

# **The Market and applications of Chinese small wind turbines**

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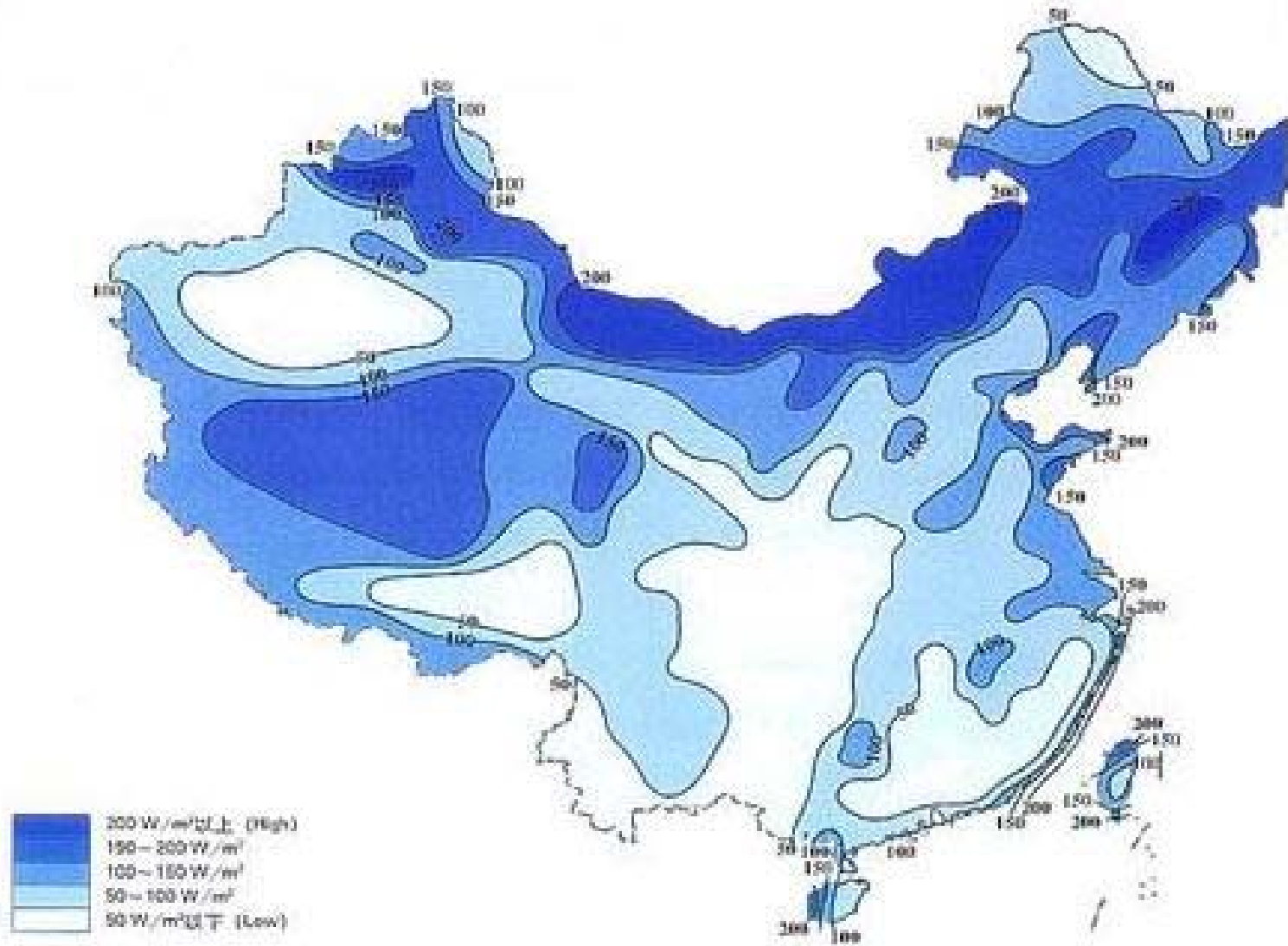
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# 1. Wind Energy Resources for Small wind turbines in China

- According to the surveying and calculating carried out by Chinese Academy of Meteorological Science, the total reserves of wind energy at 10 m height is 3.2 billion ( $3.2 \times 10^9$ ) kW, the practical developable amount at 10 m height is 253 million ( $253 \times 10^6$ ) kW.
- The much rich, rich and utilizable regions of wind resources amount respectively is 8%, 18% and 50% of the total area of the country.
- So, the 76% of the total areas of China is suitable to install small-size wind generators, the tower head of majority small wind turbines is around 10 m.

# Distribution of wind resources in China



# **Significance of Developing and Utilizing off-grid Wind generators**

- **According to the statistics, there are still 2.4 million households , 12 million people have not got electricity supplement in remote areas of China by the end of 2006. In the windy remote areas, the electricity supply of 1.2 million households( 6 million people) can be solved by using wind generators and PV power systems. And it is the most effective method in remote areas.**
- **And it is an act of constructing harmonious society with deep significant, it also has deep significance for strengthening national unite, consolidating frontier defense and promoting economic development of remote areas.**



wind piston water  
pumping System  
Supply drinking  
water for human  
beings and animals

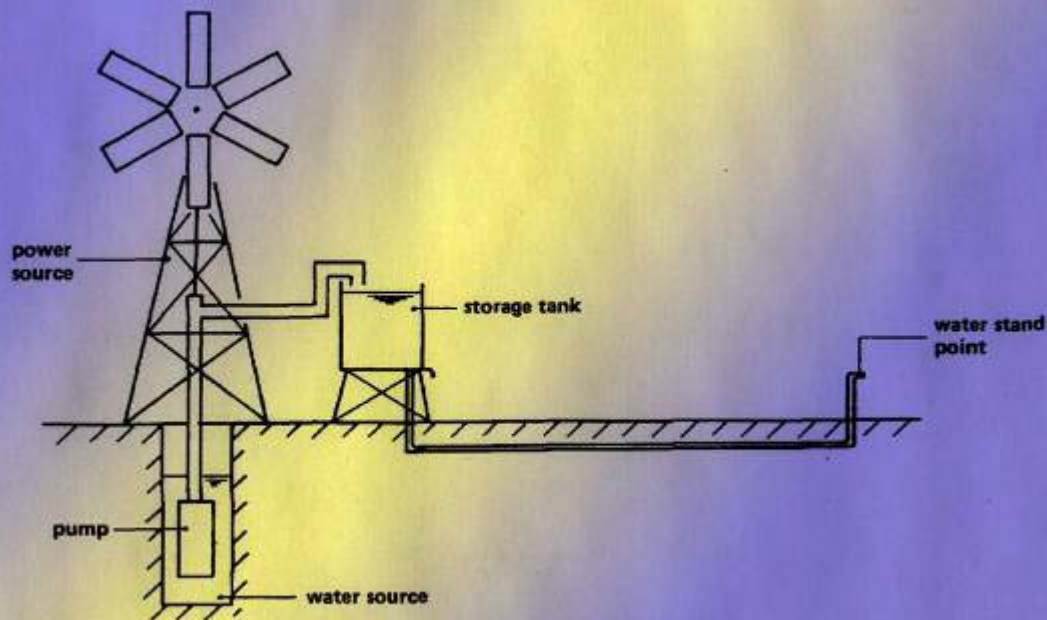
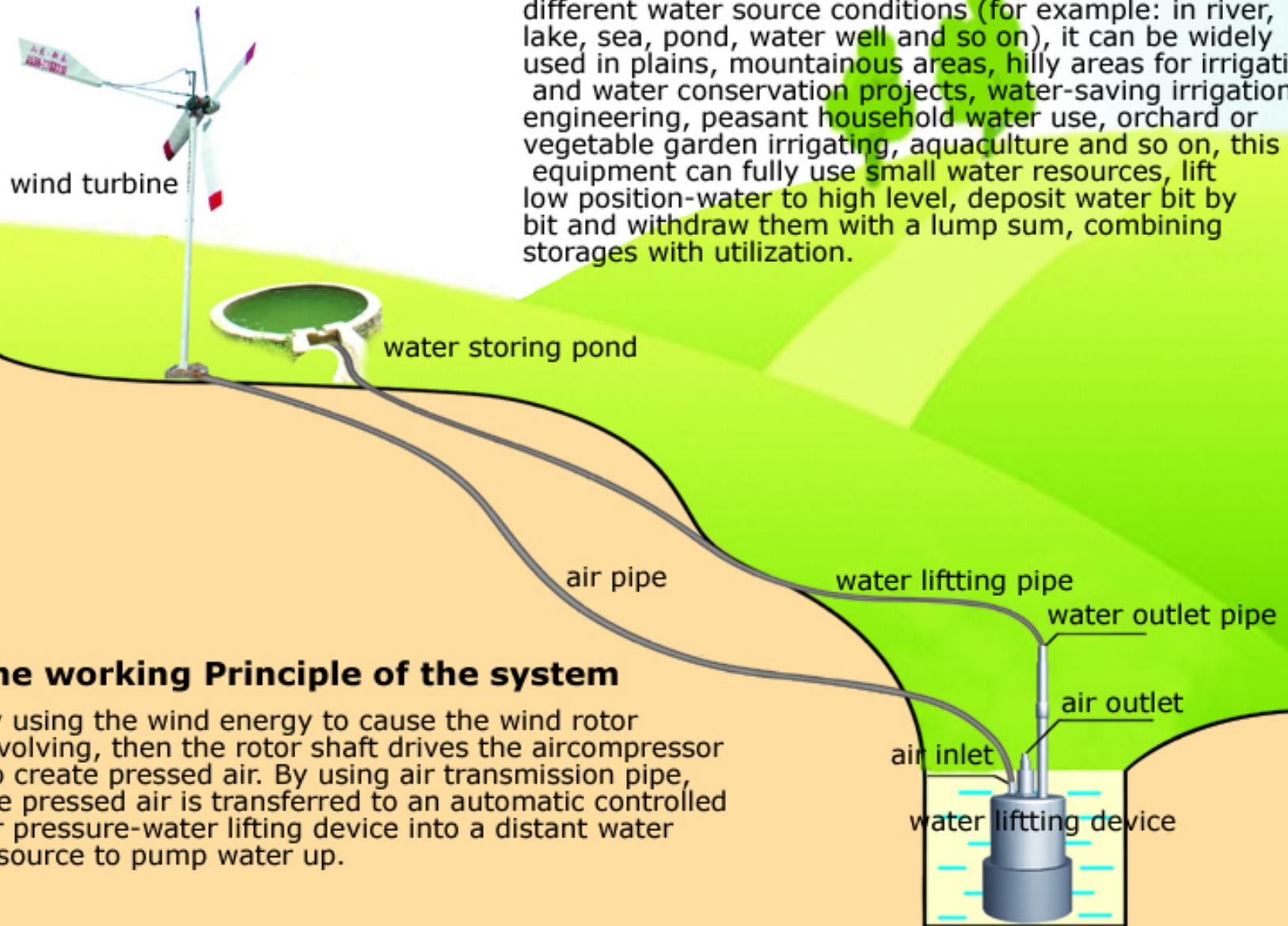


Figure 1.2.a. Schematic layout of a village water supply system showing the five major components.

The wind power water pumping system can start working in the wind speed between 3m/s to 20m/s, adapts in different water source conditions (for example: in river, lake, sea, pond, water well and so on), it can be widely used in plains, mountainous areas, hilly areas for irrigation and water conservation projects, water-saving irrigation engineering, peasant household water use, orchard or vegetable garden irrigating, aquaculture and so on, this equipment can fully use small water resources, lift low position-water to high level, deposit water bit by bit and withdraw them with a lump sum, combining storages with utilization.



### The working Principle of the system

By using the wind energy to cause the wind rotor revolving, then the rotor shaft drives the aircompressor to create pressed air. By using air transmission pipe, the pressed air is transferred to an automatic controlled air pressure-water lifting device into a distant water resource to pump water up.

# Small-size wind generators developed in China

- 100W、200W、300W、(400W)、500W、(800W) and 1kW are very popular used in mass quantity in the rural areas of China.
- 1.5kW、2kW and 5kW are used in a small quantity.
- 10kW、20kW、30kW are used in a very small quantity in China. They are mainly exported to other developed countries. Prototypes of 50 kW and 100kW are available.
- Accumulated installation number of Chinese small-size wind generators is more than 400000
- Inner Mongolia: Occupied 75%

# Chinese small wind generator manufacturers



# Manufacturers of small-size Wind generators

- There are about 80 manufacturers of small-size wind generators in China.
- About 15 main manufacturers (located in Inner Mongolia, Jiangsu, Guangdong, Shandong, Zhejiang provinces and Guangdong province, Beijing city ) with production capacity over 1000kW per year each.
- About 5 main manufacturers (located in Jiangsu,, Zhejiang provinces and Guangdong province, ) with production capacity over 5000kW per year each
- Others are small manufacturers with production capacity less than 1000kW per year each

# Some small wind generator Manufacturers

- Guangzhou Hongying Energy Technology Co.,Ltd  
[www.hyenergy.com.cn](http://www.hyenergy.com.cn)
- Shanghai Ghrepower Green Energy Co.,Ltd  
[www.ghrepower.com](http://www.ghrepower.com)
- Hunan Zkenergy Science & Technology Co.,Ltd  
[www.zkenergy.com](http://www.zkenergy.com)
- Yangzhou Shenzhou Wind-driven Generator Co.,Ltd  
[www.china-swtgs.com](http://www.china-swtgs.com)
- Zhejiang Huaying Wind Power Generator Co.,Ltd  
[www.huayingwind.com](http://www.huayingwind.com)

# Some small wind generator Manufacturers

- Qingdao Ahua New Energy Development Co.,Ltd  
[www.chinawindenergy.com](http://www.chinawindenergy.com)
- Ningbo Fengshen Fengdian Science and technology  
Co.,Ltd [www.winpower.cc](http://www.winpower.cc)
- Beijing Bergey Windpower Company  
[www.bergey.com.cn](http://www.bergey.com.cn)
- Baotou Tianlong Permanent magnet generator  
manufacturing Co., Ltd [www.tianlongxuy.com](http://www.tianlongxuy.com)
- Sungrow Power Supply Co., Ltd. (inverter and  
controller) [www.sungrowpower.com](http://www.sungrowpower.com)

# Structure of small off-grid wind generator

- Rotor: consisting by three fiber glass blades
- Generator :  
Three phases, permanent generator
- Rotating frame
- Guyed tube tower
- Tail vane with inclined pin shaft.
- Controller (for charging the batteries)
- Inverter (changing DC current from Batteries to AC current for appliances)
- Batteries
- Cables
- Components of basement
- Concrete foundation

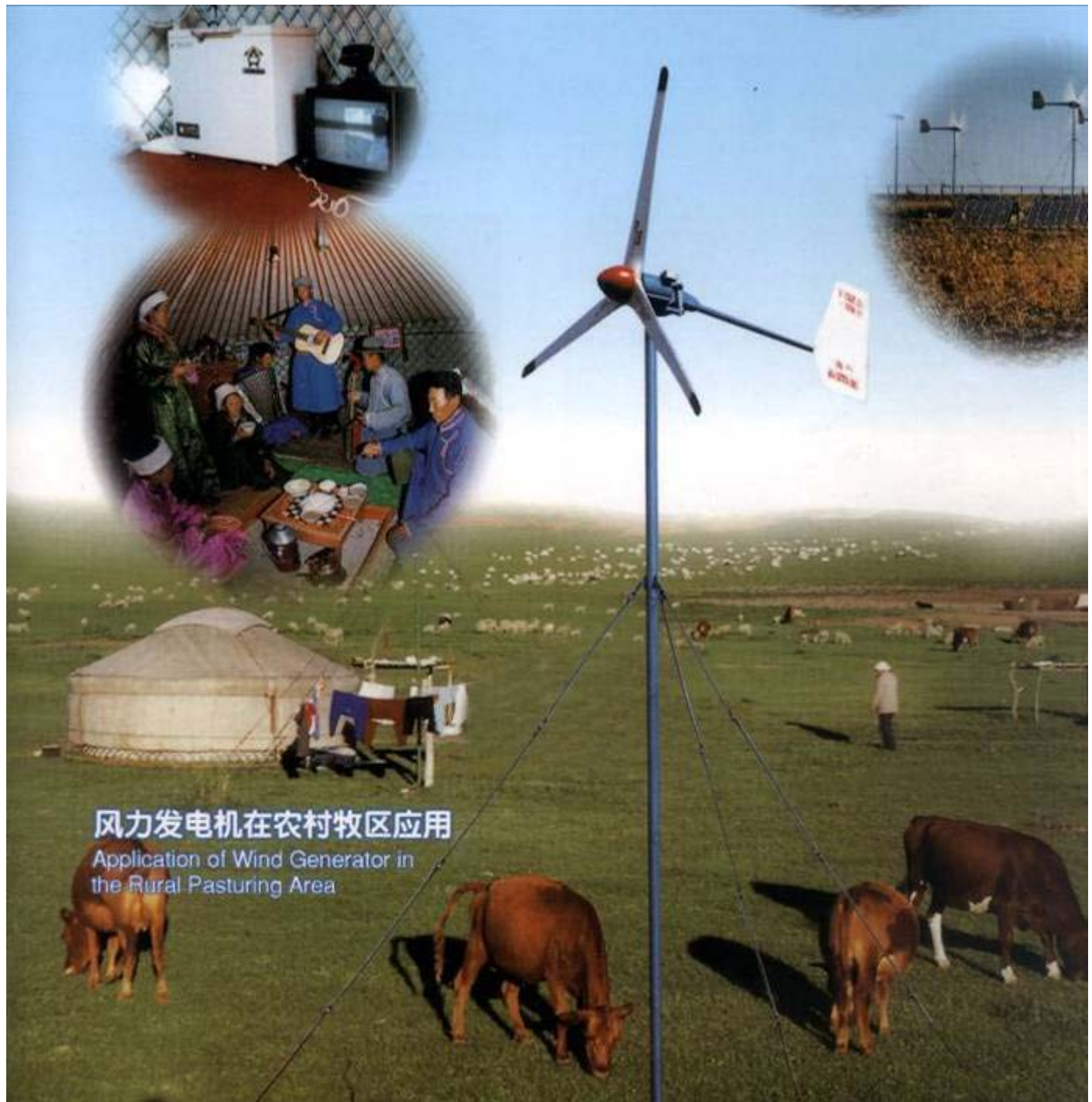
# Application range of small off-grid wind generators

- Providing 220V AC current or 24V to 120V DC current
- Home illumination: lamp, fluorescent lamp, energy saving lamp
- Home appliances: TV、Radio、VCD、fan、electric carpet、refrigerator、washing machines and so on.
- Communication devices, road lights
- Small electric tools
- Suitable power supply for households of farmers, headers men, border sentry posts, school, small railway stations,
- Communication base station and so on.



# The application of small off-grid wind generator in remote areas

- Diesel electricity generating system bring pollution to the grassland and diesel transportation is difficult.
- Wind resources is sufficient, no damage wind speed occurred on the grassland.
- Small-size wind generating technology is mature and product performance is basically reliable.
- The wind generators are wanted by herdsman urgently and majority of them are affordable.
- Therefore, it is a good combination among resources, technologies, demands and purchasing abilities . Now, 50% of herder men 's home already adapt wind generators for obtain power supply.
- There are 1.2 million households , 6 million people live in windy remote areas, public grid is not available .



## 风力发电机在农村牧区应用

Application of Wind Generator in  
the Rural Pasturing Area

# Bring benefits to the construction of remote rural countryside

- Bring the light to remote off-grid rural areas
- TV Bring the modern civilization to the life of local people by using off-grid wind generators.
- The application of radio and mobile phone facilitating the communication of local people with outside world .
- Promoting the harmonious development between the farming , fishery economies and the ecological environment.
- Liberating the labor strength of women, bring better study conditions to the children.
- Advanced agricultural technologies entered the life of farmers, herdsman and fisherman and bring benefits for their productions.
- Cultural life become reach and the living standards were improved, bad living customs were removed also.

# 1kW wind generator used on an island in China





# Overseas market

- On grid application in developed countries  
5kW, 10kW, 20kW, 25kW, 30kW and 50kW
- Off grid application in developing countries  
300W, 500W, 1kW, 2kW, 3kW, 5kW
- Wind pumping system in developing countries

From 2005 to 2009, more than 120,000 sets of Chinese small wind turbines have been exported to other countries.

Many 5kW, 10kW and 20kW Chinese wind generators have been exported to USA



Some 5kW and 20kW Chinese wind generators have been exported to Europe



# 50kW wind generator exported to Sweden



# Easy lifting the tower by using hand-drive hydraulic lifter



Three 100kW wind generators was installed in a island of Indonesia



# Developing trend of off-grid small generators in China

- *A. The output power will increase from low to high, now the 200W and 300W are the main type of products, in the near future, 500W and 1kW will become main type of products.*
- *B. From one family use expand to joint network of electricity supply, 5kW, 10kW and 20kW will be used gradually.*
- *C. From single wind energy to multi-energy compensating system (photovoltaic-wind hybrid system)*
- *D. The utilization range enlarged step by step, from north rural areas to seacoast areas and lake fishery areas.*

*500W and 1kW will become main type of products.*



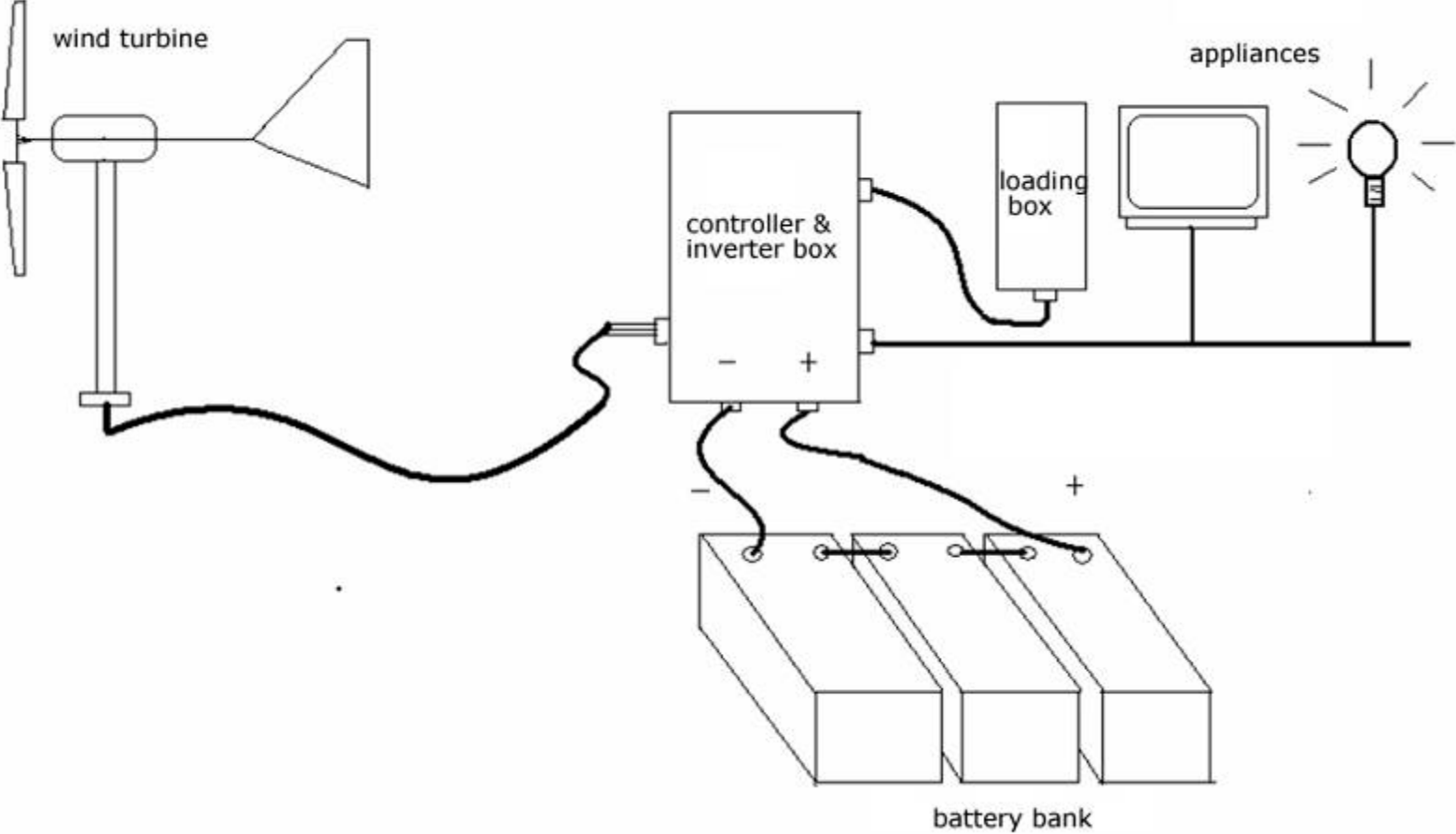
Wind-photovoltaic hybrid road light were installed in the town village to improve the illumination conditions



*Photovoltaic-wind hybrid system is the trend of future application*



# Small-size Off-Grid Wind Turbine System



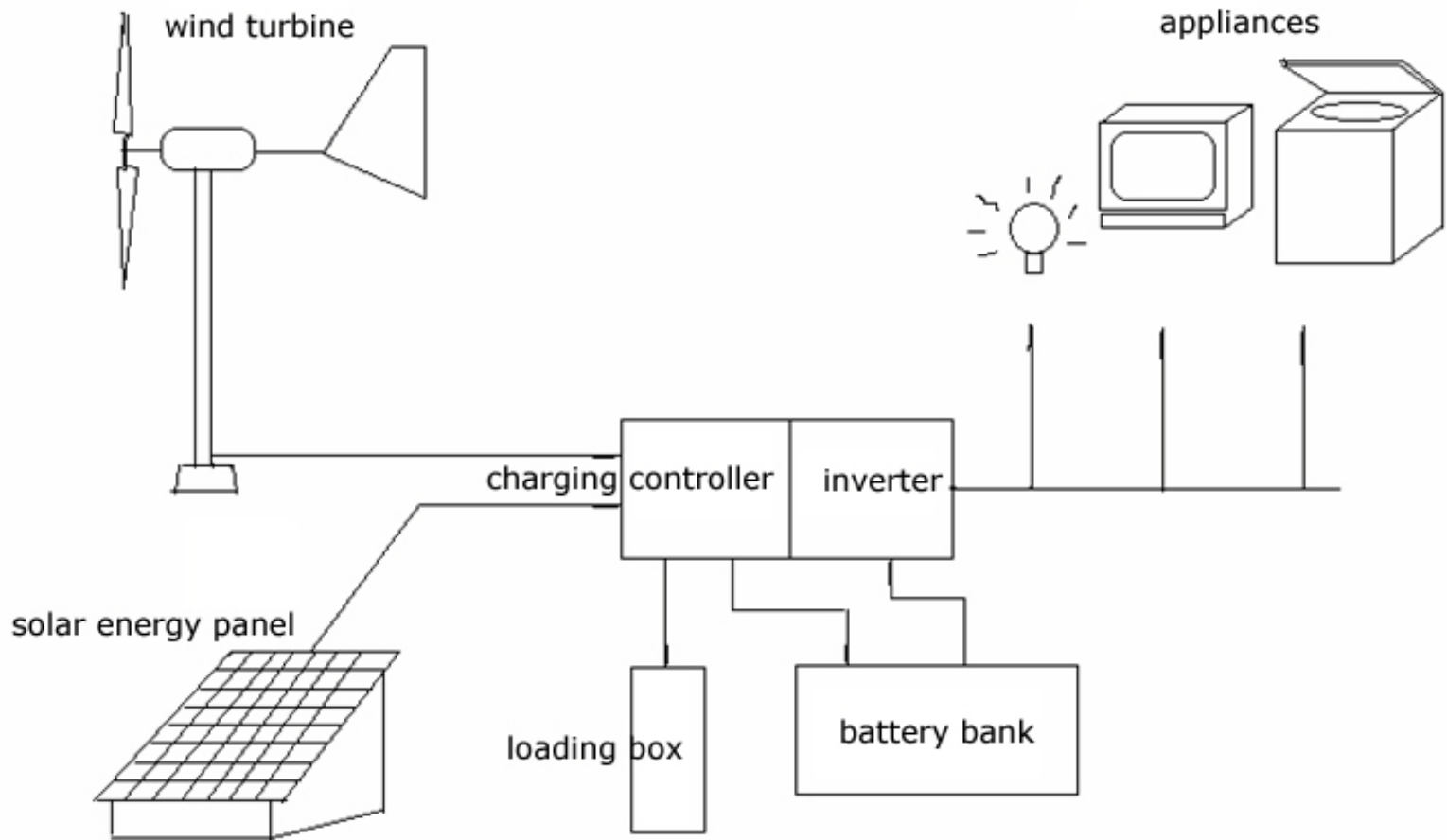
# The application of small off-grid wind generator in lake areas

- Diesel electricity generating system bring pollution to the lake and diesel transportation is difficult.
- Wind resources is sufficient, no damage wind speed occurred on the lake.
- Small-size wind generating technology is mature and product performance is reliable.
- The wind generators are wanted by fishermen urgently and they are affordable.
- There are 5000 households of fishermen in Honghu lake, public grid is not available . And there are 5 big lakes.
- Therefore, it is a good combination among resources, technologies, demands and purchasing abilities . Now, 20% of fishermen' home already adapt wind generators for obtain power supply.





# Wind and photovoltaic Hybrid generating system



# The application of small-size wind-photovoltaic generating system in lake areas

- **Compensating between solar energy and wind energy, power supply can be ensured more safely.**
- **There are rich wind energy and solar energy in lake areas.**
- **The technology of small-size wind-photovoltaic generating system is mature, and their performances are reliable.**
- **There are demand from rich fishermen's families, a few of them is affordable to purchase the system.**
- **It is a best combination of resources, technologies, demands and environment protection.**
- **320 sets of 400W wind-photovoltaic generating system have been used by fishermen families in Honghu lake areas.**
- **It is a most attractive model of energy application in lake areas, it is the developing trend in future in lake areas.**



5kW wind generator was installed on boat school of Honghu lake (an example)



# Honghu lake school wind project was progressed well

- 5kW wind generator are imported from Fortis company of the Netherlands, installed on boat school and put into operation in June.
- It is easy to start, power is sufficient, vibration is small.
- Can meet the power requirement of the boat school for education.
- 1000W photovoltaic power also installed on the boat. During night time, every room on the boat is bright, TV, computers, as well as other electric apparatuses can be used. It is the biggest and handsome wind turbine in Honghu lake.
- The living condition of the people on this boat is improved dramatically .

