



## Renewable Energy Terms

### Rated Watt— Specified output of a generating source

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*Derivation: The watt was named after James Watt, who developed an improved steam engine. "Rated" is from Latin "rata," according to a fixed part, from Latin "reri," to consider or reckon.*

What does it mean when you read that a renewable energy generating source is "rated at x watts"? Well, that depends on the device. This term can be pretty confusing.

If you're looking at photovoltaic (PV) panels, they are rated at 1,000 watts per square meter (full sun), at 25°C (77°F), and at their maximum power point. Since this point is where the voltage is generally at 17 or 18 volts, and your system voltage will be 12 to 15 volts, it doesn't represent what you'll get out of your PV panel in a battery-based renewable energy system. The real-world temperature of a PV panel in operation can be 45°C (113°F) or higher. Since PV output drops in higher temperatures, the rated output can be even more misleading.

If the panel generates 5 amps at 17 volts, we're talking 85 watts (amps x volts = watts). But if your battery is at 12.5 volts and the panel is still generating 5 amps, the wattage will only be about 62 watts. So when you see an advertisement for a 100 watt panel, you should bear in mind that it will only generate at about 75 to 85 watts when you connect it to your battery bank. Typically, you will get rated *amps* any time the sun is clear and strong from a deep blue sky. But you will not get rated *watts*.

If you're considering a hydro turbine, you're looking at a different situation. Though these machines do have an operating range, their output is determined by the head and flow available at the site. Ask hydro turbine suppliers what their turbines are rated for, and they'll start asking you what your head and flow are. This is fairly straightforward. The resource drives the output, and the relationship is very predictable.

Of course, you want a turbine that can handle your flow, and a generator capable of continuous output at that level. But asking for a certain size of turbine before you know your head and flow is putting the cart before the horse.

When it comes to wind turbines, the term "rated watt" is not very meaningful, though the manufacturers spend a lot of time and money trying to get you to focus on it. A wind turbine is rated at a certain wind speed, often (but not always) at the speed at which it generates the most. And since manufacturers use different rated wind speeds, it's hard to compare one machine to another.

The "rated watt" generally refers to the *peak* output of the wind generator. But wind generators don't spend a lot of time humming along at peak output. So focusing on the peak as a selling point or comparative measure is rather like shopping for a car based on its top speed.

What you should be more concerned about is the total energy output (KWH per month). But there is no standardized testing of small turbines, so we are at the mercy of the manufacturers' marketing departments. For now, the easiest way to compare wind turbines is not by their rated output at all, but by the swept area of their rotors.

The rotor is the "collector," the engine that drives the generator. Though there are some variations in efficiency, rotor diameter is the simplest and best comparative measure for output, whether you're talking about tiny turbines for sailboats, or gigantic, utility-scale machines.

Comparing the outputs of the three generating technologies is treacherous. A rated watt of PV has little relation to a rated watt of wind power. I can say that I have a 1,000 watt wind turbine and an 800 watt PV array, but I haven't told you much about their relative usefulness in my system at my specific site. It depends on the number of sun hours I have, and how much wind goes through my turbine's rotor.

Maybe we should put a little pressure on the manufacturers. Is it unreasonable to expect that PVs being sold for battery-based systems should be rated and advertised for what they will actually put into our batteries? Will wind turbine manufacturers acknowledge that customers want watt-hours in their battery banks, not bragging rights for the highest peak output?

Both of these industry segments could take a lesson from the hydro folks, who provide us with straightforward answers if we provide them with good information about our energy resource.

My advice? Take all the talk about rated watts with a grain of salt. Quiz the manufacturers and suppliers. And talk with experienced dealers. They have the knowledge and feel to tell you what to expect from your PVs, wind generators, and hydro turbines. Crunch your numbers, but be conservative, and allow for error. Make sure you get the energy (watt-hours) you need, not just mysterious "rated watts."

#### Access

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