

- [HOME](#)
- [INTERNET](#)
- [WTO](#)
- [INFOTECH](#)
- [TELECOM](#)
- [FINANCE](#)
- [MEDIA & ENTERTAINMENT](#)
- [AUTOMOTIVE](#)
- [AGRICULTURE](#)
- COMMENTARY**
- [WTO/Trade](#)
- [Internet/Technology](#)
- [Economics](#)
- [International Relations](#)
- [Institutional Reform](#)
- [Development/Legal](#)
- REFERENCE TOOLS**
- [TAIWAN IN THE NEWS](#)
- [BLACK MARKET](#)
- [OTHER INDUSTRIES](#)
- [CALENDER OF EVENTS](#)
- [E-STORE](#)
- [CHINA MEDIA GUIDE](#)
- [ABOUT US](#)
- [CHINAPOP PREMIUM SOLUTIONS](#)
- [CONSULTING SERVICES](#)
- [MARKET PLACE](#)

## The answer is blowin' in the wind

By Debra Lew and Jeffrey Logan

(12 March 2001) Wind power could play an important role in China's electricity sector, but key barriers must be confronted before this clean energy source meets its potential.

Electricity consumption in China grew by 10 percent in 2000 raising new questions about how the country will power its factories, businesses and homes over the coming decades. China's traditional options—coal and hydro—have significant environmental and social repercussions that have increasingly taken on serious political and economic undertones.

Natural gas has received much attention lately as an alternative, but renewable energy sources such as wind are also gaining favor.

China has been developing its wind resources for more than a decade and is the world's largest manufacturer of small turbines, with roughly 170,000 small turbines installed. However, China had only about 345 megawatts (MW) of installed capacity—equivalent to the output of a small coal or gas-fired plant—by the end of 2000.

For comparison, Germany led the world with 6,100 MW, while the United States and India had 2,500 MW and 1,200 MW, respectively. The 10<sup>th</sup> Five-Year Plan (2001 to 2005) calls for a nearly fivefold increase in China's wind capacity by 2005 to 1.5 gigawatts (GW). <sup>1</sup>With proper incentives, however, China could easily surpass this target.



Courtesy of the Dept. of Energy/Nat'l Renewable Energy Lab

China's wind-power resources are abundant. Approximately 250 GW of exploitable wind resources exist at a height of 10 meters (32.8 feet) above ground. The coastal regions of [Guangdong](#) and [Fujian](#), along with parts of [Inner Mongolia](#), [Xinjiang](#), [Shandong](#), [Liaoning](#) and [Zhejiang](#) provide excellent sources of wind power.



Debra Lew



Jeffrey Logan

Send this article to a friend!

### Related Articles

[Energy and emissions for the 21st century](#)  
[environment](#)  
(11/22/2000)



China's Largest International Trade Fair

Deacon's Guide to Telecommunications in Asia



Order Online!

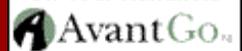
HOTELS IN CHINA MARKET ANALYSIS

ORDER ONLINE!

Redesigned More Products Than Ever Before Reports Handbooks Directories Newsletters Statistics and Now Downloadable Documents Available!

ChinaOnline Mobile

Get Our Top Stories On Your Handheld



Today, most grid-connected wind turbines are installed at a height of at least 50 meters (164 feet). Because wind speeds typically increase with altitude, China's total wind potential could far exceed 250 GW.

The pollution mitigation potential of wind power is significant. If China develops even one-half of its conservatively estimated wind resources, it could generate about 275 billion kilowatt-hours (kwh) of power each year—about one-fifth the country's current demand—displacing the need for 125 million tons of coal, the accompanying 2 million tons of sulfur dioxide and 65 million tons of carbon emissions.

### **Challenging barriers**

Technical, commercial and regulatory barriers restrain expansion of wind power in China. Wind-generated electricity is still relatively expensive, and technical problems need to be solved before wind can contribute more significantly to China's power mix.

Extensive manufacture of large, high-quality turbines in China could lower costs when compared to the units it currently imports. Most imported wind turbines currently rely on concessionary financing, but these subsidies may actually slow development of a sustainable market for wind power.

New financial and regulatory incentives, such as tax breaks and competitive bidding for planned projects, could heighten the impact of grid-connected wind farms and accelerate the development of a market for wind power in China.

### **Competing with coal**

Costs to construct wind farms, currently around US\$900 to US\$1,000 per kilowatt, continue to decline, especially when developers take advantage of economies of scale. Large wind farms in the United States now produce power for about US\$0.045 cents per kwh. Federal tax credits play an important role in further stimulating the U.S. wind market.

In China, wind power is still considered expensive relative to the competition. The government has subsidized coal and hydropower for decades. As a result, Chinese coal-fired power plants are relatively inexpensive to build and fuel, resulting in costs of as little as 3 cents per kwh.

On the other hand, Chinese utilities are currently paying US\$0.05 cents to US\$0.12 cents per kwh for wind power. One reason costs are high is that most Chinese wind farms are small, preventing them from achieving economies of scale.

The environmental benefits of wind power, namely the elimination of harmful emissions, are often ignored in prices. In September 2000, however, the State Environmental Protection Agency ([SEPA](#)) introduced new regulations to increase the fee on sulfur-dioxide emissions from roughly US\$25 per ton to US\$120 per ton. This and other environmental costs in the price of power could make wind power more competitive.

### **The cost issue**

China has recently begun restructuring its power sector to lower costs and improve efficiency, with competition among some

**SPARKICE**  
ONE SOURCE.  
to, from, within China

Free Daily  
Headlines

subscribe  
unsubscribe

Your e-mail:



generators. As this occurs, one issue to address is how the cost of wind power, if higher than other sources, is covered.

Currently, many wind-power developers are subsidiaries of provincial utilities. The incremental cost of wind power, if any, is drawn from utilities' profits, not their customers. Moreover, because the buyer and seller of power are often the same company, there is no incentive to reduce wind-power prices.

In addition, export of wind power across provincial boundaries is difficult. A proposed Inner Mongolian wind farm in a World Bank project is facing delays because other provinces are unwilling to purchase this wind power.

### **Building local production capacity**

China is trying, with some success, to develop its own wind-turbine technology, both to ensure self-sufficiency and to cut costs. Currently, however, only a handful of large Chinese turbines are produced at a cost comparable to imported units, but increased market demand leading to increased production should reduce these costs.

China is a world leader in manufacturing small wind turbines, 100 watts to 3,000 watts, but it did not attempt to produce large units, 100 kw and above, until a decade ago. Several companies in China produce 200 kw to 300 kw wind turbines, either as joint ventures or under license to foreign companies. Demand for these is low, however, because imported 600 kw and 750 kw units are more cost-effective and have a reputation for higher quality.

**A near-commercial model project was built by a Dutch developer as a build-operate-transfer project.**

The Ninth Five-Year Plan (1996 to 2000) called for greater local manufacturing of large-scale wind turbines. In 1998, Xinjiang Wind Energy Co., after buying a license from a German manufacturer to build a 600 kw turbine, became the first Chinese company to commercially manufacture large-scale wind turbines with mostly Chinese components.

To further promote localized manufacturing, the State Development Planning Commission ( [SDPC](#) ) has required that all new wind farms have at least 40 percent local components before they are approved for construction.

Furthermore, the State Economic and Trade Commission ( [SETC](#) ) has set up the National Debt program, which provides favorable loans for wind farms that have locally manufactured components. Already 80 MW of energy have been approved in the program.

### **The flip side of international assistance**

Capital for infrastructure projects such as wind farms is often limited in China, but the Danish, Dutch, German, Spanish and American governments often provide concessionary loans. For example, the government of Denmark has provided zero-interest loans for 10-year terms for their turbine manufacturers to gain access to the Chinese market.

Concessionary loans help the Chinese wind sector in the short-run by facilitating installations of wind farms. Over the long-run, however, they stifle the development of a sustainable commercial market because wind installations are limited to those that obtain concessionary finance.

By its nature, concessionary financing is limited. In addition, these loans are tied to purchases of equipment from the host country, reducing competition and discouraging use of Chinese-manufactured equipment. In addition to distorting the market and limiting development of wind power, subsidies reduce competition and encourage high capital costs.

### **Selected projects**

To address this issue, the World Bank and Global Environmental Facility (GEF) approved the Renewable Energy Development Project in 1999 to promote commercialization of wind energy in China through competitive bids for 190 megawatts of wind turbines at five wind farms. <sup>2</sup>

The bank hopes this project will establish clear and consistent guidelines for power-purchase agreements and foreign investment. This project is on hold, however, while it awaits Chinese government approval.

A near-commercial model project was built by the Dutch developer Nuon, on Nan'ao Island, as a build-operate-transfer project with foreign investment. Commissioned in June 1998, Nuon will operate the 24 MW wind farm for 20 years before transferring it to the local utility.

Nuon has a power-purchase agreement with the local utility for 6.5 cents/kwh during the first year, with annual increases of 3 percent over the next 10 years. This is the first project that includes a power-purchase agreement with a foreign company for a wind farm, agreeing to both pay hard currency and index the price to inflation.

After this project was implemented, however, approvals for wind farms of this scale were moved from the provincial government to the central government; no similarly commercial projects have been approved since.

### **New initiatives**

The Chinese government has taken other important steps to expand the use of wind power, some with greater impact than others. The 10<sup>th</sup> Five-Year Plan proposes market-based policy instruments such as a mandated market share policy, also known as renewable portfolio standard, to promote renewable energy.

This policy would be a legal requirement that some share of electricity comes from renewable energy. A market-based instrument, such as trading of green certificates, would be introduced to share the incremental costs and benefits among the

regions. However, the details on how such a policy can be implemented in China remain to be seen.

In an effort to address both the competition and economies of scale issues, the SDPC announced in late 2000 that it would award five concessions for wind-farm development of up to 100 MW each. An international competitive bid would be held.

Current plans would award winners with power-purchase agreements that would guarantee a power-purchase price for 15 years. SDPC hopes that the competition and large-scale development will result in costs lower than US\$0.05 per kilowatt-hour.

### **Key incentives to build markets**

Worldwide, 3,500 MW of wind capacity was installed last year, making wind the fastest-growing energy source. Global wind power capacity now stands at 17,000 MW.

Where wind power has flourished around the world, it has mainly been driven by policies that create a favorable climate for grid-access and purchase prices. In China, however, the market for wind power has developed more slowly than anticipated, largely due to a lack of a clear, consistent, streamlined framework for wind power, and incentives for wind developers.

Barriers preventing a more robust market for wind power in China include:

- **High costs:**  
Developers have been given little incentive to lower the cost of power produced at wind farms. Market competition is needed to trim costs and improve efficiency;
- **Limited wind resource-assessment data:**  
Project developers need more information about China's wind resources in order to minimize risk and choose the best sites;
- **Immature local-manufacturing capability:**  
China is strongly promoting local manufacturing capability for wind turbines. Greater economies of scale would lower costs, providing increased markets for these turbines;
- **Difficulty in securing project approval and negotiating power-purchase agreements:**  
Getting project approval from the central government and negotiating power-purchase agreements with the local utility may be the most difficult task for wind-power developers. These problems are not unique to the wind-power field and should become less burdensome as overall transparency within China improves;
- **Failure to account for the full environmental benefits of wind power:**  
China has become more serious in fighting its pollution problems. Additional environmental externalities associated with coal combustion should be accounted for to level the playing field; and,
- **Subsidized financing for imported wind turbines:**  
Soft loans from wind-turbine exporters may delay

emergence of a commercial market in China. Wind projects that do move forward are limited to those that offer concessionary finance. In the long-run, it will be in the foreign manufacturers' own interest to eliminate these subsidies.

As costs continue to decline, wind power may soon be able to compete directly with other power sources in China, especially in regions where coal is expensive. Market-based incentives, such as a mandated market share policy or production tax incentives, appear set to serve the advancement of China's wind-power industry better than government-imposed development targets.

Over all, incentives are needed to overcome the barriers and accelerate the learning process of what might work best for China to create a sustainable market for wind power.

#### **About the authors:**

*Debra Lew is a senior project leader for the National Renewable Energy Laboratory in Golden, Colo. She can be reached at [Debra\\_Lew@nrel.gov](mailto:Debra_Lew@nrel.gov). Jeffrey Logan is senior research scientist for Battelle Memorial Institute in Washington, D.C. He can be reached at [Jeffrey.Logan@pnl.gov](mailto:Jeffrey.Logan@pnl.gov). Views expressed in the commentary do not necessarily reflect those of the authors' respective organizations. Lew and Logan wrote this commentary for **ChinaOnline**.*

#### **Notes:**

1. A gigawatt, or 1 million kilowatts, is the size of a typical large power plant. By the end of 2000, China's entire power sector had 317 gigawatts of installed electrical generating capacity.

2. Total investment of US\$210 million will support a 190 MW of wind power component for wind farms in Inner Mongolia, [Hebei](#), Fujian and [Shanghai](#). Other components of the World Bank/GEF project include rural electrification with 10 MW of standalone photovoltaic systems in northwestern China and a technology improvement component to increase quality of locally manufactured products.

[Home](#) | [Internet](#) | [Taiwan in the news](#) | [WTO](#) | [Black Market](#) | [Infotech](#) | [Telecom](#)  
[Finance](#) | [Media/Entertainment](#) | [Automotive](#) | [Commentary](#) | [Reference Tools](#)  
[Contact Us](#) | [About ChinaOnline](#) | [E-Store](#) | [China Media Guide](#) | [ChinaPop](#) | [Premium Solutions](#)

[Job Opportunities](#) | [Request Advertising Information](#) | [Site Map](#) | [Privacy Policy](#)

ChinaOnline is an independent source of business information and  
is not funded by any government

© [ChinaOnline 2001](#)