Residential Wind Power Considerations

By Bob Gibson

More and more people are attracted to the idea of generating their own electric power through the use of “backyard” renewable energy systems. Small wind turbines are one of the most popular choices, but careful study and assistance from Carteret-Craven Electric Cooperative can make sure you know the facts before buying one of these systems.

The spinning fan of a windmill pumping water from a well was once a common sight across rural America. When electric co-ops began lighting up the countryside in the late 1930s, farmers and rural residents began replacing the mechanical energy of the windmill with electricity from power lines.

The wind turbines seen today are distant cousins to those windmills. The essential difference is that today’s wind systems—generally a three-blade rotor connected to a generator and tail and mounted on a tower—converts wind energy into electricity, rather than simply turning gears to lift water. The most popular residential-scale wind turbines can generate between around 2 kilowatts of power—about one-third to one-half of what a typical home needs—to 10 kilowatts. In recent years, small wind turbines have become more reliable and, to a degree, prices have come down as more are built. More dealers are offering a better choice of products and more experienced installers are available to erect the units.

So is installing a wind turbine at your home a good idea? That depends on two basic factors: your motivation and your location.

Your motivation

If your motivation is to save money—(to spend less on electricity than you do today)—or to make money—expecting the small wind turbine will earn you a profit by selling power back your local electricity provider or another entity, such as NC GreenPower. Even though federal and/or state tax credits have helped lower the cost for some, in most parts of the country it remains difficult to generate electricity at a price equal to or lower than what you’ll obtain from your electric co-op. While wind that blows through your property may be free, the equipment needed to capture that wind is not, and wind doesn’t blow all the time.

Electric utilities are required by law to buy your excess power. But in many areas they are only required to pay the same price they pay any other power generator—what in utility jargon is called “avoided cost.” But even where your bill might be credited for wind power at retail rates, called net metering, the sale of those kilowatts won’t make you rich. Paying back the cost of installing a wind turbine, which runs from several thousand dollars to $50,000, can take several years to several decades.

You also need to consider your location. In more densely settled areas, many local zoning laws prohibit the construction of a wind turbine. But in any location, you must know just how much wind you have, day after day. In these calculations, average wind speed becomes critical.

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While the federal government has mapped out average wind speeds across the country **(www.nrel.gov/wind)**, each specific site is unique, affected by factors such as elevation and obstruction from buildings and trees. Better wind speeds are found higher off the ground, and there can be a huge difference between wind speeds at the 300-foot heights that large-scale wind turbines have and the 80- to 100-feet height of a small wind turbine.

Do your homework

Before getting too far down the road at installing a small wind turbine, do your homework. That includes checking with your local electric co-op well in advance of making a purchase. Being aware of your co-op's policies and procedures associated with interconnecting a wind system to the grid will avoid headaches, disappointments, and unexpected costs.

The grid is a complex, interrelated machine and some costs may need to be incurred for studies or upgrades to preserve safety, reliability, or quality of power. Your co-op may be able to help you estimate what those costs might be in advance and help you find additional opportunities for energy efficiency that could further reduce your electric bills.

To find out what incentives may be available in your state, go to the Database of State Incentives for Renewables and Efficiency at www.dsireusa.org.

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Cost Calculator

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1. Enter the total cost of purchasing and installing the generating equipment. $_____
(Be sure to include an interconnection and insurance costs.)

2. Enter the amount of grants, tax credits or other funding not required to be repaid 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 cost of annual maintenance of the generating equipment. $_____

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 the years the generator equipment can be expected to operate of 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 _____
(Locate the interest rate in the top row of Table 1 that you entered in 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 (a whole number) the generating equipment will operate. _____%
*(A wind turbine may operate 25 to 40 percent of the time, depending upon your geographic location. However, you should confirm by independent analysis the percent of time **your** generating equipment is likely to operate.)*

9. Multiply (Line 8) x 8760 = the number of hours per year of operation. _____

10. Enter the rated capacity of the generating equipment in kW _____

11. Multiply Line 9 by Line 10 = kWh per year of generation _____kWh

12. Enter the cooperative's average cost per kWh for the energy you purchased for the last 12 months ($/kWh), excluding any facility or customer charges. $_____ /kWh

ANNUAL OPERATING COST CALCULATION & COMPARISON

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 from Line 4. $_____

15. To determine the total annual operating cost (TOC), add Lines 13 and 14. $_____

16. Divide Line 15, the TOC, by Line 11, the kWhs to be generated each year. $_____ /kWh
(Line 15 is the total annual operating cost for the generating equipment per kWh.)

17. Co-op average cost per kWh from Line 12. $_____ /kWh

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Cost Comparison: Self Generation v. Retail Cost from Cooperative

TABLE 1.

Years	7.50% Capital Recovery Factor	6.50% Capital Recovery Factor	5.50% Capital Recovery Factor	4.50% Capital Recovery Factor	3.50% 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	0.8970	0.0820	0.0745	0.0674	0.0607
30	0.8470	0.0766	0.0688	0.0614	0.0544
35	0.8150	0.0731	0.0650	0.0573	0.0500
40	0.7940	0.0707	0.0623	0.0543	0.0468

Results

If the total annual operating cost per kilowatt for generation equipment (Line 16 entry) is less than the cooperative's average cost per kilowatt-hour (Line 17 entry), then you have the opportunity to realize savings by using your generation equipment.

However, if the total annual operating cost (Line 16) is greater than the cooperative average, there will not be a savings by using your own generation.

Other Considerations

This analysis is purely for determining whether a given generation system will result in savings to a cooperative member as opposed to the member purchasing power from the cooperative.

Backup power service, environmentally friendly generation and future power generation costs should also be considered when deciding whether self-generation of electricity is right for you. Your cooperative staff is always available to assist you in determining what is best for you.