



Wind Power, Energy Generation Information & Data (Star Gate Model WT 6500)

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.

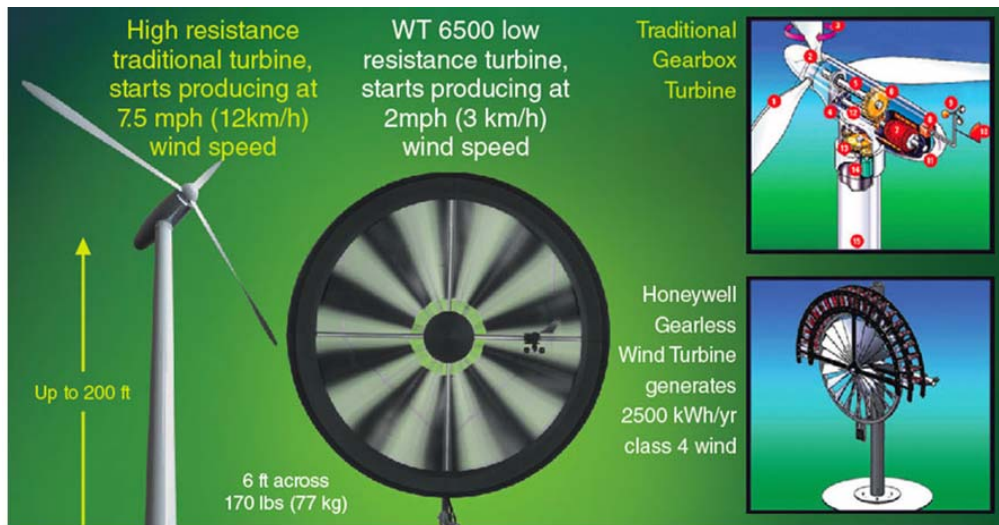
By way of an example, the determination of a car or truck's speed cannot be based on horsepower alone, without factoring in various resistance factors such as its weight, cargo, torque and of course the braking requirements that the weight imposes on the vehicle. The same holds true of wind power.

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) perimeter power system 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.

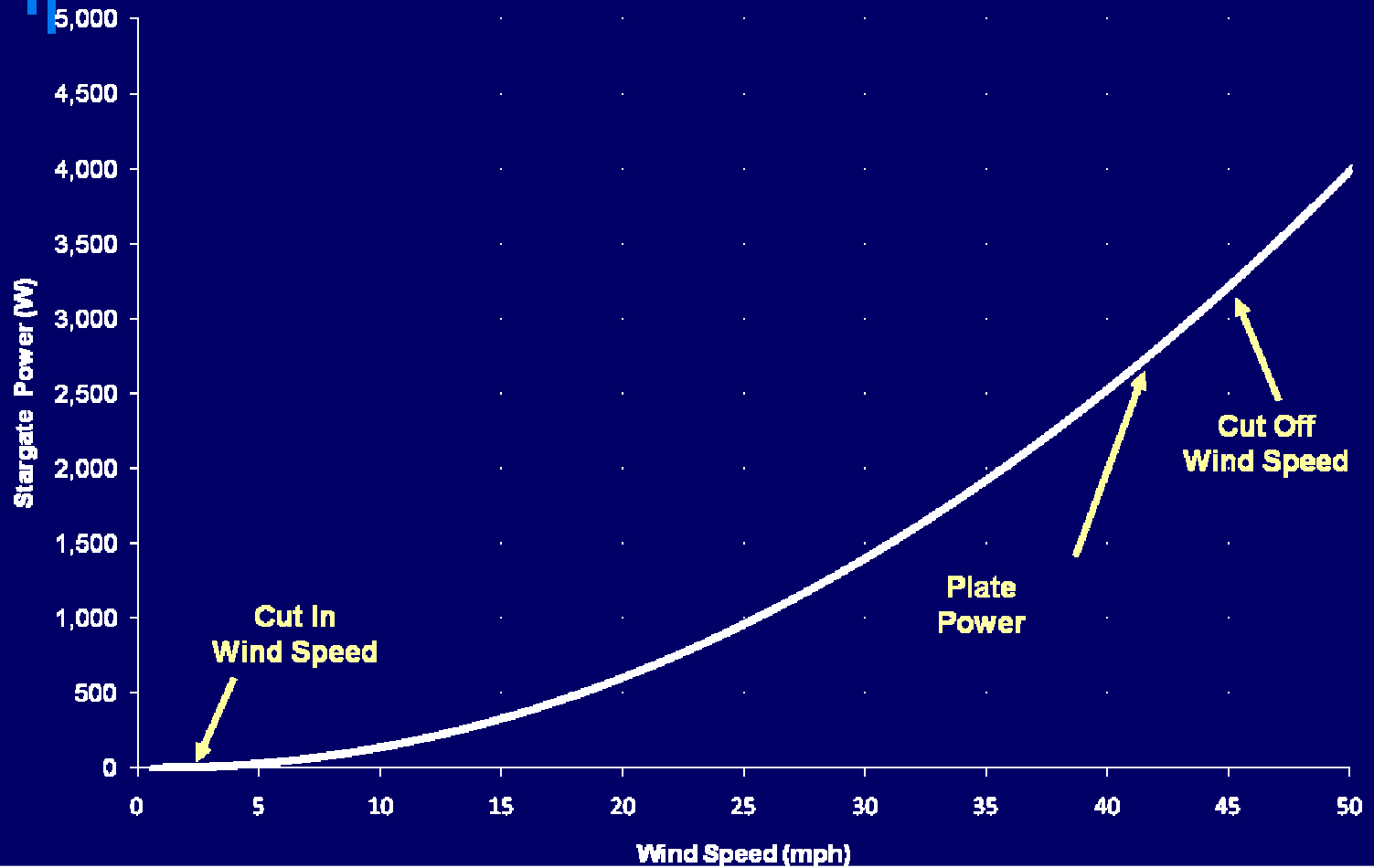


The Honeywell Wind Turbine was designed to operate in a much greater wind range, with a cut-in speed (startup) below 2 mph and a shutdown speed of 45mph in Class 4 winds, which compares favorably to traditional turbines with a cut-in speeds of 7.5 and shutdown speeds between 25-30 mph.

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 2.5 KW turbine that creates 2752 kWh/yr in Class 4 winds.

Windtronics, LLC Honeywell Model StarGate™ Turbine Power Curve



Windtronics, LLC

Honeywell Wind Turbine: Model StarGate

Wind Speed (m/s)	Wind Speed (MPH)	% At Wind Speed Class 4 Site	Annual Hours (h/yr)	Hours At Wind Speed (h/yr)	StarGate Power Curve Data in Class 4 Wind (W)	StarGate Annual Energy Generation in Class 4 Wind (Total = 2752 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	14	8
2.5	5.55	10.04	8,760	880	40	35
3.5	7.77	12.22	8,760	1,070	82	87
4.5	9.99	13.04	8,760	1,142	140	160
5.5	12.21	12.63	8,760	1,106	214	237
6.5	14.43	11.30	8,760	990	305	302
7.5	16.65	9.41	8,760	824	411	339
8.5	18.87	7.35	8,760	644	535	344
9.5	21.09	5.41	8,760	474	674	319
10.5	23.31	3.75	8,760	329	829	272
11.5	25.53	2.46	8,760	215	1,001	216
12.5	27.75	1.53	8,760	134	1,189	159
13.5	29.97	0.90	8,760	79	1,394	110
14.5	32.19	0.51	8,760	45	1,614	72
15.5	34.41	0.27	8,760	24	1,851	44
16.5	36.63	0.14	8,760	12	2,105	26
17.5	38.85	0.07	8,760	6	2,374	15
18.5	41.07	0.03	8,760	3	2,660	7
19.5	43.29	0.00	8,760	0	2,962	0
20.5	45.51	0.00	8,760	0	3,280	0
21.5	47.73	0.00	8,760	0	3,614	0
22.5	49.95	0.00	8,760	0	3,965	0
23.5	52.17	0.00	8,760	0	4,332	0
24.5	54.39	0.00	8,760	0	4,715	0
						2,752

Windtronics, LLC StarGate Turbine 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)	StarGate Power Curve Data in Class 4 Wind (W)	StarGate Annual Energy Generation in Class 4 Wind (Total = 2752 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	14	8
2.5	5.55	10.04	8,760	880	40	35
3.5	7.77	12.22	8,760	1,070	82	87
4.5	9.99	13.04	8,760	1,142	140	160
5.5	12.21	12.63	8,760	1,106	214	237
6.5	14.43	11.30	8,760	990	305	302
7.5	16.65	9.41	8,760	824	411	339
8.5	18.87	7.35	8,760	644	535	344
9.5	21.09	5.41	8,760	474	674	319
10.5	23.31	3.75	8,760	329	829	272
11.5	25.53	2.46	8,760	215	1,001	216
12.5	27.75	1.53	8,760	134	1,189	159
13.5	29.97	0.90	8,760	79	1,394	110
14.5	32.19	0.51	8,760	45	1,614	72
15.5	34.41	0.27	8,760	24	1,851	44
16.5	36.63	0.14	8,760	12	2,105	26
17.5	38.85	0.07	8,760	6	2,374	15
18.5	41.07	0.03	8,760	3	2,660	7
19.5	43.29	0.00	8,760	0	2,962	0
20.5	45.51	0.00	8,760	0	3,280	0
21.5	47.73	0.00	8,760	0	3,614	0
22.5	49.95	0.00	8,760	0	3,965	0
23.5	52.17	0.00	8,760	0	4,332	0
24.5	54.39	0.00	8,760	0	4,715	0
						2,752

Wind Speed (MPH)	StarGate Power (W)
1	5
2	7
5	32
10	140
15	330
20	603
25	959
30	1,397
35	1,917
40	2,520
45	3,205
50	3,973

Cut In Wind Speed

Plate Power

Cut Off Wind Speed

Smart Box Control System (includes)

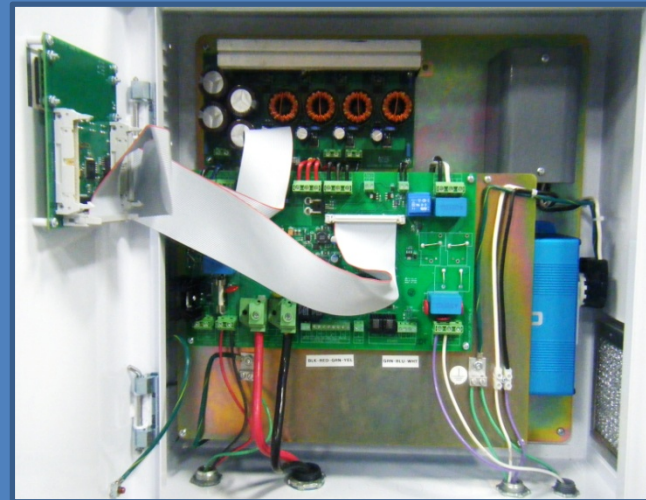
Optimal Power Transfer Controller

True Sine Wave Inverter

Battery Power Management System

Wind Direction & Speed Measurement Control System

Standard RS485 Communication Port



**Honeywell
Model WT 6500
Star Gate
Specifications**

Honeywell Gearless Wind Turbine

Blade Tip Power System (BTPS)

BTPS Permanent Magnet Electric Generator, Patents Pending

UL Certified (Dec 2009)

Installs on Pole or Roof Mount

Lowest Cost kWh Installed Technology in Class

Enclosed Blade Tip Power System

Wide Wind Acceptance Angle

Acoustic Noise Emissions < 35dB

Tip to Tip Blade Dimension 5.7' (170 cm)

170 lbs (77.2 kg)

120 AC 60 Hz

220 AC 50 Hz (May 2010)

2.2 KW Plate Power

< 2mph (3 km/h) Cut in Speed, Shut down 42 mph (67.5 km/h)

Renewable Electric Generation 2000 kWh/yr - Class 3 Winds

Renewable Electric Generation 2500 kWh/yr - Class 4 Winds
(D.O.E. average US household electric 11,000 kWh/yr)

Smart Box Control System (includes)

Optimal Power Transfer Controller

True Sine Wave Inverter

Battery Power Management System

Wind Direction & Speed Measurement Control System

Standard RS485 Communication Port

5 Year Limited Warranty

Annual CO2 Displacement 2.2 Tons

Product Design Life 20 Years