

McKinsey on **Electric Power and Natural Gas**



Perspectives on electric power and natural gas

Number 1,
Winter 2008

Pioneers to industrialists: How to grow profitably as the renewables sector matures 3

As the industry grows to substantial size, its complexity will increase, making success and returns more difficult to attain.

How to operate and maintain wind assets 9

Superior O&M practices are critical to achieving optimal profitability of wind farms and can increase return to shareholders by 20 percent.

The economics of solar power 15

Don't be fooled by technological uncertainty and the continued importance of regulation; solar will become more economically attractive.

Biomass: Fueling the next era of power generation in Europe 24

To achieve the European Union's renewable-energy goals, generators will have to take a more active role in mobilizing supplies and shaping the regulatory framework.

Renewables in China: Opportunity or threat? 31

Companies should use China to keep abreast of dynamic changes in the industry and as a manufacturing platform to stay ahead of the game globally.

Renewable energy: Bridging India's power gap 36

Large and growing electricity shortages, as well as favorable natural conditions, make the future of renewable energy in India very bright.

The future of wind and solar power: An executive roundtable 43

International leaders from several high-profile companies discuss the future of the wind and solar industries.



Renewables in China: Opportunity or threat?

Companies should use China to keep abreast of dynamic changes in the industry and as a manufacturing platform to stay ahead of the game globally.

**Kevin Chan, Michael Wang,
and David Xu**

Rapid economic development and the need to address carbon emissions and climate change have made the pursuit of renewable energy an urgent priority for China. With around 80 percent of its energy needs coming from coal but with reserves estimated to last only 50 years, China is extremely concerned about the rapid depletion of this resource. As a rising global power, China is also self-conscious about its emissions of greenhouse gases, which in 2005 amounted to seven billion tons per annum, second only to the United States. Finally, the Chinese government is increasingly aware of the ecological damage it is suffering as a result of climate change. As was noted in a national policy paper,¹ all of China's major rivers have shrunk over the past five decades.

In response to these imperatives, the Chinese government has adopted aggressive targets and policies designed to force the country to become both a major adopter of and market for renewable-energy technologies. Its Mid- and Long-Term Plan for the Development of Renewable Energy calls for renewable installed capacity of 30 gigawatts (GW) by 2020 (Exhibit 1). It is supporting this goal with a panoply of policies including favorable tax rates, subsidies for renewable projects, and incentives to enhance the economics of renewable-energy generation.

A dynamic renewable-energy sector has already emerged in China, with projects mushrooming across the country (Exhibit 2). Players from a

wide variety of different backgrounds, led by wind power, are entering the fray and competing aggressively with the traditional power generation players.² The dynamism of China's market is demonstrated by the fact that some recently established renewable-energy targets have already been raised. The 2010 target for the installed capacity of wind power, for example, was doubled to 10 GW, as the previous target had already been surpassed. Some industry analysts expect the 2020 target to be boosted from the current goal of 20 GW to 100 GW.

On the supply side, the fertile domestic market and the robust fundamentals of the sector have led to the emergence of Chinese

¹ China's National Climate Change Programme, National Development and Reform Commission, June 2007.

² At the end of 2006, six out of the top ten players in wind power came from grid, mining, and other sectors, accounting for more than 30 percent of the total installed capacity.

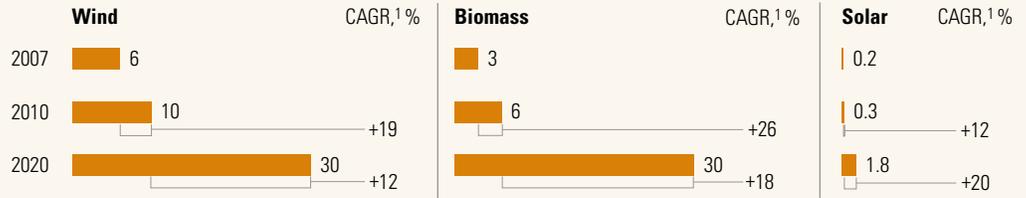
Exhibit 1

China will be a major adopter of renewable technologies

It has set aggressive targets, supported by favorable tax rates, subsidies, and policies.

Aggressive targets have been established for renewable energy . . .

Installed capacity, gigawatts (GW)



. . . while supportive policies for renewables have been issued.

Favorable tax rates

- Reduced income tax from 33% to 15%
- Reduced VAT² from 17% to 8.5%
- Reduced import duty for key components

Subsidies

- Special funding for renewables research and development projects
- Discounted interest rates on loans

Incentive policies for renewable-energy power generation

- Grid operator is required to buy up to 100% of the generated power
- For biomass projects, a subsidy of RMB³ 0.25 per kilowatt hour (kWh) has been introduced to encourage the development

¹Compound annual growth rate.

²Value-added tax.

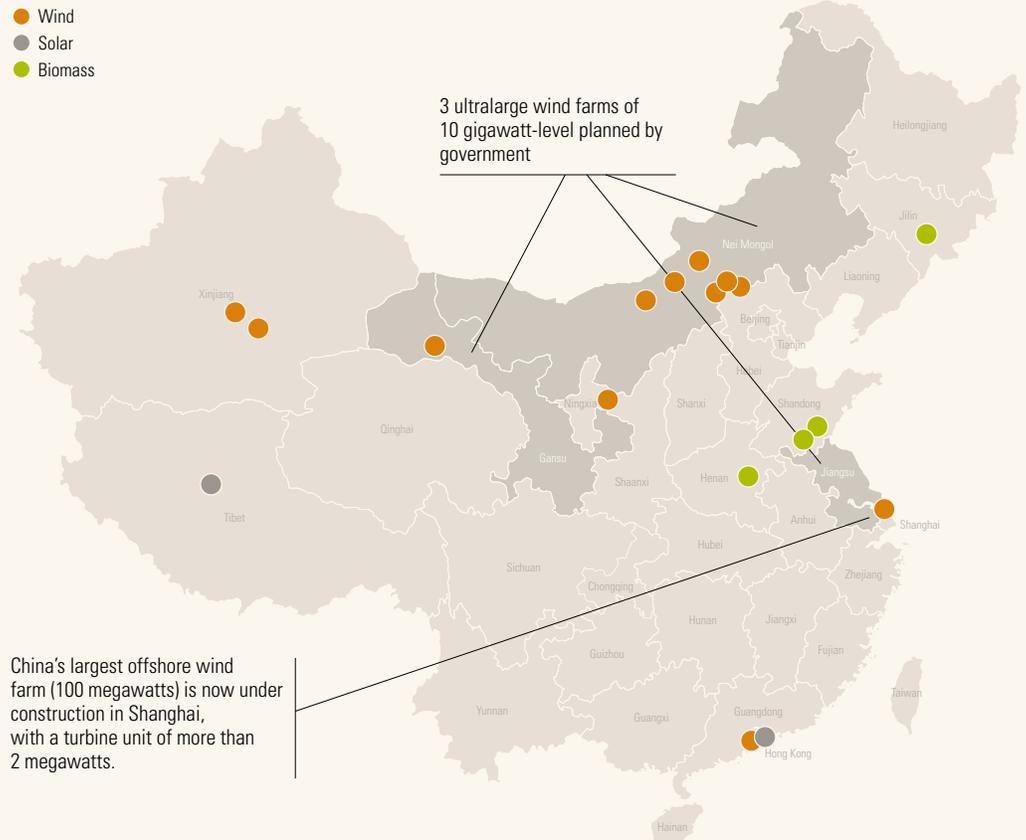
³Renminbi.

Source: Mid- and Long-Term Plan for the Development of Renewable Energy, China; McKinsey analysis

Exhibit 2

A renewable sector has already emerged in China

Renewable projects are blooming across the country.



players as strong global competitors. From a cost perspective, Chinese equipment makers enjoy the benefits of a large and low-cost talent pool, competitive freight transportation, relatively cheap metals supply, and flexible manufacturing processes. Some leading local companies also benefit from simplified equipment designs that confer an additional cost advantage. Goldwind's direct-drive design in its 750 kilowatt (KW) wind turbine generator (WTG), for example, allows it to save on gearbox costs. Moving forward, economies of scale will amplify the cost advantage of Chinese suppliers.

Chinese enterprises are also focusing their energies on the right areas, such as addressing key bottlenecks in the value chain. Players like Maanshan Fangyuan Slewing Ring and Tianma Bearing are investing heavily in large bearings for 1.5 megawatt (MW) WTGs and above. In solar equipment, players such as LDK Solar and Emei Semiconductor are investing heavily in solar-grade silicon production.

At the same time, aggressive Chinese firms are acquiring proven technologies abroad. Goldwind invested €41 million in April 2008 to acquire 70 percent of Vensys Energy, a leading German direct-drive wind turbine manufacturer. That will give it a leading technology in permanent magnetic direct-drive generators as well as intellectual property and design capability for WTGs of more than 2.5 MW.

The natural selection of intense competition at home will produce a class of players with a genuine competitive edge. With expected government support, many Chinese equipment suppliers are likely to become not only locally competitive but also shapers of the overall industry

structure. Companies with entrepreneurial vision and drive such as Suntech have already become global players (Exhibit 3).

Opportunities for foreign power companies

Global power generators should explore sourcing or supply chain partnership opportunities with Chinese equipment makers. In July 2008, for example, Italy's Enel signed deals with Suntech and Trina for photovoltaic (PV) modules. As China's wind power-equipment supply capacity catches up with domestic demand, leading wind-equipment manufacturers like Goldwind and Sinovel Wind are looking to grow exports. Even if China sourcing is not yet on the agenda, global players need to appreciate the emergence of Chinese equipment makers and how this is reshaping the global supplier chain.

Given its scale, the China market presents an important investment opportunity that is hard to ignore. With its rapid expansion of infrastructure, China will in time become a cutting-edge market for the adoption of renewable technology. The urgent need to develop the sector will also mean China's renewables market could be increasingly open to foreign investment as compared to other sectors.³

As in many other markets, however, significant risks need to be considered. First is the fundamental uncertainty over access to attractive sites. For example, access to choice land for wind farms is highly competitive. Second, the viability of many attractive renewable sites will depend on the construction of transmission lines from remote regions, so foreign companies will have to be sure that they can influence the development plans for crucial transmis-

³Whereas foreign investment in traditional generation sectors is restricted, foreign investment in renewables is encouraged—which means that local governments can approve projects up to \$100 million.

sion lines. Third, global players face tough competition in this sector, particularly from Chinese state-owned enterprises. Given their parentage and deep networks, state-owned enterprises have a distinct advantage in lobbying government for access to preferential tariffs, land, and transmission linkages.

To succeed in China, global players need to do more than just study project economics or site selection. They have to do their homework and be crystal clear on their value proposition.

- They must develop a deep appreciation of the government relationships and stakeholder interests that lay at the heart of any project. Indeed, many global companies that are successful in China have had to master the art of government relationship and stakeholder coalition building.

- They need to craft a distinctive value proposition. For example, AES, which has been a long-term partner of China, has over the years introduced multiple new technologies as it invested into new projects.⁴ Today AES has highlighted helping Chinese players successfully invest outside China as a new value add.
- They should leverage partnerships with local players to enhance chances of success. Potential partners include grid operators seeking to enter the generation space, renewable-equipment players seeking to expand down the value chain, as well as local generators. For example, despite its long history in China, when AES launched its first renewable-energy project in China, last year, it did so through a joint venture with local generator Guohua.

⁴These included coal-fired circulating fluidized bed (CFB) technology in the 1990s, and in recent years renewable-energy projects.

Exhibit 3

Chinese companies will shape the renewables industry

Leading Chinese players are catching up to their global peers.

	Company	2007 revenue, \$ million	Global ranking ¹	Revenue growth, %	Market cap ² , \$ million
Cells	Sharp	2,959 ³	1	36	19,788
	Suntech	1,348	2	433	6,232
	Q.Cells	1,175	3	103	12,397
	Yingli Solar	556	N/A	469	4,049
	LDK	505	N/A	1,125	4,527
Turbines	Vestas	6,651	1	26	16,049
	Gamesa	4,461	2	36	7,642
	Goldwind	406	7 ⁴	103	9,623
	Sinovel	N/A	9	N/A	N/A

¹Solar ranking based on capacity in first half of 2007; wind ranking based on capacity of 2007.

²2007 year-end data.

³Solar revenue and growth estimated by Photon.

⁴By 2010, the capacity of China top three wind players (Goldwind, Sinovel, and Dongfang Electric) will be 4.5 gigawatts (GW), about half of Vestas's forecasted capacity (9–10 GW).

Source: ABN AMRO; Bloomberg; Company Web sites; Deutsche Bank; *Photon International* survey, 2006; Prometheus Institute; McKinsey analysis

Challenges for foreign equipment suppliers

For global equipment manufacturers, China represents an opportunity as well as a competitive threat. As we have seen in power-equipment segments such as mid- and low-voltage transformers, Chinese equipment manufacturers rapidly improve on technology and dominate the local market through their superior relationships and cost advantage. Subsequently, anticipation of future over-supply and intense competition compels them to explore global exports, gradually changing the global supply-demand balance.

Global equipment manufacturers must also anticipate the impact Chinese suppliers will have on global cost levels once they eliminate upstream bottlenecks that raise their cost levels. For instance in the current silicon-constrained environment, Chinese solar cell makers pay spot prices for silicon that are three times as high as their Western competitors who have locked in long-term rates. Yet Chinese cell manufacturers are 25 to 50 percent cheaper in the nonwafer aspects of solar cell manufacturing. As silicon moves into overcapacity, the price disadvantage of Chinese solar cell makers will diminish, and Chinese equipment makers will start to reshape the global cost model.

China offers opportunities as well. Western equipment makers should fully leverage it as a supply base to source components to lower total costs. At the same time, they can seek partnerships in manufacturing and R&D with local Chinese companies to tap the country's production capacity and massive engineering talent pool. Since the renewable-energy supply sector is in its infancy and has many new entrants, it is relatively fragmented and less protected by government. This environment will give global players in this sector more leeway to cooperate with or acquire local companies along the value chain to enhance their overall supply competitiveness. This strategy can help global players springboard into the China market and also leverage China's manufacturing capacity to defend their global business.

As in many other industries, China's renewable sector will change the face of the industry globally—both as a leading adopter, especially in wind power generation, and as an equipment supplier. Some players may choose to ignore the China market until it is too late, but smart companies will, despite its challenges, learn to use it as a means to stay abreast of the most dynamic changes in the industry and as a platform to stay ahead of the game globally. ●