Renewable Energy in China

Grid Connected Wind Power in China

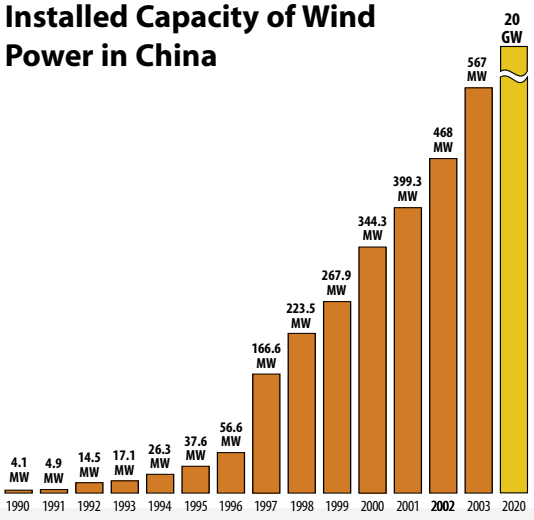
PIX10713, Credit: Jean Ku

Wind turbines at the Renewable Energy Experiment and Demonstration Center in Hohhot, Inner Mongolia, China.

Since the invention of the modern wind turbine generator (WTG) in 1891, China has recognized that wind energy technology offers an effective way to provide electricity to rural and isolated areas. The first Chinese wind farm was located in Rongcheng of Shandong Province in the northeast of China; by the end of 2003, 40 wind farms were operating nationwide, with the largest wind farms located in Dabancheng of Xinjiang Province, Nan'ao of Guangdong, Donggang of Liaoning, and Huitengxile of Inner Mongolia.

China's installed wind capacity has grown from a mere four MW in 1990 to 567 MW by the end of 2003 as a result of recent policy reforms, dedicated R&D initiatives, new financing mechanisms, and clear goals in the most recent Five-Year Plans. In 1994, the former Ministry of Electric Power issued a pioneering regulation on grid-connected wind farms. This regulation required provincial electric power authorities to give priority to wind-generated electricity when purchasing energy. In 1999, with the approval of the State Council, the National Development and Reform Commission (NDRC) and the Ministry of Science & Technology (MOST) issued an official notice to further support the development of renewable energy, including a rule to set wind power pricing at a level that would repay capital cost with interest plus a reasonable profit.

Installed Capacity of Wind Power in China



The installed capacity of wind power in China has grown dramatically since the 1990s. As this figure shows, the installed wind capacity is expected to reach 20 GW by 2020.

China's Wind Resources

China has abundant wind energy resources. China's Academy of Meteorological Sciences estimates that the practical wind energy potential on the Chinese mainland is 235 GW (at a height of 10m). At an estimated 23-29% capacity factor, annual potential production of electricity from wind power could be as great as 506-632 TWh. Additionally, China has a large area of shallow sea along its eastern coastline, and preliminary estimates show that the offshore wind energy potential may be three times greater than onshore potential. This large offshore area is especially promising for wind farm construction because offshore wind speed is higher and more stable than onshore wind, and the potential wind sites are close to the main load centers of eastern China.

Policy and Market Development

With the Ride the Wind Program, NDRC initiated a market model of "demand created by the government, production by joint venture enterprise, and ordered competition in the market." Wind farm projects approved by NDRC during the Ninth Five-Year Plan (1996-2000) required that WTG equipment purchased for these projects contain at least 40% locally-made components. Under this program, several international and Chinese companies capitalized on this requirement and formed joint venture companies for 600 kW and 660 kW WTGS. (Note that the NDRC was known as the State Development and Planning Commission, or SDPC, until 2003.)

Tax Incentives

In 2002, the Ministry of Finance and the State Duty Bureau implemented a new tax policy that reduced the Value-Added Tax for wind generation from 17% to 8.5%. According to the new tax policy, the average price for wind-generated electricity will decrease by $0.05-0.06/kWh and new wind farms are expected to sell energy for as little as $0.06 or even lower.

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Wind Power Concessions

In an effort to develop large-scale wind farms, effectively bringing down the cost of wind through competition, the Chinese government introduced a wind concessions approach in late 2001. The basic concept of the Wind Power Concession is that the local government will invite international and domestic investors to develop 100 MW wind farms on a potential wind site, through a tendering procedure aimed at bringing down the cost of wind-power generation. In October 2003, two companies were selected through competitive bidding to develop the first large-scale wind concession projects in China. Hua Rui Company will be the developer of 100 MW at Rudong in Jiangsu Province, while Guangdong Yuedian Company will develop 100 MW at the Shi Bei Shan site in Guangdong Province. Work began in January 2004, with planning and construction scheduled for completion within three years.

Financing Programs

The State Economy & Trade Commission (SETC) implemented the National Debt Wind Power Program to use national debt with favorable interest subsidy conditions to build wind farms with locally manufactured turbines. By 2000, this program had established four demonstration projects with a total installed capacity of 73 MW. (Note: In government restructuring in Spring 2003, the renewable energy branch of SETC was absorbed into the newly formed National Development and Reform Commission.)

Additional Programs

- The Wind Technology Partnership is a bilateral program between the U.S. government and NDRC to support development of the Chinese wind market, through market-relevant approaches that encourage private sector participation. The U.S. Environmental Protection Agency and Department of Energy sponsor activities including developing an overall wind strategy for China, evaluating under-performing wind farms, building capacity in wind developers, and addressing barriers to wind farm development. Priority areas include wind power concessions and the new renewable energy law.

- Through the Capacity Building for the Rapid Commercialization of Renewable Energy project, the United Nations Development Project has been supporting efforts to remove barriers to wind farm commercialization by helping to establish best practices and standards for the installation, operation and maintenance of wind measurement systems and data collection standards and codes. In addition, the project is gathering on-site wind data at 10 locations using 40 meteorological towers.

Research and Development Programs

In an effort to help Chinese WTG manufacturers develop products and technologies, MOST funded research to develop technologies for 600 kW WTGs during the Ninth Five-Year Plan (1996-2000). A prototype machine developed through this research was approved at the national level, and was used successfully at a wind farm. Chinese professional component manufacturers have produced key components of 600 kW WTGs, such as blades, gearboxes, generators, yawing systems, and control systems.

863 Wind Program—During the Tenth Five-Year Plan (2001-2005) MOST is supporting R&D programs to develop megawatt-size wind turbines, including technologies for variable pitch rotors and variable speed generators.

Contacts

The National Renewable Energy Laboratory China Web site
www.nrel.gov/china

The National Development & Reform Commission
www.sdpc.gov.cn

The following fact sheets on renewable energy in China are available on the National Renewable Energy Laboratory's China Web site ***(www.nrel.gov/china)***.

- WB/GEF Renewable Energy Development Project
- Grid Connected Wind Power in China
- Renewable Energy Policy in China: Overview
- Renewable Energy Policy in China: Financial Incentives
- Township Electrification Program
- China's Plan for Renewable Energy
- Brightness Rural Electrification Program
- Renewable Energy Business Partnerships in China

These fact sheets were prepared by DOE/NREL and the China Renewable Energy Industries Association under the US/China Protocol for Cooperation in the Fields of Energy Efficiency and Renewable Energy Technology Development and Utilization.

PIX10769. Credit: Jerry Bianchi

A tower maintenance mechanic from Rushan Electric Power Bureau climbs a Bergey Excel 10 kW wind turbine to install the meteorological instruments. DOE/NREL and the State Power Corporation of China (SPCC) developed this pilot project, using a wind/diesel/battery system, to electrify 120 households on Xiao Qing Dao island located in the Yellow Sea off Shandong Province.

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