



China to lead global wind energy development?

THERE IS GOOD NEWS IN THE WIND FOR PROPONENTS OF WIND POWER. WIND TURBINE CAPACITY HAS BEEN INCREASING DRAMATICALLY, AND THE UNIT COST OF POWER GENERATED BY WIND ENERGY IS EXPECTED TO DROP FURTHER. MUCH OF THIS WILL CONTINUE TO BE CREDITED TO CHINA'S EFFORTS, ACCORDING TO A NEW REPORT FROM THE **GLOBAL INTELLIGENCE ALLIANCE**.

The **World Wind Energy Association** forecasts that by 2020, wind turbine total installed capacity will reach an estimated 1,500 GW worldwide (*ED: caution – this is a higher figure than many other predictions*), accounting for 20% of global electricity consumption. This will represent a substantial jump in the role of wind energy in the next decade, where it represented just 1.5% of global electricity consumption in 2008. Though many would see this target as hugely ambitious and perhaps even unrealistic, even a more conservative scenario – such as the **Global Wind Energy Council** (GWEC)'s *Advanced Scenario* – would see almost 1,100 GW of installed capacity by 2020.

Whereas environmental pollution is seen as a considerable issue of concern in China – as well as a bone of contention for the rest of the world trying to agree emissions targets at the COP15 in Copenhagen – it is also China that will play a major role in the global wind energy revolution, ahead even of many other countries that have had more time to adopt to wind power but have been sluggish in sorting out problems, the UK being one pertinent example.

"It's a paradox that in the West, proponents of the green movement protest against the very infrastructure that is needed to drive sustainable energy practices. As we all know there is a NIMBY (not in my back yard) mentality. This paradox is not seen in China – not yet anyway," says Ms. Kim Khoo, manager of intelligence services at **Global Intelligence Alliance (GIA)**. "In fact, China will not only become a global leader in wind energy, but may be an important supplier to fast growing emerging Asian economies, such as Vietnam, Thailand and Indonesia, which themselves have limited development in the wind energy technology sector."

The Chinese Government's firm commitment

Within an economy characterised by a slow-down in growth rather than actual recession, investment in sustainable energy has continued to grow, by 18% last year to US\$15.6 billion, helped by timely policy interventions. In accomplishing this, the Chinese are building up their manufacturing base. This will further benefit from a portion of the country's large financial stimulus, reported as US\$680bn, with which the country is boosting its domestic markets.

A sign of China's ambition is that, under its stimulus plan, it has named a new target

of 20GW of solar power by 2020, up from the 1.8GW installed at present. Helping to meet the target will be a generous incentive of US\$3 per Watt given upfront for solar projects, enough to cover about half the capital cost in most cases.

In-country sources say that China has also raised its wind energy target for 2020, from 100GW previously, to 150GW. Already the country has doubled its installed wind power base for four years running and could soon surpass the USA to become the world's largest wind power market.

Chinese manufacturers such as **Goldwind Science and Technology** Company (which had its origins in Germany) and **Sinovel Wind Energy Company** are now producing nearly all the wind turbines being erected in the country, albeit with elements of overseas origin. Goldwind uses turbine blades which, although produced in north-east China, are made at a factory owned by Denmark's **LM Glasfiber**.

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The Chinese Government regards the development of wind energy as a key priority. At the end of 2008, China overtook India in having the highest installed capacity of wind energy in Asia with a total 12.2GW of total installed capacity versus India's 9.6GW.

The Chinese wind power equipment manufacturing industry has been attracting investment from many enterprises. With the market capacity of wind power equipment forecasted to reach US\$32 billion by 2010, investing in China is important for many

foreign enterprises wishing to take advantage of the substantial and rapid build up of wind energy in China.

In addition, overseas turbine companies have made substantial investments in China, in order to comply with an earlier Government stipulation requiring at least 70% of components to be sourced domestically for use in Chinese wind energy projects. In order to meet the demands of the growing market, domestic production and the technology of wind turbines and components also had to step up.

With this accelerated development of manufacturing, China is gearing up to meet both its domestic demands – as well as preparing to supply components to the international market.

Key trends in China's wind energy industry

Supply shortage for wind turbines and associated components predicted

The demand for wind turbines and related components in many countries is increasing. Together – according to predictions including GWEC's reference, moderate and advanced scenarios – the USA, the EU and China are targeting installed capacity of between approximately 300 and 650 GW by 2020.

But currently only a number of specialised suppliers are able to produce key parts for higher capacity wind turbines however, and demand may overwhelm some suppliers, especially for those specialising in gearboxes and bearings. In addition, other industries also use similar wind turbine components for their equipment and machinery, and this competition for technology will be problematic.

As an emerging technology, wind turbine designs are still evolving. Parts made are mostly customised and non-interchangeable, making replacement suppliers hard to find. Moreover, the advanced technology required to enter the wind turbine industry is a barrier for new entrants.

Currently, most Chinese wind turbines and components for higher-MW products are licensed or jointly-developed with overseas players (see case study – *American Superconductor's business model for wind targets a foray into China*), whilst local manufacturers still lack the independent capacity to build higher wattage turbines. With fewer players supplying the higher-MW products, there are

Case study – American Superconductor's business model for wind targets a foray into China

American Superconductor's (AMSC) foundation technology is, as its name suggests, the exploitation of superconductivity, a phenomenon the company sees as key in developing the smart grid technologies that the USA and other countries will need as renewables grow their contribution to the future energy mix.

Determined to drive its technology forward in the fast-moving wind power market, AMSC decided to enter the wind energy mainstream. In 2007 it acquired **Windtec GmbH**, a German company that was providing complete technology transfer packages to OEMs wishing to build their own wind turbines (although most transfers by AMSC Windtec have not so far involved superconductivity, the potential is there for the future).

Windtec was seen as valuable both because of its established designs in the 1.65MW and 2MW Classes, and because it already had significant presence in several countries including in Asia. The acquisition enabled AMSC to step straight into a dynamic business sector while providing a ready-made platform for projecting its own technology worldwide. Currently, Windtec technology packages are offered for wind turbines of up to 5MW.

An example of how the business model can work is provided by Hyundai Heavy Industries (HHI), of Korea, which has licensed AMSC Windtec technology so that it can enter the market with 1.65 and 2MW wind turbines without delay. Part of the deal was that HHI will have marketing and sales rights for both turbines in most countries around the world, including North America.



AMSC Windtec is also licensing its technology in China. The Zhuzhou Electric Locomotive Research Institute Co Ltd is producing the 1.65MW design, including within it core electrical components from AMSC. As Du Jinsong, general manager of CSR-ZELRI's wind power business unit has declared, "AMSC Windtec's wind turbine designs, supply chain support and proven power electronics allowed us to enter this rapid-growth market quickly and help in meeting China's objective to increase electricity supply while reducing carbon emissions."

Another Chinese beneficiary of licensed technology is Shenyang Blower Works Group Co Ltd, which similarly has its sights set on the wind turbine market and plans to begin series production of a 2MW machine next year. In Taiwan, TECO Electric and Machinery Company, a world-scale manufacturer of electric motors, has licensed AMSC Windtec 2MW technology. AMSC receives royalty payments on each turbine and has first right of refusal to provide full electrical systems for all TECO wind turbines.

AMSC also works with producers who have their own established designs. Under a multi-year contract with Beijing-based Sinovel Wind Energy Company Ltd, China's largest wind turbine manufacturer (and number 7 in the world), it is supplying core electrical components for Sinovel's 1.5MW turbine series. AMSC is currently having to accelerate shipments of components due to the scale of China's wind farm construction – and Sinovel's part in it.

bottlenecks affecting the supply shortage for wind turbine related equipment, particularly with the Government's emphasis on higher wattage turbines.

Price volatility for raw materials, notably steel, copper and carbon, is a critical factor in some of the wind turbine parts. Steel is used in towers, gearboxes and rotors; copper used in generators and carbon in rotor blades. Any price volatility can result in bottlenecks in the supply chain.

More partnerships amongst wind turbine industry players


In order for foreign players to ease their market entry and secure consistent supplies and services, partnerships in the form of mutual agreements, joint ventures or acquisitions between market players; such as wind farm developers or operators, wind turbine manufacturers and wind turbine component manufacturers, will continue.

Through such ventures, local players will in turn get to secure proprietary technology. Examples include **Shanghai Electric's** joint effort with German **Aerodyn**, and **Zhejiang Windley's** partnership with **Garrad Hassan and Partners Ltd (GH)** from the UK (see case study – *American Superconductor's business model for wind targets a foray into China*).

Local technological advancement

Due to market regulation in China that favours locally made products, foreign players wanting to enter China need to work with local Chinese companies.

This in turn, promotes technology transfer amongst Chinese companies and builds local expertise.

Click through 

Part of this article uses extracts from **Global Intelligence Alliance's** white paper entitled: *The Chinese Wind Energy Market*.

Download it here by clicking on this link from the digital version of the magazine: <http://www.globalintelligence.com/insightsanalysis/white-papers/>

An example of this is **Sinovel's** joint program with **Austria Windtec**. Sinovel is developing a three MW double feedback, variable shift and constant frequency wind turbine system, the first high-tech Chinese offshore wind turbine system, which will be installed in the first offshore wind farm, the *Shanghai Donghai Bridge Wind Farm*.

China as a major supply chain centre within wind energy industry

If current trends persist, China will become an important global supplier for the wind energy market, especially in key wind turbine components and services.

High local demand, China's strategic location to supply Asian markets with parts and equipments, coupled with the development of local research and development skills may encourage a future role as a global wind energy hotspot for services and equipment.

"China's increasing ability to manufacture more affordable wind power equipment might even push South East Asia's wind energy utilisation, especially for small to medium scale projects. While the Chinese

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government is actively promoting the production of turbines with capacities of over two MW, Chinese suppliers are still catching up with the technology. For now, their strength will continue to be in small to medium scale wind energy projects, which are a good fit for South East Asia markets," said Saraswati Diah, an analyst at Global Intelligence Alliance Singapore.

China wind energy suppliers go global

Chinese suppliers' interest in European companies may be of strategic geographical importance in the long term.

Chinese market leader **Goldwind** has acquired a majority share of German **Vensys** in order to concentrate on the development of its direct drive wind turbine technology. After the acquisition of Vensys, Goldwind also bought the subsidiary companies that produced inverters and variable propeller systems for Vensys, through Vensys in Germany.

For Goldwind, this ensures a local foothold in Europe with spin-off benefits both in Germany as well as in China. It has also absorbed cross-border talent with management experience in the domestic and international markets from companies such as **Shenzhen Huawei**, **Motorola**, **GE**, the bearings company **SKF**, **Siemens** and **ABB**.

One thing is certain: China has been described as the world's factory. In wind energy, many believe that the global environment will be the benefactor of its manufacturing prowess.

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