



# INSIDE STORIES

## on climate compatible development

Climate & Development  
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### Key messages

- A clear expression of political will, backed by a set of effective policy measures, has been key to China's success in building the world's largest wind power market.
- The establishment of a stable and favourable pricing mechanism is crucial for the development of wind power, because it increases the chances for profitability and growth.
- A strong domestic market contributes to the growth of local wind power equipment manufacturing.

## How China built the world's largest wind power market

**The story of the Chinese wind power industry is remarkable. From a small number of demonstration projects at the beginning of the century, the Chinese wind power market has grown to become the world's largest. At the end of 2010, it overtook the United States to become the leader in terms of cumulative installed capacity. Even though China used to import 80% of its wind energy equipment, domestic manufacturing has exploded since 2006 and now supplies more than 70% of the domestic market. In 2010, China's wind power market attracted investments of RMB 89 billion (US\$14 billion) and employed over 150,000 people<sup>1</sup>.**

### Overview of China's wind market

Just as China's economy has grown at a breathtaking pace over the past two decades, so too has its energy demand. Such development puts enormous pressure on the security of the country's electricity supply in China, 70% of which is based on coal. The price of coal has been rising steadily, gradually making wind power a competitive alternative. Moreover, coal's environmental impacts – such as air pollution, solid waste generation and climate change – have also become major concerns to both the government and the public<sup>2</sup>.

As a result, the Chinese government is increasingly looking at renewable energy sources to help provide electricity in an environmentally and socially acceptable way – and at a competitive price. Among various renewable energy sources, wind power is one of the most technologically proven and financially

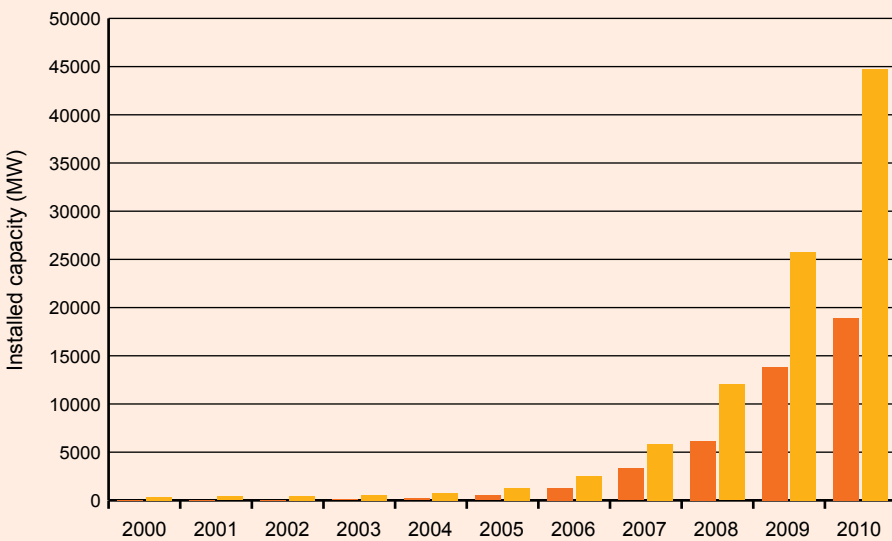
viable technologies, making it today's market leader. The figure below shows the growth of China's wind market over the last decade. Since 2006, the year that China's Renewable Energy Law came into effect, the wind market in China has almost doubled its capacity each year<sup>3</sup>.

In 2005, the Chinese government announced a target of 30 GW installed capacity of wind power by 2020. As shown in the figure above, this target was surpassed a full 10 years ahead of schedule. Today, according to the China Wind Power Outlook 2010 report, the industry believes that it can achieve as much as 200 GW by 2020. Under this scenario, assuming that 200 GW of wind power capacity could generate 440,000 GWh of electricity, wind development will help reduce greenhouse gas emissions by 440 million tons by 2020. It will also limit air pollution by reducing coal consumption, generate over RMB 400 billion (US\$63 billion) in industrial added value, and create half a million jobs.<sup>4</sup>

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## Growth of China's wind power market



Newly Installed Capacity	77	57	66	98	197	507	1288	3311	6154	13803	18928
Total Installed Capacity	342	399	465	563	760	1267	2555	5866	12020	25805	44733

Source of data: China Wind Energy Association

## Package of supportive policies for wind power

The key to China's wind power success is a clear expression of political will, combined with a set of effective support measures. China's policies promoting the development of wind power are enshrined in the Renewable Energy Law, which has been in effect since January 2006, and its related implementation rules and regulations. Collectively, these measures send a clear message to businesses and government officials at all levels that China has great ambitions for wind power. They also form a legal framework that can be summarised by the following key elements:

- **Clear development targets:** The '30 GW by 2020' goal was the country's first target for wind power. Representing 23 times the installed capacity when it was announced in 2005, the goal sent a strong signal that wind power development was a government priority.
- **Compulsory purchase of renewable energy power:** Grid

companies are legally obliged to purchase 100% of the wind power generated, thus ensuring full grid access for wind power.

- **Stable and favourable pricing mechanism:** This provides more predictability and profitability for wind power investors and developers.
- **Cost sharing for wind power development:** The added costs of developing wind power as compared to those of traditional fossil fuel generation (determined by local prices of desulphurised coal generation) are shared across the country so that places rich in wind resources have incentives to develop their full potential. This helps create a level playing field for the wind power market across different regions.
- **Creation of the Renewable Energy Fund:** This fund aims to support technology research and development, wind resource assessment, development of technology standards, and demonstration projects.

In reality, the implementation of these policies has encountered problems. For example, delays in grid construction by the grid companies have hindered the ability of existing wind farms to sell power. As state monopolies, the grid companies often escape accountability. The Renewable Energy Fund remains embryonic: the amount of money in the Fund has yet to be defined and detailed provisions regarding its use have yet to be announced. And, although the '30 GW by 2020' development target clearly underestimated market growth and has already been met, the government has not provided a new target to further inspire market development.

However, the existing framework has sent a strong signal regarding the government's intended policy direction, and has successfully provided the incentives needed for the development of the wind market in China.

## Pricing mechanisms: feed-in-tariff versus concession bidding

Wind power is a proven technology. The main barrier to the large-scale development of wind power is that it is often not yet competitive compared with traditional fossil fuels. Therefore, a favourable pricing mechanism is the main factor affecting the level of active investment by developers and market growth.

According to the 'True cost of coal' study<sup>5</sup> released in 2008, it is estimated that each ton of coal burned in China generates an environmental cost of RMB 150 (US\$24). Many countries with renewable energy policies use the external costs (environmental, social, health, etc.) of fossil fuel to justify supportive pricing mechanisms for wind power, which are normally considered market phase-in subsidies.

However, countries have used different tools to design these subsidies, including the most common forms:

- A **feed-in-tariff system** offers a guaranteed rate for all generated wind power fed into the national grid, in order to provide wind power developers with more certainty as to the profitability levels. Feed-in tariffs have contributed to the success of the wind power industries in a number of countries, including Germany and Spain.
- In a **concession bidding system**, developers bid to provide wind power at the cheapest prices. This competition mechanism aims to lower the cost quickly. However, bidding systems in countries such as the United Kingdom have so far had little success in promoting market growth, mostly because developers bid so low that they later decide not to implement their projects.

Starting in 2003, China used a concession bidding system to determine the tariffs for wind power. China's Renewable Energy Law promised that the government would determine feed-in-tariffs for renewable energy projects, based on the characteristics of different types of renewable energy and the situations in different regions. However, even after the Renewable Energy Law was adopted, the government continued to organise concession bidding as the tool for price discovery. By 2007, there were five rounds of bidding, with a total installed capacity of 3.35 GW<sup>6</sup>. However, because the bidding prices were too low, some of these concession projects have suffered losses while others did not even go forward.

In order to ease the growing tensions between the enthusiasm of the wind market and the ineffective pricing system, the Chinese government announced the Notice on Pricing Policy Improvement for Wind Power in 2009, which set up a systematic feed-in tariff model for wind power with variations according to the quality of the wind resources in different regions. There are four different categories for the tariff ranging from 0.51 RMB/kWh (US\$ 8.0 cents) to

0.61 RMB/kWh (US\$ 9.6 cents)<sup>7</sup>. While the bidding system could still be used – for example, for offshore wind projects – the feed-in tariff allowed wind farm developers to plan their projects based on a guaranteed price. The industry and most experts warmly welcomed this move, as it eliminated one of the biggest uncertainties standing in the way of wind power development in China.

### The growth of local manufacturing

At the same time as the government created a huge domestic market, the Chinese government was also determined to have it supplied by its own wind equipment manufacturers. In July 2005, the National Development and Reform Commission of China released a directive stating that wind farms had to buy equipment in which at least 70 percent of the value was domestically manufactured. This was a formidable challenge, since in 2005 only one Chinese wind equipment manufacturer (Goldwind) was able to produce on a commercial scale.

Foreign players in the global wind market heavily criticised this local sourcing requirement. Many claimed that it violated World Trade Organization (WTO) rules. In late 2009, the Chinese government revoked the requirement.

However, by then, the objectives of the localisation requirement had already been achieved – over 70% of wind equipment bought by wind developers was produced in China. Normally, producers of wind equipment choose to locate their factories as close to the point of delivery as possible, because the components of turbines are large and expensive to ship. By 2006, the major international manufacturers had already started to move their production to China. Inspired by the huge market potential, many of the biggest Chinese heavy industry manufacturers had also established new production lines for wind power equipment. While it is difficult to

rule out that the localisation requirement played some role in accelerating local manufacturing, the Chinese government and most industry players argue that it was mainly the strong domestic market that fuelled the transition<sup>8</sup>. By 2010, 7 of the 15 largest global wind power equipment producers (in terms of annual installed capacity) were Chinese companies<sup>9</sup>.

China's advances in the production of wind power equipment have reduced the cost of wind power significantly. Since 2005, the price of wind turbines has dropped by one third in China, benefitting not just China but the global wind power market due to China's growing export ambition<sup>10</sup>.

Falling prices seem to have led to some sacrifice of quality control, as with a number of incidents where some locally manufactured wind turbines had to be disconnected from the grid due to quality failures. In early 2011, the Chinese government issued a series of technical standards in response to this problem. These new policy initiatives from China contribute to the general trend among global wind manufacturers to change the focus from quantity to quality in order to achieve sustainable market development.

### Lessons and implications

Examining the rapid growth of China's wind power market leads to the following reflections:

- China's experience with pricing policies for wind power shows that at the early stages of market development, it is very important to prioritise support for wind power developers over efforts to lower the price of wind power. The use of policy instruments such as feed-in tariffs provides a stable market environment with greater certainty of profitability. In contrast, the use of a concession-bidding model for the purpose of price discovery could risk discouraging potential investors,



especially smaller or foreign investors, because of uncertainty regarding profitability.

- China's achievements with wind power development demonstrate that a stable and favourable market environment is what ultimately creates the demand that fuels local industry. At the same time, the compatibility between policies promoting domestic clean industry and WTO rules will continue to be a hot topic in the years to come.
- The sheer size of China raises the question of whether its success can

be replicated elsewhere. Fortunately, wind power is a truly global market, with over 80 countries around the world working to deploy this clean technology. Each country will decide for itself whether it makes more economic sense to support local manufacturing or to import. Some countries may also consider the creation of a regional market, as with the experience of the European Union, in order to attract investments and accelerate market growth.

- Although China has made great strides in developing wind power,

it has made little progress in restructuring its energy mix in the past few years. The massive gap between energy supply and demand has created space for the development of all sources of power generation. That is why the proportion of coal in China's energy production remains at over 70 percent. To achieve a cleaner and more balanced energy mix, it is imperative to tilt the playing field by introducing policies that take into account the externalities of fossil fuels.

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## Endnotes:

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## About CDKN

The Climate and Development Knowledge Network (CDKN) aims to help decision-makers in developing countries design and deliver climate compatible development. We do this by providing demand-led research and technical assistance, and channelling the best available knowledge on climate change and development to support policy processes at the country level.

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