Consider wind to power a stock well

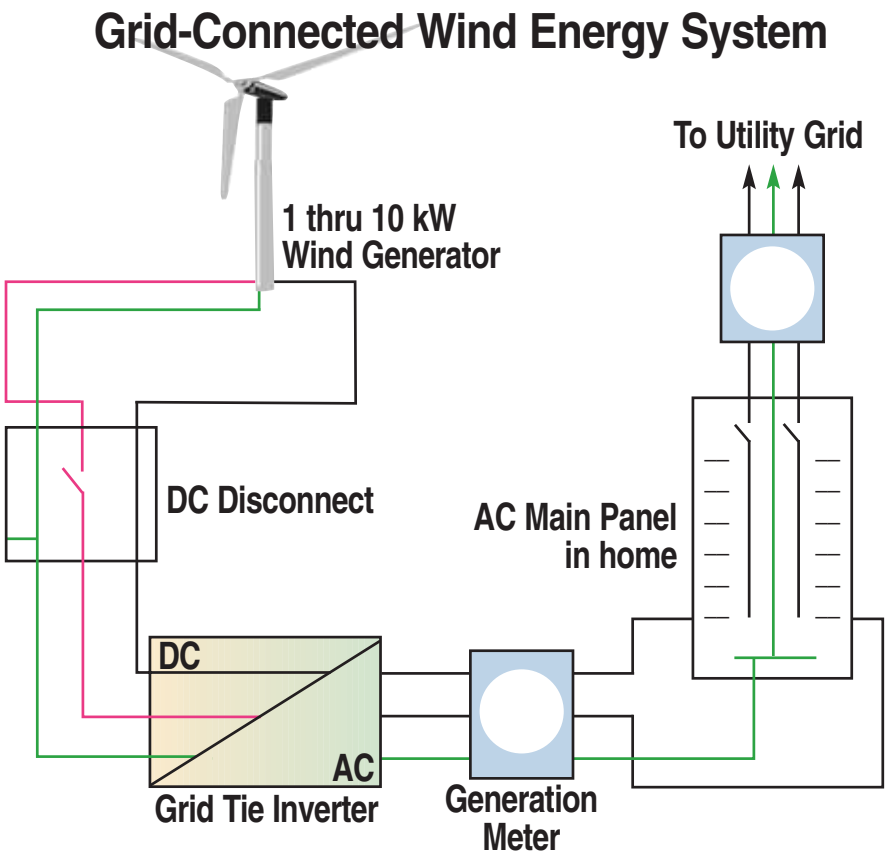
Wind has a long history of helping the West: from the early "wind chargers and battery systems" used to provide rural homes with some electrical energy (prior to the delivery of central station power), to the windmills that provide water to animals in remote locations.

Today, with the development of reliable electronic controls, wind generation is becoming a recommended option for remote generation applications.

In this article, assume that wind-generated electrical energy is being used to pump water for a stock-watering system. The same approach, however, can be used for any small, remote electrical application.

Looking at the potential of wind generation to solve energy problems, note that there are two elements to evaluate:

Generation → Load



Start with generation

In assessing the feasibility of wind generation, first consider where to site it. The generator must be located where the wind blows. Since wind speed and duration are related to height, the ideal location will be on high ground.

According to the wind profile diagrams for Wyoming, locating a wind generator 50 meters (164 feet) above the ground results in higher wind speeds than locating the generator 30 meters (98 feet) above the ground.

Electric cooperatives, municipal utilities, and tribal electric utilities can borrow wind measuring and recording devices from the Western Area Power Administration. Taking the time to measure the wind speeds can be an important step in site selection and wind generator sizing.

Ideal wind speeds can range between five and 30 miles per hour. It's best if they blow constantly. For many turbines, maximum electricity generation is achieved when the wind speed is a constant 30 mph.

As the wind speed doubles, generation output increases eight times. So, higher wind speeds provide the most energy. Above the 30-mile-per-hour threshold, however, the turbine generally stops generating and spins free. This ensures the unit won't be destroyed by very high winds.

Next, assess load

After completing basic site selection, consider next how the electrical energy will be used. In the case of pumping water, some thought needs to be given to:

- how much water will be needed

- when the water will be needed
- how deep the well is (or will be)
- whether the well has the quantity and quality of water required

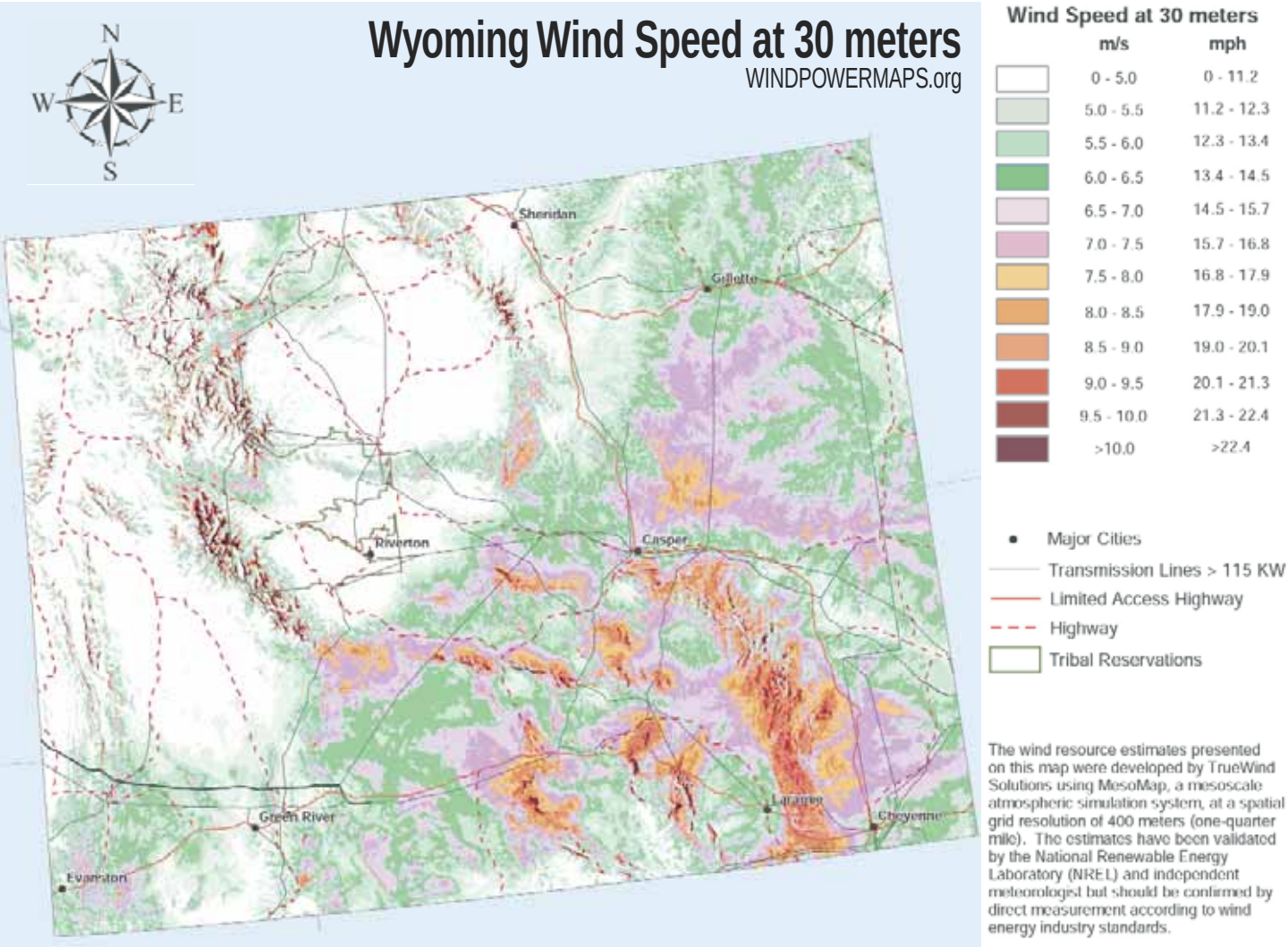
If the water requirements are different from what the wind generation can deliver electrically, some adjustment to this two-part system needs to be made. The most common adjustment is to add a storage element.

Generation → Energy Storage → Load

Energy storage options

If the nature of the generation resource (the wind turbine) does not match the load requirement (the required 'how much' and 'when' of pumping), something must be stored. There are at least two storage options in this water pumping example.

- Electrical Storage —Batteries would store electrical energy until it is needed by the pump.
- Water Storage —A water-holding tank would store water (fill) when the wind is blowing. When the wind is not blowing, gravity could move stored water from a higher elevation



tank through lower-elevation watering systems.

Summary

Before purchasing a wind generator and taking it to the field location, it is important to take the following steps:

1. Evaluate the site (your electric co-op may be able to help with this)
2. Evaluate the available water
3. Determine the water requirements: quantity, quality
4. Determine the size of storage, if required.

All wind generation systems that power stock wells should be customized. There is no one-size-fits-all. For specific sizing recommendations, send the following information to UW, Electric Motor Training & Testing Center, Dept. 3295, 100 E. University Ave., Laramie, Wyo., 82071, or call 307-766-5149.

- well recharge rate
- depth of pump
- number and type of livestock drinking from location
- draw-down level and at what flow it is taken (for example: say a well is 150' deep and the static water level is at 50'. When it is pumped at 10 gallons per minute, the well draws down to 100')
- amount of water required over the course of one week
- daily water requirements (if unsure, note how many head are drinking daily from this location.)
- when water is required (time of year) and for how many days/weeks/months

Wind systems for powering remote stock wells (including pump) can start at $2,200 and be as much as $7,000 or more. The most expensive systems either require large volumes to be pumped or pump from wells 300 feet deep or more.

Jim Kirsch is a former electric cooperative manager and operations manager in Wyoming. *This article was initially published in the March, 2006 edition of the* WREN magazine. *It is reprinted here with permission.*