WindTracker 10 KW and 5 KW VAWT Wind Turbine Applications and System Developments

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Updated on 9/21/2021

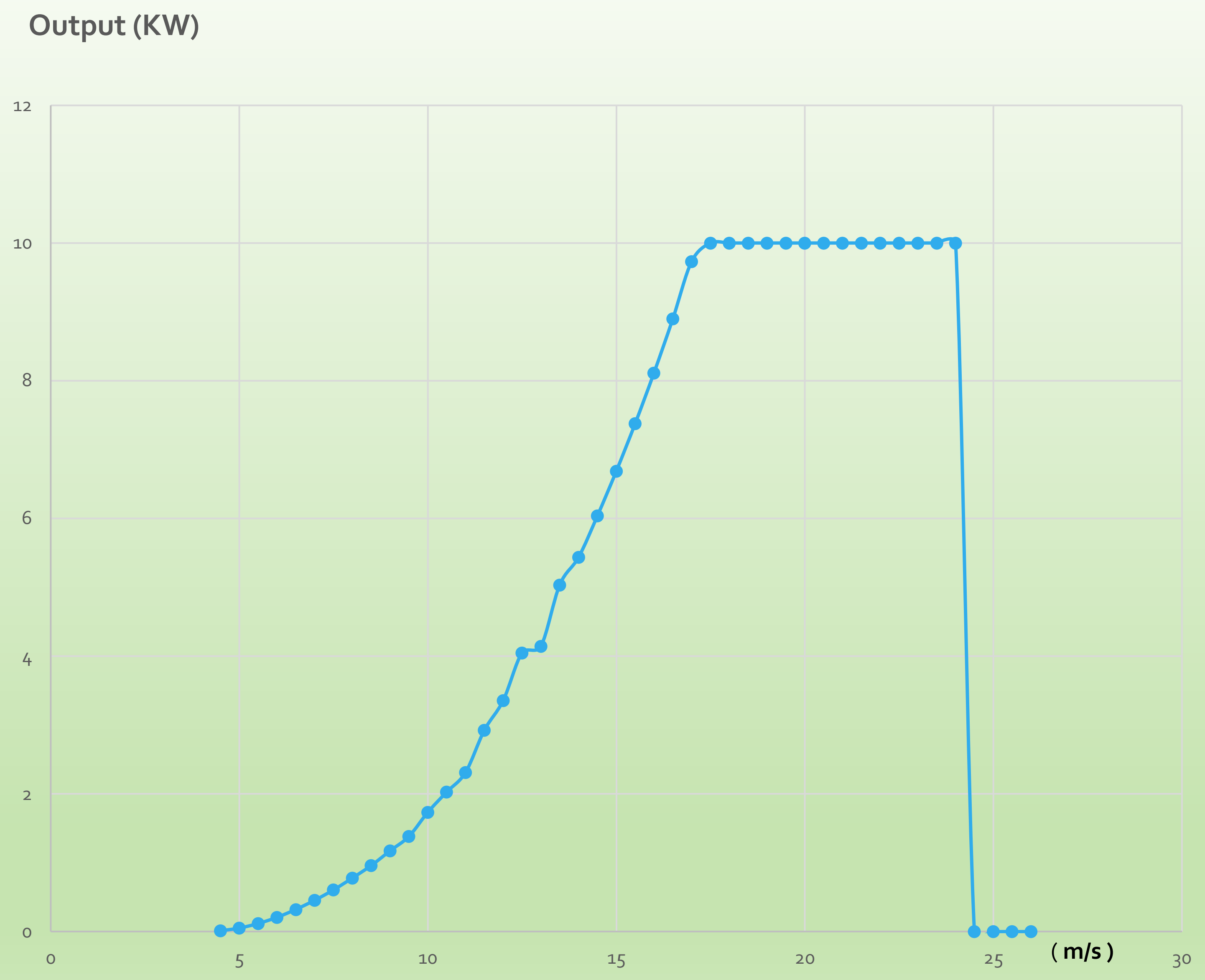
Wherever there is 风 wind， needs 电 electricity， there are going to be 我们 our integrated solutions

玄风de能源革命

德国de原创技术对垂直风力发电的重新定义
系列产品全面诠释风能标准 IEC61400-2

Rated Power	10 KW
Design characteristics	twin turbines, V shaped deflector, low wind speed startup, low noise, withstand strong wind conditions, small footprint, no impact to migrate birds, modular design
SWT Class	II
Startup wind speed	2 m/s
Cut-out wind speed	25 m/s (brakes engaged)
Max wind speed	52 m/s
YAW	automatically pointed into the wind directions
Rated wind speed	17 m/s
Output types	AC/DC, energy storage, number of outlets
Remote monitoring and controls	optional (WAN/LAN, Cellular networks, IoT Apps, satellite)
System Design and Development	DIRECT TECH Global GmbH, Dusseldorf, Germany (wholly owned by Windquiet Technologies Inc.)
OEM Manufacturer	Xuan Feng Technologies (Zhejiang) Ltd., Zhejiang, China, a division of Windquiet Technologies Inc.
Holding Company, and the Corporate WHQ	Windquiet Technologies Inc., San Jose, CA 95128, USA

TYPICAL POWER OUTPUT VS WIND SPEED



Value Added Features

1). Low wind speed startup, low noise, withstand strong wind conditions, small footprint, no impact to migrate birds, modular design

2). There are 20 m^2 surface area for PV solar panels, luminating, as well as for advertisements

3). At the top of the tower, there is space for equipment such as the antennas for 5G cellular networks, instruments for weather stations, etc.

4). There are plenty of options for other mounted features such as, but not limited to, lighting, speakers, cameras, to meet customer's particular need

5). Integrated solutions with the energy storage units as well as the remote monitoring and control features.

5G Base Station Integrated Power Solution

Power consumptions: 3-5 KW
Daily usage : 120 KWh
Storage capacity: 400 KWh (off-grid setup)
Generations: PV, wind, grid, diesel genset

EV Charge Station for both Urban and Rural Locations

Voltage: 220V, 380V
Outlets: 2.5A X15
5A X 5
14A X 10
Peak hours: 8 am-6 pm
Off hours: 6 pm-8 am

Remote Location where Grid Power is not available:

- Remote islands
- High mountains
- Fjords
- Coastal locations
- Tundra and barren
- Hight latitude
- Prairie
- Deserts

Marine, polar regions, and Ocean Shipping

- Freight liners
- Oil tankers
- Bulk freighter
- LNG ships
- Off-shore rigs
- Lighthouses
- Research stations
- Weather stations

HYDROPONIC AND AEROPONIC GROWS

- High latitude locations
- Solar is not effective
- Desert locations
- HVAC
- Lighting
- Flow control and management
- Environment sensible
- High operational costs

DESIGN GUIDELINES

- *MODULAR DESIGNS*
- *STANDARDIZED AND SCALABLE*
- *LOCAL SOURCED COMPONENTS*

Output from the PMG Generator

AREND PM-D160L, 10KW GENERATOR:

3 PHASE, 660 RPM, 10 KW, 66Hz, IP55, CLASS-F

1). VOLTAGE: 550 V (600 V max)

2). CURRENT: 15 A (60 A, max. 5 s)

3). RATED POWER: 10 KW

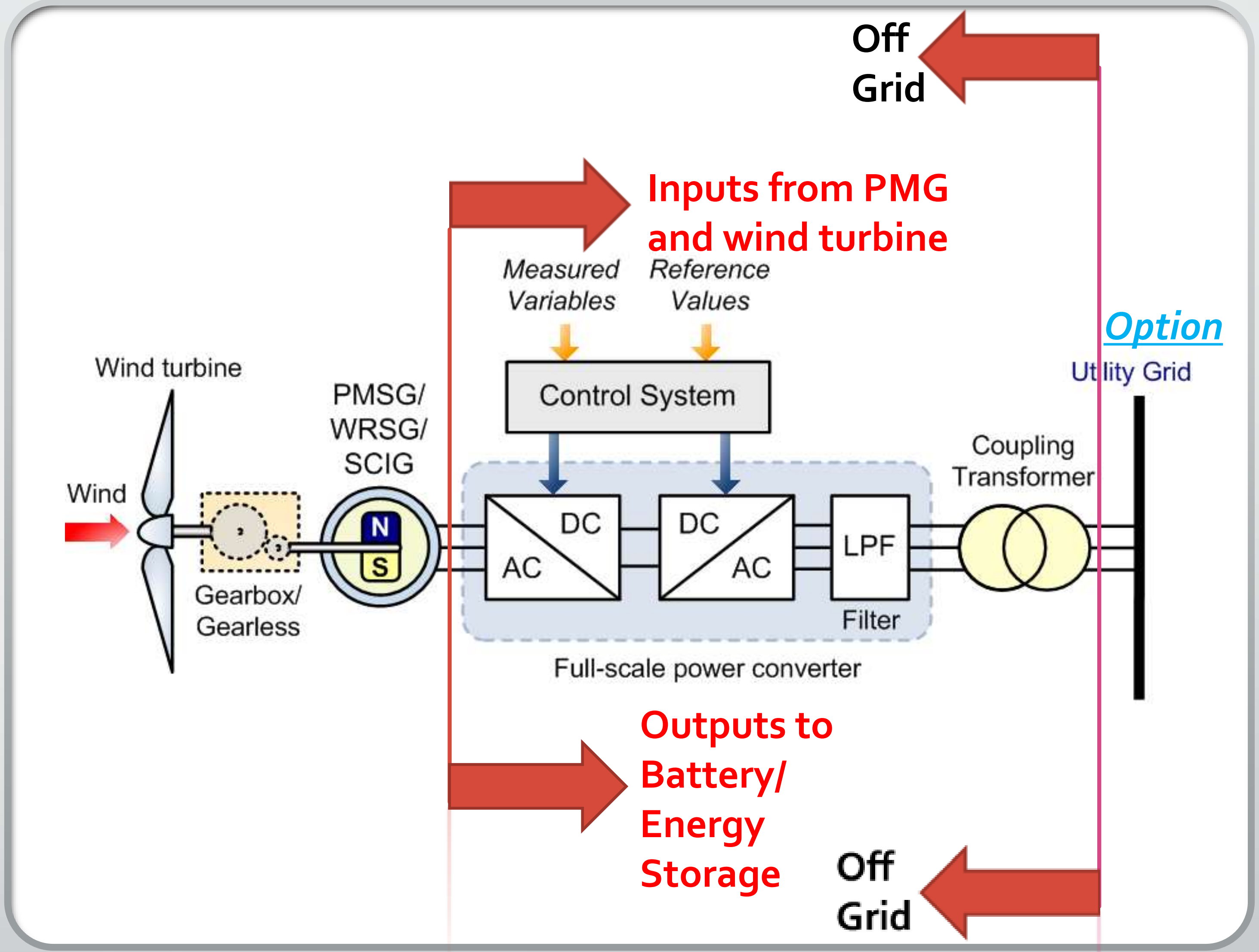
EXISTING MONITOR I/Os:

RPM, TEMPERATURES, ISOLATIONS, CURRENT, VOLTAGE, WIND DIRECTION, WIND SPEED, BRAKE (FAIL-SAFE), POWER OUTPUT (KW)

COMMUNICATIONS: CAN, TCP/IP

High Level System Overview

- Originally designed for Urban/Grid applications
- Siemens PLC Controller, LOGO(Simatic 2040cmr)
- Smart!Wind SW-10, 3-phase 10 KW Power Converter with system control functions for wind turbines



System Architecture, the current and future states

PHASE I OBJECTIVES

- *OFF-GRID APPLICATIONS*
- *SIMPLIFY THE EXISTING SYSTEM*
- *LOCAL SOURCING FOR* **C/R**

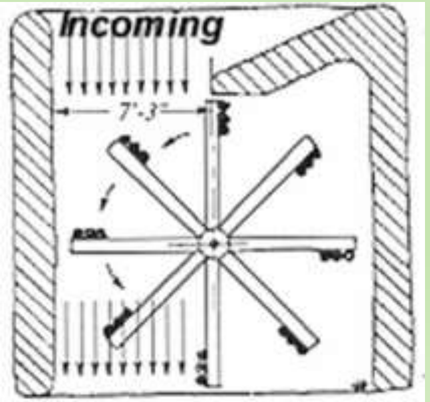
PHASE II OBJECTIVES

- *STANDARDIZED SYSTEM DESIGN*
- *MODULAR AND SCALABLE*
- *FULLY INTEGRATED SYSTEM (WIND, PV, ENERGY STORAGE, REMOTE MONITORING AND CONTROL, APP, ETC.)*

THANK YOU FOR YOUR TIME

The ancient Persian wind mills at the village of Nashtifan

- A vertical axis setup
- Deflection wall
- Multiple rotors
- Still functional



Wind energy is the kinetic energy of air in motion, also called wind. Total wind energy flowing through an imaginary surface with area A during the time t is:

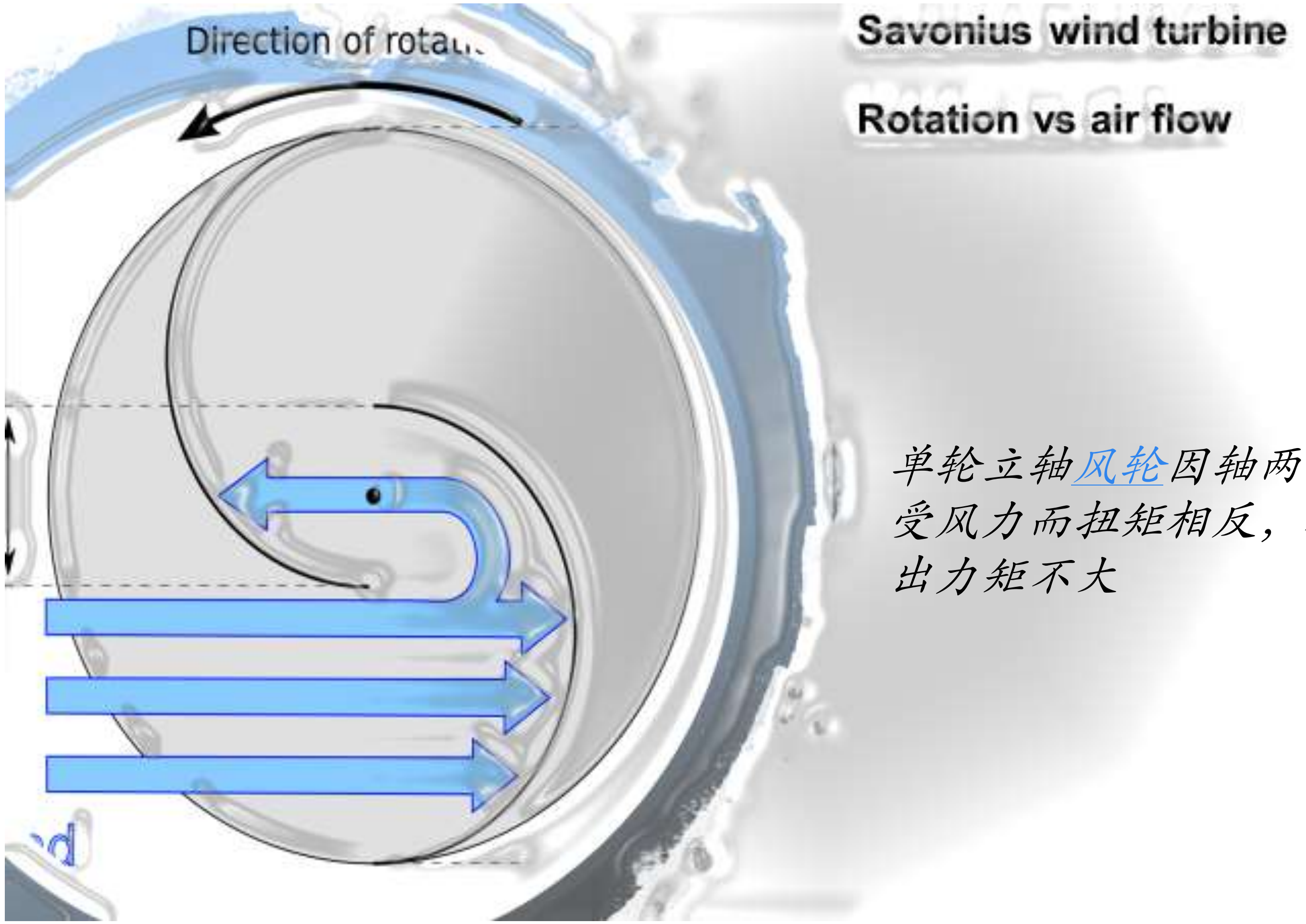
$$E = \frac{1}{2}mv^2 = \frac{1}{2}(Avt\rho)v^2 = \frac{1}{2}At\rho v^3$$

where ρ is the density of air; v is the wind speed; Avt is the volume of air passing through A (which is considered perpendicular to the direction of the wind); Avtρ is therefore the mass m passing through "A". ½ ρv2 is the kinetic energy of the moving air per unit volume.

Power is energy per unit time, so the wind power incident on A (e.g. equal to the rotor area of a wind turbine) is:

$$P = \frac{E}{t} = \frac{1}{2}A\rho v^3$$

Wind power in an open-air stream is thus proportional to the third power of the wind speed; the available power increases eightfold when the wind speed doubles. Wind turbines for grid electric power, therefore, need to be especially efficient at greater wind speeds.



单轮立轴风轮因轴两侧桨叶同时接受风力而扭矩相反，相互抵消，输出力矩不大

Power and rotational speed

According to Betz's law, the maximum power that is possible to extract from a rotor is

$$P_{\max} = \frac{16}{27}\frac{1}{2}\rho \cdot d \cdot h \cdot v^3$$

where p is the density of air, h and d are the height and diameter of the rotor and v is the wind speed. However, in practice the extractable power is about half that [2] (one can argue that only one half of the rotor — the scoop co-moving with the wind — works at each instant of time). Thus, one gets

$$P_{\max} \approx 0.18\,\mathrm{kg\,m}^{-3} \cdot h \cdot d \cdot v^3$$

The angular frequency of a rotor is given by

$$\omega = \frac{\lambda \cdot v}{r}$$

where r is the radius and v is a dimensionless factor called the tip-speed ratio. *λ* is a characteristic of each specific windmill, and for a Savonius rotor *λ* is typically around unity.
For example, an oil-barrel sized Savonius rotor with *h*=1 m and *r*=0.5 m under a wind of *v*=10 m/s, will generate a maximum power of 180 W and an angular speed of 20 rad/s (190 revolutions per minute).

"双轮效应"是一种新型风能转化方式

- 径流双轮效应或叫双轮效应是一种新型风能转化方式。

- 首先它是一种双轮结构，相对于水平轴流式风机，它是径流式的，同已有的立轴式风机一样都是沿长轴布设桨叶的，直接利用风的推力旋转工作的,单轮立轴风轮因轴两侧桨叶同时接受风力而扭矩相反，相互抵消，输出力矩不大。

- 设计为双轮结构并靠近安装，同步运转，就将原来的立轴力矩输出对桨叶流体力学形状的依赖进而改变为双轮间的利用转动产生涡流力的利用，两轮相互借力，相互推动；而对吹向两轮间的逆向风流可以互相遮挡，进而又依次轮流将其分拨于两轮的外侧，使两轮外侧获得有叠加的风流，因此使双轮的外缘线速度可以高于风速，双轮结构的这种互相助力，主动利用风力的特点产生了"双轮效应"。

TYPICAL POWER OUTPUT VS WIND SPEED