CEWE3.0

--Value Realization

CMB ENERGY WIND POWER

Advanced Technology

Achieve innate efficiency

3.0 Wind Turbine Generator

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Type	CEWE3.0-121	CEWE3.0-135
Rate Power	3.0MW	
Rotor Diameter	121m	135m
V-in	3 m/s	3 m/s
Rate speed	10 m/s	9.5 m/s
V-out	25 m/s	20 m/s
Ve50	65 m/s	52.5 m/s
Design V-av	8.5 m/s	7.5 m/s
I_{15}	0.16	
Hub High	85 m	90 m
Nacelle dimension	6.8×3.5×4.1(m)	
Nacelle Weight	78 tons	

Technology route

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Structure of drive chain of WTGs

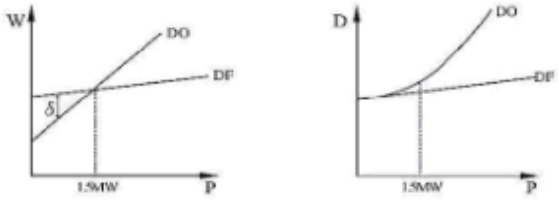
Direct Transmission

- Permanent Generator + Full power convertor
- Electrically exciting synchronous Generator+ Full power Convertor

Gear Transmission

- HS-Gearbox+ DFIG + partial power convertor
- HS-Gearbox+ Squirrel cage generator + Full power convertor
- HS-Gearbox +PMG + Full power convertor

Direct Drive or Gear box drive ?



For the wind farm have a terrain of low wind speed, hills, offshore, it require a wind turbine with Higher capacity, Higher efficiency, but smaller size, lower weight, to convenient the Transportation and installation O&M etc .

Best Option : Semi-Direct Drive

The concept of Semi Direct Drive is from the developing process of increasing unit capacity of Direct Drive and DFIG. It is a hybrid solution of one stage (or two stage) Gearbox with Medium speed Generator.

Technology Route

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Feature	Directive Drive	Semi Direct Drive
Advan-tage	1, Non-gear design with higher reliability 2, Full power convertor with well power quality; 3, Extended speed range, lower cut-in wind speed;	1,Synthesized advantage of Direct Drive and DGIF, Higher reliability, Lower weight, Smaller dimension and well power quality; 2, Wider speed range, Higher efficiency of drive train, Obviously Higher production; 3, Well performance of seal and thermal dissipation, more suitable for Offshore or Hi-altitude; 4, Lower cost on Transportation & Construction, and O&M of whole life-time.
Weakness	1, Significantly more poles of magnetism with higher weight, and vast dimension, then higher cost on transportation and construction, O&M etc; 2, Demagnetization due to Hi-Temperature, Vibration; 3、Higher cost on Full Power convertor;	1、Higher cost on Full Power convertor.

CEWE- Global leader of Semi Direct drive

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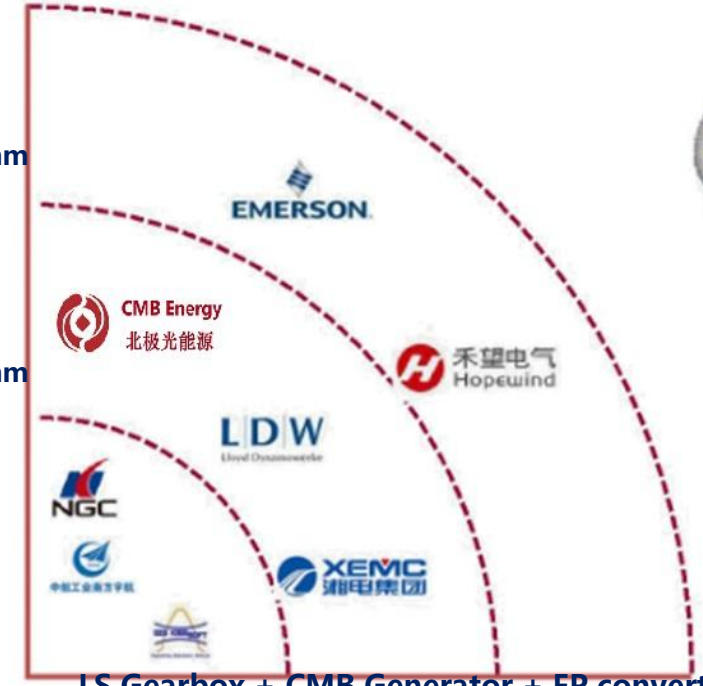
CEWE (CMB Wind Energy) is a typically designed semi-directly drive WTGs, the technology is collected the advantages of DGIF and Direct Drive solution, adopted the integrated design of LS-Gearbox and Main shaft to drive the Medium speed Permanent Magnetic Generator.

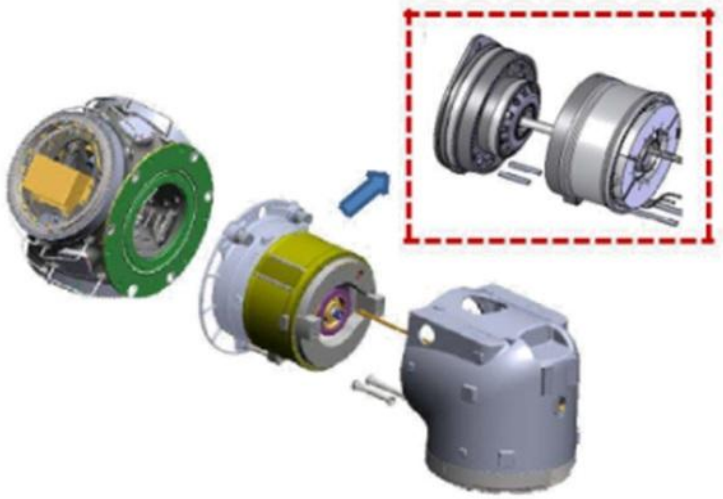
Convertor
Weight：4T
Dimension：2700×2200×1280mm

Generator
Weight：18T
Dimension：2610×2772×1733mm

Gearbox
Weight：25T
Dimension： Φ3300×2260mm



LS Gearbox + CMB Generator + FP convertor



For the Purpose of system matching, the component of WTS are self design and tested, e. g generator, gearbox.

CEWE Plat Form

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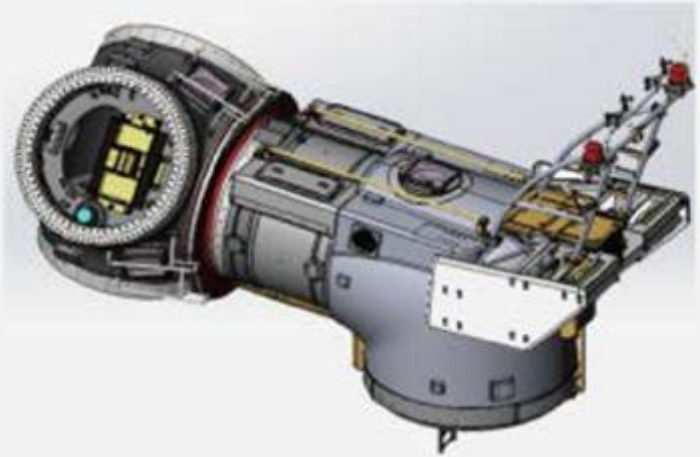
Product line: 2.5MW、2.75MW、3.0MW



CEWE platform with an adjustable main structure design could provide the varies capacity of 2.5~4.0MW (RD UP to 14Xm).

CEWE3.0-110 CEWE3.0-121 CEWE3.0-13X

CEWE3.0 Efficiency

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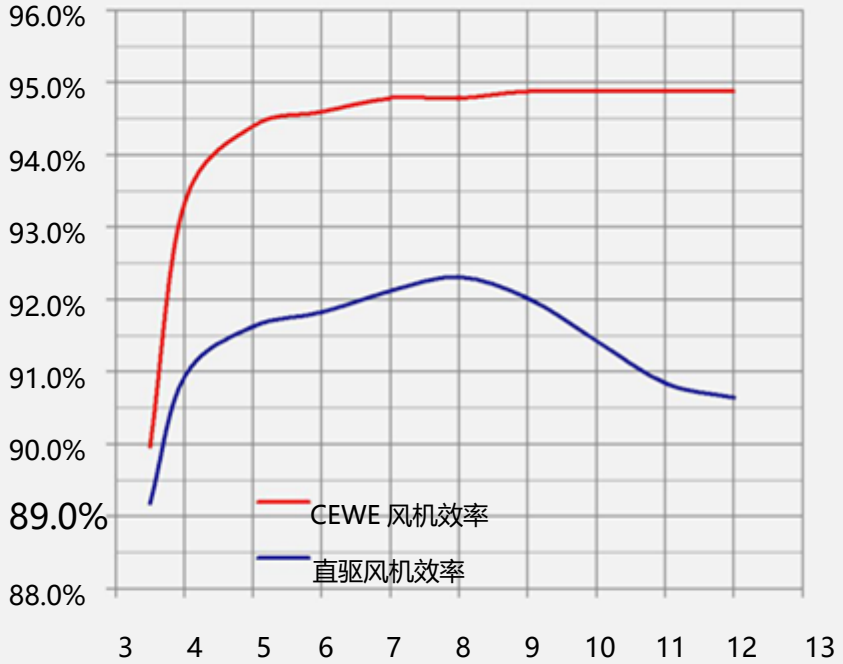
➢ Output Efficiency of WTGs:

$$P = P_{rotor} \cdot \eta_M \cdot \eta_E$$

η_M : *Mechanical*efficiency

η_E : *Electricalefficiency*



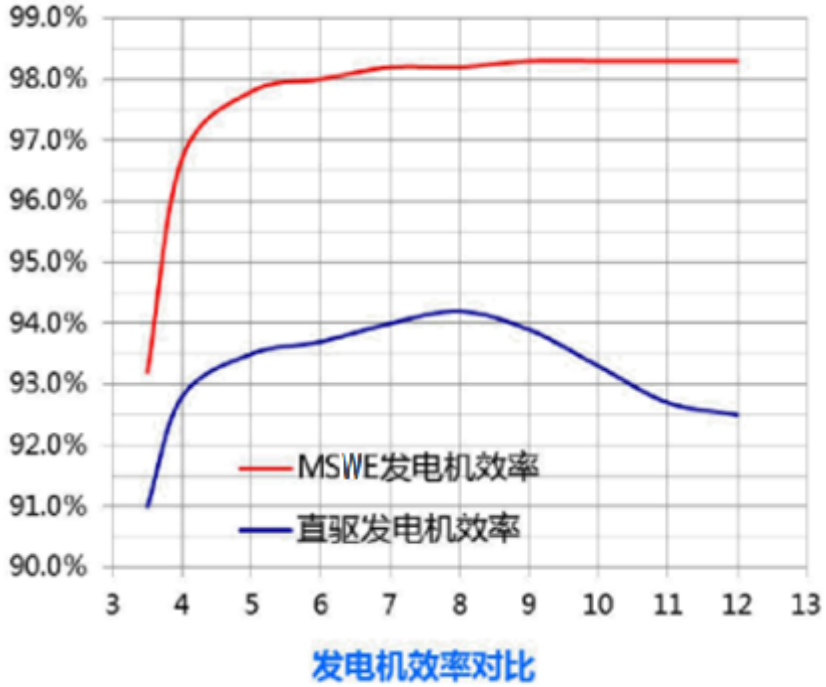
Comparison of Efficiency

CEWE3.0 WTGs adopted a two stage planetary Gearbox with 98.5% efficiency, and a full power convertor with 98% efficiency, so the system efficiency is higher than Direct drive, and that could produce more electricity, especially in Lower speed wind farm.

CEWE3.0 Medium-Speed permanent magnetic Generator

CEWE3.0 WTGs adopted a Medium Permanent Magnetic Generator, the weight of the MPMG is 18 tons with24 poles, which is Lower weight than other DD generator (usually 84 poles 68tons) 70%, and a 2.6m smaller diameter than other DD of (4.95m) 50%, higher efficiency in whole speed range.

V	CEWE3.0 Efficiency	DD Efficiency
3.5	93.20%	91.0%
4	96.70%	92.8%
5	97.80%	93.5%
6	98.00%	93.7%
7	98.20%	94.0%
8	98.20%	94.2%
9	98.30%	93.9%
10	98.30%	93.3%
11	98.30%	92.7%
12	98.30%	92.5%



发电机效率对比

CEWE3.0 Parameter of Generator

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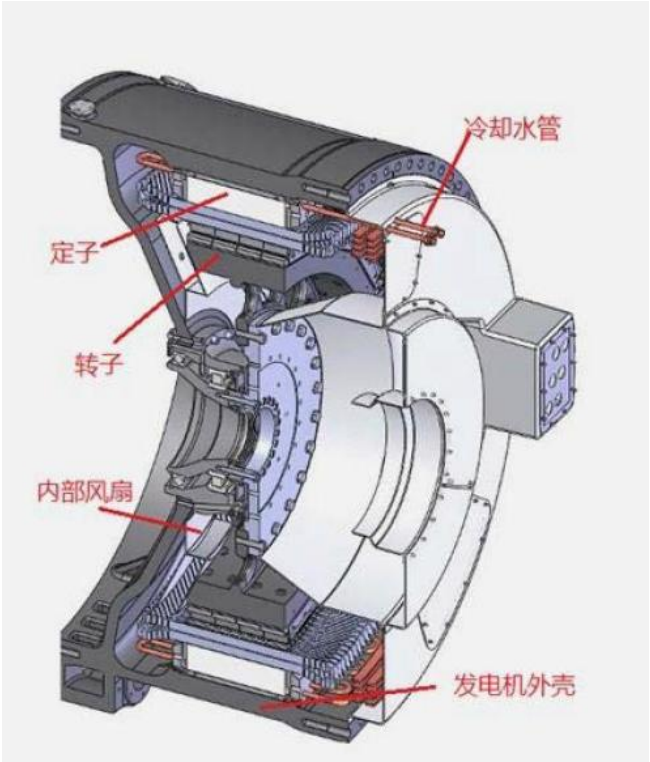
Generator：Medium PMG
Weight：18500kg
Rate power：3250kW
Poles：24
Rate speed：350rpm
Speed Range：119.7~423.5rpm
Rate efficiency：98.5%
Cooling：Liquid cooling
Power Factor：+0.95~-0.95
Insulation class： H
Protection Class： IP54
THD：2.3%



Generator Structure

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➢ Capability of High Altitude

1、The temperature of MPMGH is H class designed and F class tested, the actual temperature rise test is 82.1K to environment, obviously lower than the insulation examine figure (115K). According to the GB755 natioanl standards regulation, maxi 0.8K per 100m altitude increasing , so this generator could operation at a site with 5000m normally.

Which means the H (180 ℃) class design is considered an extreme temperature rise to 155 ℃, and if the temperature rise at a altitude of 5000m, corrected by maxi 0.8K, extreme temperature is 114.1K, Extreme temperature is 154.1 ℃, therefore the generator could normally operation.

2、CEWE3.0MW WTGs adopted air-water cooling system for the generator, means the cooling of generator is by water, the impact of high altitude site is limited in the cooling efficiency of water cooling fan, according to he GB755 national standards , it is no-necessary to correct the indirect water-cooling system, because of the high altitude, the temperature at out side is lower as well, the cooling performance of water-cooling is no significantly decrease.

3、 Increased Temperature rise range, to enhance the capability of over-load.

CEWE3.0 Parameter of Gearbox

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Principle: Two stage planetary

Transmission ratio: 1:25.34

Rate power-in: 3376kW

Efficiency: **98.5%**

Weight: 27000kg

Quantity of coolant: 450L

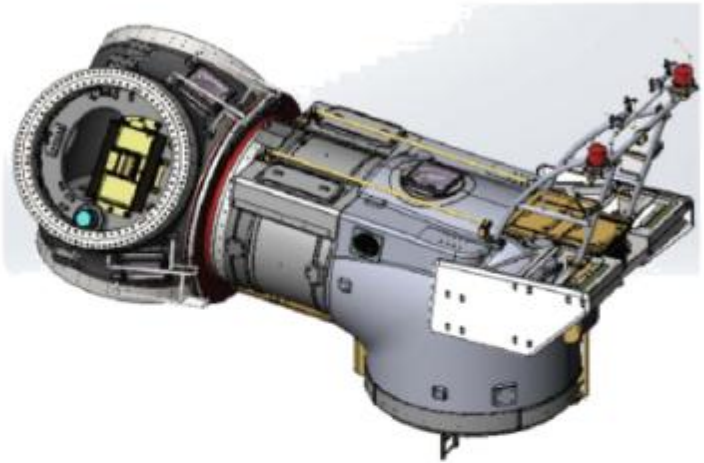
Cooling type: Oil

CEWE3.0 Blade Design

The 65m Length blade is a self-designed and optimized airfoil product, fully considered the acoustic effect. By through the Low noise designed airfoil, lower weight and higher electricity generation, to meet the national and industrial standards in acoustic, to reduce aerodynamic load, and maxi AEP.

The purpose of self-design, self-manufacture, self-test is to enhance the matchability of reliability and performance.

WTGs Efficiency comparision



Rotation range of CEWE3.0 WTGs is
5.0~15.8rpm
(Max/Min=3.16)

Rotation range of other DD WTGs is
7.6~12.6rpm
(Max/Min =1.76)

Extended rotation range, Wider optimization Cp range, Higher efficiency.

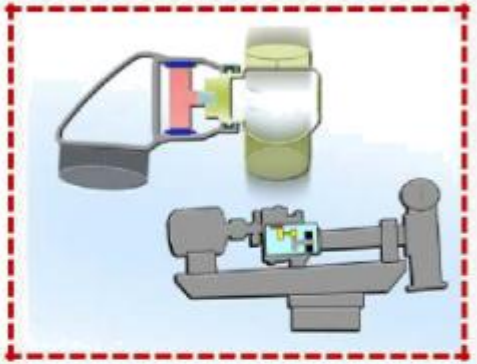
Ingenious Structure Design

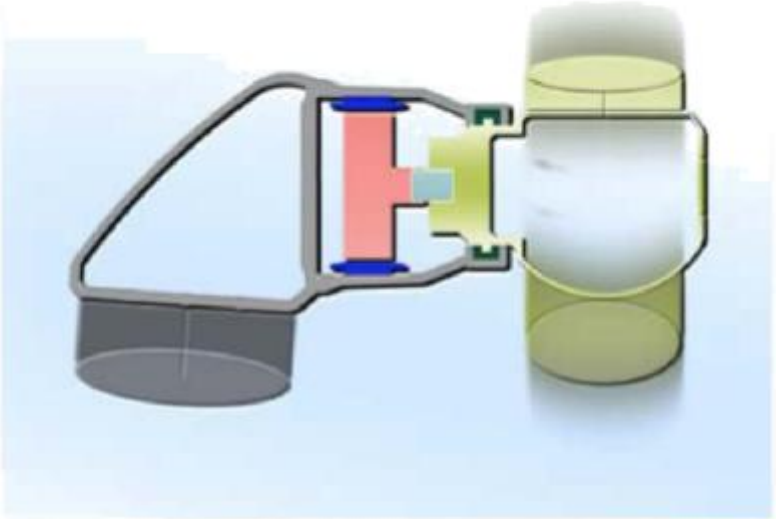
Faster, Higher, Conveniently

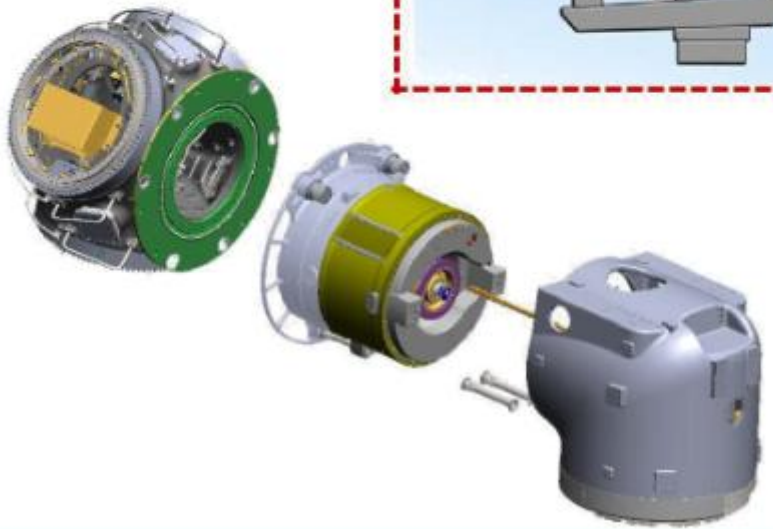
Feature 1：Super compact improve efficiency

CEWE WTG adopted both advantages from DFIG and DD in drive chain layout, it is designed an integrate stressed drive chain of main shaft, gearbox and generator, fully reflects optimized layout of WTG.

- Compact design, more effectively working space inside nacelle;
- Reduced distance between rotor wheel and tower, shorter drive chain transmission to improve the reliability of WTGs,
- Skilful design in load transmission of main shaft with Tower, avoid load impact.

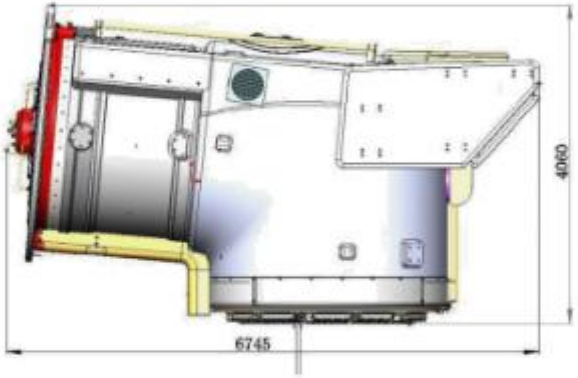




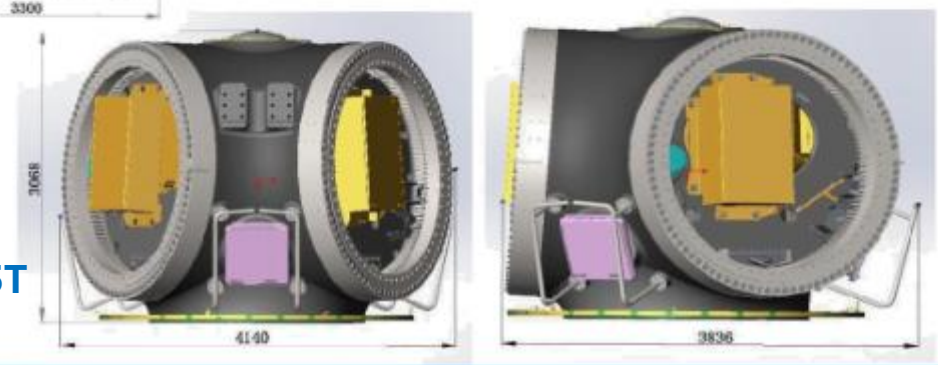


Feature 2：Lighter structure, Reduced load

CEWE3.0 WTGs with Lower weight of non-load will provide a convenience, faster and safety for the Transportation, O&M of the project. It could be applied in the project financial model for the 2.0MW turbine type, but not increase project investment duo to increased unit capacity. And its lower weight in Nacelle will positive impact the tower and foundation cost, to reduce the entire project investment.



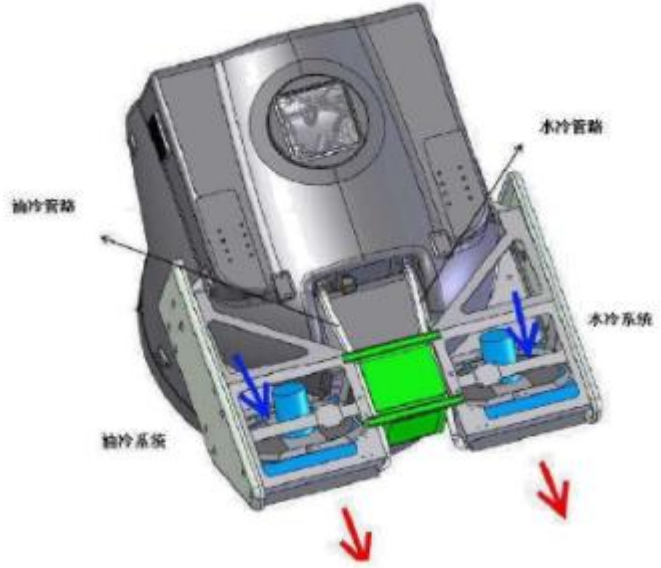
Nacelle Weight：80T

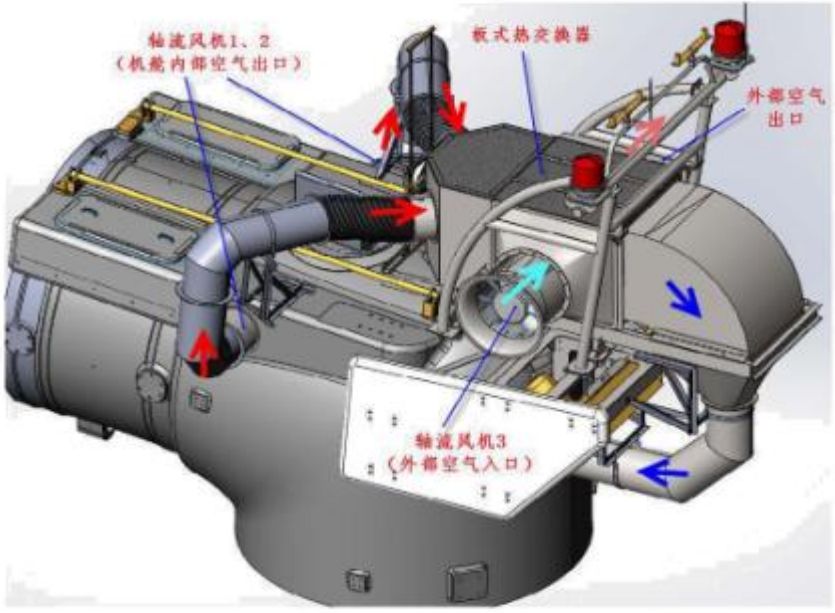


Hub Weight：35T

Feature 3：Whole Seal, improve performance

CEWE is designed to close off the air between Nacelle and Hub, all air entry the wind turbine is designed to filtering the moister, salinity and sandy dust to avoid corrosion. One set Water-cooling system is used in the hydraulic station and generator rectifier, it is used to exchange heat and air of outside by the water/air exchanger.





Feature 4：Easy transportation

CEWE3.0 platform WTGs with the Super Compact Drive design lead the dimension of nacelle to a level almost same as 2MW turbine, both nacelle and wheel rotor are less than 82tons. Compare with other turbine of 3MW, Significant advantage in transportation and site installation.

V112-3.0MW

Nacelle weight：123(t)

Nacelle dimension：12.8 × 4.0 × 3.4 (m)

CEWE3.0-121

Nacelle weight ： 78(t)

Nacelle dimension：6.8 × 3.5 × 4.1 (m)

Feature 4：Easy transportation

More complex hill/ condition

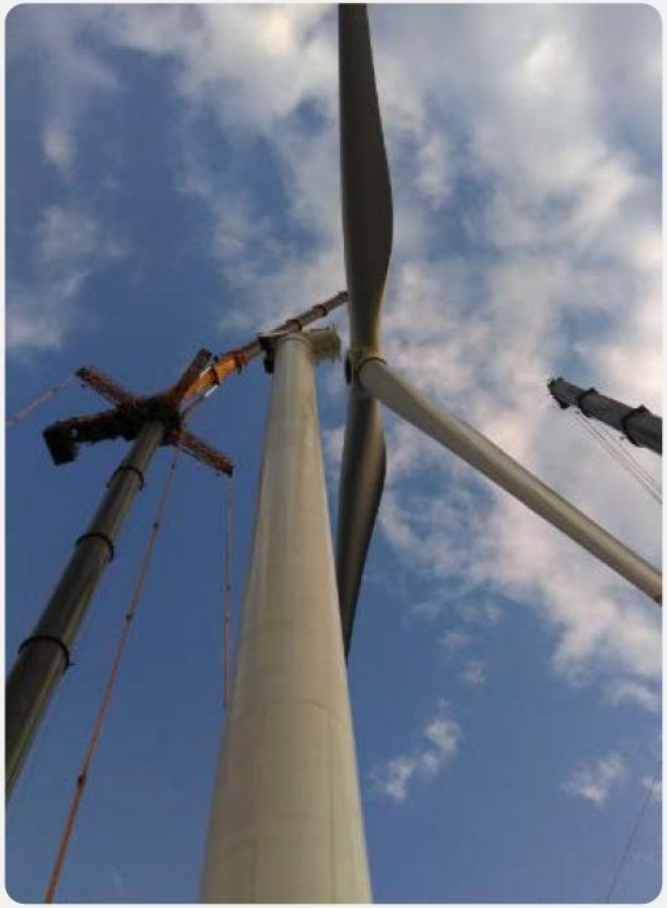
CEWE provide the solution for…

More rugged road.

Difficult transport port

……

Feature 6, Safety installation



CEWE , more convenience, faster, skilfully in installation

CEWE3.0 Power Curve

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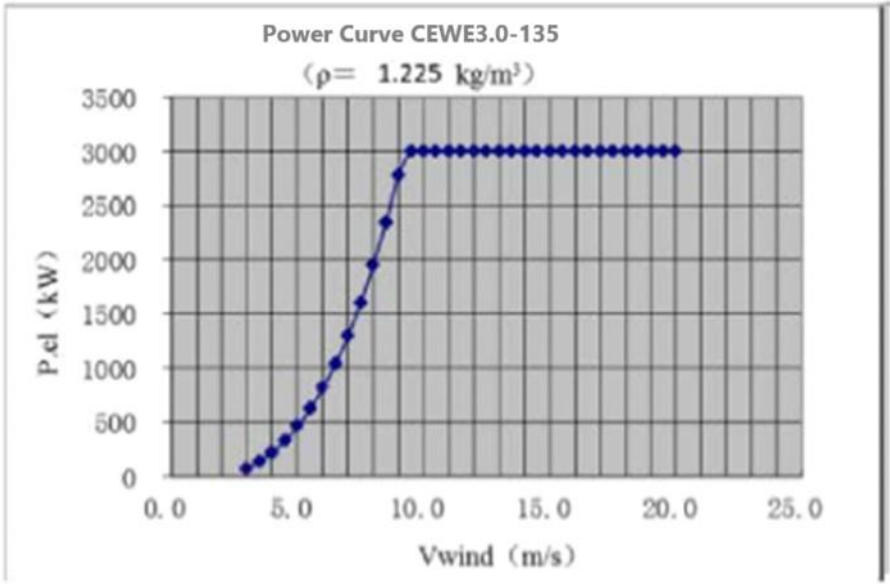

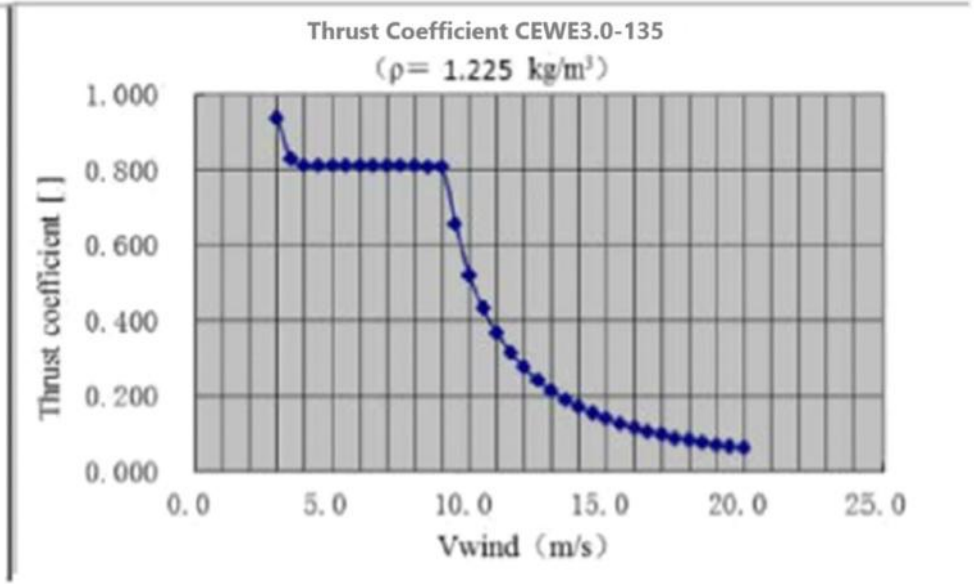

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