

Energy Versus Power

A quick overview prepared by Gail Raker, NW SEED (June 2004)

When dealing with electricity generation it is important to understand the difference between a kilowatt (kW) and a kilowatt-hour (kWh). The first, kilowatt, is a unit of power, while the second, kilowatt-hour, is a unit of energy. Your monthly energy bill is in kWh while the rating of your turbine is in kW. Below is an analogy to clarify the difference between these two terms.

In this picture a garden hose is being used to fill a wading pool. The rate at which the water comes out of the hose determines how long it will take to fill the pool. In the first image the water is coming out very slowly and it will take a long time for the pool to fill.



In this second image the water is coming out of the hose more quickly allowing the pool to be filled in a shorter time period.



In this analogy the rate at which the water comes out of the hose is equivalent to the power output of a turbine. The water that has filled the wading pool is equivalent to the energy generated by a turbine. While both hoses have produced the same amount of water (energy), the rates at which they did so (power) were different. The jet of water coming from the second hose was stronger, or more powerful, meaning that at any given moment more water was passing through the nozzle. In the same way that the nozzle of the hose can be adjusted to regulate the rate at which the water flows, the turbine output (power) will change with the wind speed. A higher wind speed will increase the power output of the turbine. Over a period of time this results in the production of energy.

To convert between the two remember that:

$$\text{Power} \times \text{Time} = \text{Energy}$$

Here is an example of a wind turbine running at 7 kW for 20 minutes:

$$7 \text{ kW} \times 1/3 \text{ hours} = 2.33 \text{ kWh}$$