Small Wind Column

Back to the Basics 8: Wind Site Assessments

By Mick Sagrillo

Last month’s column (http://www.awea.org/windletter/100325_AWEA_WL.pdf) described the best tools that we have today for estimating the wind resource for a small wind turbine, and the need to have a trained wind site assessor evaluate your site and wind resource. This column will lay out the items that should be covered in a thorough wind site assessment for a home, business, farm, or even a school district.

Initial contact

When you contact a person who does wind site assessments, you need to determine his or her capabilities, and any ties they might have to small turbine manufacturers—however loose those ties may be. For example, many people who have been trained to do wind site assessments (but certainly not all) received their training by attending a workshop put on by a manufacturer. Such trainings vary considerably in quality, with some adequately covering the all-important topics of wind turbine towers and siting, while others focus far more on simply closing the sale. Training from or association with a manufacturer is not a fatal flaw, but it is good to know if there will be any potential bias.

When you’re going through the process of screening prospective assessors, be sure to quiz your candidates, using the information on best practices for siting a wind system that have been covered in this series of columns. If the assessor represents a company that offers “one tower size for all sites and applications,” look elsewhere, as all you are likely to come away with is an intense sales pitch.

The first piece of information that the assessor will require is your annual electricity usage. She will likely ask you about your major appliances and try to identify energy efficiency strategies that make sense in your situation. Keep in mind that it is always cheaper to use energy more efficiently with compact fluorescent lighting and high efficiency appliances than it is to install renewable energy equipment to offset electricity consumed by wasteful appliances. The rule of thumb that is used for small wind systems is that every dollar spent on efficiency saves three dollars in generating capacity.

Make sure that you settle on a price for the service, which should include a written report to be delivered to you within a reasonable time after the assessor visits your site.

The site visit

When the assessor visits, he will want to walk around your premises. He is simply getting the lay of the land, and looking for current and potential future obstacles that will affect the performance of the wind turbine by restricting wind flow. The assessor will also want to know your preferred location for the turbine and tower, as well as the location of the building where the controls and inverter for the system will be housed. Measurements including the height of the tallest obstacles on the property, usually trees, and their distance from the proposed tower site will be used to determine the minimum acceptable tower height for the location; those measurements will also help the assessor arrive at an estimated average annual wind speed for the site.

A good assessor will take pictures of the site in eight or more directions, for two reasons. The first is simply to refresh his or her memory when reviewing your site information. The second reason is to include these pictures in the wind site assessment report. It is not unusual for a wind site assessment report to be reviewed by a number of people besides the prospective wind turbine owners, including the permitting or zoning authority, the local utility, any fi-
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financial institution considering a loan for the system, or the state public benefits program or U.S. Department of Agriculture (USDA) should a grant application be submitted. These entities will not be privy to what the site looks like, and any photographs will go a long way toward helping them understand what you are planning.

“Landmines” and installation considerations
Finally, the assessor will need to assess potential “landmines” for the installation—that is, services and structures that may be problematic for any installation. For example, where are the septic tank and field? You certainly do not want a backhoe excavating for a tower anchor in your leach field. Nor do you want a crane driving over your septic tank.

Other critical questions about the site include:
  - What is the location of the well and any water lines?
  - Is there an underground gas or LP line in the area?
  - What about the existence of underground services such as utility or phone lines?
  - Are there any red flags with respect to your soil type? Do you have “critical” soils that consist essentially of gravel or muck, neither of which will support a standard tower foundation?
  - Does your property have a high water table, which might impact the foundation design?
  - How deep is the bedrock on the property? (This too may affect the foundation design.)

Infrastructure issues
  - What is the capacity of your electrical service? Is your circuit breaker box adequate?
  - What about the utility transformer on the pole at the road—is it adequately sized?
  - Are there any plans for future buildings on the property?

Regional concerns
  - Are there any nearby airports or air fields? Where are they located?
  - Does anyone engage in aerial application of pesticides on neighboring fields?

Zoning
  - Are there any height restrictions in your township or county?
  - What setback restrictions from roads or property lines would apply to the tower?

Utility interconnection
  - What are the local utility’s regulations and restrictions on interconnecting the system to the grid? Are there any turbine capacity limitations?
  - Is there a requirement for a wind system disconnect switch? If so, is there a specified location for this disconnect?
  - What are the insurance requirements of the utility?
  - Will your insurance company insure the system without charging a substantial premium?

Site logistics
  - Where is the proposed wire run to terminate?
  - Will bedrock interfere with the wire run?
  - Is there a secure and environmentally conditioned location for the balance of system components (e.g., controls (Continued on page 6)
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and inverter) that has an adequate circuit breaker box? Is there adequate space for all such components? Can the wire run be minimized by siting the turbine close to the controls and inverter without compromising the wind resource or creating more turbulence with ground clutter?

Siting logistics
- Is there an elevated area on the property that is relatively close to the location of the balance of system components that can be utilized to optimize the wind resource?
- Where are the site obstacles and trees relative to the prevailing wind directions? It is important to site the tower upwind of such obstacles to maximize wind speed and minimize turbulence.
- What is the distance and height of the trees in the area (which are usually the tallest obstacles that must be overcome by the tower)?
- What is the planned future use for the location of the tower? Are there any activities or planned structures what will either interfere with the installation or with accessing the tower for future maintenance and repair work?
- Where are any overhead power lines which could pose a danger during installation or while workers and service personnel are on the tower?

Installation logistics
- If the tower style chosen is guyed, is there adequate room for the guy cables?
- If a tilt-up tower will be installed, is there sufficient space to lower the tower to the ground, and possibly leave it in that position for periods of time?
- Can a concrete truck access the site to pour the foundation?
- Will a crane be able to access the location to set the tower and turbine in place?
- Will either of these heavy pieces of equipment need to drive over the septic tank or field, or other infrastructure that could be damaged by heavy weight?

The final report
Once the assessor has collected all of the site information they need, they will create a report that includes:

- The minimum acceptable tower height for the site based on terrain and ground clutter. This should take into account the height that the surrounding trees will attain in the 20-30 year life of the wind system.
- The wind rose for the site that details the seasonal prevailing wind directions and any patterns. This is useful for siting the tower upwind of obstacles to minimize ground drag and turbulence.
- The conservatively estimated wind resource at the site at the minimum tower height specified, as well as an explanation about how the average annual wind speed for the site was arrived at.
- A list of several wind turbine models that will, ideally, offset the electrical consumption of the owners. The suggested turbines may include systems that are larger than required if growth in consumption is anticipated in the future of the customer, or smaller than currently required if there are opportunities for savings by incorporating efficiency. The proposed project also needs to meet the needs, goals, and budget of the customer. Some clients are interested in only installing a token wind system, more as a statement of values. Others might be limited by local utility restrictions as to the size of turbine they can install.

The estimated annual energy output of the suggested turbines, at this location, at the specified tower height and estimated wind speed. In the end, this is really the purpose of a wind site assessment—to estimate how much electricity

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this investment will generate that offsets utility-supplied energy. An explanation of how the annual energy outputs were arrived at will also be included.

In addition, some public benefits programs, as well as the USDA, require additional information for their grants—specifically, any historical, cultural, or environmental ramifications of the project.

Based on the above, as well as a review of the possible red flags and installation considerations discussed above, the assessor will make recommendations to the customer to optimize the wind resource at the site with a small wind system.

Other features of a wind site assessment that help the client understand their resource include:

- site pictures;
- aerial photographs of the property showing all structures, infrastructure, and trees within a 500-foot radius of the tower location; and
- a topographic map of the area with a 1-3 mile radius that conveys a sense of the lay of the land

In addition, the site assessment may offer more than one location for the tower, with pros and cons for each locale. The best location may not be the one preferred by the prospective owners, but the final choice is ultimately theirs—unless, of course, they want something that is completely unreasonable or will result in a seriously underproductive wind system.

The site assessment may also include towers taller than the minimum dictated by the site obstacles, as well as the annual energy output on the taller towers. A taller tower is often justified as the least expensive way to generate a larger amount of electricity, compared to installing a system with a larger swept area or multiple wind systems to meet the electric needs of the client.

Finally, the assessment will need to specify how the customer should proceed. The customer’s first tasks should be contacting the local utility for the interconnection requirements and application, and zoning authority for the building permit. Without permission from these two entities, you simply cannot install a wind system legally (unless it is off-grid in a location with no zoning).

Food for thought
The product you receive from the wind site assessor will take a while to read and digest. Don’t procrastinate—read it, and then read it again. By the time an assessor is done creating the wind site assessment report, he or she may have logged a score of hours. So, again, make sure you read it thoroughly. If you have any questions, which you invariably will, be sure to contact the assessor for answers in a timely manner. The fresher the visit is in everyone’s head, the greater the value of the entire effort.

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Editor’s note: The opinions expressed in this column are the author’s and may not reflect those of AWEA’s staff or board.