Consumer Handout Packet

SECTION 5

Edgecombe-Martin County EMC
P.O. Box 188
679 NC Hwy. 33 E.
Tarboro, NC 27886

December 17, 2008

Dear Edgecombe-Martin County EMC member-consumer:

Thank you for requesting information about interconnecting a small wind generator to Edgecombe-Martin County EMC's system. To assist our member-consumers, we have developed a streamlined process for the safe, reliable, efficient, and cost-effective interconnection of small renewable energy systems.

Our mission is to protect the safety of cooperative personnel and member-consumers, maintain the integrity and reliability of the grid, and establish mechanisms to ensure rate equity for all member-consumers. Because small wind systems can affect the safety and reliability of the distribution system, we have developed technical interconnection rules that address those safety and reliability impacts. These rules ensure that we can continue to provide you and all other member-consumers with safe and reliable electricity service.

We are ready to help you by providing information and answering questions. We want to give you the tools you need to make an informed decision about a small wind system.

In this packet, you will find the following documents:

- Interconnection information, including an interconnection application, a summary of the cooperative's interconnection process, a schedule of interconnection costs, and the cooperative's interconnection agreement.
- Information on rate schedules for consumers with their own generation, including the rates we pay for any net excess generation you may produce.
- A capital cost recovery analysis worksheet, which will help you determine the annual operating cost of a small wind system.
- Steps to a small wind system, which will walk you through the various issues associated with a small wind system.
- Questions to ask wind turbine vendors, which you may want to ask before purchasing a small wind system.
- Frequently asked questions (FAQs), which provide answers to the questions that member-consumers most often ask their cooperatives.

We look forward to working with you. If you have any questions, please don't hesitate to contact me at (252)641-9513 or winston.howell@ememc.com

Yours sincerely,
Winston T. Howell

Sample Information for Consumer Handout Packet

Capital Cost Recovery Analysis

As interest in renewable energy grows, some cooperative member-consumers are considering the purchase of a small wind system. If you are interested in installing a small wind system to replace all or some of the electricity that your cooperative provides, talk with a cooperative representative about your plans.

Before you decide to buy a small wind system, however, you should consider the economics to determine whether such a system will lower your monthly electricity costs. This capital cost recovery analysis, prepared by the Association of Illinois Electric Cooperatives (AIEC),* will enable you to determine the annual operating cost of a small wind system and compare that cost to the cost of the electricity that you purchase from your cooperative.

INFORMATION REQUIRED FOR THE CAPITAL COST RECOVERY ANALYSIS

1. ENTER THE TOTAL COST OF PURCHASING AND INSTALLING THE GENERATING EQUIPMENT INCLUDING ANY INTERCONNECTION AND SYSTEM UPGRADE COSTS:	$ _____

2. ENTER THE AMOUNT OF GRANTS, TAX CREDITS, OR OTHER FUNDING NOT REQUIRED TO BE REPAID BY THE MEMBER FOR THE PURCHASE AND INSTALLATION OF THE GENERATING EQUIPMENT:	$ _____
3. SUBTRACT LINE 2 FROM LINE 1 TO DETERMINE THE NET COST OF THE EQUIPMENT:	$ _____
4. ENTER THE ESTIMATED AMOUNT OF ANNUAL MAINTENANCE COST OF THE GENERATING EQUIPMENT (INCLUDE ANY ANNUAL OPERATION COSTS, INCLUDING INSURANCE PREMIUMS IF ANY):	$ _____

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Table 1					
Years	7.5 % Capital recovery Factor	6.5 % Capital recovery Factor	5.5% Capital recovery Factor	4.5 % Capital recovery Factor	3.5 % Capital recovery Factor
1	1.0750	1.0650	1.0550	1.0450	1.0350
3	0.3845	0.3776	0.3707	0.3638	0.3569
5	0.2472	0.2406	0.2342	0.2278	0.2215
10	0.1457	0.1391	0.1327	0.1264	0.1202
15	0.1133	0.1064	0.0996	0.0931	0.0868
20	0.0981	0.0908	0.0837	0.0769	0.0704
25	0.0897	0.0820	0.0745	0.0674	0.0607
30	0.0847	0.0766	0.0688	0.0614	0.0544
35	0.0815	0.0713	0.0650	0.0573	0.0500
40	0.0794	0.0707	0.0623	0.0543	0.0468

5. Enter from Table 1 either: (a) the interest rate of borrowed funds to purchase the generating equipment, or (b) the interest rate that would be received on the money used to purchase the generating equipment:	_____

(Pick the closest interest rate from the table)

6. Enter from Table 1 the number of years the generating equipment can be expected to operate or the number of years for the loan:	_____

(Pick the closest number of years from the table)

7. Enter the capital cost recovery factor from Table 1 above:	$ _____

(Locate the interest rate in the top row of table 1 that you entered on line 5. Proceed down that column to the number of years corresponding to the entry on line 6. Enter the capital recovery factor indicated in that box on line 7.)

8. Enter the estimated percent of time the generating equipment will operate (enter as a whole number):	_____ %

(A wind turbine may operate 25% to 40% of the time depending upon your geographic location. But you should confirm by independent analysis the percent your specific generating equipment is likely to operate.)

9. Multiply (8) x 8760/100 = the number of hours per year of operation	_____
10. Enter the rated capacity of the generating equipment in kilowatt (kW)	_____ kW
11. Multiply (9) x (10) = kilowatt-hour (kWh) per year (generated)	_____
12. Enter your cooperative's average cost per kilowatt-hour for the energy you purchased during the last 12 months ($/kWh):	$ _____/kWh

(Excluding any monthly facility charge or consumer charge.)

CALCULATION OF ANNUAL OPERATING COST OF EQUIPMENT

The total annual operating cost (TOC) of equipment is calculated by:

13. Multiply the net cost of the generating equipment (Line 3) by the capital recovery factor from line 7	$ _____
14. Add the annual maintenance cost of the equipment (line 4):	$ _____
15. To determine the TOC of the equipment, add lines 12 and 14:	$ _____
16. Divide line 15, the TOC of the equipment, by line 11, the kilowatt-hours to be generated each year:	$ _____/kWh

(Line 16 is the TOC for the generating equipment per kilowatt-hour.)

17. Cooperative average cost per kilowatt-hour from line 12:	$ _____/kWh

* *Calculation form developed by Carl Dufner, vice president of engineering for the AIEC. To order brochure copies of the original AIEC form contact Angie Bingenheimer at the AIEC, 217-529-5561, abingenheimer@aiec.coop.*

Ten Steps to a Small Wind System

Is a small wind system right for you? These 10 steps will help you decide.

1. **Determine how much electricity you use and what it costs, annually and by the kilowatt-hour. Then, find ways to make your home more efficient and reduce your energy use.**

   Start by calculating your average electricity bill. The U.S. Department of Energy (DOE) provides some rules of thumb in its *Small Wind Electric Systems: A U.S. Consumer's Guide* [http://www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/small_wind/small_wind_guide.pdf].

   Then, conduct an energy audit of your home to identify ways of using energy more efficiently and ways of reducing energy use. Implementing energy efficiency opportunities will almost always offer a quicker return on your investment and additionally may enhance the viability of a wind turbine project through a lower capital expense associated with a smaller turbine that will satisfy the new lower energy load. This could lower your electricity bill significantly. The National Rural Electric Cooperative Association (NRECA) recently reviewed several Web sites that host online energy audits. The review identified one Web site—Home Energy Saver—as among the best [http://hes.lbl.gov].

2. **Determine your site suitability and wind resource.**

   Site suitability. Most experts recommend that you have at least one acre of land if you are considering the installation of a small wind system. Smaller parcels may be suitable if adequate tower setbacks can be achieved.

   Examine your site for potential turbulence. When wind flows around buildings, trees, and other structures in the landscape, it slows down or becomes turbulent. A wind turbine should be placed in a location where turbulence is minimized. It also should be placed upwind of buildings and trees.

   In addition, you should determine the "roughness"—the terrain and density of vegetation on the landscape—within a radius equal to 20 times the tower height, in the prevailing wind direction.

   Information on determining site suitability is available at:
   Small Wind Electric Systems: A U.S. Consumer's Guide
   [http://www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/small_wind/small_wind_guide.pdf]
   Small Wind Industry Implementation Strategy (SWIIS) Consortium's Web site [http://www.smallwindindustry.org/fileadmin/ewea_documents/documents/projects/swiis/technology/050406SWTsiting050405.pdf]

Wind resource. Wind speed varies from year to year, season to season, with the time of day, and with the height above ground. For a grid-connected wind system, an average annual wind speed of 10 mph is usually considered the cutoff. Most experts recommend average annual wind speeds between Class 2 (11.5 mph at hub height) and Class 4 (13.4 mph at hub height). Class 3 sites have average wind speeds of 12.5 mph at hub height. Hub height is the distance from the ground to the center of the turbine rotor.

A small increase in average wind speed results in a large increase in power produced. A site with an average wind speed of 15 mph contains nearly 54% more energy than a site with an average wind speed of 13 mph. The ideal wind resource has relatively stable high speeds. If your trees and vegetation are permanently deformed because of constant wind exposure—known as "flagging"—you may have a good wind resource to generate electricity.

There are several Web sites with wind resource maps. One is the National Renewable Energy Laboratory's (NREL's) Wind Energy Resource Atlas of the United States [http://rredc.nrel.gov/wind/pubs/atlas]. You can also access state wind maps at http://www.eere.energy.gov/windandhydro/windpoweringamerica/wind_maps.asp.

NREL also provides a United States Annual Wind Resource Potential map, where you can find a location by zip code [http://mapserve2.nrel.gov/website/wind_resource1/viewer.htm].

3Tier Group is a forecasting company that provides information on average wind speeds by hub height and city, address, or geographic coordinates. The model, called First Look, can be found at http://firstlook.3tiergroup.com.

You can measure the wind speed at your site using an anemometer on a tower, but this can be expensive. One option is to review data from nearby sites such as airports or state-administered meteorological stations. But airports tend to be sited in sheltered locations, so data on wind speeds may not be a reliable indicator of wind speeds at your site. Computer models are available that can help you estimate your wind resource.

Although the wind at a given site may blow more frequently from the west, more wind energy at that same site may come from different directions. You should find out which directions have the best winds for electricity production to help with micrositing.

You may want to find an installer at this point. Be sure to ask for references, licenses and certifications, proof of insurance, and a performance bond. A good installer can do a site assessment for you.

At this point, you should talk to your cooperative about what you are considering.

3. Determine how much electricity you want your wind generator to produce. Select turbine and calculate tower height based on that output.

Energy output. An installer also can look at your historic electricity usage and the amount of energy you want a small wind generator to produce. With this information, the installer can help you select a turbine size and tower height.

Most small turbine manufacturers provide an estimated monthly energy output in kilowatt-hours. Experts caution consumers about taking these figures at face value, however. The capital cost recovery analysis worksheet, provided as part of your cooperative's information packet, will enable you to determine the annual energy output—in kilowatt-hours—of a given small wind system.

Turbine features. Once you know how much electricity you want your wind generator to produce, monthly or annually, you can look at the specifications of all turbines matching that output. Important features to consider include the rotor diameter and the turbine's revolutions per minute (rpm). Turbines with a lower rpm tend to be quieter and last longer.

The amount of power that a turbine will produce is determined mainly by the diameter of its rotor and its tower height. The diameter defines the rotor's swept area—the quantity of wind intercepted by the turbine. The larger and higher the swept area (the area through which the rotor blades spin) of the generator's rotor, the more electricity it can produce. Swept area is the feature that will help you compare the output of one wind generator with another.

For more information on selecting a turbine, see *Home Power* magazine's "Wind Turbine Buyer's Guide" [http://www.homepower.com/files/featured/TurbineBuyersGuide.pdf].

Other considerations. Look for turbines with a good track record and a good warranty—five years, if possible. Some experts believe that weight matters; in their view, the heavier the machine, the more robust it is. They say a heavy-duty wind generator is more likely to handle sites with stronger winds or turbulence than a lighter turbine. But lighter weight turbines typically have lower "cut-in" wind speeds and produce more power in lower winds.

Tower height. One of the most common installation mistakes is mounting a wind turbine on a tower that is too short. A rule of thumb for tower height is that the wind generator should be at least 30 feet above any trees, buildings, or other structures within 500 feet. Taller towers result in higher wind generation because of reduced ground drag. An additional 40 feet on a tower can substantially increase the power available—by as much as 200%—and return the incremental initial investment with greater energy generation revenues over the lifetime of the turbine. But taller towers also are more expensive.

The question you need to answer is whether the increased tower height is economically justified compared with the increased electricity production. Information on how to answer this question is available on Renew Wisconsin's Web site at http://www.renewwisconsin.org/wind/Toolbox-Homeowners/Towers%204-Tower%20Costs%20versus%20Power.pdf.

4. **Find out what incentives—rebates, buydowns, and loans—are available, and whether you qualify for a U.S. Department of Agriculture (USDA) Section 9006 grant.**

   The Database of State Incentives for Renewables & Efficiency (DSIRE) provides detailed information on each state's incentives that apply to renewable energy systems, including small wind. You can access the database at http://www.dsireusa.org.

   The Farm Security and Rural Investment Act of 2002, which expired September 30, 2007, included a provision—Section 9006—that provided grants of $2,500 to $500,000 or up to 25% of the eligible costs of rural renewable energy projects. The Farm Bill Extension Act of 2007, which continues agricultural programs through 2012, provides $500 million in grants for small-scale renewable energy projects.

   The grants are only available for agricultural producers that earn at least 50% of their income from agricultural products. Small rural businesses also are eligible. But the application process for a grant or loan under Section 9006 can be complicated and time-consuming. A sample application form is available on DOE's energy efficiency and renewable energy (EERE) Web site at http://www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/farm_bill_small_wind_sample_application.pdf.

5. **Determine estimated installed cost of system and calculate return on investment.**

   A rule of thumb for estimating the cost of a small wind system is $4–$10 per installed watt. The total installed cost is the cost of the wind generator and tower plus the cost of permitting, installation, and interconnection to the grid.

   The payback for a small wind system is the amount of time it takes for the system to pay for itself in energy savings. You can calculate the payback for a given small wind system by using the capital cost recovery analysis worksheet provided in your cooperative's information packet for member-consumers.

6. **Determine what zoning regulations, if any, apply to the installation of a wind turbine, and what permits—building, electrical—are required. Talk with your neighbors about your plans.**

Zoning. Zoning regulations vary from state to state, and from one local jurisdiction to the next. Contact your local county officials to learn about zoning laws. These laws may include height restrictions and may require that a wind turbine be set back from your property line. The standard setback for a small wind system is calculated as a distance from the property line equal to the height of the tower. Sometimes, the setback requirement restricts where a tower can be installed.

In many cases, local municipalities do not have any zoning regulations that apply to the installation of wind turbines and towers. As a result, a zoning hearing often becomes part of the processes that an applicant must go through before a building permit is issued.

At zoning hearings, neighbors are allowed to express any concerns they might have about the small wind system. Preparation for these types of meetings is key. The more answers you have ready for questions that are likely to arise, the easier the process will be.

Information on zoning issues is available on the Renew Wisconsin Web site, on the Small Wind Toolbox page [http://www.renewwisconsin.org/wind/windtoolbox.html]. Scroll down to *Toolbox—Information for Homeowners and Installers*, and look for documents *Zoning 1* through *Zoning 6*.

Permitting. Contact your local building inspector, board of supervisors, or planning board to learn whether you will need to obtain a building permit. They will provide you with a list of requirements, which will probably include a site plan, a structural analysis on the foundation and tower, and an electrical one-line diagram.

At this stage, talk with neighbors about your plans and listen to any of their concerns. If there are any other small wind turbine owners in your area, talk with them about any concerns their neighbors had and how they dealt with those concerns.

7. **Ask your cooperative about its interconnection requirements, including costs and liability insurance.**

If you have not already talked with your cooperative about your plans, do so now. Discuss the steps you have taken to get to this point, and provide information on the small wind system you are considering. You need to make sure that the system meets the cooperative's criteria for interconnection.

Most cooperatives have interconnection agreements, which are often posted on their Web sites. Your cooperative can provide information on its interconnection process and policies as well as a sample interconnection agreement, and answer any questions that you may have.

8. Find a small wind system installer (if you haven't already done so).

You might want to start looking for an installer by asking any current small wind system owners in your area for references. In addition, contact the manufacturer of the wind turbine you are interested in for recommendations and suggestions for authorized installers.

Another option is to ask your state's renewable energy organization or energy office. DOE's EERE Web site provides contact information for state energy offices [http://www.eere.energy.gov/state_energy_program/seo_contacts.cfm]. Regional organizations, such as the Midwest Renewable Energy Association (MREA) [http://www.the-mrea.org] might also be able to help.

Once you have a short list of installers, contact at least three of them for quotes for the equipment and installation. Question any quote that appears to be too high or too low.

Some questions to ask when considering an installer are:

- Does the company have experience installing grid-connected systems? What models?
- Does the company use licensed and certified contractors? Is the company insured?
- Does the company have any consumer complaints, judgments, or liens against it?
- Will the company help with the applications required by the local building permitting agency and the utility for grid-connected systems?
- How much, if any, of the work will be contracted out?
- When will construction begin and how long will it take?
- What warranty is offered on the installation (covering workmanship for tower and turbine assembly, electrical, and foundation work)? Will the company accept a performance bond?
- Does the company do service and repairs on the equipment?
- Will the company provide references of previous consumers?

Some states link installation requirements to incentives. Vermont, for instance, makes incentives for new small wind systems available only if the system is installed by a participant in the Vermont Solar and Small Wind Partners Program.

Additional information on selecting an installer is available at Renew Wisconsin: http://www.renewwisconsin.org/wind/ToolboxHomeowners/Planning%20Your%20Wind%20System%208-Finding%20An%20Installer.pdf.

The North American Board of Certified Energy Professionals has decided to create a certification program for small wind turbine installers, with the first examination planned for 2008. The knowledge, skills, and abilities required for the installation and maintenance of a small wind system are discussed in the board's task analysis at http://www.nabcep.org/Monticello/userfiles/File/SmallWindTA1206FINALv1.0.pdf.

9. Order the turbine and tower.

Before actually placing an order, ask the manufacturer or installer for the names of consumers who have installed the same make and model. Contact those consumers to ask about machine performance and reliability and support from the manufacturer. Ask if the system is meeting their expectations.

Ensure that the manufacturer offers at least a one-year warranty with an optional extended five-year warranty for all hardware, and that the inverter is Underwriters Laboratories (UL) listed.

If you plan to purchase a rebuilt or remanufactured wind generator, find out the history of the machine, obtain the remanufacturing report the specific turbine that you will be purchasing, be sure there is a warranty, ask about a maintenance contract, and ask about the availability of spare parts.

Additional information is available in the *Wind Turbine Buyer's Guide* at http://www.homepower.com/files/featured/TurbineBuyersGuide.pdf.

10. Contract for installation of your small wind system.

This is the final step. If you did not contract for the installation of your wind generator with the manufacturer, contact the installer you found in step 8 and arrange for installation.

Questions to Ask Wind Turbine Vendors

Cooperative members interested in installing a small wind system should ask vendors or distributors the following questions:

1. **How reliable is the rated energy output? How did you calculate the output? What wind speeds did you use?**
   Experts advise ignoring peak output and power curves provided by vendors. Rather, look for the monthly or annual energy numbers—in kilowatt-hours—for the turbine, estimated for the average wind speed that you expect or have measured at your site. If the turbine manufacturer or distributor does not provide energy production estimates, find another manufacturer.

2. **Is the inverter UL listed?**
   If the inverter is not UL listed, find another vendor. Most utilities require that an inverter have a UL 1741 certification for interconnection with the grid. As part of the certification, the inverter is required to fail open in the absence of power on the grid.

3. **What is the estimated total installed cost? What does the turbine cost? What does the tower cost? How much is installation estimated to cost?**
   It is important to know the total installed cost of a wind turbine system to ensure sufficient budgeting for the system. Budget for installation labor expenses as well as the cost of equipment rental, concrete and rebar, electrical components, shipping, and sales tax.

4. **How long is the warranty? What does it cover? Parts? Labor? Can it be extended? If so, what will it cost?**
   Warranties range from one to five years. The longer the warranty, the better. Make sure the warranty covers labor as well as parts. Cooperative members should ask owners of wind systems purchased from the same vendor about performance and reliability before making a decision on an extended warranty, if available.

   If you live in an area that is prone to lightning strikes, you should strongly consider the option of lightning protection. At present, only one U.S. vendor—Abundant Renewable Energy (ARE)—offers such protection with its machine. But third-party vendors can design and install adequate protection systems.

5. **What are your credentials? How long have you been in business? How many turbines have you sold? Have your turbines been certified?**
   Look for vendors that have been in business for at least five years, or have acquired the product line of another vendor. In addition, cooperative members should ask the vendor for the names of at least two people who have installed a wind turbine that is the same as, or similar to, the model the cooperative member is interested in.

   Currently, there is no U.S. small wind certification process, but small wind turbines can be certified using the International Electrotechnical Commission (IEC) standard—IEC 61400-2—for testing wind turbine power performance. This standard is increasingly used by U.S. manufacturers in their wind turbine designs.