

WIND POWER DEVELOPMENT IN CHINA

Shi Pengfei

China Hydropower Planning General Institute

WIND ENERGY RESOURCE IN CHINA

Potential:

253GW at 10m height has been estimated by China Academy of Meteorological Sciences

China is rich in wind energy resource.

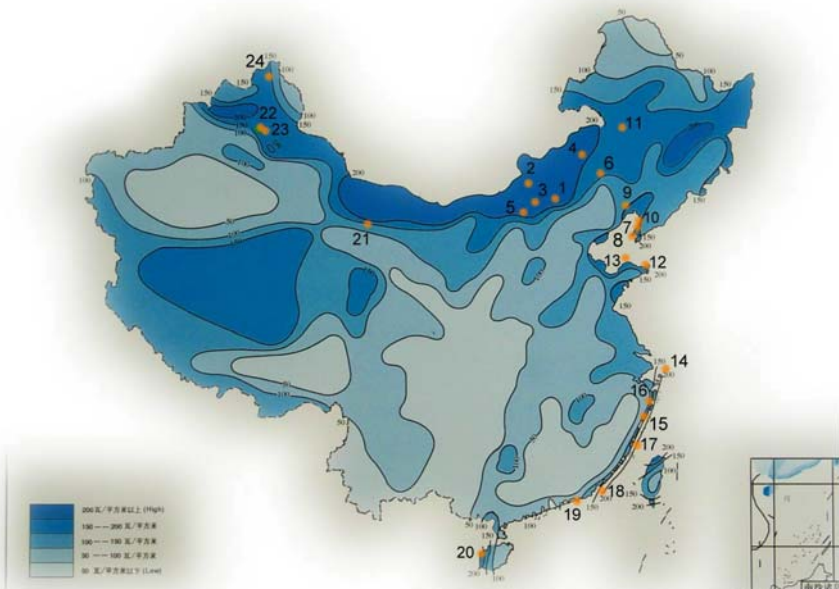
A detailed survey is urgently needed to obtain the potential installed capacity which could be real utilized economically.

WIND ENERGY RESOURCE IN CHINA

Distribution:

Grasslands or the gobi desert of northwest, north and northeast China

Coastal area and islands in east and southeast China, wind and hydropower are good seasonal mutually compensatory power source



2000/3/25 12:14

WIND ENERGY RESOURCE IN CHINA

Offshore wind energy resource along the coast of eastern China, maybe **three times** higher than mainland. It is estimated to be **750GW**,

Offshore wind sites are close to the main electricity load centers in eastern China, it is a **great potential for the future energy supply**

WIND ENERGY RESOURCE IN CHINA

Wind mapping:

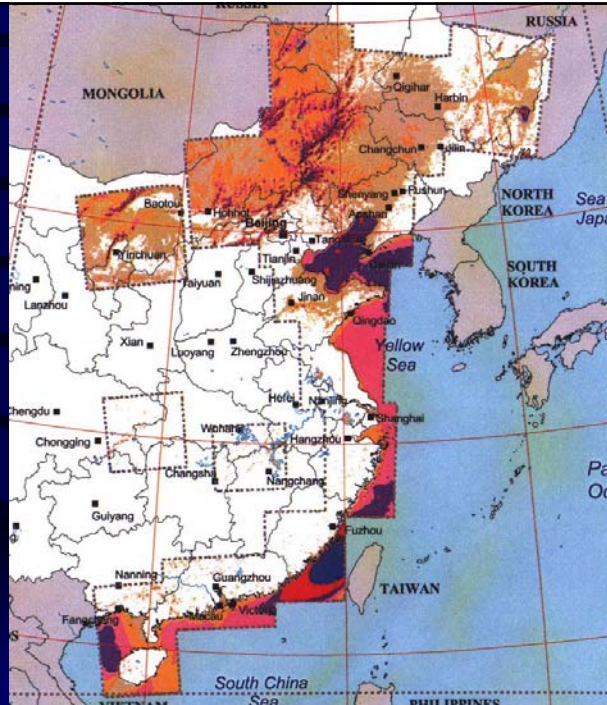
Assisted by the National Renewable Energy Laboratory (**NREL**) of USA

wind map of selected potential windy areas in southeast China had been made with resolution of 1 km²,

Supported by the United Nations Environment Program (**UNEP**): about 1 million square kilometers of windy areas are selected for mapping.

UNEP MAPPING

Wind power
Density
(W/m²)



WIND ENERGY RESOURCE IN CHINA

UNDP on site wind measurement project:
Sponsored by the United Nations Development
Program (UNDP)

10 wind sites nationwide were selected,

each site should accommodate at least 100MW

One 40m tower was installed on a flat island 10km
from coast, called Luo Dou Sha.

WIND ENERGY RESOURCE IN CHINA

UNDP provided wind measurement equipment, each site will have **one 70m tower** **some 40m towers**

The project duration will be **2002-2005**

Wind energy resource assessment of the 10 sites will be made, assisted by

Risoe National Laboratory of Denmark and **Garrad Hassan** consulting firm of UK

WIND FARM DEVELOPMENT

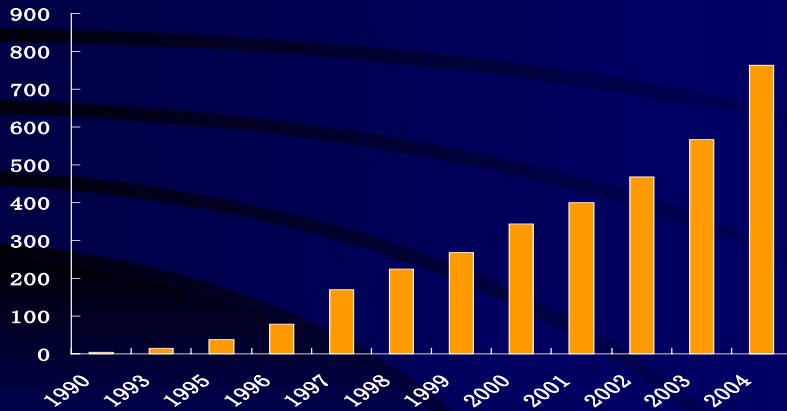
By the end of **2004** **43** wind farms

Total installed capacity of **764MW**

197MW were increased in **2004**
annual growth rate **34%**.

The largest wind farm is Dabancheng No.2
with installed capacity of **83MW**.

Installed capacity of wind power(MW)



WIND FARM DEVELOPMENT

Wind turbine size mainly in the range of 600kW to 1500kW,

domestic made wind turbine accounts for 18%,
European made accounts for 81%.

MW size machines accounts for 4.9%,
including Nordex 1.3MW and GE Wind 1.5MW
wind turbines.

LOCAL MANUFACTURING CAPABILITIES

To develop local manufacturing of utility-scale wind turbines

through local R&D and foreign technology transfer

Six Chinese manufacturers to produce 600kW, 660kW or 750kW wind turbines

with local made key components.

LOCAL MANUFACTURING CAPABILITIES

Goldwind in Xinjiang Autonomous Region

600kW wind turbines in batch production
the technology was licensed by former Jacobs of Germany

90% of Chinese made key components:

blade, gearbox, generator, yaw mechanism and control system

LOCAL MANUFACTURING CAPABILITIES

Ministry of Science & Technology supports the R&D programs

To develop MW size wind turbine, technologies for variable pitch rotor and variable speed generator, gearless wind turbine, etc. 1.2MW prototype wind turbine was installed in April 2005 by Goldwind.

Testing facilities and wind turbine certification scheme are needed.



COST REDUCTION IS PRIORITY

- In 2003 a 100MW wind farm project
- With annual full load hours of 2000h or the capacity factor of 0.23
- Feed-in-tariff should be
 - RMB 65 fen (USD 7.8 cent)
 - Compare to coal power RMB 30 fen (USD 3.6 cent)
 - Wind is 2.2 times higher than coal

COST REDUCTION IS PRIORITY

- China is a developing country
- The national priority is to develop economy at lower cost
- In the near term wind power is not able to satisfy the fast growing electricity demand
- Currently China no obligation to reduce CO₂ emission
- Driving forces to develop wind power in China should be
 - Capacity building and local economy development.

COST REDUCTION IS PRIORITY

- Capacity building
- China should be able to manufacture the major components of wind turbine
 - blade, gearbox, generator, yaw mechanism and control system
 - Same quality but lower price compare to imported components
 -
- No matter the firm is owned by Chinese, by joint venture or solely by foreigner
- Key issue is to utilize the existing machinery industry through local manufacture to bring down wind turbine cost

COST REDUCTION IS PRIORITY

- Major components for 600 kW stall regulated wind turbine are available in China
- More than 100 units were installed which keep good operation record
- Price is 15% lower than foreign made
- Upscale size and upgrade technology in urgent need
- Such as MW size variable pitch variable speed wind turbine

COST REDUCTION IS PRIORITY

- Local economy development is a result of wind farm construction
- Most of strong wind sites in remote rural area with poor people
- A 30 MW wind farm in west part of Jilin province, the annual income tax paid to county government accounts for a significant portion of local financial budget
- Benefits also including power grid extension for rural electrification
- Job creation for wind farm construction and maintenance

WIND POWER CONCESSION

- The National Development and Reform Commission (NDRC) is promoting wind power Concession projects, for large scale commercial wind power development.
-
- The basic concept of “Wind Power Concession” is that the provincial government will invite investors both international and domestic, to develop 100MW size wind farm on potential wind site
- through tendering procedure, aims to bring down the wind power generating cost.

WIND POWER CONCESSION

- The major components in wind power concession model project:
 -
 - Each project should be **100 MW** and wind turbine size not smaller than 600 kW.
 - **70%** of the components should be local made, wind turbine also to be assembled in China.
 - County government invest and build **access road** to wind farm.
 - Power grid company invest and build **transmission line** to the sub-station of wind farm

WIND POWER CONCESSION

- Investor will be selected by public bidding procedure, the bidder offering the **lowest feed-in-tariff** would obtain the contract.
- The period of wind power Concession will be **25** years.
- All electricity generated by wind project must be purchased by **provincial power grid company** according to Power Purchase Agreement signed with the contractor.
- The **increment cost** of wind power will be shared within provincial power grid.

WIND POWER CONCESSION

- • Two different feed-in-tariff will be gained by the contractor,
- The first phase cumulative electricity production equivalent to 30,000 full load hours
- means 3 billion kWh for 100 MW project,
- feed-in-tariff will be the bidding price of the contractor;
- The second phase will be the average feed-in-tariff on the power market at that time.

WIND POWER CONCESSION

- Cost of wind power is much higher than coal fired power in China
- wind power Concession project shows that wind power will not join the market competition
- Government commitment of fixed price for a certain quantity of wind generated electricity according to the result of competition between investors
- The negative impact is the winner offered extremely low price, 3.8 Euro cents, no incentive to the wind industry.

FUTURE WIND POWER DEVELOPMENT IN CHINA

- In 2004 another three concession projects were approved, **650MW** in total
- Tongyu 400MW, Huitengxile 100MW and Rudong No.2 150MW
- **1000MW** of cumulative wind installation could be achieved by the end of **2005**.

FUTURE WIND POWER DEVELOPMENT IN CHINA

- The Renewable Energy Law was approved by the end February, with the **principles** for wind energy:
- Power grid enterprises have to buy the electricity generated by renewable energy.
- Feed-in-tariff shall be determined by the price authorities. (**How to set ?**)
- The incremental cost of renewable energy shall be shared in selling price.
- (**Share in the whole country ? How to share ?**)
- A **detailed regulation** is needed for implementation.

FUTURE WIND POWER DEVELOPMENT IN CHINA

- NDRC has called for proposals from provincial authority, to conduct another **20** wind concession projects with size of **100MW to 200MW** each during next **5** years
-
- Based on the “Experience curve or **learning curve**” theory to estimate cost reduction
- Market demand of **3000MW is needed** to bring down the wind power cost closer to that of coal
- **4000MW** wind power is proposed for the goal of **2010**

FUTURE WIND POWER DEVELOPMENT IN CHINA

- Considering **more proportion of wind power** in the **fast growing power industry** in China
-
- **20GW** wind power has been proposed for year **2020**
- At that time wind power installation would be **2%**
- wind generated electricity would be **1%**
- of total power industry in China.

Installed capacity of wind power(MW)

