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5 kW Wind Turbine (study)

28February 2019

Author:

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Contents

1. PRINCIPLE OF OPERATION

1.1 HOW WIND CREATES ENERGY

Wind is a form of solar energy caused by a combination of three concurrent events:

- ✓ The sun unevenly heating the atmosphere
- ✓ Irregularities of the earth's surface
- ✓ The rotation of the earth.

The terms "wind energy" and "wind power" both describe the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy from the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity.

A wind turbine turns energy in the wind into electricity using the aerodynamic force created by the rotor blades, which work similarly to an airplane wing or helicopter rotor blade. When the wind flows across the blade, the air pressure on one side of the blade decreases. The difference in air pressure across the two sides of the blade creates both lift and drag. The force of the lift is stronger than the drag and this causes the rotor to spin. The rotor is connected to the generator, either directly (if it's a direct drive turbine) or through a shaft and a series of gears (a gearbox) that speed up the rotation and allow for a physically smaller generator. This translation of aerodynamic force to rotation of a generator creates electricity.

1.2 TYPES OF WIND TURBINES

Modern wind turbines fall into two basic groups:

Horizontal-Axis Turbines: Horizontal-axis wind turbines (pictured right) are what many people picture when you think of wind turbines. They most commonly have three blades and are operated "upwind," with the turbine pivoting at the top of the tower so the blades face into the wind.

Large three-bladed horizontal-axis wind turbines (HAWT) with the blades upwind of the tower produce the overwhelming majority of wind power in the world today. These turbines have the main rotor shaft and electrical generator at the top of a tower, and must be pointed into the wind. Small turbines are pointed by a simple wind vane, while large turbines generally use a wind sensor coupled with a yaw system. Most have a gearbox, which turns the slow rotation of the blades into a quicker rotation that is more suitable to drive an electrical generator. Some turbines use a different type of generator suited to slower rotational speed input. These don't need a gearbox, and are called direct-drive, meaning they couple the rotor directly to the generator with no gearbox in between. While permanent magnet direct-drive generators can be more costly due to the rare earth materials required, these gearless turbines are sometimes preferred over gearbox generators because they "eliminate the gear-speed increaser, which is susceptible to significant accumulated fatigue torque loading, related reliability issues, and maintenance costs.

One Energy in Findlay, OH assembles one of their permanent magnet direct-drive wind turbines.

The rotor of a gearless wind turbine being set. This particular turbine was prefabricated in Germany, before being shipped to the U.S. for assembly.

Most horizontal axis turbines have their rotors upwind of the supporting tower. Downwind machines have been built, because they don't need an additional mechanism for keeping them in line with the wind. In high winds, the blades can also be allowed to bend, which reduces their swept area and thus their wind resistance. Despite these advantages, upwind designs are preferred, because the change in loading from the wind as each blade passes behind the supporting tower can cause damage to the turbine.

Turbines used in wind farms for commercial production of electric power are usually three-bladed. These have low torque ripple, which contributes to good reliability. The blades are usually colored white for daytime visibility by aircraft and range in length from 20 to 80 meters (66 to 262 ft). The size and height of turbines increase year by year. Offshore wind turbines are built up to 8(MW) today and have a blade length up to 80 meters (260 ft). Usual tubular steel towers of multi megawatt turbines have a height of 70 m to 120 m and in extremes up to 160m.

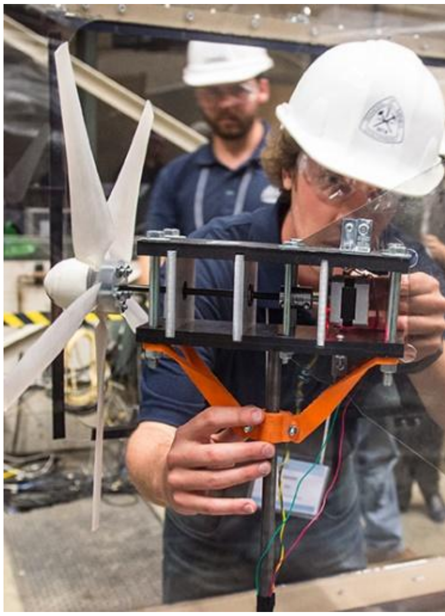
NREL 42794, Mike vanBavel (Left), NREL 50000, Suzanne Tegen (Right)

- ✓ Vertical-Axis Turbines: Vertical-axis wind turbines (pictured left) come in several varieties, including the eggbeater-style Darrieus model, named after its French inventor. These turbines are omnidirectional, meaning they don't need to be adjusted to point into the wind to operate.

1.3 SIZES OF WIND TURBINES

Utility-scale wind turbines range in size from 100 kilowatts to as large as several megawatts. Larger wind turbines are more cost effective and are grouped together into wind farms, which provide bulk power to the electrical grid.

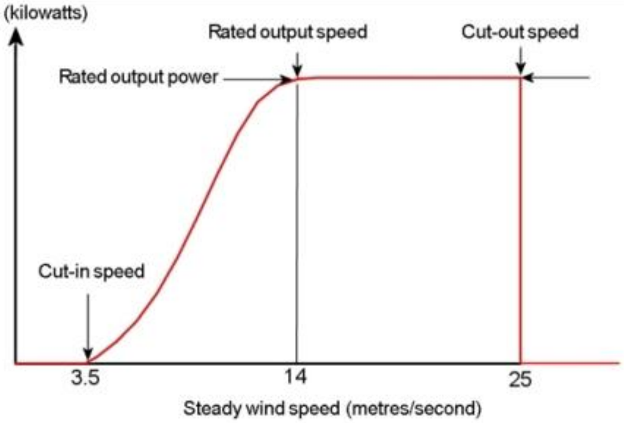
Offshore wind turbines are larger, can generate more power, and do not have the same transportation challenges of land-based wind installations, as the large components can be transported on ships instead of on roads.



Single small turbines—below 100 kilowatts—are typically used for residential, agricultural, and small commercial and industrial applications. Small turbines can be used in hybrid energy system with other distributed energy resources, such as microgrids powered by diesel generators, batteries, and photovoltaic. These systems are called hybrid wind systems and are typically used in remote, off-grid locations, where a connection to the utility grid is not available, and are becoming more common in grid connected applications for resiliency. **Ref 1**

1.3.1 Wind Power Density

(WPD) is a quantitative measure of wind energy available at any location. It is the mean annual power available per square meter of swept area of a turbine, and is calculated for different heights above ground. Calculation of wind power density includes the effect of wind velocity and air density. Wind turbines are classified by the wind speed they are designed for, from class I to class III, with A to C referring to the turbulence intensity of the wind.



Typical wind turbine power output with steady wind speed.

Class	Avg Wind Speed (m/s)	Turbulence
IA	10	16%
IB	10	14%
IC	10	12%
IIA	8.5	16%
IIB	8.5	14%
IIC	8.5	12%
IIIA	7.5	16%
IIIB	7.5	14%
IIIC	7.5	12%

1.3.2 Efficiency

Conservation of mass requires that the amount of air entering and exiting a turbine must be equal. Accordingly, Betz's law gives the maximal achievable extraction of wind power by a wind turbine as 16/27 (59.3%) of the total kinetic energy of the air flowing through the turbine.

The maximum theoretical power output of a wind machine is thus 16/27 times the kinetic energy of the air passing through the effective disk area of the machine. If the effective area of the disk is A, and the wind velocity v, the maximum theoretical power output P is:

$$P = \frac{16}{27}\frac{1}{2}\rho v^3 A = \frac{8}{27}\rho v^3 A\,,$$

where ϱ is the air density.

Wind-to-rotor efficiency (including rotor blade friction and drag) are among the factors impacting the final price of wind power. Further inefficiencies, such as gearbox losses, generator and converter losses, reduce the power delivered by a wind turbine. To protect components from undue wear, extracted power is held constant above the rated operating speed as theoretical power increases at the cube of wind speed, further reducing theoretical efficiency. In 2001, commercial utility-connected turbines deliver 75% to 80% of the Betz limit of power extractable from the wind, at rated operating speed.

Efficiency can decrease slightly over time, one of the main reasons being dust and insect carcasses on the blades which alters the aerodynamic profile and essentially reduces the lift to drag ratio of the airfoil. Analysis of 3128 wind turbines older than 10 years in Denmark showed that half of the turbines had no decrease, while the other half saw a production decrease of 1.2% per year. Ice accretion on turbine blades has also been found to greatly reduce the efficiency of wind turbines, which is a common challenge in cold climates where in-cloud icing and freezing rain events occur. Vertical turbine designs have much lower efficiency than standard horizontal designs.

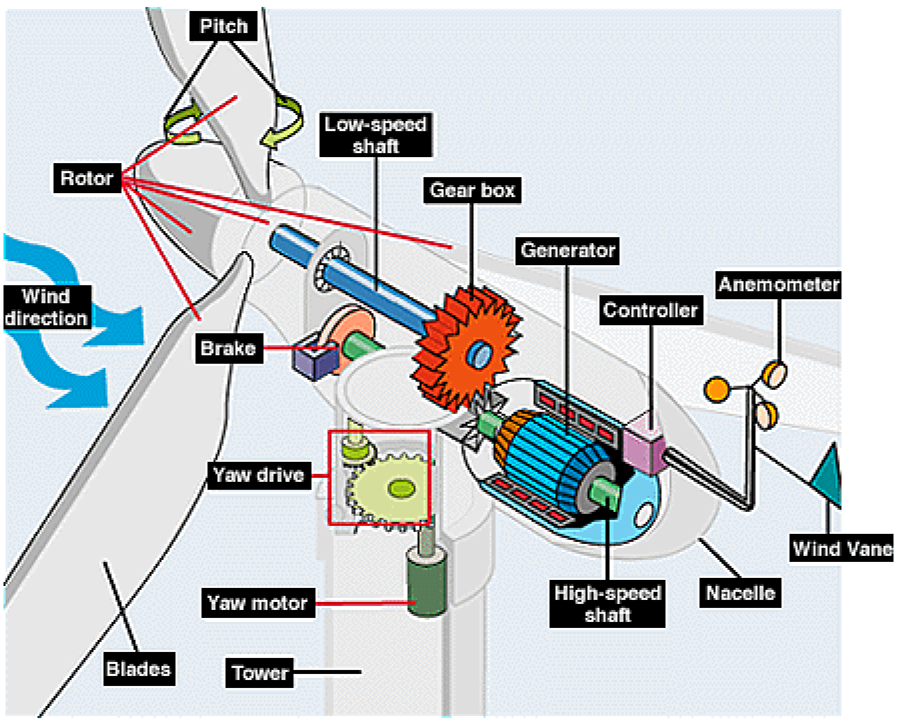
Refer 2

2. DESIGN AND CONSTRUCTION

Wind turbine design is a careful balance of cost, energy output, and fatigue life. These factors are balanced using a range of computer modelling techniques.

2.1 COMPONENTS

Wind turbines convert wind energy to electrical energy for distribution. Conventional horizontal axis turbines can be divided into three components:

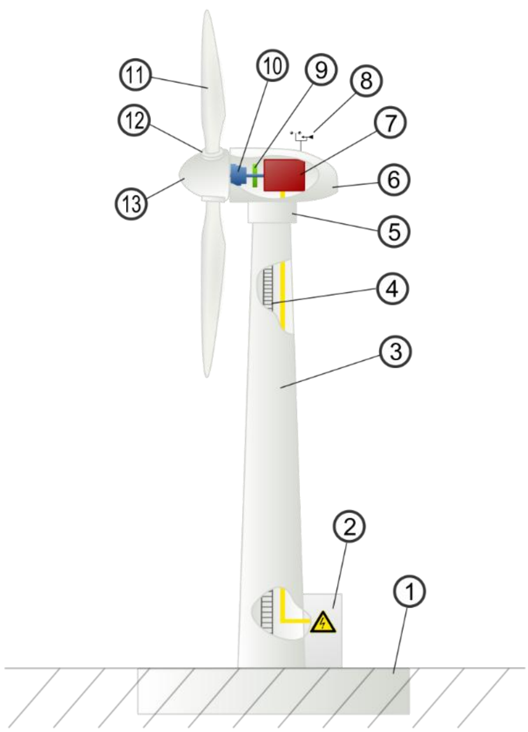


- The rotor, which is approximately 20% of the wind turbine cost, includes the blades for converting wind energy to low speed rotational energy.

- The generator, which is approximately 34% of the wind turbine cost, includes the electrical generator, the control electronics, and most likely a gear box (e.g. planetary gear box), adjustable-speed drive or continuously variable transmission component for converting the low-speed incoming rotation to high-speed rotation suitable for generating electricity.

- The surrounding structure, which is approximately 15% of the wind turbine cost, includes the tower and rotor yaw mechanism.

A 1.5 (MW) wind turbine of a type frequently seen in the United States has a tower 80 meters (260 ft) high. The rotor assembly (blades and hub) weighs 22,000 kilograms (48,000 lb). The nacelle, which contains the generator, weighs 52,000 kilograms (115,000 lb). The concrete base for the tower is constructed using 26,000 kilograms (58,000 lb) reinforcing steel and contains 190 cubic meters (250 cu yd) of concrete. The base is 15 meters (50 ft) in diameter and 2.4 meters (8 ft) thick near the center.

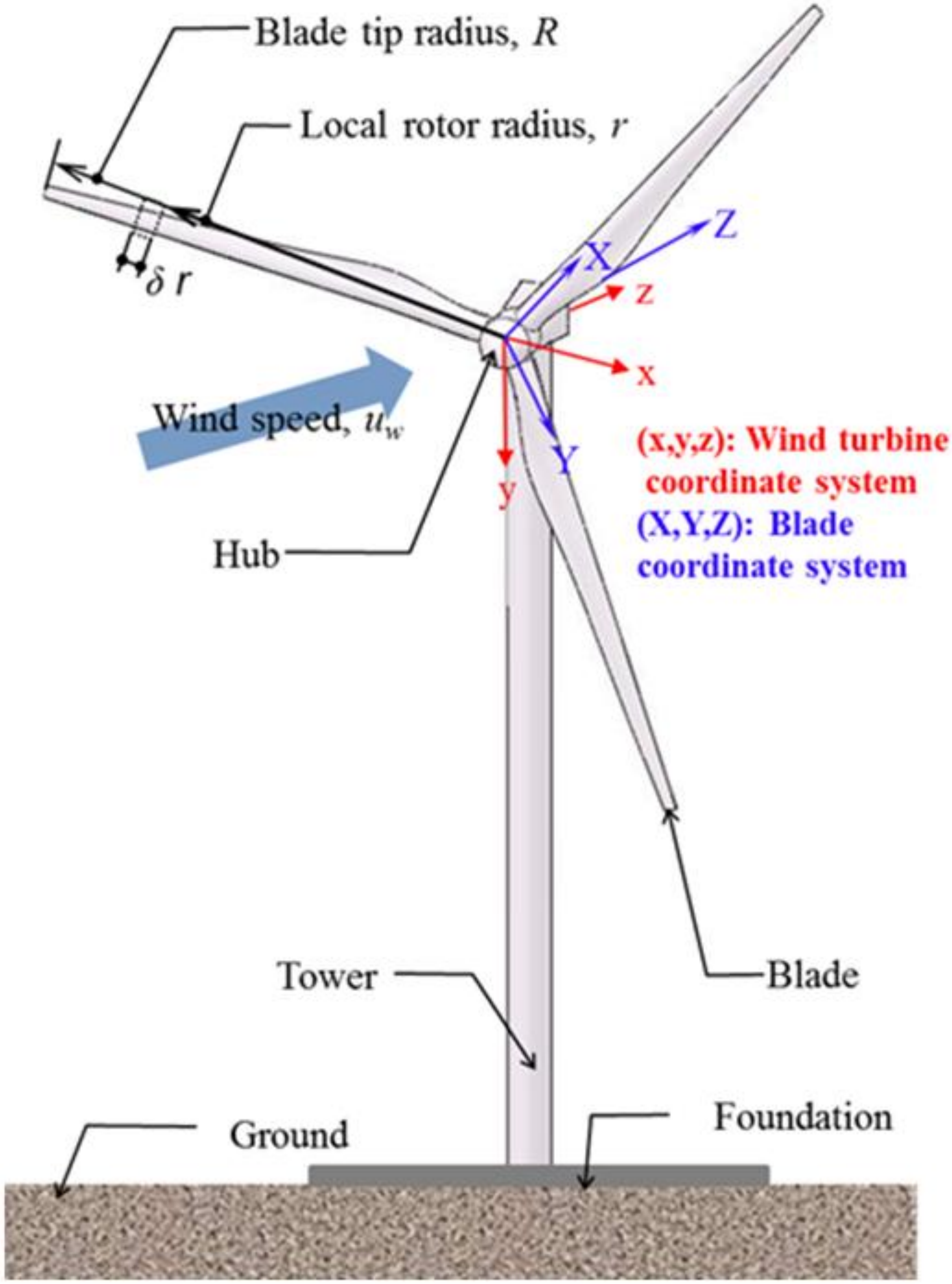


Wind turbine components: 1-Foundation, 2-Connection to the electric grid, 3-Tower (tubular steel), 4-Access ladder, 5-Wind orientation control (Yaw control), 6-Nacelle, 7-Generator, 8-Anemometer, 9-Electric or Mechanical Brake, 10-Gearbox, 11-Rotor blade(fiberglass), 12-Blade pitch control, 13-Rotor hub.

Ref 2

1 mile per hour =

0.44704 m / s



2.2 DESIGN

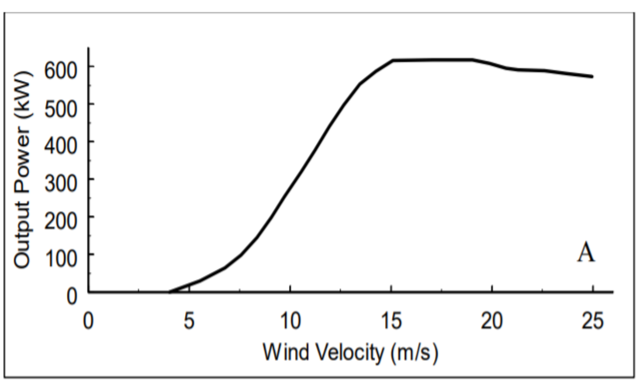
- The height of the tower can vary from 1.5X to 3X the rotor radius. It is important to get the bottom of the blade well clear of the ground to avoid wind shear.

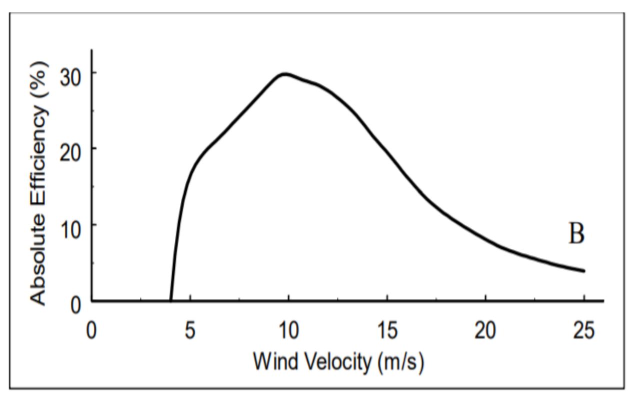
Power Rating (kW)	Rotor Diameter (m)
300	27-33
500	33-40
600	40-44
750	44-48
1000	48-54
1500	54-64
2000	64-72
2500	72-80

- the nacelle (enclosure directly attached to the rotor) contains a gearbox and one or more generator. the rotor rotates to about 20 to 40 rpm. The gearbox then gets a high-speed shaft rotating at about 1500 rpm.

2.2.1 POWER CURVE

An example of a wind of 600 KW shows this curve power.



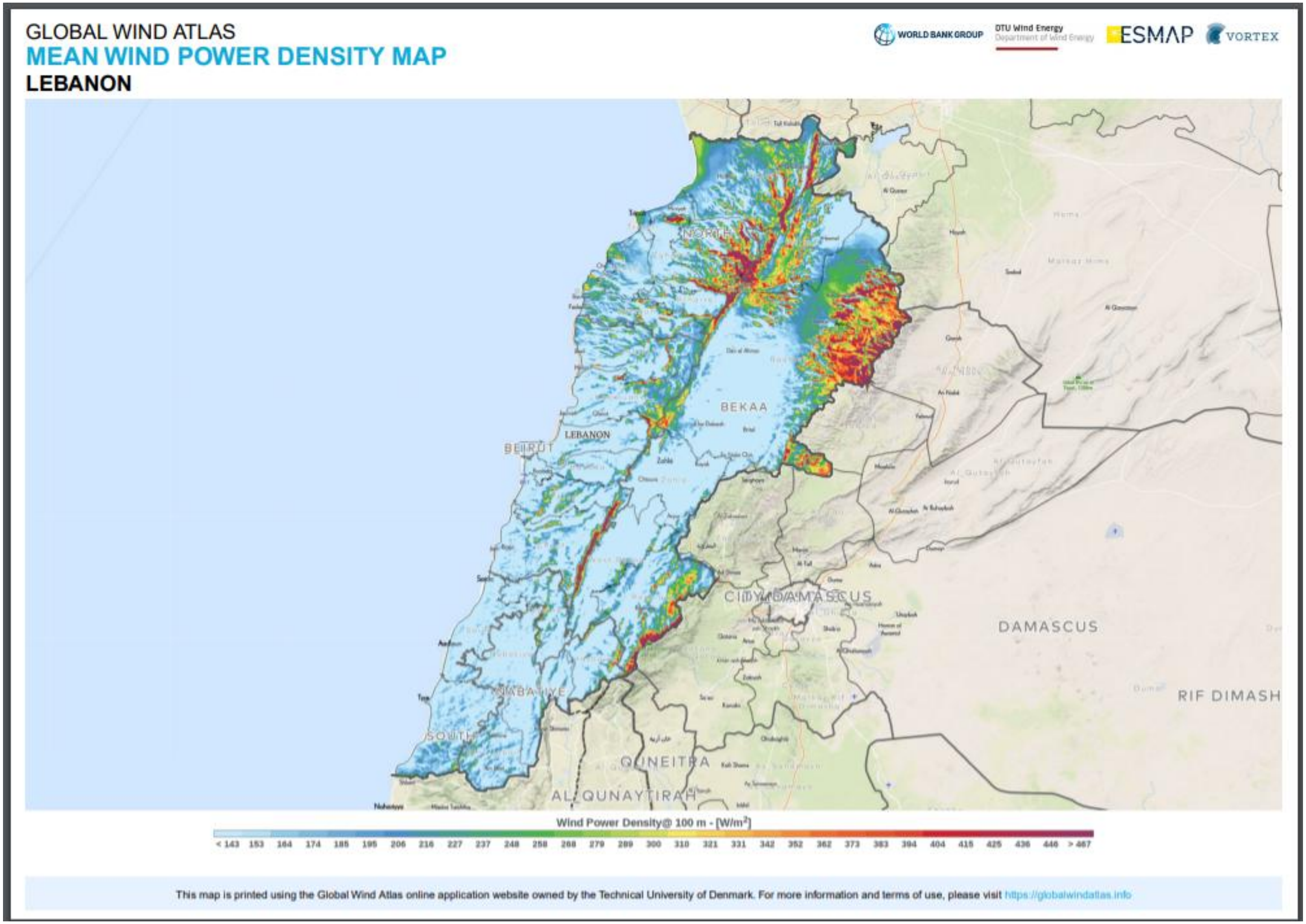


2.2.2 WIND POWER MODELLING

The amount of energy which can be harvested by a wind turbine is expressed by multiplying the power of the wind with the coefficient of performance, CP. CP is depending on the blade design as well as the number of blades, and is a function of the blade pitch angle and the tip speed ratio, λ, which is the ratio between the blade tip speed and the wind speed (M. Ragheb & Ragheb, 2011). The CP value increases with λ until the optimal ratio around 7, which is the point where the negative effects from a high tip speed becomes major to the positive effects. The positive effects from a high λ are good breaking of the wind and high efficiency of the generator. The negative effects are increased noise, blade, erosion, drag losses and increased flow around the wind turbine instead of through it. If all the kinetic energy in the wind was to be extracted, the wind would stop completely and no wind would be able to pass through the wind turbine. Therefore, according to Betz law, the theoretical maximum value of CP is 0.593 (Dixon & Hall, 2014). In reality three bladed wind turbines normally have a maximum CP value in the span of 0.4 to 0.5, which sometimes also includes mechanical and electrical losses (Carrillo et al., 2013). A power curve describes the power production of a wind turbine as a function of the wiwind speed. Power curves could either be provided by the wind turbine manufacturer or be approximated. A real wind power curve, Preal, is described as a function of CP (v), which varies with the wind speed. The approximate cubic power function, Pcub, is according to Carrillo et al. (2013) a widely used simplified model of the power curve, even though it slightly overestimate the electricity production. The simplification is to set the CP value constant at its maximum value, CP,max, for all wind speeds. The difference between a real and an approximate cubic power curve can be seen in Figure 2.1, and the equations for the curves can be seen in next Equations respectively.

$$P_{\text{real}}(v) = \begin{cases} 0, & \text{if } v_{\text{ci}} > v \text{ or } v > v_{\text{co}}, \\ \frac{1}{2} \cdot C_P(v) \cdot \rho_{\text{air}} \cdot A \cdot v^3, & \text{if } v_{\text{co}} \geq v \geq v_{\text{ci}}, \end{cases}$$

$$P_{\text{cub}}(v) = \begin{cases} 0, & \text{if } v_{\text{ci}} > v \text{ or } v > v_{\text{co}}, \\ \frac{1}{2} \cdot C_{\text{P,max}} \cdot \rho_{\text{air}} \cdot A \cdot v^3, & \text{if } v_r \geq v \geq v_{\text{ci}}, \\ P_r, & \text{if } v_{\text{co}} \geq v \geq v_r, \end{cases}$$



In Tripoli, the wind power density is about 258 w/m^2

We will build insha Allah a 5kW wind turbine then according to the formula

$$P = \frac{16}{27}\frac{1}{2}\rho v^3 A = \frac{8}{27}\rho v^3 A\,,$$

Then P (wind turbine) =0.59* Wind Power Density*Swept area of blades

5000 w =0.59*258 w/m^2 *A

A=32.84 m^2

Radius=3.23 m

Therefore, the height of tower should be between 1.5X to 3X the rotor radius, then between 4.85 &9.7m. The speed of wind is between 6.0 m/s (13.4mph) / 6.4m/s (14.3mph).

(λ(TSR)=4*pi/number of blades)

rpm = 60 * V * TSR / (Pi * D)

Number of rotation per minute =77

Classes of Wind power density at 10 m and 50 m [a]				
.	10 m (33 ft)		50 m (164 ft)	
Wind power class	Wind power density (W/m^2)	Speed [b] m/s (mph)	Wind power density (W/m^2)	Speed [b] m/s (mph)
1	<100	<4.4 (9.8)	<200	<5.6 (12.5)
2	100 - 150	4.4 (9.8) / 5.1 (11.5)	200 - 300	5.6 (12.5) / 6.4 (14.3)
3	150 - 200	5.1 (11.5) / 5.6 (12.5)	300 - 400	6.4 (14.3) / 7.0 (15.7)
4	200 - 250	5.6 (12.5) / 6.0 (13.4)	400 - 500	7.0 (15.7) / 7.5 (16.8)
5	250 - 300	6.0 (13.4) / 6.4 (14.3)	500 - 600	7.5 (16.8) / 8.0 (17.9)
6	300 - 400	6.4 (14.3) / 7.0 (15.7)	600 - 800	8.0 (17.9) / 8.8 (19.7)
7	>400	>7.0 (15.7)	>800	>8.8 (19.7)

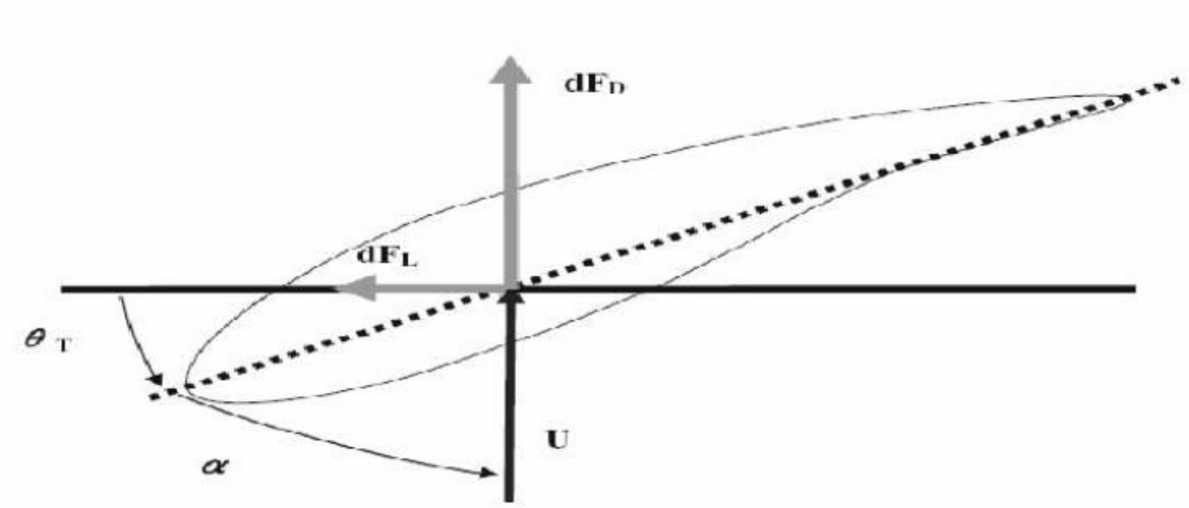
(a) Vertical extrapolation of wind speed based on the 1/7 power law

(b) Mean wind speed is based on the Rayleigh speed distribution of equivalent wind power density. Wind speed is for standard sea-level conditions. To maintain the same power density, speed increases 3%/1000 m (5%/5000 ft) of elevation. (from the Battelle Wind Energy Resource Atlas)

Table of data compiled by the American Wind Energy Association

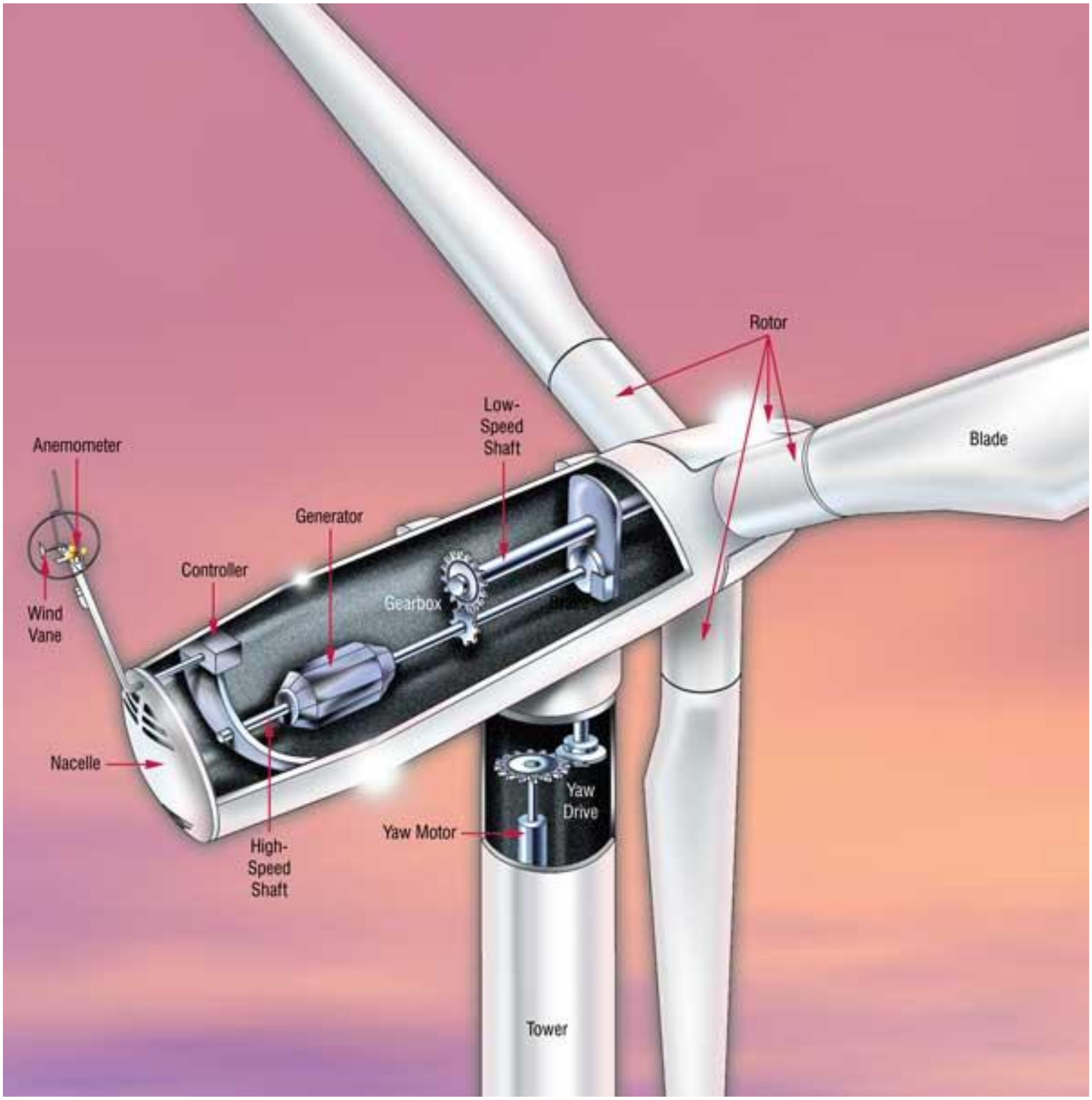
2.2.3 THE TIP-SPEED RATIO

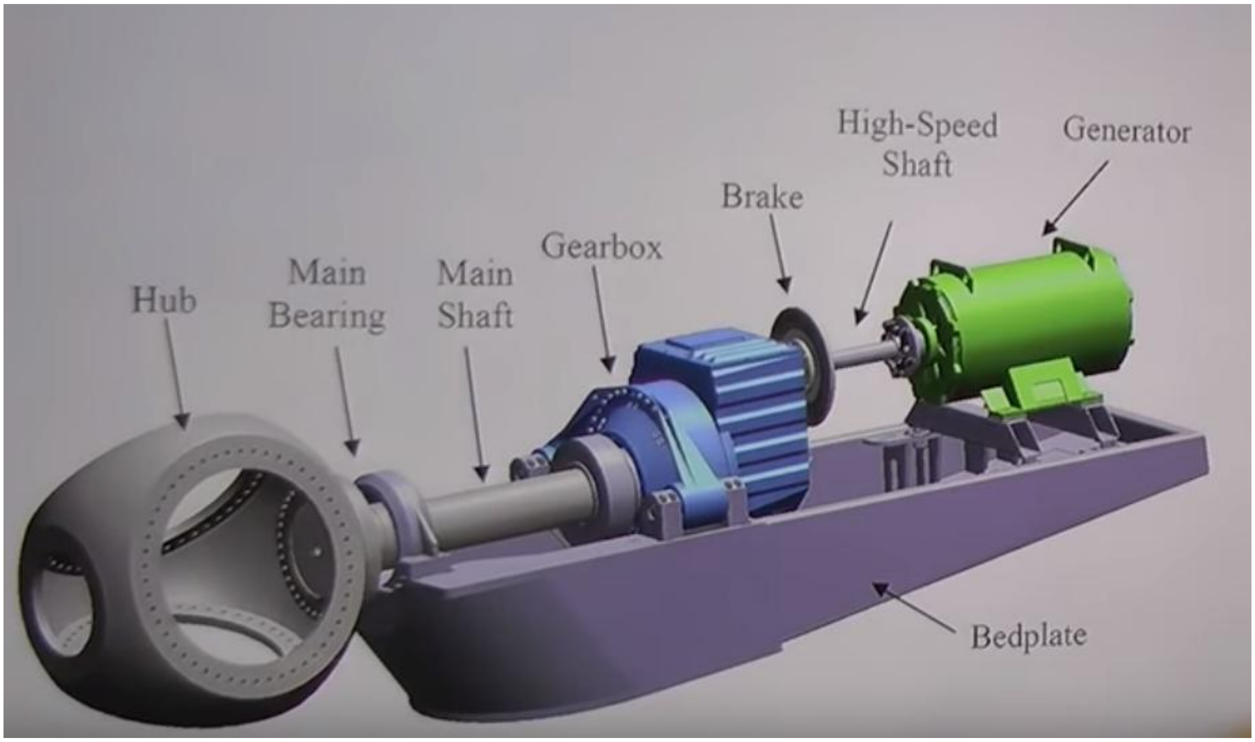
X, or TSR for wind turbines is the ratio between the tangential speed of the tip of a blade and the actual speed of the wind, v. The tip-speed ratio is related to efficiency, with the optimum varying with blade design. Higher tip speeds result in higher noise levels and require stronger blades due to large centrifugal forces.

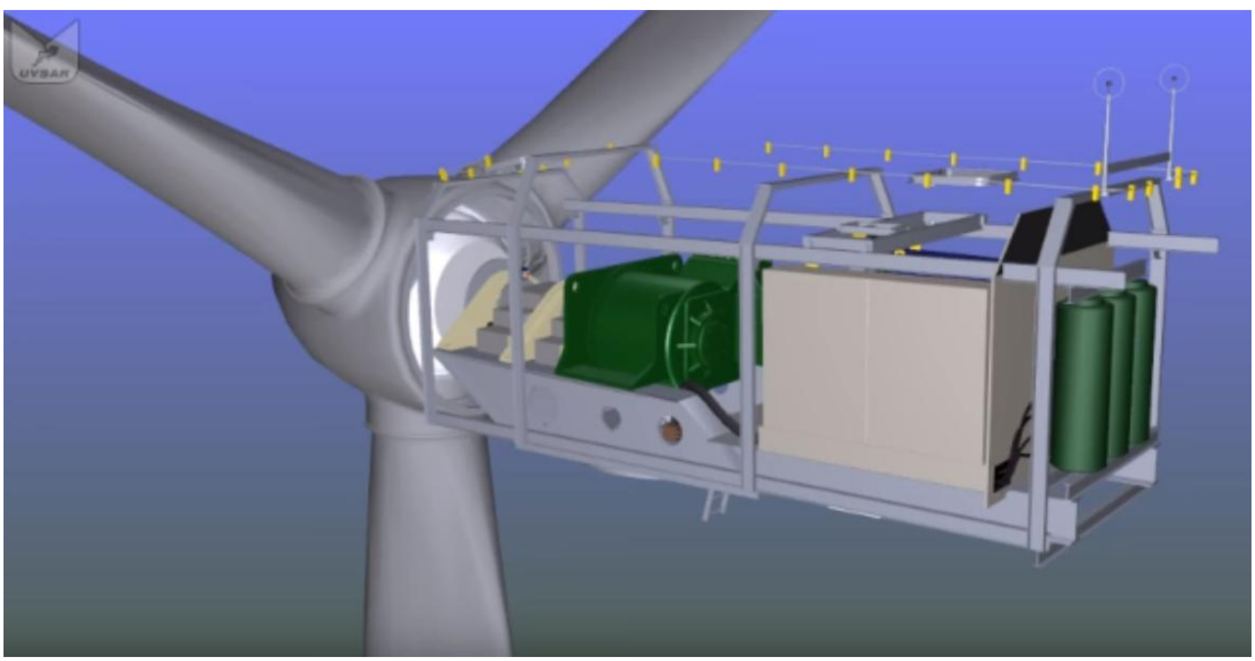


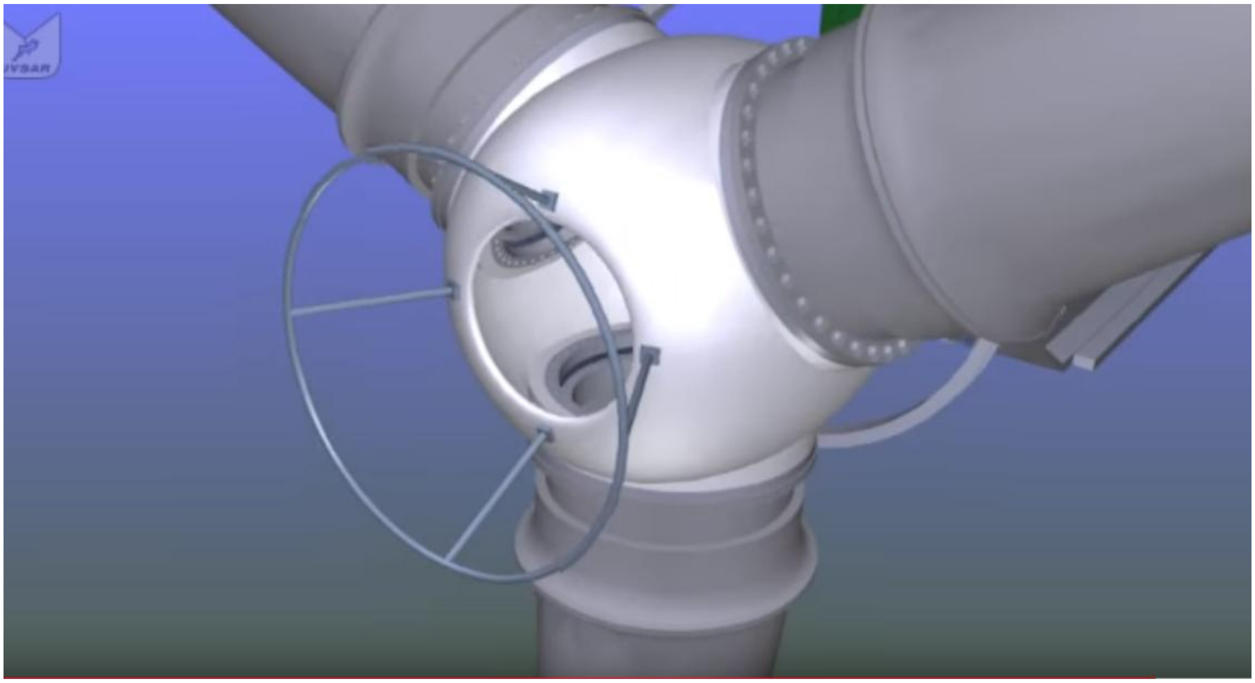
The cross section of a blade element under loading at the parking position

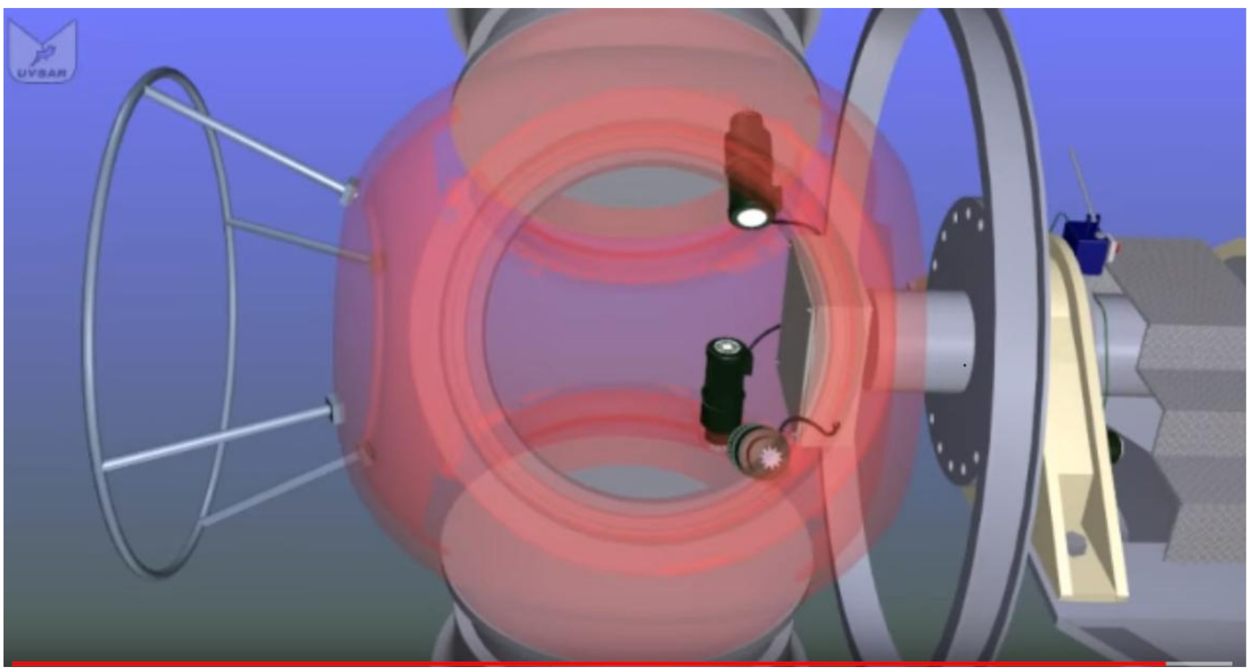
2.2.4 INSIDE WIND TURBINE

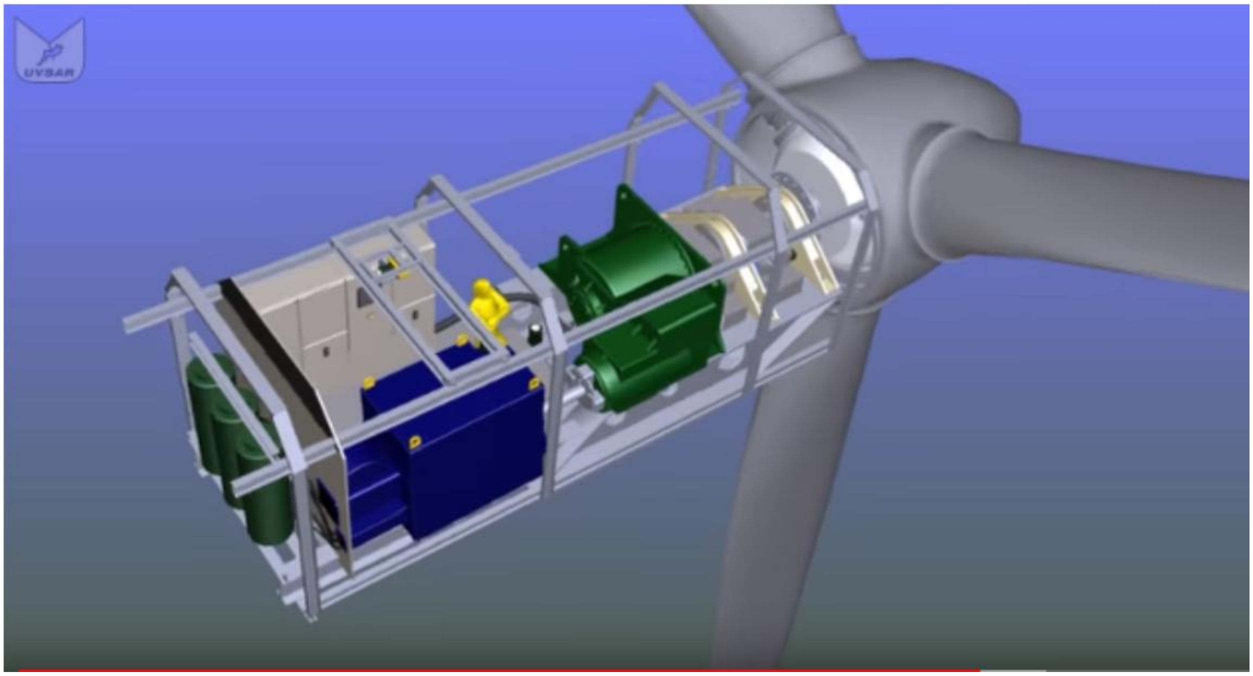


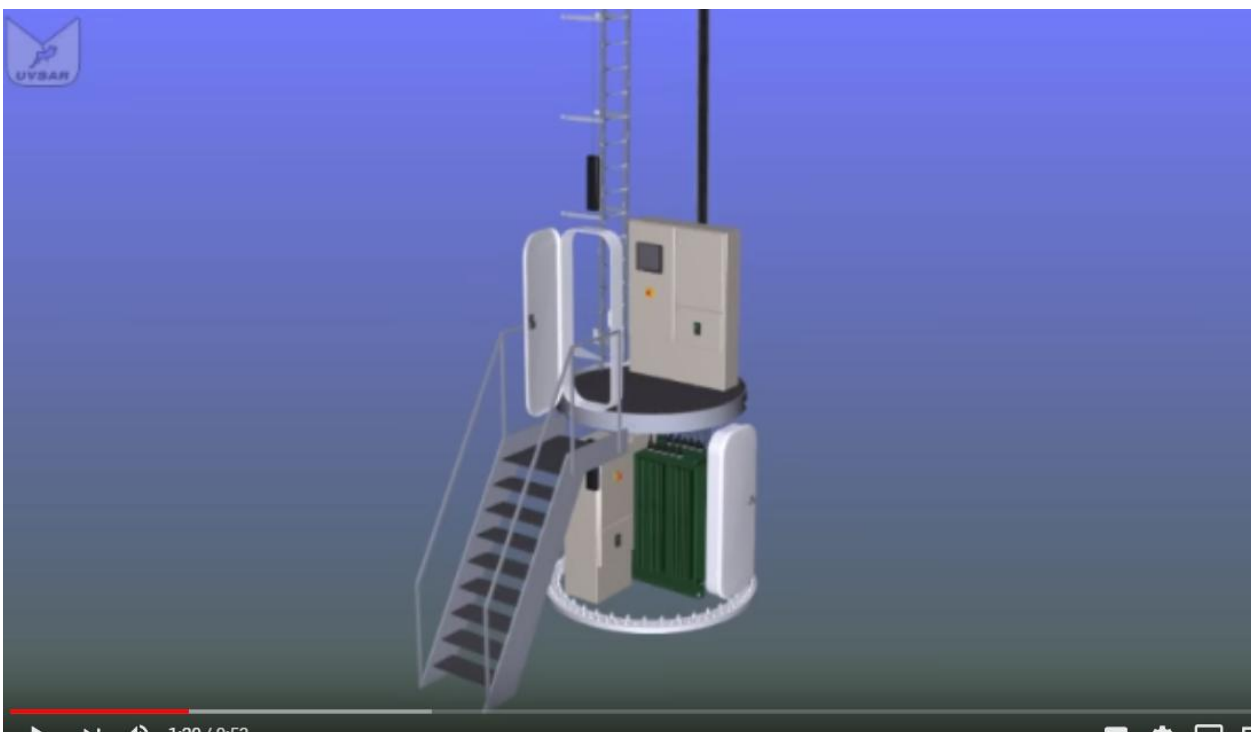

High-Speed
Shaft
Generator
Brake
Gearbox
Main
Bearing
Main
Shaft
Hub
Bedplate











Anemometer:

Measures the wind speed and transmits wind speed data to the controller.

Blades:

Lifts and rotates when wind is blown over them, causing the rotor to spin. Most turbines have either two or three blades.

Brake:

Stops the rotor mechanically, electrically, or hydraulically, in emergencies.

Controller:

Starts up the machine at wind speeds of about 8 to 16 miles per hour (mph) and shuts off the machine at about 55 mph. Turbines do not operate at wind speeds above about 55 mph because they may be damaged by the high winds.

Gear box:

Connects the low-speed shaft to the high-speed shaft and increases the rotational speeds from about 30-60 rotations per minute (rpm), to about 1,000-1,800 rpm; this is the rotational speed required by most generators to produce electricity. The gear box is a costly (and heavy) part of the wind turbine and engineers are exploring "direct-drive" generators that operate at lower rotational speeds and don't need gear boxes.

Generator:

Produces 60-cycle AC electricity; it is usually an off-the-shelf induction generator.

High-speed shaft:

Drives the generator.

Low-speed shaft:

Turns the low-speed shaft at about 30-60 rpm.

Nacelle:

Sits atop the tower and contains the gear box, low- and high-speed shafts, generator, controller, and brake. Some nacelles are large enough for a helicopter to land on.

Pitch:

Turns (or pitches) blades out of the wind to control the rotor speed, and to keep the rotor from turning in winds that are too high or too low to produce electricity.

Rotor:

Blades and hub together form the rotor.

Tower:

Made from tubular steel ,concrete, or steel lattice. Supports the structure of the turbine. Because wind speed increases with height, taller towers enable turbines to capture more energy and generate more electricity.

Wind direction:

Determines the design of the turbine. Upwind turbines—like the one shown here—face into the wind while downwind turbines face away.

Wind vane:

Measures wind direction and communicates with the yaw drive to orient the turbine properly with respect to the wind.

Yaw drive:

Orients upwind turbines to keep them facing the wind when the direction changes. Downwind turbines don't require a yaw drive because the wind manually blows the rotor away from it.

Yaw motor:

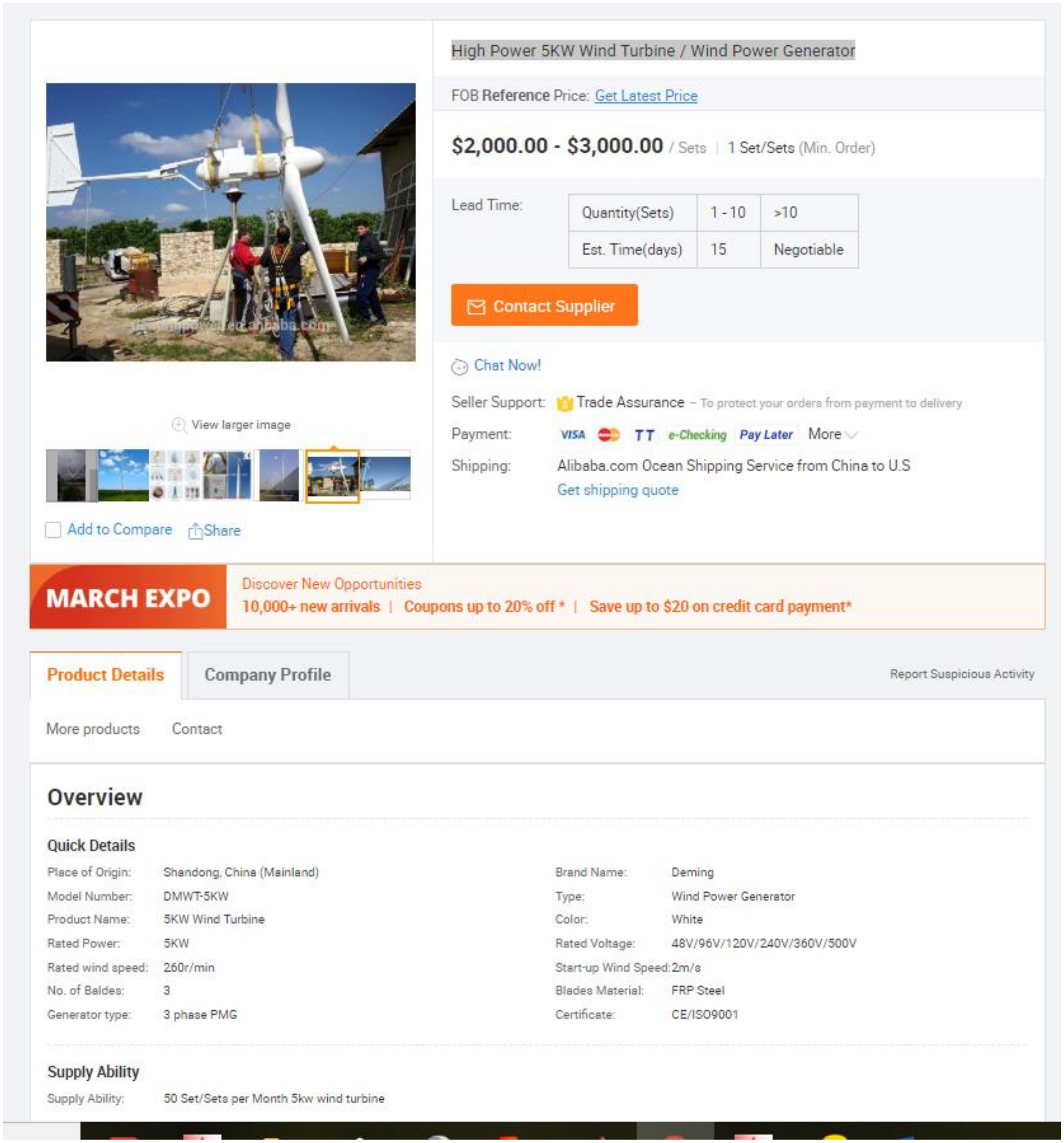
Powers the yaw drive. The tower, for example, is over 26% of the total cost of a wind turbine, rotor blades 22%, the gearbox 13%, and the other components 5% or less.

Rotor hubs are made with welded sheet steel, cast iron, forged steel. The types of rotor hubs are: Hinge-less hub-Teetering hub

(ref 3)

3. SUPPLIER

3.1 WIND TURBINE GENERATOR 5 KW



High Power 5KW Wind Turbine / Wind Power Generator

FOB Reference Price: Get Latest Price

$2,000.00 - $3,000.00 / Sets | 1 Set/Sets (Min. Order)

Lead Time:

Quantity(Sets)	1 - 10	>10
Est. Time(days)	15	Negotiable

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Overview

Quick Details

Place of Origin:	Shandong, China (Mainland)	Brand Name:	Deming
Model Number:	DMWT-5KW	Type:	Wind Power Generator
Product Name:	5KW Wind Turbine	Color:	White
Rated Power:	5KW	Rated Voltage:	48V/96V/120V/240V/360V/500V
Rated wind speed:	260r/min	Start-up Wind Speed:	2m/s
No. of Baldes:	3	Blades Material:	FRP Steel
Generator type:	3 phase PMG	Certificate:	CE/ISO9001

Supply Ability

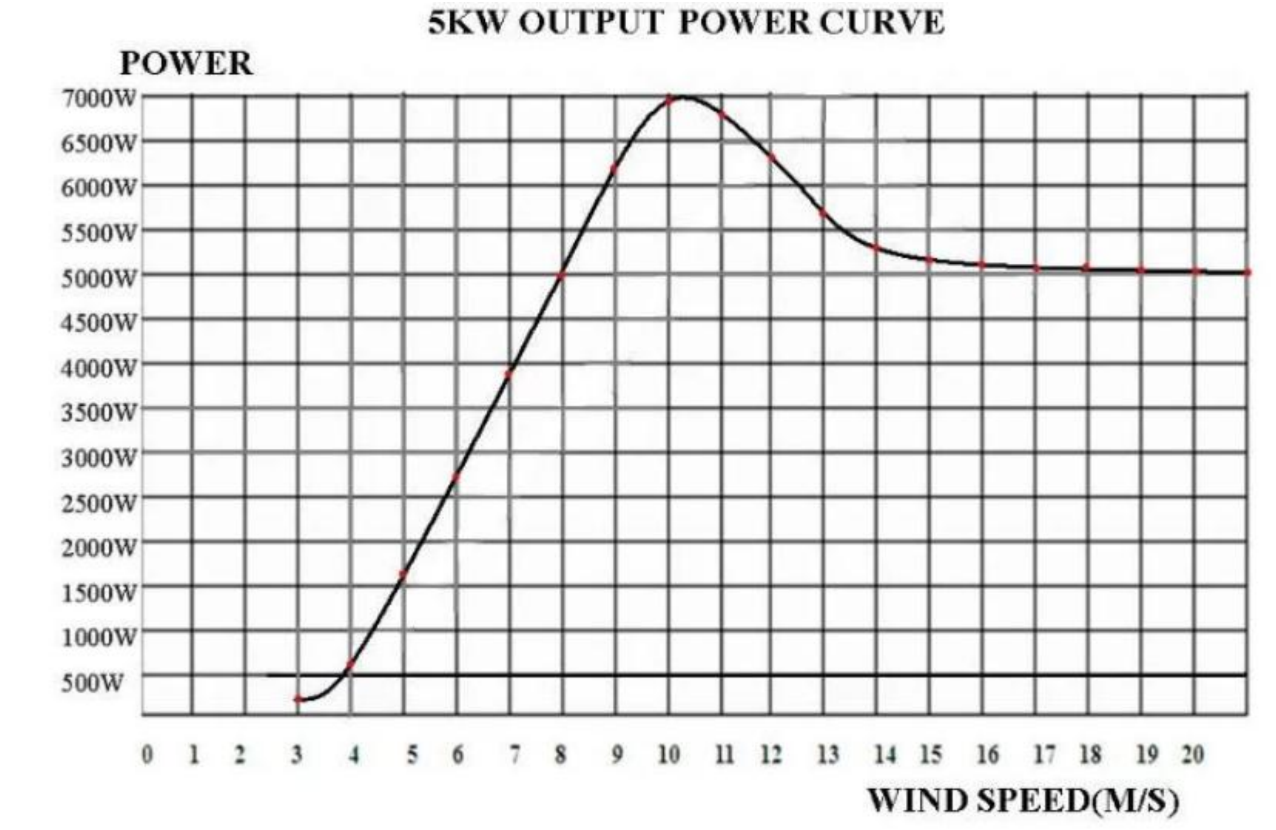
Supply Ability: 50 Set/Sets per Month 5kw wind turbine

5KW Stator | 5KW Vertical Axis | Accesories of Guy Wire Pole

Technical Parameters

Model	DM6.0-5KW
Rated speed(r/min)	260r/min
Rated power(KW)	5KW
Rated voltage(DC/V)	48,96,120,240,360,500 VDC
Rated current(A)	104,52,42,21,14,10 A
Start-up wind speed(m/s)	2m/s
Rated wind speed(m/s)	10m/s
Safe wind speed(m/s)	40m/s
No of blades	3 pieces
Material of blades	reinforced fire glass steel
Generator	3 phases PM generator
Braking system	Electromagnetic braking control
Wind turbine weight(kg)	310kg
Packing weight(kg)	360kg
Tower height(customized)	pull rod and independent rod

More products


5KW OUTPUT POWER CURVE
POWER
7000W
6500W
6000W
5500W
5000W
4500W
4000W
3500W
3000W
2500W
2000W
1500W
1000W
500W
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
WIND SPEED(M/S)

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Renewable new power 5kw wind turbine/generator wind turbine blade

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Payment: VISA TT e-Checking Pay Later More

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Product Details | **Company Profile** | Report Suspicious Activity

Overview

Quick Details

Place of Origin:	Guangdong, China (Mainland)	Brand Name:	PWG
Model Number:	FD6.4-5000	Type:	Wind Power Generator
High wind speed pr...	Pitch-controlled	High voltage protec...	Dump load
System:	Off-grid system and grid tie system for option	Tower:	Guy cable tower and free stand tower for option
Security wind speed:	6om/s	Yawing type:	electronic
Generator work way:	magnetic saturation	Blade material:	fiber glass
warranty:	5years	Certificate:	CE&ISO

Product Details | **Company Profile** | Report Suspicious Ac

5Kw wind turbine is our normal FD-L series wind turbine , it has wide use , convenient and green . The introduction are as follows :

Features:

1. Special design in generator with low starting technique applied, start-up wind speed low to 2-2.5m/s and cut-in wind speed low to 3-3.5m/s. (Patent No.: 201020259726.4).
2. Magnetic saturation generator design, engage for the safety of generator and the 20 years lifespan of generator. (Patent No.: 201020296641.3)
3. Blade flange processed with reinforced rib increasing the intensity. Blades are in good angle to make sure the start-up wind speed in 2-2.5m/s.
4. NSK Bearing from Japan which have a long lifespan.
5. Worm gear is made from copper, which with high tenacity, and worm is made from chromium to make sure the lifespan.
6. Worm and worm gear specially assembled to make the clearance small.
7. First design of MPPT function from wind turbine to make sure the wind turbine have the rated output when the wind turbine over the rated wind speed. (It's been applied for patent)
8. Special signal transmission system, wind vane and wind anemoscope no need to be on the wind turbine any more. (It's been applied for patent).
9. Mechanism brake for your option.
10. Complete isolation design with stable quality to make sure the controller can work in extreme conditions. Life time can reach up to 6 years.
11. Matched controller with PWM charging (Patent No.: 200910213782.6), electronic and manual brake (Patent No.: 200910213784.5), dump load (Patent No.: 200910213783.0), untwisted protection (Patent No:200910213785.X).
12. Each parameter showed on the LCD display of the controller. Some parameters are adjustable and can be set by yourself.

Technical Specifications:

Model	FD6.4-5000
Rated power(W)	5000
Rated voltage(V)	240
Rotor diameter(m)	5.4
Start-up wind speed(m/s)	2
Rated wind speed(m/s)	12
Safety wind speed(m/s)	60
yawing type	Electronic
Rated rotating rate(r/m)	200
Generator work way	Magnetic saturation
Generator material	Steel
Blade material	Fiber glass
Blade quantity	3
Tower height (m)	12
Tower diameter (mm)	273
Suggested battery capacity	12V150AH 40pcs
Matched inverter type	Sine wave

3.2 BLADES MANUFACTURER

View larger image

Add to Compare Share

1kw to 300Kw wind turbine blades with CE, original design, original data

FOB **Reference** Price: Get Latest Price

$5,000.00 - $6,000.00 / Sets | 1 Set/Sets (Min. Order)

Contact Supplier

Leave Messages

Payment: VISA TT e-Checking Pay Later More

Shipping: Alibaba.com Ocean Shipping Service from China to U.S
Get shipping quote

Product Details | **Company Profile**   Report Suspicious Activity

Product Description   Packaging & Shipping

Overview

Quick Details

Place of Origin:	Shandong, China (Mainland)	Brand Name:	AEROSA
Model Number:	1Kw-300kw wind turbine blades	Certificate:	CE, EN61400-1
Process:	Vacuum infused	Blade length:	1.0m-15.0m
Rated power:	1Kw-300Kw	Start wind speed:	2.5m/s
Material:	FRP	Design life:	20 years
Max Cp Value:	0.48	Power control:	stall or pitch regulated

Blades Technical Specifications

AEROSA Composites manufactures a range of different blades for 1Kw-300Kw generator, including both stall-regulated and pitch controllec blades.

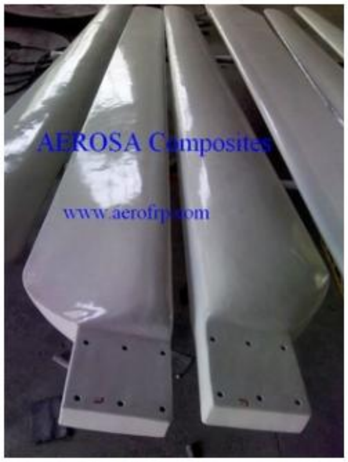
1. 2-30Kw

<table>
<tr><th>Blade Type</th><th>Blade Length (m)</th><th>Rotor Diameter (m)</th><th>Generator (Kw)</th><th>Swept Area (m^2)</th><th>Rated Wind Speed (m/s)</th><th>Root type</th><th>Cut-in Speed (m/s)</th><th>Cut-out Speed (m/s)</th><th>Survival Wind Speec (m/s)</th></tr>
<tr><td>WT40P</td><td>1.96</td><td>4.0</td><td>2~3</td><td>12.57</td><td>10~12</td><td rowspan="6">Flat</td><td rowspan="9">2.5</td><td rowspan="9">25</td><td rowspan="9">60</td></tr>
<tr><td>WT64P</td><td>3.1</td><td>6.4</td><td>5</td><td>32.15</td><td>10</td></tr>
<tr><td>WT62P</td><td>3</td><td>6.2</td><td>10</td><td>30.17</td><td>12</td></tr>
<tr><td>WT80P</td><td>3.9</td><td>8.0</td><td>10</td><td>50.27</td><td>10</td></tr>
<tr><td>WT90P</td><td>4.4</td><td>9.0</td><td>10~15</td><td>63.58</td><td>9~10.5</td></tr>
<tr><td>WT100P</td><td>4.8</td><td>10.0</td><td>20</td><td>78.54</td><td>10.5</td></tr>
<tr><td>WT100</td><td>4.8</td><td>10.0</td><td>20</td><td>78.54</td><td>10.5</td><td>Round</td></tr>
<tr><td>WT120P</td><td>6</td><td>12.4</td><td>30-50</td><td>120.7</td><td>10.5-12</td><td>Flat</td></tr>
<tr><td>WT120</td><td>5.7</td><td>12.0</td><td>30</td><td>113.1</td><td>10.5</td><td>Round</td></tr>
</table>

Airfoil: 1. NACA44xx 2. NACA63-3xx 3. FFA-Wx-xxx

2. 50-300Kw

Blade Type	Blade Length (m)	Rotor Diameter (m)	Generator (Kw)	Swept Area (m^2)	Rated Wind Speed (m/s)	Root type	Cut-in Speed (m/s)	Cut-out Speed (m/s)	Survival Wind Speec (m/s)
WT160	7.4	16.0	30-50	200.96	8.5-12				
WT152	7.2	15.2	50	176.72	10.5				
WT165	7.85	16.5	50-65	213.82	10~12				
WT191	9.2	19.1	50~100	286.52	12~13	Round	2.5	25	70



View larger image

Add to Compare Share

5Kw wind turbine blades with CE

FOB **Reference** Price: Get Latest Price

US $0-50 / Sets | 1 Set/Sets (Min. Order)

Contact Supplier

Leave Messages

Payment: VISA TT e-Checking Pay Later More

Shipping: Alibaba.com Ocean Shipping Service from China to U.S
Get shipping quote

Product Details | **Company Profile** | Report Suspicious Activity

Overview

Quick Details

Place of Origin:	Shandong, China (Mainland)	Brand Name:	AEROSA
Model Number:	5 Kw	Process:	RTM
Materil:	GFRP and CFRP	Certificate:	CE and GL

Supply Ability

Supply Ability:	100 Set/Sets per Month

More details, please contact with us freely.

General Configuration	
Model	WT64
Rotor Diameter (m)	6.4
Rotor Radius (m)	3.2
Swept Area (m^2)	32.1536
Direction of Rotation	clockwise
Orientation Relative to Tower	Upwind
Configuration	Horizontal axis
Lightning Protecton	Standard integrated system
Survival Wind Speed (m/s)	60
Design Standard	AWEA and IEC
Design Life(years)	20
Rotor Performance	
Generator (Kw)	5
Shaft Power (Kw)	6
Rated Wind Speed (m/s)	10
Cut-in Wind Speed (m/s)	3
Cut-out Wind Speed (m/s)	25
Rotation Speed (m/s)	
Rotor Tip Speed (m/s)	
Tip Ratio	
Cone Angle	
Tilt Angle	
Cp	0.45
Blade	
Airfoil	S8xx, NACA63xxx
Blade length (mm)	3100
Tip chord (mm)	235
Max chord (mm)	360
Material	FRP
Blade Weight(Kg)	18
Bolt Diameter(mm)	6-M12

5KW Wind Turbine Data Sheet

Model	DM6.0-5KW
Rated speed(r/min)	260r/min
Rated power(KW)	5KW
Rated voltage(DC/V)	48,96,120,240,360,500 VDC
Rated current(A)	104,52,42,21,14,10 A
Start-up wind speed(m/s)	2m/s
Rated wind speed(m/s)	10m/s
Safe wind speed(m/s)	40m/s
No of blades	3 pieces
Material of blades	reinforced fire glass steel
Generator	3 phases PM generator
Braking system	Electromagnetic braking control
Wind turbine weight(kg)	310kg
Packing weight(kg)	360kg
Tower height(customized)	pull rod and independent rod

Mrs. katherine zhang

Chat Now!

Jinan Deming Power Equipm...ID: 100

7YRS

Show

Notification 2019-02-26 10:04

Trade Assurance order may be at risk if you communicate and order outside of Alibaba.com's platform. To help protect yourself:

Keep communication transcript
Complete order payment on Alibaba.com

only you can see this message

katherine zhang 2019-02-26 12:08

Hello Dear Mayssa,

The 5KW wind turbine was presented to selling, can be with tower.
Prices of 5KW wind turbine and its tower will be quoted seperately.

EXW Price of 5KW wind turbine: **USD2560/set**(without tower)
And how many meters tower you need?
the tower is usually 2 or 3 meters higher than the buildings or trees around.

Technical spec of 5KW wind turbine is enclosed, please kindly check and download it.

Wait for your reply.

BR

John Huang <greef@greefenergy.cn>
to me

8:04 AM (5 hours ago)

Dear Mayssa,

Thanks for your kindly inquiry.

We have GH-5kW model horizontal wind turbine, the single blade length is 2.49 meters, the rated wind speed is 10m/s, it could produce 21900kwh per year under the 7m/s wind speed.
We don't know if this model is workable for you.

We don't have well-designed wind turbine with 3.2 meters single blade length and 7m/s rated wind speed, but if you want to design and test, we can supply indepedent 5kW generator and 3.2 meters FRP blades to you.

So please let us know if you have further quesitons.

Best Regards,

John Huang
Sales Manager
Mob: +86-13299938899 (WhatsApp/WeChat)
Tel: +86-532-67731422-804
WeChat: shunqiziran817412
Line ID: huangyujohn

mayssa kamarii
Thank you for your response. i was wondering if you manufacture a rotor that should be suitable of those blades that you presented because

John Huang <greef@greefenergy.cn>
to me

Hello Mayssa,

We can only manufacture 5kW 1500RPM 220/380V Permanent magnet generator with 10 pcs 3.2 meters FRP blades.
For the blades, in order to quote prices, we still need to know the questions in my last Email.

mayssa kamarii
we need a flange root with the holes in blades please

The quotation—GREEF NEW ENERGY

Inbox ×

John Huang <greef@greefenergy.cn>
to me

Good morning dear Mayssa,
Thanks for your prompt reply.

We check with shipping agent about the port, BEIRUT port has the shortest transit time 28 days, there is no available shipment could arrive Tripoli port.

Following is the offer:
Flange root type 3.2 meters FRP wind turbine blades: USD 4180/10 pcs
Flange hub: USD 190
5kW 1500RPM 3 phase permanent magnet generator: USD 900
Ocean freight to BEIRUT port: USD 330
Total Price: USD 5600 CIF BEIRUT

When will you need them?
Any comments by return must be very appreciated.

Looking forward to hearing you from soon.
Best Regards,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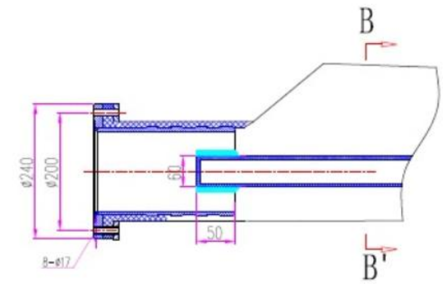
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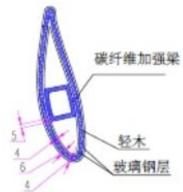
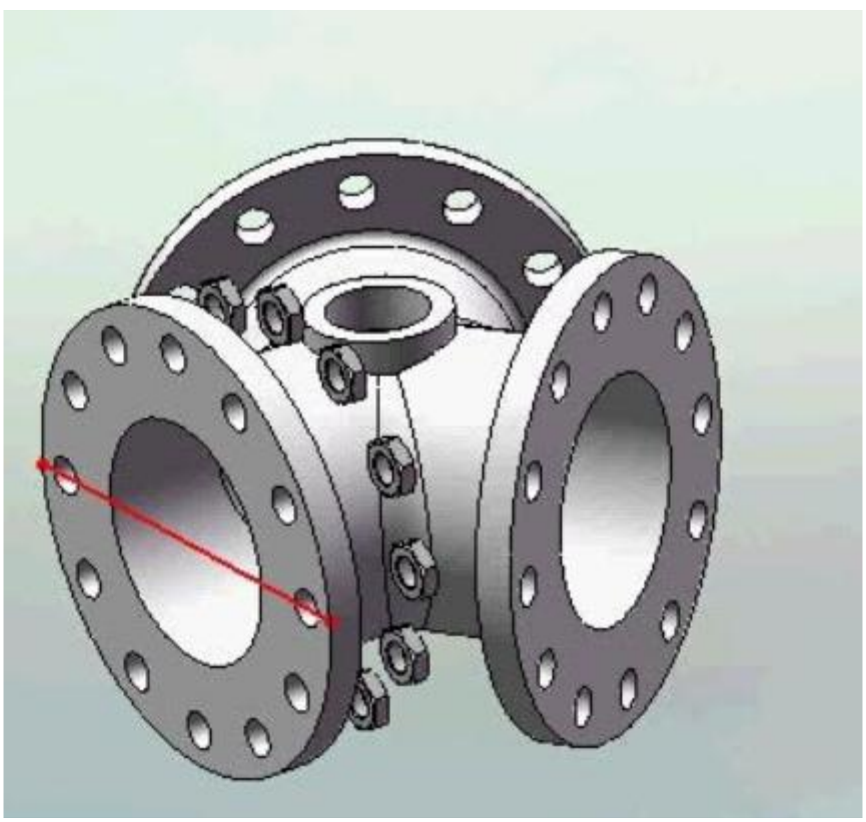
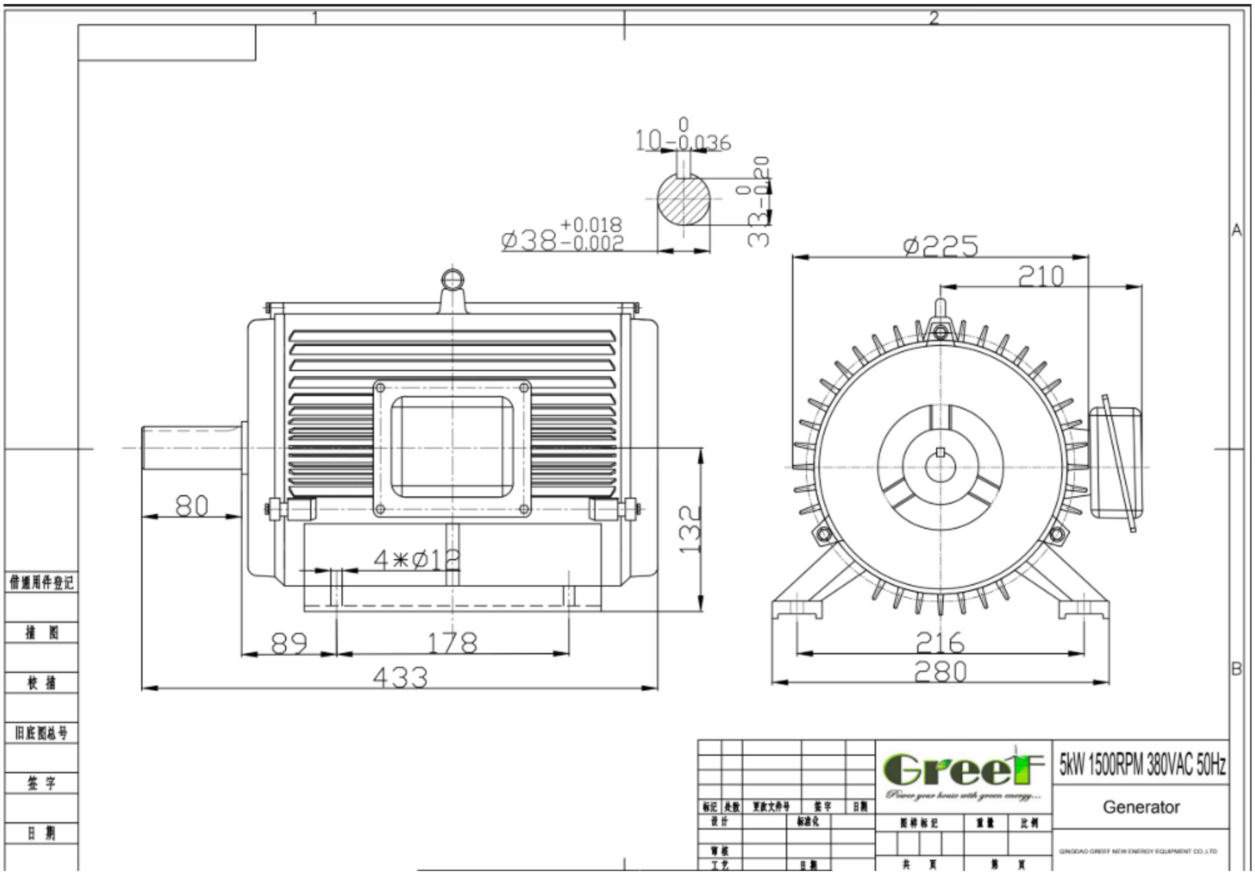

碳纤维加强梁
轻木
玻璃钢层

B-B'截面图





3.3 SUPPLIER OF GEAR BOX (SPEED UP)

me > All Industries > Machinery > Machinery Accessories > Power Transmission > Speed Reducers **(87046682)**

gear box speed reducer motor speed-up gearbox for wind turbine generator

FOB **Reference** Price: Get Latest Price

$200.00 - $2,000.00 / Sets | 1 Set/Sets (Min. Order)

Rated Power: 0.25~15 kw

Model Number: B09 B0 B1 B2 B3 B4 B5 B6 B7

Lead Time:

Quantity(Sets)	1 - 50	>50
Est. Time(days)	30	Negotiable

Home > All Industries > Machinery > Machinery Accessories > Power Transmission > Speed Reducers (87046682)

View larger image

Gear box Speed Reducer Motor speed-up gearbox for wind turbine generator

FOB **Reference** Price: Get Latest Price

$100.00 - $300.00 / Sets | 1 Set/Sets Gear box Speed Reducer Motor speed-up gearbox for wind turbine g (Min. Order)

Contact Supplier

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Seller Support: Trade Assurance – To protect your orders from payment to delivery

Payment: VISA TT e-Checking Pay Later More

Shipping: Alibaba.com Ocean Shipping Service from China to U.S

Get shipping quote

speed increaser for 5kw wind turbine Inbox ×

sales@orbitindustry.com <sales@orbitindustry.com>

to maysaa.kamardine, me

Please find the speed increaser (model no. RF87S-19.1-AD4-M1 in attached drawing.

The price for the gear unit as follows:

purchase quantity 1 unit, unit price: USD650/unit FOB Shanghai

purchase quantity 10-20 units, unit price: USD390/unit FOB Shanghai

purchase quantity >20 units, unit price: USD372/unit FOB Shanghai

Delivery time: in 20-25 days after accepting order

Best regards,

Anson Wang

Shanghai Orbit Trading Co., Ltd. (import & export business only)

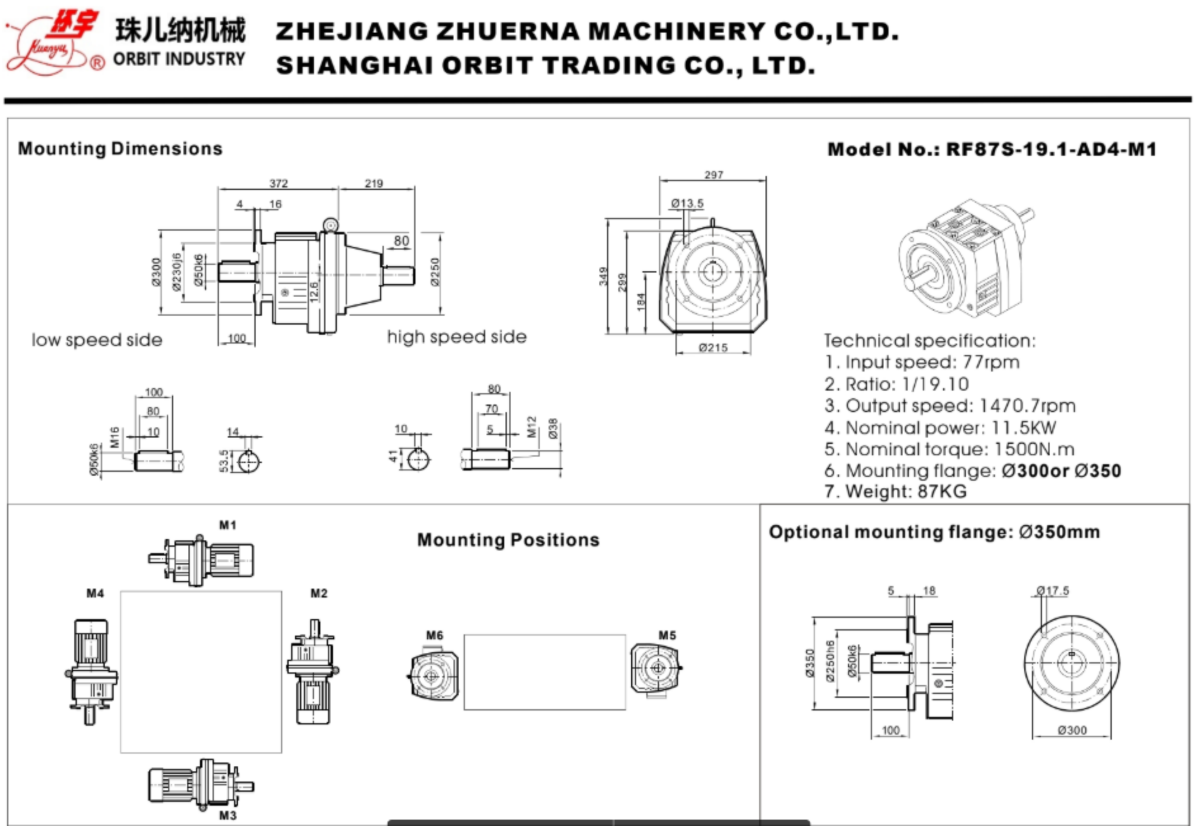
Tel: +86-21-6150 2517

Cell: +86-135 8581 7681 (WhatsApp)

Eml: sales@orbitindustry.com

Zhejiang Zhuerna Machinery Co., Ltd. (production plant)

Add: No. 2780 Xinpingyi Rd,Pinghu Economic Development Zone,Jiaxin,Zhejiang,China



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