lakes, hills, and topographical features. Installing this device, however, will represent additional expense.

Having said that, if you want a general idea of what the wind regime in the area of your site is, look it up on the Minnesota Department of Commerce web site at www.commerce.state.mn.us and find the link to the state wind map. As you get deeper into your investigation, there are companies that will complete a detailed wind analysis of your site using recorded information from as close as possible then will add your own site parameters into the study. This study is normally not cheap, but will save you money in the long run if the actual wind at your site is not good enough to support your generator.

Research Other Relevant Issues

Once you determine there is enough wind to power your unit, take a closer look at the site.

- Who owns the land where the site is located? If you own it, you don't have to make a lease agreement. If you don't own it, you will have to make an agreement with the landowner for access, use, loss of their use, percentage of production, insurance, etc.
- Who is the local utility?
- How far away is the local utility line? Is it overhead or underground? Single phase or three phase? If you plan to connect to the local utility, it will cost a lot of money to have them run their lines a long distance to your site.
- How far is the nearest neighbor? Would the unit fall on them if it toppled in a big storm? Do they have any issues with the view, the noise, or other things?
- How big is your lot; are there any setback rules you need to comply with?
- What is the tree population? They have a huge impact on the wind, even if you are able to get above them.
- How far off the road do you plan to locate the unit? It needs a road to access the unit that is passable in nice weather as well as spring thaw. Springtime is a windy period; if your unit is down and you can't get there to repair it, you will have missed a large part of your production time.
- What type of soil will the unit's tower be placed on? Sandy soil doesn't support towers well. You may want to contact a soil testing agency that will determine the supporting strength of the soil and subsoil for a structure with such a high overturning force like a wind tower. They drill down to find how good the soil is at holding up the unit.

Research County Regulations/Agencies

Before you invest in a small wind energy system, you will want to research local regulations to determine if zoning ordinances or covenants allow the siting of a wind turbine on your property.

The role and responsibility of government agencies in regulating land use with regard to the siting of wind turbines will center around a couple of issues: protection of the public's health and safety, and the determination of whether or not the turbine installation will be compatible with existing and future land uses.

Some issues that regulatory agencies may consider when determining land use for a wind turbine follow:

- Proper setbacks that provide sufficient land in the unlikely but possible event that a tower collapses, a rotor blade separates from an operating turbine, or ice buildup is thrown by the blade of an operating turbine.
- Determination of whether guy wires stabilizing the proposed turbine would be a hazard to snowmobile or ATV riders.
- Determination of whether the installation of a wind turbine on one property may unduly impact the viability of a wind project or cause telecommunications interference on an adjacent property.
- Other objections occasionally surface as well, such as neighbor's concerns regarding noise or visual impact from a nearby turbine, a shadow effect from the turbine, or whether the installation of a turbine will affect habitat for animals, such as grassland habitat where birds nest.

Kandiyohi County Permits

At the present time, the construction of wind turbines in Kandiyohi County is addressed in Chapter 28 of the Kandiyohi County Zoning Ordinance titled "Wind Energy Conversion Systems." If you are considering constructing a wind turbine in Kandiyohi County please familiarize yourself with this chapter and contact the Zoning Administrator with any questions you may have regarding your specific project.

To apply, contact:

Zoning Administrator

Kandiyohi County Planning and Zoning Office

400 SW Benson Avenue, Willmar, MN 56201

(320) 231-6229

Note: If your property lies within city limits, near an airport, or close to designated land use areas, additional restrictions may apply. Please contact your city's Planning and Zoning Office for further details in those situations.



FINANCIAL COSTS & INCENTIVES

Part III | Small Wind Energy Guide

Financing Considerations

The cost of putting up a small wind generator is not cheap. You can probably figure the total project expense at better than \$50,000, depending on generator size and other add-ons. Whether you want to spend this much depends on many considerations, not the least of which is whether you need to borrow the money to do it. Of course, doing it with your own money is best: it is not always likely that the cost of borrowing money is less than the opportunity available for investing it in a safe alternative. You need to do the math, as explained elsewhere in this Guide.

However, if you do borrow some or all of the money you should be aware of a few things. First, borrowing does not have to be complicated, provided you have the collateral to support it. **Collateral** in the wind generator and tower may not be acceptable to, or sufficient for, a lender – this type of activity (wind electrical generating) is new to lenders. Despite the argument that these systems do not lose their value if well maintained, a lender will have to consider the last resort possibility of having to **repossess** and resell the installation. This not only requires a **fixture filing** and **easement** to facilitate access to the equipment, but also knowledge about how to arrange the dismantling and a commercially reasonable sale. (And in the case of a big wind or megawatt project, it requires documentation about one inch thick!).

Second, the easiest way to finance your project is to **roll** it into other borrowings, or to secure it in the same manner as existing loans (**security agreement** or **mortgage**), provided there is enough collateral to support the request. **Farmers** are very familiar with this process. **Homeowners** may be less familiar, but most have had the experience of taking out a mortgage. Here, again, homeowners can roll the cost into a refinance of an **existing mortgage**, or take out a **second mortgage** or a **Home Equity Line of Credit**. Again, the underlying collateral will have to support the request in terms of appraised value. It is not likely that lenders will have any special programs to buy down the interest rate, so you will be paying a market rate.

Third, **interest rates** vary. Borrowing is far less attractive when rates are high. But whatever the case, the cost of borrowing must be taken into account when calculating the payback. It is entirely possible that the government will promote wind energy in the future by providing collateral guarantees, or interest rate subsidies (other than depreciation, investment tax credits or production tax credits). But there is no interest rate assistance at the present time.

Other Costs and Unknowns

Someone once said, “You don’t know what you don’t know.” The purpose of this guide is to try and eliminate as many of those unknowns as possible. However, it isn’t always possible to anticipate everything. Here are a few “surprises” you might encounter in your project.

>Soils

Because footings have to be deep enough to support a tower, perhaps 10' or more depending on the tower height, the soil on and in which it is built must support the footings. You can anticipate that the Building Inspector will review the hole before allowing the project to be completed. Be sure to avoid gravel, sand and, maybe water. You don't want to incur the expense and delay of relocating your site.

>Equipment Housing

The meters and inverter need to be protected from the elements. If you already have an adequately protected meter for your residential use, this may not present a problem. But if you don't, or if you don't have enough space, you may have to build a shed with adequate ventilation to prevent condensation build up. If so, this may cost an additional \$1000-\$2500.

>Commercial Designation

This is something to avoid. If you are "net metering" from a residential location, you are OK ("net metering" means you are using your wind-generated electricity for personal use, but selling the remainder back to the utility). But if this is not the case you may incur a much higher installation charge from the utility company (as they may not provide the subsidized rate residences enjoy). Also, your insurance expense could be substantially higher.

>Insurance

You should check with your agent **before** you begin construction. You need to protect yourself against liability (maybe some fool will want to explore the site, or climb the tower). You should also decide if you want to insure the equipment as well. Here, too, you are far better off if you can endorse your homeowner's policy than if you have to buy a stand-alone policy (as could be the case with a commercial installation).

>Timeline

Establish a timeline with your contractor or salesperson. However, be prepared for delays. Equipment may not arrive when you expect – and you may be dealing with different suppliers of the tower, the generator and the blades. The subcontractors (installer, electrician) may also run into scheduling conflicts with your project or with their own. It could even happen that a key player falls ill.

>Legal

You want to be certain to follow County requirements to the letter. Planning & Zoning has total authority over the development of your project. You may also run into leasing issues if you are building on someone else's land. In that case, you will need legal advice.

>Monitoring

After the project is completed and operational, be sure to monitor that your turbine is functioning. A visual check is easy enough to do. But check the meters as well – if your blades are spinning, you are probably producing electricity. But, if a breaker is tripped, the blades may still spin, but no electricity will be produced. You do need to check the meter to be sure you are producing electricity.

>Self-Certification with FERC

Your utility may require you to self-certify with the Federal Energy Regulatory Commission (FERC). This is not as hard as it sounds. Just go to www.ferc.gov, search for Form 556 and follow the directions. Just answer the first six questions and mail to the address shown. There is no cost associated with filing this form. *Link to form:* <http://www.ferc.gov/docs-filing/hard-filing/form-556/form-556.doc>

Small Wind Rough Cost Estimate

Wind Turbines are available in a variety of sizes and configurations. For a rough estimate at construction costs, we will look at a 20 kW turbine on a 120 foot tower. Please note that these numbers are estimates that are subject to market fluctuations, site conditions, and various other factors, and are based on values as of August 2007.

>Scenario 1:

Estimated construction costs and financial benefits of a hypothetical 20 kW wind turbine owned by a residence or non-profit organization.

A. Construction Costs

Turbine	\$27,720
Tower	\$13,860
Concrete base	\$ 3,780
Electrical – grid connected inverter	\$ 8,820
Lightning protection	\$ 2,520
Electrical equipment enclosure shed	\$ 2,520
Equipment rental	
– Crane, trencher, compactor, etc.	\$ 2,520
Miscellaneous construction costs -	
– Soil test boring, warranty, shipping,	
Excavation, etc.	<u>\$ 4,410</u>
<i>Subtotal</i>	<u>\$66,150</u>

B. Other Costs

Legal fees, permits, zoning, utility charges, etc.	<u>\$ 1,000</u>
--	-----------------

Total

\$67,150

C. Financial Benefits

Electric production – 27,000 kWh/year @ \$0.065/kWh	\$ 1,755 / year
Tax credit @ \$0.019/kWh	<u>513 / year</u>
	\$2,268 / year
-	500 / year (insurance)
-	<u>250 / year (maintenance)</u>
	\$1,518 / year

D. Return on investment

\$1,518 / \$67,150 = 2.26%

NOTES: As the cost of electricity increases, so does your income. There may also be income from an emerging green credits exchange, and antenna leasing. Generous tax credits have been proposed in Congress, but have not been written into law as of this writing.

Some of the above start-up costs may be eliminated if already in place, such as lighting, shed, etc.

>Scenario 2:

Estimated construction costs and financial benefits of a hypothetical 20 kW wind turbine owned by an operating farm or business.

A. (Same as Scenario 1)

B. (Same as Scenario 1)

A + B Total Start-up Costs **\$67,150**

C. Financial Benefits

Electric production – 27,000 kWh/year @ \$0.065/kWh	\$ 1,755 / year
Tax credits @ \$0.019/kWh	513 / year
Depreciation (1 st 6 years only, 35% combined tax bracket)	1,748 / year
	- 500 / year (insurance)
	- 250 / year (maintenance)
	\$3,266 / year

D. Return on investment

\$3,266 / \$67,150 = 4.86% (first 5 years only)

\$1,518 / \$67,150 = 2.26% (after 5 years)

*Note: The same note from Scenario 1 applies here as well. Also, USDA grants may be available for 25% of the project costs. Be sure to apply **before** signing any purchase agreements.*

Finally, there are a number of considerations to be taken into account prior to calculating the return on investment. As of now, the tax credit can only be earned if the facility is in service prior to January 1, 2008. Active/passive income rules may come into play as might your total tax liability. The business versus personal character of the project is also very important. The only way to be sure is to consult your tax advisor, preferably in advance.

Financial Incentives for Wind Projects

*Important Note: If you are interested in pursuing financial incentives for your wind project, check out the incentive programs **before** you start your project. Eligibility requirements vary, and you may become ineligible for some programs because you don't follow the required procedures.*

The federal government and some states have developed incentives for wind energy investors, which may include property tax exemptions, production incentives, tax credits, depreciation, net metering, and a sales tax exemption. Since these programs change over time, can be complex, and may vary with the size of an individual project, it is best to check with individual programs to determine what incentives are available at the present time.

Incentives for wind projects in Minnesota can be found at the Minnesota Department of Commerce web site at: www.commerce.state.mn.us. Enter "Renewable and Efficiency Incentives" in the search box at the top of their home page. This will lead you to a table of federal and state incentives for various types of renewable energy, including wind.

Other incentives can be found at the following websites:

<http://www.ase.org/content/article/detail/2654> (federal tax credits)

<http://www.energytaxincentives.org/> (federal tax credits)

<http://www.dsireusa.org> (renewable energy incentives in MN – click on MN on the map)

<http://www.windustry.org> (Windustry)

At the federal level, the US Department of Agriculture (USDA) offers a program that invites applications for renewable energy systems and energy efficiency improvements grants and guaranteed loans through the USDA 9006 Farm Bill. The USDA conducted one competitive grant solicitation in 2006, and the deadline for submissions was May 12, 2006. Grant applications postmarked after this date will be returned to the applicant with no action. Guaranteed loans will be awarded on a continuous basis. Applications were due to the National Office for funding consideration by July 3, 2006. Applications should be submitted to the USDA Rural Development State Office in the State where the project is located. Submitting an application for this program is too complex to cover in this document. You may ask your contractor if they have access to grant-writing services.

Please go to the USDA Rural Development website to obtain further information at:

<http://www.rurdev.usda.gov/rbs/farmbill/index.html>

Below is the listing on the USDA website for the West Central MN USDA Field Office:

Willmar Field Service Center:

Serving Kandiyohi, Meeker, Renville, Big Stone, Swift, and Chippewa Counties

Michel Hinrichsen, Area Manager

1005 High Avenue

P.O. Box 1013

Willmar, MN 56201

(320) 235-5612 phone | (320) 235-0984 fax

Michel.Hinrichsen@mn.usda.gov



TECHNICAL ISSUES

Part IV | Small Wind Energy Guide

Note: A contractor may address the following issues for you, but it is useful to be aware of what they are carrying out on your behalf.

Foundation

Starting from the bottom, you need a good foundation. The manufacturer may recommend the foundation dimensions, but you have to make sure that your soil is good enough to use that design (see soil testing section). There are many types of concrete mixes available. You should not need any exotic mix, but ask the supplier before they send it out to you. You will need reinforcing rods and anchor bolts; the tower supplier should be very helpful in this department too.

Before you pour, remember to route anything that needs to go through the concrete first before it is poured. Conduits, grounding wires, anchor bolts, etc. all need to be in place before the pour, because trying to put things into hardened concrete is not so easy.

Electrical

Once the foundation is in and the tower is up, you will install the generator and connect the output to something. If you are not a licensed electrician, you need to contact one. You also need to get an understanding of the national electrical code. All the details of the installation are governed by the code, and if you install substandard equipment, the installation will have to be rebuilt. Included in your electrical requirements will be:

- Wire or cable big enough to handle the largest amount of generation.
- A safety disconnect breaker with the same or larger rating to switch off the output when you need to work on it and when there is something wrong.
- Metering installation for both input from the utility system, and output from the generator.
- If needed, an enclosure to house all the electrical equipment.
- Telecommunication or warning device that warns you if there is something wrong so you can fix it before you lose generation. If you live next to the unit, you won't need the telecom.
- Towers in the air are lightning rods and will attract it. You need to be careful in your installation of lightning protection devices. Your ground rods must be deep enough to contact the water table during dry years to have good conduction.

Generator

Choosing a generator size is important. In Minnesota, if the unit is smaller than 40 kW, its generation output is required to be purchased by the host utility at the retail rate of that utility. In other words, if you generate more than you use, you reverse your meter and the utility pays you their retail rate for that power.

Typically, the larger the nameplate capacity of the generator, the greater the cost efficiency. The larger the generator, the taller and stronger the tower supporting it has to be. As you go up in the air, the wind gets stronger and more consistent. The power of the wind is a function of the cube of speed. It may make sense to pay more for a taller tower and get better return on your generator. Most suppliers will work with you to make the foundation and other support materials stronger as you increase the height of the tower.

Maintenance of the unit is critical. If you don't change the oil in your car periodically, it won't work as well and may finally fail. Wind generators run many more hours than your car, so if the generator manufacturer recommends you perform maintenance on something at a certain number of hours, take that seriously and do it or have it done by someone trained to do it. If you don't do some of these maintenance tasks, it may work poorly or fail entirely. After all, why own a unit that isn't making power when the wind is blowing just because you forgot to change the oil?

Interconnecting With Your Electric Utility

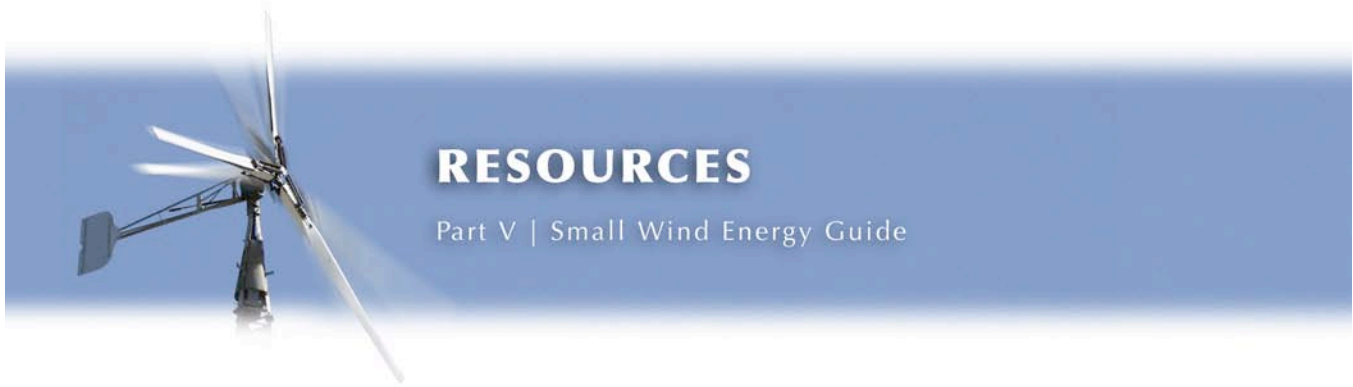
Using the electricity from any private generating source can be accomplished in several different ways. One option, and the one discussed here, is an interconnection with your electric utility. The rules for interconnection vary between states. In Minnesota, if your generating system has a nameplate capacity of 40 kW or less, your electric utility is required to allow you to connect to the distribution system. An important step to include early in this process is to contact your electric provider and get the correct information as to the type of interconnection, proper certification, and compensation rate for energy put back out on the utilities distribution system. The name and contact information of your electric provider is best found on your electric bill. Your utility should have the correct documents describing the standard interconnection for various generating systems. A part of these documents will also include instructions for certifying your system with the proper federal and state agencies. Proper wiring and installation, and the use of components that have been certified for fire and electric safety, are required along with inspection by a state electrical inspector before a generating system will be allowed to connect to the utility system. With safety being the primary concern, the utility needs to be absolutely sure that when there is a power outage condition on the distribution system, the generator does not continue to put electricity out on the line.

The generator output needs a connection point to transfer the energy it produces onto the utility system. This connection is made on the consumer's side of the utility meter. With this type of connection, when the wind generator is producing more than is being consumed by the customer, the excess is sent out onto the distribution grid. In the opposite scenario, if the wind generator is not producing enough to satisfy the customer's needs, the additional energy would be acquired from the distribution grid.

A liability insurance policy will need to be maintained to safeguard against mishaps that may occur. Typically these policies are in the \$100K to \$300K protection range, although some instances of requiring \$1M in coverage have been reported.

Be sure to clear your installation with the state electrical inspector. In our region, that person is:

Don Nemeth
(320) 894-5096 or (320) 354-4644



RESOURCES

Part V | Small Wind Energy Guide

Local Resources to Get You Started

For your convenience, we've put together a list of local distributors to get you started. This is not a comprehensive list, and we are not recommending any contractors or suppliers in particular. You need to do your own "due diligence investigating."

For a more comprehensive list of manufacturers and distributors, you may also wish to check out Windustry's list of Wind Energy Companies at www.windustry.org/resources/developers.htm

Some of the questions you should ask are the following:

- *What is the contractor's specific experience?*
- *Will some of the work be subcontracted and to whom?*
- *Can the contractor supply references?*
- *How is payment scheduled? (It should be in installments and only after work has been completed as agreed -- don't let yourself be pushed around)*
- *What is the financial condition of the contractor?*
- *What is the timeline for completion? What happens if this timeline isn't met?*

Be aware that the turbine and tower manufacturers are probably different companies. Remember: stuff happens and things don't always go according to plan.

> Manufacturers

Bergey WindPower Co.
2200 Industrial Blvd.
Norman, OK 73069
(405) 364-4212
Fax- (405) 364-2078
www.bergey.com

Energy Maintenance
Service, LLC
129 Main Ave
P.O Box 158
Gary, SD 57237
(605) 272-5398
www.energymys.com

Wind Turbine Industries
Corporation
16801 Industrial Circle SE
Prior Lake, MN 55372
(952) 447-6064
Fax- (952) 447-6050
www.windturbine.net

> Dealerships

Innovative Power Systems
Jamie Borell
1153-16th Ave SE
Minneapolis, MN 55414
(612) 623-4041
www.ips-solar.com

The Water Foundation
Dave Winkleman
9121 City Rd 23
Brainerd, MN 5640
(218) 764-2321
Fax- (218) 764-3582
www.bogfrog.com

Joe Straley
15541- City Rd 159
Avon, MN 56310
(320) 356-7401

Chosen Options
Gary Kretzschmar
43168 Reeds Lake Rd
Janesville, MN 56048
(507) 267-4796

Earth Scientific National LLC
Rich Croon
48- Ferndale St. N
Maplewood, MN 55119
(612) 414-2235
Fax (651)-730-8385
www.earthscientificnational.com

DanMar & Associates, Inc.
996 190th Avenue
Woodstock, MN 56186
(507) 777-4310
djuhl@woodstocknet.tel

Next Generation Power Systems, Inc.
Jacob Stahl, President
3220 W 57th Street, Suite 100
Sioux Falls, SD 57108
(605) 275-3749
jacob.nextgeneration@midconetwork.com

Renewable Energy Team, LLC
Denny Jarosch
14715 Edgewood Drive, Suite 1
Baxter, MN 56425
(320) 310-2653
denny@reenergy.com

Tommie's, Inc.
Tom Boike
4570 368th Avenue
Montevideo, MN 56265
(320) 841-2232
(320) 269-7832
tomanddar@charter.net

> Electric Co-Ops

Kandiyohi Power Cooperative
8605 47th Street NE
P.O. Box 40
Spicer, MN 56288
(320) 796-1155 or (800) 551-4951
Fax (320) 796-0620
www.kpcoop.com

Meeker Cooperative
1725 E Hwy 12
Litchfield, MN 55355
(320) 693-3231
Fax (320) 693-2980

Willmar Municipal Utilities
700 Litchfield Ave. SW
Willmar, MN 56201
(320) 235-4422

Agralite Electric Co-op
320 Hwy 12 E
Benson, MN 56215
(320) 843-4150

Stearns Electric Association
7341 Old Hwy 23
St. Cloud, MN 56303
(320) 259-6601

> Maintenance Providers

Trico/TCWind
111 East 10th Street, P.O. Box 722
Litchfield, MN 55355
(888) 694-6200
www.tcwind.net

> Soil & Concrete Testing Labs

American Engineering Testing, Inc
550 Cleveland Ave. N
St Paul, MN 55114
(800) 972-6364
www.Amengtest.com

Braun Intertech
1520 24th Ave. N
PO Box 189
St Cloud, MN 56302
(320) 253-9940
tblumberg@braunintertech.com

Northern Technologies, Inc
7403 19th St. S
St Cloud, MN 56301
(320) 654-9409
gary@northerntechinc.com

STS Consultants, LTD
10900 73rd Ave. N, Suite 150
Maple Grove, MN 55369
(763) 315-6300
Fax: (763) 315-1836
www.Stsconsultants.com

Helpful Websites

Researching any area of renewable energy can quickly become an overwhelming task. Where can you go to find accurate information? How can you avoid information overload? It is good to know that you are not alone, and that many reputable nonprofit organizations and governmental agencies have done much of the research work for you.

Listed below are several organizations that focus on promoting and supporting wind energy development. Their websites will offer you a great deal of information to get you started down the pathway on installing your own wind energy system. We acknowledge this is not a complete list of resources, and we do not control any content on the sites in this guide. As always, when you access information from the internet, please use the following information only as a starting point for research.

>Minnesota Department of Commerce

www.commerce.state.mn.us

When you get to the Department of Commerce's site, click on the Energy Info Center. There you will find several category headings with information that will be helpful to you with regard to energy. Of specific interest if you are interested in installing a wind turbine is the "Wind" category. This category will give you assistance such as information about using wind as an energy source, special promotions, Minnesota wind maps, and links to other resources.

Of particular help on this site are two areas – the first is a general document explaining the basics of wind power: "Small Wind Electric System – A Minnesota Consumer's Guide." This guide is available from the Department of Commerce's website at the following address:

http://www.state.mn.us/mn/externalDocs/Commerce/Small_Wind_Energy_Systems_110702042021_MNNRELsmallwind3.pdf

The second item of particular interest is wind map data. The Department of Commerce State Energy Office is an active proponent of wind energy development, and maintains and monitors wind sites across the state and gathers data from them. The maps are available as PDF files suitable for printing. This data is available at the following address:

<http://www.state.mn.us/portal/mn/jsp/common/content/include/contentitem.jsp?contentid=536887066>

>Windustry

<http://www.windustry.org>

Windustry works to create an understanding of wind energy opportunities for rural economic benefit. Windustry promotes wind energy through outreach, educational materials, and technical assistance to rural landowners, local communities and utilities, and state, regional, and nonprofit collaborations.

Windustry also offers excellent overviews on wind basics, the U. S. Farm Bill (covering the value-added producer grant program), the Wind Farmer's Network (a membership based exchange for interested landowners and communities to connect with each other and access in depth wind information and experts) and a great deal of other helpful information.

>The American Wind Energy Association

<http://www.awea.org>

The American Wind Energy Association (AWEA™) promotes wind energy as a clean source of electricity for consumers around the world. AWEA is a national trade association that represents wind power plant developers, wind turbine manufacturers, utilities, consultants, insurers, financiers, researchers, and others involved in the wind industry -- one of the world's fastest growing energy industries. In addition, AWEA represents hundreds of wind energy advocates from around the world.

The Association provides up-to-date information on:

- wind energy projects operating worldwide;
- new projects in various stages of development;
- companies working in the wind energy field;
- technology development; and
- policy developments related to wind and other renewable energy development.

>Other

You may also wish to check out the following organizations regarding wind and/or renewable energy:

- National Renewable Energy Laboratory: www.nrel.gov
- Fresh Energy: www.fresh-energy.org
(Formerly Minnesotans for an Energy-Efficient Economy)
- Center for Producer-Owned Energy: www.mncpoe.org
- Clean Energy Resource Teams (CERTS): www.cleanenergyresourceteams.org
- Union of Concerned Scientists: www.ucsusa.org
- The Minnesota Project: <http://www.mnproject.org>
- Center for Producer Owned Energy (affiliated with the Agricultural Utilization Research Institute-AURI): <http://www.mncpoe.org>
- Interstate Renewable Energy Council: <http://www.irecusa.org/smallwindenergy/index.html>



PHOTO GALLERY

Part VI | Small Wind Energy Guide

Local Turbines in Operation

> Prairie Wood Environmental Learning Center, Spicer, Minnesota

The target date for the turbine installation is the third week in September, 2006, contingent upon availability of the 20 kW generator set. Once the turbine is installed it may be viewed by the public on a walk-in basis during daylight hours. The Center requires advance notice for groups and would prefer advance notice by individuals as well.

Directions to Prairie Woods Environmental Learning Center

Prairie Woods is located approximately eleven miles north of Willmar, MN and seven miles west of Spicer, MN at 12718 10th Street NE, Spicer MN 56288 (watch for signs on Highway 71). Prairie Woods is easily accessed from State Highway 71 by turning west on Kandiyohi County Rd 29 on the north side of Ringo Lake and proceeding for approximately one and one half miles to the Prairie Woods entrance which is well marked. The turbine installation site is at the main campus and situated just north of the Westby Observatory. Visitors will find a map and directions on the Prairie Woods website at www.prairiewoodselc.org

>Atwater, Minnesota

Bob Meyerson's 20 kW Jacobs generator can be viewed at 135th Street, Atwater. It is located one and a quarter mile south of Kandiyohi County Road #4, which is the road running along the south and west side of Diamond Lake.

>Kandiyohi, Minnesota

Dale Walth's 39 kW EMS generator is located 1/2 mile north of Highway 12 on County Road #127 on the west side of the road.

>Dublin Township, Swift County, Minnesota

Tom Clemens has 2, 20 kW Jacobs generators located 5 1/2 miles south of DeGraff. Take County Road #31 to County Road #6. It is on the north side of the road.

Installation Photos

Below are photos of an actual small wind energy turbine being installed in Morrison County, Minnesota by Winkelman's Environmentally Responsible Construction (WERC). For more information about conservation technologies, go to their website at www.hopshop.net.

PHOTOS COURTESY OF WERC





PHOTOS COURTESY OF WERC

> AGRIBUSINESS/RENEWABLE
ENERGY DEVELOPMENT COMMITTEE
Kandiyohi County and City of Willmar
Economic Development Commission

320.235.7370 | www.kandiyohi.com

NOTE: This manual will be updated on a regular basis.
To be sure you have the newest version, go to www.kandiyohi.com