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Wind Power in China

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THE WORLD'S MOST POPULOUS COUNTRY HARNESSES WIND TO HELP POWER A BURGEONING ECONOMY

Editor's Note: With 20% of the world's population, China now consumes 10% of the world's energy. This would suggest that just to come up to the international average, China will need to double its energy consumption. With an economy growing at 9% per year, China is on track to do just that, and consequently they are developing every source of energy they possibly can.

It's important to remember the contribution from alternative energy to total world energy production is still minute. In China, a country that consumes 40 quadrillion BTU's of energy per year, less than one percent comes from wind power. But wind-generated power, which is growing worldwide at 30% per year, and which costs 80% less per megawatt than it did 20 years ago, is an important part of China's energy strategy. The world leader in wind energy is the nation of Denmark, whose wind manufacturers have forged strong ties with Chinese partners. Over 50% of the large capacity windmills currently installed in China are manufactured in Denmark.

Wind power, like solar power, is an alternative energy resource of virtually unlimited potential. After years of heavy subsidies, especially in Europe where the will to become energy independent has been unwavering, wind power is now economically competitive with conventional energy sources. This fact, combined with the energy security of windfarms that constitute a renewable domestic energy supply, suggest the Chinese committment to develop wind power is just beginning. – Ed Ring

By the end of 2004, China produced 200,000 off-grid wind turbine generators, ranking it number one in the world.

Chinese enterprises have mastered advanced off-grid wind turbine generator technology through technology transfer from foreign companies.

There are two kinds of utilization which must be discussed in any review of wind power developments: off-grid and in-grid. Off-grid utilization is used primarily as an independent power operation system, often in remote regions. The power generation capacity of a single off-grid generator ranges from 100 watts to 10 kilowatts. In-grid power is integrated within conventional power grids, providing the most economical

utilization of wind power. The maximum power generation of a single in-grid wind turbine in 2006 is five megawatts.

China's abundant inland and offshore wind energy resources provide potential for large-capacity, in-grid wind farms. By the end of 2005, China had built 59 wind farms with 1,854 wind turbine generators and a 1,266 megawatt in-grid wind power installed capacity, ranking it number ten globally.

CHINA'S WIND POWER POTENTIAL

Today, wind power in China is developing rapidly and receives particularly strong government support. The new Renewable Energy Law and its detailed incentive policies reflect the Chinese government's intention to build up this industry. By 2020, China plans to have 30 gigawatts of wind power.

European companies dominate China's wind power equipment market. Among U.S. companies, only GE Wind Power is active in China. In 2005, GE Wind Power occupied 3% of the in-grid wind turbine market in China.

According to the China Academy of Meteorological Sciences, the country possesses a total 235 gigawatts of practical onshore wind power potential that can be utilized at 10 meters above the ground. Annual potential production from wind power could reach 632.5 gigawatts if the annual, full-load operation reaches 2,000-2,500 hours. A detailed survey is needed, however, for economically utilizable wind power resources. The potential for offshore wind power is even greater, estimated at 750 gigawatts. Offshore wind speed is higher and more stable than onshore wind, and offshore wind farm sites are closer to the major electricity load centers in eastern China. Areas rich in wind power resources are mainly concentrated in two areas: northern China's grasslands and Gobi desert, stretching from Inner Mongolia, Gansu, and Xinjiang provinces; and in the east coast from Shangdong and Liaoning and the Southeast Coast in Fujian and Guangdong provinces.

In 1986, China built its first wind farm in Rongcheng, Shandong Province. From 1996 to 1999, in-grid wind power developed very quickly, entering a localization stage. By the end of 2004, there were 43 wind farms with 1291 wind turbines in China, with 764 megawatts of installed capacity. Liaoning, Xinjiang, Inner Mongolia, and Guangdong experienced the fastest wind power development, representing 60% of the installed power generating capacity of national wind power. Currently, Xinjiang's Dabancheng is the largest wind farm in China, with 100 megawatts of installed power generating capacity. Most generators range from 500 kilowatts to 1 megawatt, accounting for 84% of China's wind turbine generators.

To support the development of wind power technology and growth of the in-grid wind power market, the Chinese government has recently pushed hard on renewables, and it implemented a series of projects and also stipulated a series of economic incentive policies:

– **Ride the Wind Program**

To import technology from foreign companies and to establish a high-quality Chinese wind turbine generator sector, the former State Development and Planning Commission (SDPC) initiated the "Ride the Wind Program" in 1996. This initiative led to two joint ventures, NORDEX (Germany) and MADE (Spain). These JVs effectively introduced 600kilowatts wind turbine generator manufacturing technology of 600 kilowatts into China.

– **National Debt Wind Power Program**

To encourage the development of domestic wind power equipment manufacturing, the former State Economic & Trade Commission (SETC) implemented the "National Debt Wind Power Program." This program required the purchase of qualified, locally-made wind power components for new generation projects. China's government provided bank loans with subsidized interest to wind farm owners of as compensation for the risk of using locally-made wind turbine generators. These loans funded construction of demonstration project wind farms with a total installed capacity of 8megawatts. This program has been completed.

– **Wind Power Concession Project**

The National Development and Reform Commission (NDRC) initiated the "Wind Power Concession Project" in 2004 with a 20-year operational period. This program aims to reduce the in-grid wind power tariff by building large capacity wind farms and achieving economies of scale. Each of the wind farms built in this program must reach a 100 megawatts capacity. By 2006, NDRC had approved 5 wind farms, in Jiangsu, Guangdong, Inner Mongolia, and Jilin Province.

In any typical wind power concession, the power grid company signs a long-term power purchase agreement with the wind power project investor and agrees to purchase electricity generated by the project. The bidding competition determines in-grid tariff and the agreement clearly prescribes the quantity of in-grid wind power to be purchased. The duration of the agreement covers the total operation period of the wind project.

Therefore, the investor minimizes risk in recovering investment costs. The concession agreement between the government and project investor guarantees the power-purchase agreement. All end-users of the grid's electricity share the tariff increase due to wind power purchase. As incentives, the government waves import customs tariff and VAT on the equipment and accessories.

Although China's government has, for many years, encouraged the use of wind power, favorable conditions for wide-scale development have yet to develop. Through the wind power concession project, the Chinese government hopes to create further incentives for companies to develop this renewable energy resource. The concession agreement and long-term power purchase agreement protect the interests of wind power investors,

encouraging large companies, especially foreign ones, to invest in the Chinese wind power sector. Under this policy, market risk is reduced significantly, which in turn reduces the risk premium of the internal rate of return for wind power projects. Eventually, the wind tariff shared by end-users will be cut due to this decreased risk.

The Chinese government has expanded the capacity of wind farms to a 100 megawatt level, and has created new wind power tariffs based on the market mechanism and tendering process. This has attracted a number of Chinese companies into this program. Through successful implementation of the project, the Chinese government hopes to make wind power an economically-viable power choice, effectively competing with conventional power sources in China.

Incentive policies have finally begun to emerge within China. China encourages the development of wind power in its "National Middle and Large Term Development Plan." According to the plan, by 2010, China's installed capacity of wind power will reach 5 gigawatts. By 2020, it will achieve 30 gigawatts. In order to achieve this level of growth, China needs to build 800 megawatts of new wind power capacity each year from 2006 to 2010.

In Feb 2005, China's Renewable Energy Law was formulated and was put into effect on January 1, 2006. The law stipulates that the power grid company must sign a grid connection agreement with the wind power generating company and purchase the full amount of the wind power generated by it. The wind power tariff will be determined by the wind farm project tendering. The winner's quoted tariff will be the tariff of that wind farm project.

Wind power is a priority "National Clean Development Mechanism Project," i.e., wind farm developers can sell Certified Emission Reduction Certificates (CER's) to developed countries under the terms of the Kyoto Protocol.

The Chinese government reduced the Value-added Tax (VAT) for wind power from 17% to 8.5% in 2001 and adjusted the import custom tariff of wind turbine generator sets to 8% and that of its components to 3% in 2004. The import duty of wind power equipment and accessories can be waived if it is for the wind farm developer's own use.

Some local governments in Guangdong, Jilin, Xinjiang and Inner Mongolia formulated their own incentive policies to develop wind power. By the end of 2005, China's wind power installed capacity was about 1gigawatts. According to NDRC's planning, China's wind power installed capacity will reach 5gigawatts by 2010 and 30-40 gigawatts by 2020. According to statistics, the cost of wind power is 33%-60% higher than that of coal, which makes the wind power tariff 68%-94% higher than the coal tariff. Industry expert predicts that the wind power can be commercially viable and compete with clean coal-fired power economically by 2020.

On any listing of the very best prospects for China-focused wind sector business development, these would be amongst the top priorities:

” Large capacity wind turbine generators, especially at the 1megawatts level and above.

” Design and operation technology of large-scale wind farms.

Development trends for single wind turbine generators favor large capacity sets, especially at the 1 megawatt level. Before 1997, the 1 megawatt-level wind turbine generators occupied less than 10% of the worldwide market share. In 2001, that figure had risen to 52.3% and reached 62.1% in 2002. Although China has the ability to manufacture wind turbine generators below the 750 kilowatt level, production of higher capacity generators remains a challenge.

Although China has made a prototype of a 1.2 megawatt level wind turbine, it has only been used for demonstration projects. International suppliers will find strong demand in China for wind turbine generators at 1 megawatt and above levels. Beyond the manufacturing sector, Chinese companies also lack experience for investment, design, and operation of large wind farms.

Chinese Domestic Suppliers

Although China’s wind turbine generator industry has been developing for more than 20 years, it still remains in a research phase. By 2002, there were nearly 10 wind turbine generator manufacturers in China: six generator manufacturers, two joint ventures, and three research and development entities. By the end of 2004, the installed capacity of locally-made wind turbine generators reached 48.5megawatts, accounting for 18% of China’s accumulated wind turbine generators. That figure increased to 28% by 2005. China still has to import 90% of its large-capacity wind turbine generators.

THE WINDIEST PLACE IN CHINA

China’s highest sustained winds are the central coast of the Fujian province. Darker areas indicate higher winds. Source: China Wind Atlas

CHINESE WIND TURBINE MANUFACTURERS:

Chinese manufacturers and their key products:

–Xinjiang Goldwind Co. China’s largest wind turbine manufacturer with a 20% market share. Manufactures 600 kilowatt and 750 kilowatt wind turbines. Made a prototype of 1.2 megawatt wind turbine. More than 400 units in operation.

–Zhejiang Yunda Co. Manufactures 120 kilowatt, 200 kilowatt, 250 kilowatt and 750 kilowatt wind turbines. More than 45 units in operation.

–Shenyang Industry University (Shenxin Co.) Manufactures 75 kilowatt and 200 kilowatt wind turbines. Developing a 1 megawatt wind turbine.

–Wandian Co. Manufactures 600 kilowatt wind turbines. 6 units in operation.

–Shanghai Bluesky Co. Manufactures 300 kilowatts wind turbines. 2 units in operation.

–Dalian Heavy Machinery. Developing and manufacturing 1.5 megawatt wind turbines with German-based Furlander.

Chinese Wind Turbine Manufacturers Licensing Technology:

–Dongfang Electric Group. Developing and manufacturing 1.5 megawatt wind turbines with German company REPower's license.

–Baoding 550 Co. Developing and manufacturing 1 megawatt wind turbines with the German-based Furlander Corporation's license.

–Xi'an Weide Co. A joint venture of Xi'an Aero Engine Co. with the German-based Nordex Corp. Manufactures 600 kilowatt wind turbines.

FOREIGN SUPPLIERS OF WINDMILLS TO CHINA:

European government financing has helped European companies penetrate the China's wind power equipment market and occupy a dominant position. Danish equipment comprises 52.37% of in-grid wind power projects in China, followed by Germany 20.27%, Spain 8.05%, the United States 3.75% and the Netherlands 3.74%. By 2004, Danish company NEG Micon dominated the wind turbine market in China, occupying a 35% market share.

Foreign manufacturers and their country of origin:

NEG Micon, Denmark

Nordex, Germany

Vestas, Denmark

MADE, Spain

GE Wind, USA

Nedwind, Netherlands

Zond, USA

Bonus, Denmark

Gamesa, Spain

REPower, Germany

More than 30 Chinese companies, including the five large power generation companies, are building wind farms in China. The total investment exceeds USD 1.24 billion. The largest wind power investor is Longyuan Power Co. under China Guodian Corporation. By the end of 2005, the installed capacity of wind power under Longyuan Power's operation reached 416 megawatts, 40% of the national total. It has another 564 megawatts of new capacity under construction now.

CHINA'S MAJOR WIND FARM DEVELOPERS:

1. Long Yuan Electric Power Group Corp (China Guodian Corporation)

Tel: 8610-6657-9803

Fax: 8610-6657-9899

www.cgdc.com.cn

2. Huaneng New Energy Industrial Co. Ltd.

Tel: 86-10-6827-3888

Fax: 86-10-6822-3990

http://www.hpi.com.cn

3. China Datang Corporation

Tel: 86-10-5196-7608

Fax: 86-10-5196-7612

http://www.china-cdt.com

4. China Power Investment Corporation

Tel: 86-10-5196-8745

Fax: 86-10-5196-8741

http://www.zdt.com.cn

5. China Huadian Corporation

Tel: 8610-5196-6767

Fax: 8610-5196-6874

http://www.chd.com.cn

With the gradual opening of Chinese markets, customs duties have dropped for many imports. Duties on renewable energy equipment are lower than average. Beginning in 2003, the import duty for a complete wind turbine generator set was 8%; the duty for wind turbine generator components is now 3%, and the VAT is 8.5%. There are no licensing requirements for imported wind power products. Since equipment cost makes up 70% of total wind farm construction investment, currently, the major barrier for foreign goods in the wind power industry is the high price of the wind turbine generator.

KEY BEIJING CONTACTS:

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Tel: 8610-68002615

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