



Wind Power, Energy Generation Information & Data (Windgate Model WT 6000)

The dawn of a new day brings the Sun's rays to warm the environment and sustain life. The earth absorbs the Sun's energy and heats up as the day continues. The air that surrounds the warm earth surface slowly heats up and rises against gravity. Since, hot air has a lower density than cold air the cold air takes its place rushing in from far away colder regions. This air motion is what we experience as wind flow. Wind on our earth is caused by our Sun, and this renewable air flow has both power and energy that we can harness.

All human activities require energy: food to sustain us and enable our mobility, gasoline for our automobiles and transportation, electricity for our lights, heating and air conditioning. To date this energy has come primarily from fossil fuels (oil, natural gas, and coal) and nuclear fuels. Fossil and nuclear energy sources are not renewable and produce harmful by-products such as carbon dioxide and nuclear waste. Renewable energy from wind, solar, and biomass is sustainable and does not lead to increased carbon dioxide emissions. The use of renewable energy is beginning to slowly displace fossil energy and will substantially increase in use over the next few decades.

Wind flowing at a certain speed has significant energy that can be harnessed. Wind turbines convert wind energy into mechanical energy using blades that are attached to a mechanical shaft. This wind energy makes the shaft rotate, and when connected to a standard electric generator, electricity is produced. The electric energy harnessed from the wind depends on the wind speed, the size of the wind turbine, and the duration of wind at a certain speed. Wind may be flowing as a gentle breeze one day, blowing hard another day, and occasionally reach dangerous hurricane levels. The wind flows according to the differences in air densities as described above. While the commonly used term "average wind speed" in a given location is useful for general comparisons of various regions, it does not lend much assistance in quantifying the total energy that can be harnessed from wind for a given wind turbine design.

An important point of comprehension and differentiation is to understand a wind turbine's power and energy creation in terms of the wind we have and when we have it. For such quantification the standard measurement (KW plate power) must be evaluated in terms of kWh production (as per a utility bill) as opposed to strictly a KW rating:

The current plate power ratings scale (maximum output rationale KW Rating) is rooted in the assumption that the AVERAGE wind speed occurs ALL the time, when actually it DOES NOT. For example, in a class 4 wind regime (normal US wind value) the average wind speed is 12.2 MPH. But this 12.2 MPH only occurs 13% of the time during the year.

By way of an example, the determination of a car or truck's speed cannot be based on horsepower alone, without factoring in various resistance factors such as its weight, cargo, torque and of course the braking requirements that the weight imposes on the vehicle. The same holds true of wind power.

Wind has both power and energy. Wind power depends strongly on wind speed. The power increases eight times when the wind speed doubles. On the other hand wind energy depends on the length of time the wind stays at a certain speed. Consider for example a section of a wind tunnel in which wind is flowing at 5 kilo Watts (kW) power. If this wind continues to flow steadily at this power for one half hour (h) then the energy in this wind is said to be 5 (kW) x 0.5 (h) or 2.5 kWh. Wind energy is a product of wind power and time.

Department of Energy publishes tables for each of the 7 wind classes (wind range). These tables contain columns of measured wind speeds versus the percent of time the wind is at this wind speed during the year. This gives “Percent of Time” during the year at each wind speed, (Class 4 represents the majority of North America). The following is the correct way to compute the electric energy generated by a turbine, kWh, in a given year:

1. Multiply this Percent of Time by the number of total hours in the year: 8760 hours. This gives the number of hours in the year for each wind speed.
2. Use the specific (and certified) turbine power curve to calculate the power output at each wind speed. This is in kilowatts (kW).
3. Multiply this turbine power output (kW) by the total hours (h) in the year for each wind speed and we get electric energy produced at each wind speed in kWh.
4. Then add each wind speed energies during the year to find the total turbine generated wind energy for the year in kWh.

Wind power is an important part of our future and all efforts to reduce carbon emissions are critical. Part of the process is to start talking about energy creation in terms of the wind we have, when we have it and how much energy is converted at these intervals. Windtronics, the developer of the Honeywell Wind Turbine created the Blade Tip Power System (BTPS) to drastically reduce the mechanical resistance and weight of a turbine. The BTPS is a gearless system that permits performance at wind levels well above and below a traditional turbine’s cut-in and cut-out wind speeds.



The Honeywell Wind Turbine was designed to operate in a much greater wind range, with a cut-in speed (startup) below 2 mph and a shutdown speed of 45mph in Class 4 winds, which compares favorably to traditional turbines with a cut-in speeds of 7.5 and shutdown speeds between 25-30 mph.

It is this ability to capture and convert a wider range of wind energy that has advanced the highest output, lowest installed cost per kWh technology in the industry.

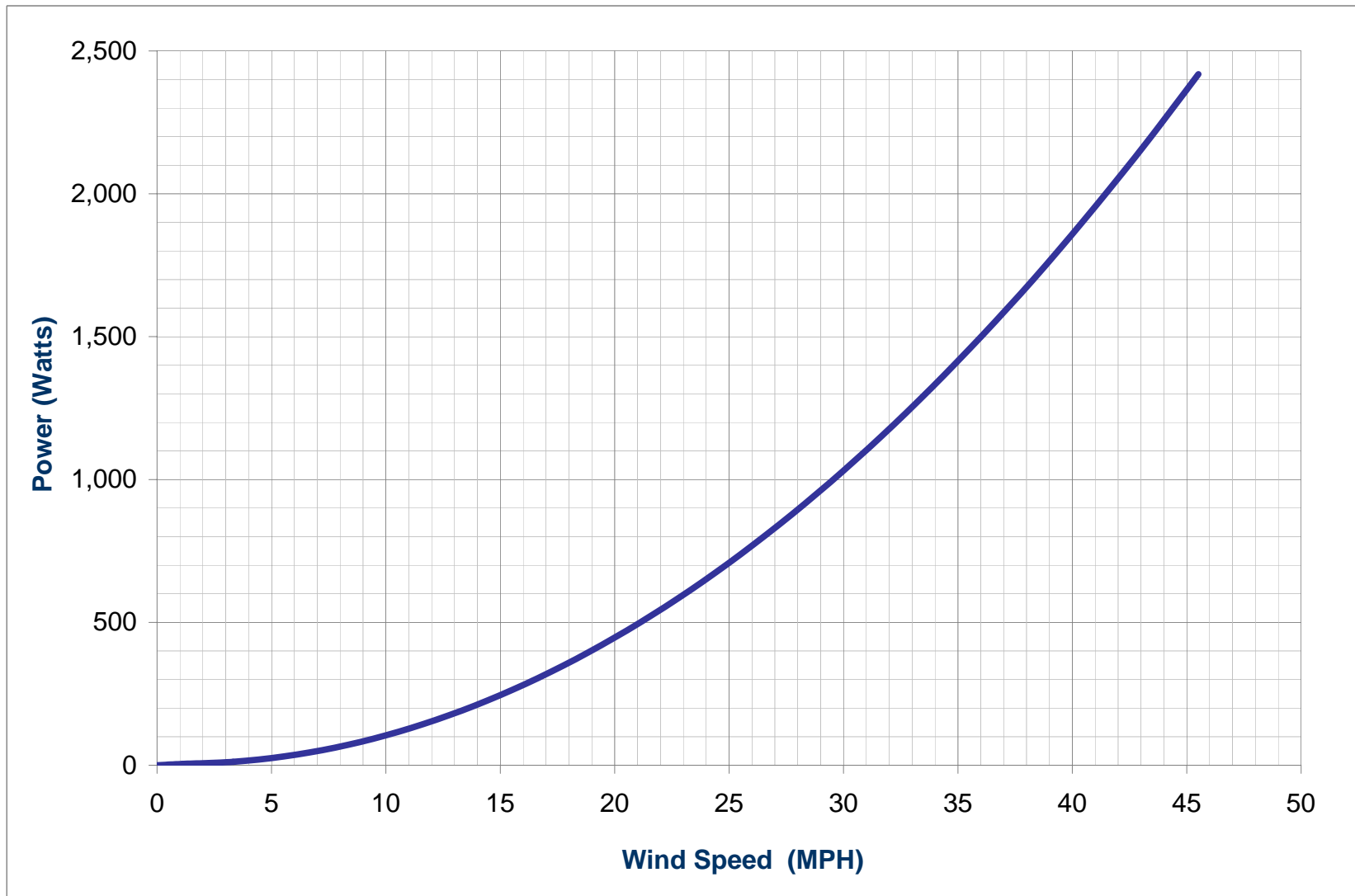
The Honeywell Wind Turbine is a 2 KW turbine that creates 2000 kWh/yr in Class 4 winds.

Honeywell Wind Turbine (WT 6000) Windgate Power Curve and Annual Energy Data

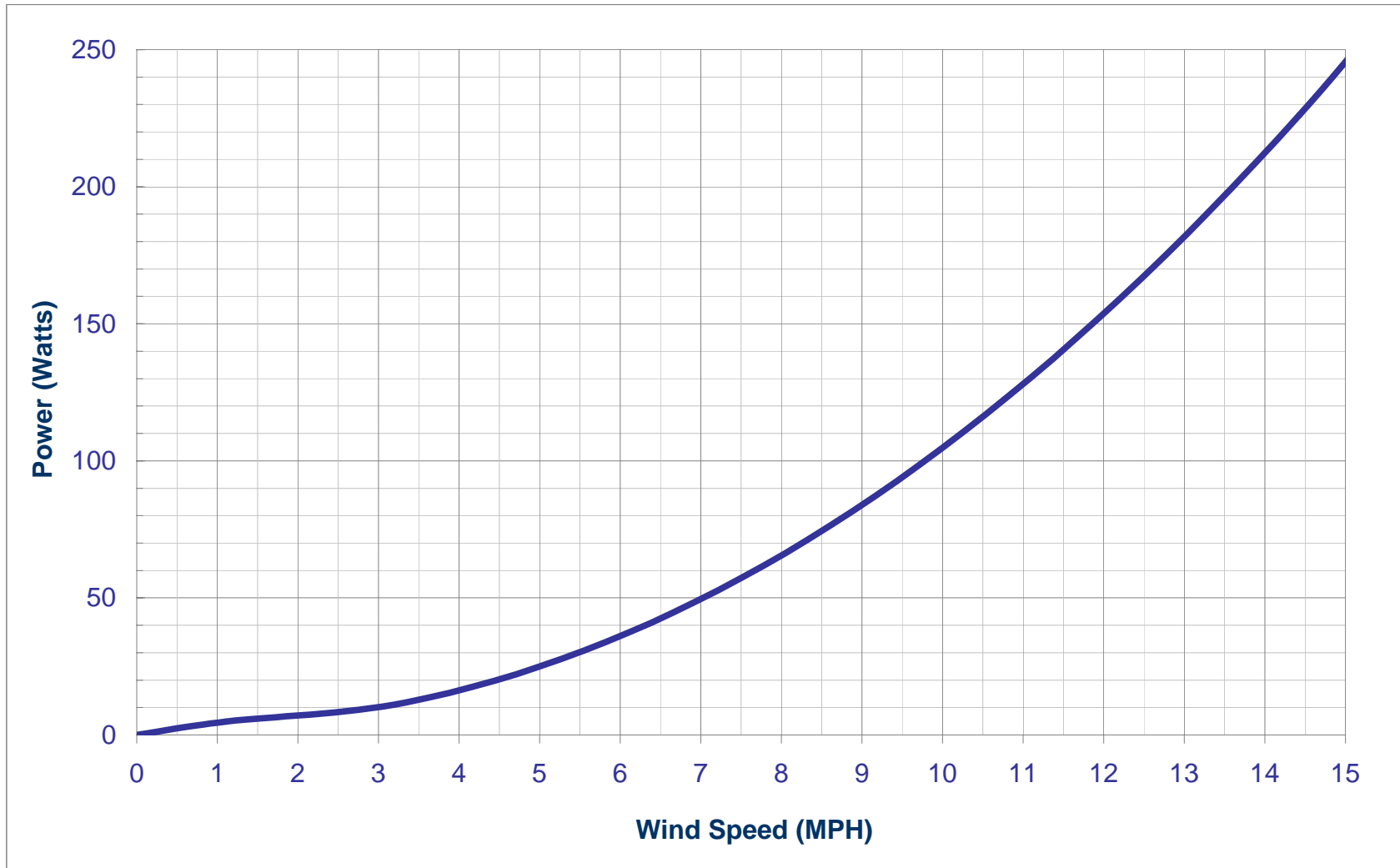
Wind Speed (m/s)	Wind Speed (MPH)	% At Wind Speed Class 4 Site	Annual Hours (h/yr)	Hours At Wind Speed (h/yr)	WT 6000 Power Curve Data in Class 4 Wind (W)	WT 6000 Annual Energy Generation in Class 4 Wind (Total = 2000 kWh/yr) (kWh/yr)
0	0	0.00	8,760	0	0	0
0.5	1.11	0.00	8,760	0	5	0
1.5	3.33	6.61	8,760	579	12	7
2.5	5.55	10.04	8,760	880	31	27
3.5	7.77	12.22	8,760	1,070	62	66
4.5	9.99	13.04	8,760	1,142	105	119
5.5	12.21	12.63	8,760	1,106	159	176
6.5	14.43	11.30	8,760	990	226	224
7.5	16.65	9.41	8,760	824	305	251
8.5	18.87	7.35	8,760	644	396	255
9.5	21.09	5.41	8,760	474	499	236
10.5	23.31	3.75	8,760	329	613	201
11.5	25.53	2.46	8,760	215	740	159
12.5	27.75	1.53	8,760	134	879	118
13.5	29.97	0.90	8,760	79	1,029	81
14.5	32.19	0.51	8,760	45	1,192	53
15.5	34.41	0.27	8,760	24	1,366	32
16.5	36.63	0.14	8,760	12	1,553	19
17.5	38.85	0.07	8,760	6	1,751	11
18.5	41.07	0.03	8,760	3	1,962	5
19.5	43.29	0.00	8,760	0	2,184	0
20.5	45.51	0.00	8,760	0	2,419	0
						2,042

Wind Speed (MPH)	WT6000 Power (W)	
1	5	
2	6	Cut In Wind Speed
5	25	
10	105	
15	245	
20	447	
25	709	
30	1,031	
35	1,415	
42	2,053	Plate Power
45	2,364	Cut Off Wind Speed

Windgate Full Power Curve



Windgate Power Curve to 15 MPH



Honeywell Wind Turbine

Model: Windgate™

The Home Energy Solution: Bringing Wind Technology to Life

- High Efficiency Patented Horizontal Axis Wind Turbine
- Rotor Diameter 5.7 Feet (1.7 m)
- Plate Power at 42 MPH (18.9 m/s) 2.0 kW
- Cut in Wind Speed 2 MPH (0.9 m/s)
- Annual Energy in Class 4 Wind 2000 kWh/yr
- Annual CO2 Displacement 2.2 tons
- Product Design Life 20 Years
- Permanent Magnet Custom Electric Generator (Pat. Pending)
- Standard Zinc Treated Steel Tripod Roof Mounting System
- Acoustic Noise Emission 35-45 dB
- Electromagnetic Emission to be CE Certified, BS EN 6100
- Custom Smart Box Electronics with Proprietary Battery Charging System
- Standard RS-232 Communications. Optional Ethernet Wireless and Data Software
- Home Utility Box Connection, Safety, Electrical reliability Standards Pending Independent UL Verification
- This Home Energy Wind Turbine Technology has been designed to be environmentally harm neutral