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East Wind

*Prospects for Equipment Manufacturers in China's
Burgeoning Wind-Power Sector*

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To the casual observer, China's wind-power sector appears to have vaulted into the jet stream. It is breaking records for size and for growth in capacity and creating boundless opportunities for industry participants, which have multiplied from a handful to more than 70 over the past few years. Amid the growth, however, there is a great deal of turbulence. Improvements in technology have been accompanied by an accelerating drive toward commoditization, leading to a race to the floor in cost. Simultaneously, many players are making bold moves to seize an innovation advantage. The result of these dynamics is the sector's emerging but dramatic bifurcation into a handful of winners and the rest of the pack.

For the former—the shortlist of top-tier Chinese turbine manufacturers (the “national champions”), along with leading domestic manufacturers of custom-made key components, such as gearboxes and bearings—a bright future of continued growth and increasing global competitiveness seems almost assured. But the prospects for China's smaller or newer domestic manufacturers, many of which have not yet advanced beyond manufacturing and deploying a few prototype machines, are far less rosy. For these companies, the imperative is clear: break into the top tier now or be left in the dust.

International manufacturers also face considerable uncertainty. Many are witnessing a dramatic change in fortune, as the market they helped build and once nearly dominated has become seemingly impenetrable. In the near to medium term, these companies will need to develop more focused, segment-specific strategies that optimize price and product features with the requirements of those segments in which they can best compete (for example, in the nascent offshore-wind segment, where their technology brings a material edge). In the longer term, the only likely international winners will be those companies that have sustained a unique, recognized edge in their product and technology innovation, those that have focused on winning in niche segments, or the select few that have established early partnerships in offshore wind equipment with a significant domestic player.

This paper examines the prospects for these different groups of players in China's dynamic wind-power sector. It looks at forces shaping demand, the current competitive landscape and how it has evolved, and factors likely to drive future success. It concludes with a checklist of questions that competitors should ask themselves if they hope to remain (or become) viable over the next several years. One thing is certain: few players can afford to sit still.

Demand Growth and Market Segmentation

The evolution of China's wind sector has been following a pattern often observed in the development of other industries in the country, particularly those of strategic importance to the government.

- ◇ *Stage 1.* To stimulate the industry's formation, the government encourages foreign investment and technology transfer. (From 2005 until recently, international companies seeking to establish operations or joint ventures in China were subject to a 70 percent local-content requirement. Additionally, domestic companies have been able to secure technology by licensing designs willingly offered by international companies.)
- ◇ *Stage 2.* The government introduces policies to stimulate domestic demand while also nurturing the development of a select set of domestic players—the national champions—which have distinguished themselves through bold early moves or have been able to leverage political advantage.
- ◇ *Stage 3.* Because customers are heavily state-owned, demand stimulation policies trigger a multiplier effect, since customers often act beyond the policy requirements in their zeal to demonstrate compliance. As a consequence, demand rapidly accelerates, generating “instant scale” for domestic suppliers. This

enables suppliers to move down the experience curve rapidly and close the gap in technology and quality with more established competitors, while simultaneously building a significant cost advantage.

- ◇ *Stage 4.* As the national champions become globally competitive and begin to export, domestic policies are lifted or relaxed to encourage reciprocity with targeted export markets. By this point, the national champions can compete effectively without requiring further policy support and will seek to expand their global footprint.

China's onshore wind market is currently in stage 3, soon to shift to stage 4. The country's emerging offshore market is on the cusp between stages 1 and 2.

A Policy-Fueled Dash—and Subsequent Regulation and Stabilization

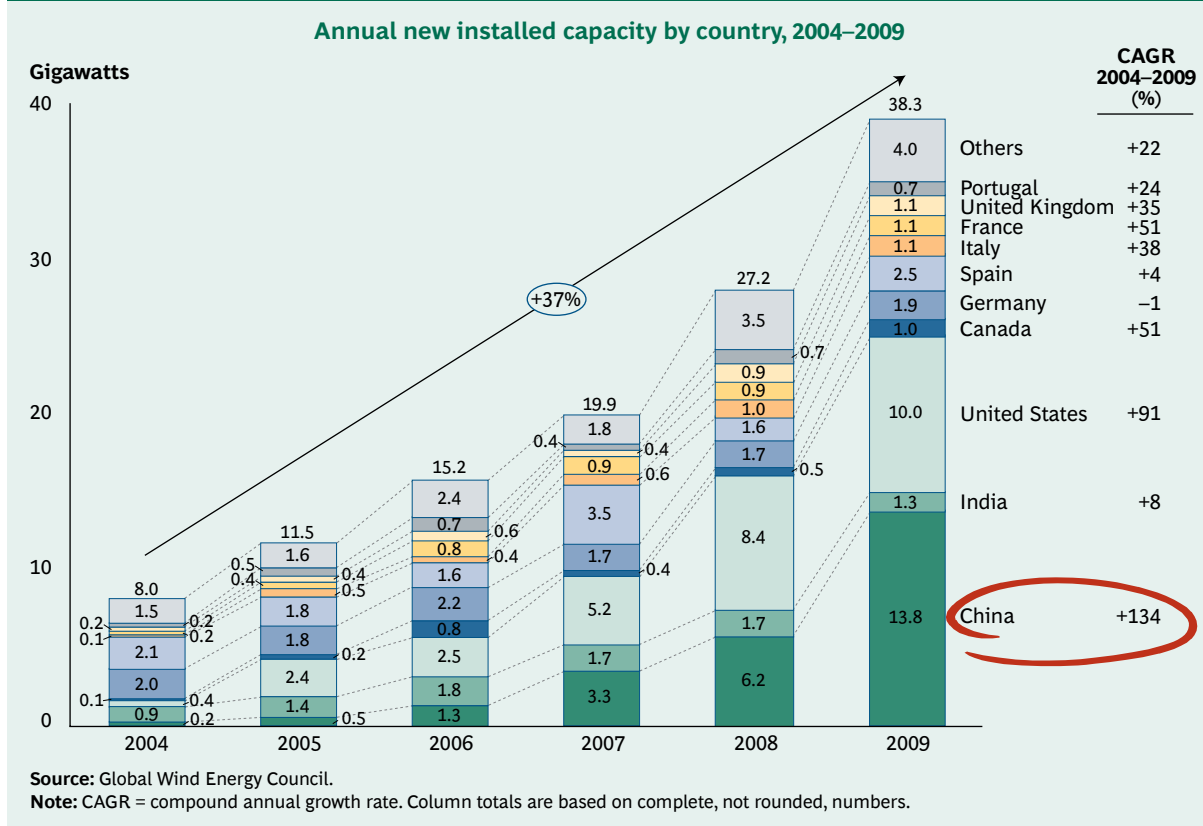
Major stimuli for the market's development have been the targets, policies, and subsidies contained in the government's Eleventh Five-Year Plan (a series of economic-development initiatives) and Renewable Energy Law, both of which took effect in 2006, as well as the government's Medium- and Long-Term Development Plan for Renewable Energy, which was instituted in 2007. In an effort to put the brakes on the growth of China's carbon emissions, these and subsequent policies aimed to have 15 percent of China's energy come from renewable sources by 2020. (See Exhibit 1.) The wind equipment sector has been a direct beneficiary, with China vaulting into first place among the world's wind markets in 2009 and accounting for one-third of the world's new installations that year. (See Exhibit 2.)

During this period of remarkable growth, the market has seen its share of exuberant behavior. As government policy directed China's power generators and other energy producers (which are predominantly state-owned) to build renewable-energy sources into their portfolios through the establishment of renewable portfolio standards (RPS), managers at many of these companies have sought to meet or beat those targets and expand their renewable-energy capacity as quickly and cost-effectively as possible. Consequently, in a land-grab rush, they have bid to develop and operate wind farms at uneconomically low,

Exhibit 1. China Aims to Have 15 Percent of Its Energy Come from Renewable Sources by 2020



Exhibit 2. China Became the World's Largest Wind Market in 2009



on-grid tariff rates. They have also sought to buy the needed turbine equipment at the lowest prices possible, irrespective of the actual power output the turbines were likely to produce, since RPS targets are measured in nameplate capacity rather than actual power production.

Additionally, some players have established wind farms in wind-rich but remote areas, far from the existing power grid. The result has been a number of unsustainable wind farms with many poorly functioning wind turbines, a nontrivial portion of which have not even been connected to the power grid.

In a midcourse correction, the government's National Development and Reform Commission (NDRC) and recently established department, the National Energy Administration (NEA)—which is responsible for formulating and implementing the country's energy-development plans and industrial policies—have sought to stabilize the situation by introducing several measures. The most significant one was the decision in 2008 to consolidate the country's best wind sites into a set of massive (more than 10 gigawatts each) wind bases (there are seven such sites to date), with the NDRC guiding the tendering processes both for wind farm development at these bases and for the equipment to be used.

The NDRC has subsequently taken a number of concrete steps, which on balance have generated positive results. To contain further uneconomic bidding for wind farm projects, it has largely removed pricing as a discretionary factor by setting four benchmark tariffs for different regions on the basis of the average wind resources available in each region. To encourage more rational pricing by turbine manufacturers, the NDRC has stipulated that bidders no longer be rewarded for offering the lowest price but rather for offering a price closest to the average of all bids. The NDRC has also reduced the overall weighting of price versus other factors, such as the track record of the bidder's equipment in China, in the awarding of bids.

The NDRC's involvement has delivered other results as well. Owing to the large size of these gigawatt-scale wind-base tenders, winning bidders for equipment supply have an opportunity to increase their scale substantially and improve their economics, compared with the more typical 50-megawatt-scale tenders

outside of these wind bases. And by controlling the wind bases, the NDRC has the leverage to prod the grid companies, where needed, to establish connectivity to the wind bases.

At the same time, the revised tendering process and its qualifying criteria (for example, product technology requirements and advantages given to those with prior project experience in China) *appear* to have steered business toward domestic manufacturers. No international OEMs have won any awards under NDRC-guided tenders, including the wind base auctions or their predecessor, the wind concession tendering program, which covered openly tendered wind-farm projects with capacities in excess of 50 megawatts.

The Sub-50-Megawatt Segment

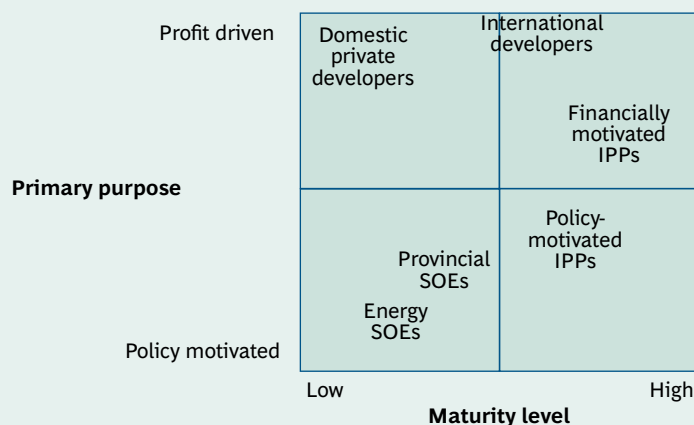
Consequently, international manufacturers have increasingly focused on the segment of the market comprising sub-50-megawatt projects. At this smaller scale, approval is required by the provincial, not central, government, and the award and approval processes can often be more straightforward and more economically driven—but not always.¹ Project developers' buying behavior is heavily influenced by two factors: the developer's primary purpose (financial gain versus compliance with policy) and maturity level (or experience) in power and wind specifically. An experienced international project developer relying on bank financing, for example, will carefully assess the net present value associated with one turbine versus another when selecting the equipment for a project. A larger, publicly listed domestic developer will generally behave similarly. State-owned energy companies that are just beginning to invest in wind farms, however, may be doing so largely to meet their RPS requirements and thus may seek to minimize their capital outlay rather than optimize project economics. These companies also might not yet have developed the internal capability to correctly assess the likely economics of one turbine versus another, and thus may instead focus on other, noneconomic factors.

The sub-50-megawatt portion of the market, then, may be segmented into four sets of buyers. (See Exhibit 3.)

- ◇ International developers
- ◇ Domestic private developers
- ◇ Financially motivated independent power producers
- ◇ Policy-motivated independent power producers and other energy-related state-owned enterprises

1. To avoid lengthy approval procedures, developers will thus break down sites into 50-megawatt phases, with the equipment supply contracts for each phase to be awarded separately.

Exhibit 3. Project Developers Can Be Segmented by Their Primary Purpose and Maturity Level



Source: BCG analysis.

Note: IPPs = independent power producers; SOEs = state-owned enterprises.

The less established domestic turbine suppliers have generally been strongest at selling to policy-motivated buyers, using low price as the chief weapon in their arsenal. These suppliers have also often sold at a loss, since they lack the scale to match the cost structures of their larger and more experienced rivals. The less established players face a future hurdle as well: it is likely that, over time, their policy-driven customers will adopt more rational buying behavior (that is, focusing on the expected lifetime performance and economics of the turbines), since they won't be seen by the government authorities as becoming any "greener" by having nonperforming wind farms in their asset portfolios.

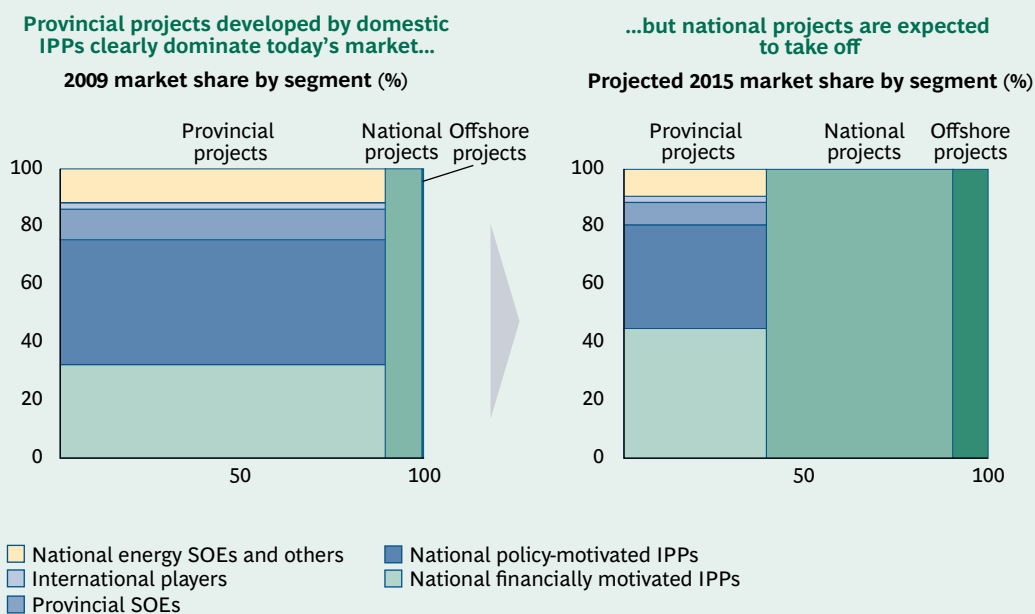
The top-tier domestic turbine suppliers and their international counterparts have been stronger at selling to financially motivated customers. The long-term challenge for international suppliers is that the sub-50-megawatt portion of the market will decline in importance and size as the national wind bases come to predominate, while the top-tier domestic players continue to grow and improve their competitiveness. (See Exhibit 4.) For international companies, it will become harder and harder to secure new projects, unless they can maintain a technological edge in the turbine that translates into superior operating economics for their customers through improved reliability and availability, lower cost, and greater energy output.

The Offshore Segment

The offshore wind segment remains in its infancy in China compared with other markets, particularly northern Europe. The technological hurdles versus onshore are considerable: turbine sizes need to be much larger to cover the higher infrastructure cost of developing and supporting an offshore wind farm, and the harsh environmental conditions to which the turbines are exposed present a significant engineering challenge. Consequently, while the top-tier domestic players have independent initiatives under way in offshore design and development, their technological success is by no means assured, increasing the likelihood that some of these players will partner with their international peers. Indeed, this segment represents a potentially large and attractive space for those international companies that have proven technology, because they hold the keys to a vehicle that has the potential to accelerate the development of a weaker first-tier or stronger second-tier domestic player.

A critical challenge for international companies considering a partnership in the offshore segment, however, will be to determine how to collaborate in such a way that mitigates the likely risk of technology

Exhibit 4. The Rise in National Projects Poses a Significant Challenge for International Players



Source: BCG estimates.
 Note: IPPs = independent power producers; SOEs = state-owned enterprises.

leakage to other competitors in China or to markets outside China. These international players will need thoughtful technology-development strategies—both for continuously driving advances ahead of the market and for determining what gets designed and deployed where and in which sequence.

Development of the Industry's Players

Over the last few years, much to their disappointment, the international players have lost their leading market-share positions in China to domestic companies. This change has been facilitated by a few fundamental factors. The first is relatively easy access to technology for the domestic companies. Most domestic players entered the market with little experience in wind turbine technology but were able to close the gap either by licensing technologies from independent design houses or manufacturers or by acquiring technology developers outright. The domestic companies have wasted no time in absorbing and adopting such technologies, launching prototypes, and continuously integrating and further developing the technologies while strengthening their own R&D capabilities.

The second factor behind domestic players' rapid growth is supportive government policies. Such support can take many forms, including direct subsidies (such as value-added-tax rebates, corporate tax incentives, and R&D subsidies), low-interest loans, and facilitation of customer and project access (for example, the government has been fostering partnerships between domestic manufacturers and state-owned project developers). The most prominent of these supportive policies have been those guiding the evolution of national wind concession projects into what have become the wind base projects, which now include the best wind resources. The bidding results of these projects, which, as noted earlier, have gone entirely to domestic players, seem to demonstrate this point. Correspondingly, the domestic equipment makers have also focused their efforts on domestic customer segments, including wind bases as well as the large national independent power producers.

The third factor driving domestic players' growth is the aggressive and successful strategies they have pursued with regard to scale and value chain positioning. Over the past two or three years, Chinese players have rapidly built scale, enabling them to race down the experience curve and become very cost competitive. This, in turn, has allowed them to price from 10 to 15 percent below international players. Certain players have also made selective integration moves across the value chain to control key capabilities—such as investments in design firms or gearbox manufacturers—further enhancing their competitiveness.

Domestic players have evolved into three tiers, distinguished by their scale and share positions, customer access, and demonstrated competitiveness. The first tier includes market leaders and national champions such as Sinovel, Xinjiang Goldwind, and DongFang Electric, while the second tier encompasses players such as Guangdong Mingyang, Guodian United Power, SEC, Zhejiang Windey, and XEMC. The remaining 70 to 80 domestic players fall into the third tier.

First-Tier Competitors

Domestic first-tier players are the undisputed market leaders, with dominant positions in national wind-base projects and uniformly strong market share across all provincial segments (ranging from 20 to 50 percent as of the first quarter of 2009). Besides benefiting from government support, these companies are also now competitively positioned vis-à-vis the top international players in cost, technology, and quality. Among them, Sinovel Wind Group is currently the market leader, with 3.5 gigawatts of installations in 2009—a 250 percent increase over 2008. It also has the highest planned capacity (4.7 gigawatts) by the end of 2010—a 230 percent increase from 2008. In addition, Sinovel has benefited from affiliation with its parent, state-owned DHI-DCW Group, which has provided access to low-cost financing as well as component supply.

Xinjiang Goldwind Science & Technology is one of the early forerunners in China's wind industry, and it has accumulated a strong project track record. It also saw a 250 percent increase in installations in 2009, to 2.7 gigawatts, establishing itself as the second leading player in the market. Xinjiang Goldwind's capacity-expansion plans—to 3 gigawatts by year-end 2010—are more modest than those of Sinovel but still represent a doubling of 2008 capacity. Xinjiang Goldwind is notable for having adopted the relatively

new permanent magnet synchronous generator (PMSG) power-generation technology, which offers potential performance and cost advantages, in contrast to other players, which have hedged their bets through portfolios of different technologies. The company is also noteworthy for its integrated business model, which covers design, component manufacturing, and turbine assembly, as well as project development and service. This is in contrast to the other national champions, which have remained focused predominantly on turbine manufacturing.

The last of the three, DongFang Electric (DEC), is part of a state-owned electronics conglomerate that offers the company benefits in financing, government support, talent, and component supply. It has also been reported that Sichuan-based DEC received significant government support, in the form of preferential customer and project access, in addition to direct government aid, following the company's substantial loss of life and property in the catastrophic 2008 earthquake. DEC ranked third in 2009 with 2 gigawatts of installations and a plan to increase capacity to 3 gigawatts by year-end 2010.

It is likely that the current first-tier players will retain their dominant position in the Chinese market in both the onshore and offshore segments, given their significant lead, current momentum and capabilities, and ambitious plans. Realization of those plans will be further complemented by the external ecosystem, which includes continued government support, access to robust domestic financial markets, and access to the rapidly growing and maturing supply base of domestic component manufacturers. While other players are able to benefit from these factors as well, the first-tier players can do so disproportionately because of their overwhelming scale advantage.

The first-tier domestic players are also those most likely to pursue expansion overseas, but they currently face two challenges: product certification and logistics. Many leading players have certification efforts under way, so this will be just a matter of time. Logistical challenges and their associated costs—especially given the sizable weight of nacelles and the lengths of blades—will prove more challenging, however, and may constrain the potential of these companies to export significant volumes from manufacturing bases in China. During the next five years, therefore, we may see the first-tier domestic players venturing overseas gradually, initially by exporting in limited volumes and then through acquisition or setup of overseas assembly and blade-manufacturing operations. To the extent that government subsidies continue to play a key role in wind farm economics in the major markets around the world, there will likely also be political pressure for first-tier companies' overseas sales to come from locally manufactured turbines in those markets.

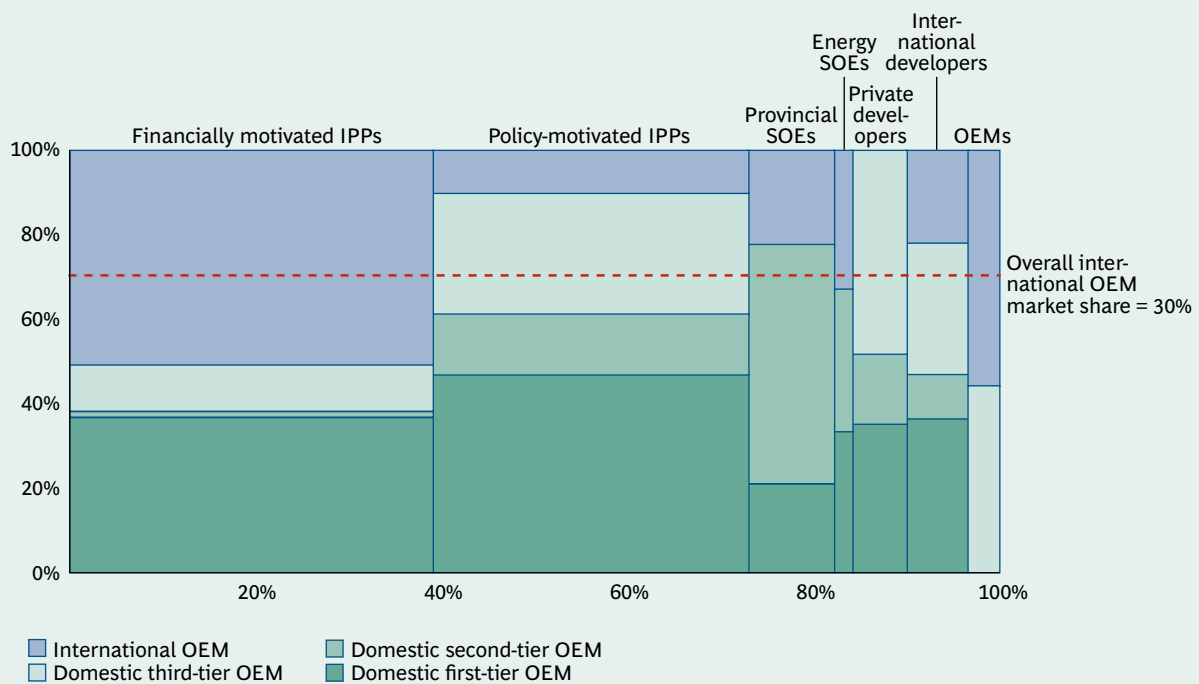
Near-term growth challenges for these top players will include their ability to secure component supplies (especially for key components such as the gearbox) and control quality across the supply chain. They will also need to make the “right” choice of generation technology—double-fed induction generation (DFIG) versus PMSG; that is, they will have to accurately pick the one that developers and grid companies are most likely to favor. Given the first-tier players' aggressive rates of expansion, each of these challenges carries nontrivial risk. The players' respective positioning may influence how they approach and tolerate that risk. Sinovel and DEC, backed by the strength of their conglomerate parents and their associated value chains, as well as product lines that span multiple generation technologies, would seem to be more hedged, whereas Xinjiang Goldwind's more focused approach brings both bigger risks and potentially bigger rewards. (Xinjiang Goldwind, it should be noted, has a relatively strong track record of managing execution risk.)

Second- and Third-Tier Players

The sweet spot for second-tier domestic players has been in the provincial state-owned-enterprise segment, in which they have a roughly 55 percent share. These companies also have a reasonably strong (10 to 30 percent share) presence across other provincial segments. (See Exhibit 5.) They have achieved it partly by leveraging their provincial ties for customer and project access and by maintaining more flexible (and smaller-scale) operations. (Many of them have provincial state-owned-enterprise backgrounds and have been chosen as provincial renewable-industry champions.) Some have also succeeded through commercial savvy. They have by necessity been technology followers, not pioneers.

Among the second-tier players, Guangdong Mingyang Wind Power, backed by both provincial government support and international capital, is viewed as having the strongest commercial operations and the

Exhibit 5. Manufacturers' Share of Provincial Projects Varies Significantly by Customer Segment



Source: BCG analysis.

Note: IPPs = independent power producers; SOEs = state-owned enterprises.

greatest access to and focus on overseas markets. (It was among the first domestic companies to seek internationally accepted Germanischer Lloyd certification for its products.) Xiangtan Electric Manufacturing Corporation (XEMC) and Shanghai Electric Group (SEC), with their parent groups' industry expertise, have a support framework analogous to that of DEC. They also benefit from the support of their respective provincial governments. Guodian United Power Technology is owned by the large state-owned independent power producer Guodian and its subsidiary Longyuan Electric Power Group, China's largest wind-farm developer. Zhejiang Windey Wind Generating Engineering has leveraged specific customer relationships, especially that with China Energy Conservation Investment Corporation, which has enabled it to reach its current strong position.

Domestic second-tier players have made only minor inroads in terms of segment penetration and building scale, however. Their immediate challenge is to break into the most important and fastest-growing market segments, such as the wind bases and the financially motivated independent power producers. They will have to pull out all the stops to secure key relationships, especially with the NDRC and the leading independent power producers, if they are to have any hope of catching up on scale and cost competitiveness. Otherwise, they will likely be left out in this reshuffling game.

Of the large number of domestic third-tier players, many are still in the very early stages of development, and some are still in the prototype stage. For most of them, survivability in this business is in doubt, and this is where consolidation will begin—with many likely to drop out over the next three years.

International Competitors

International players, having experienced the significant share drop discussed earlier, now lead only in a few smaller segments. Amid the booming market growth, most have seen their sales levels *decline* in recent years. With lackluster performance and a challenging outlook, some major international players have recently exited the Chinese market, and it remains a question how the others should position their businesses to succeed. Given the growing scale of the domestic leaders, it is likely that remaining competitive with them will require international players to *increase* their presence and commitment while working relentlessly to upgrade technology and drive down cost.

For those international players that can hold on and remain competitive, however, the future may be brighter. It is likely that, as the onshore market's development advances into stage 4 (as described above) in the coming years, existing domestic policies will be relaxed to allow broader market access for all players, including foreign ones, in an effort to encourage international markets to open their doors to China's domestic players. Thus there should be significant longer-term opportunities for international companies in China's market.

China's offshore wind market is still in its infancy but is expected to grow rapidly over the next decade: to date, 12.5 gigawatts of projects have already been planned, and the government has a target of establishing 30 gigawatts of offshore capacity by 2020. It therefore presents a different set of potential opportunities and challenges for international players. The government is just starting to open the market but has also introduced policies requiring international companies to enter into partnerships with domestic companies in order to gain access to projects. This could ultimately prove a win-win proposition for international players and their domestic counterparts, given the substantial technology lead in the offshore market held by the top international manufacturers and the comparative strength in local market access and customer relationships held by the domestic leaders. Speed, both in choosing a partner and in execution, will be crucial for success: as in the onshore market, this will likely evolve rapidly into a "winner takes all" endgame.

Future Success Factors

By 2015, the winning turbine manufacturers will likely be generating more than \$3 billion in revenue each at 10 to 15 percent profit margins—a stunning achievement considering that the largest players were only \$200 million to \$300 million in size in 2007. However, it is very likely that these winners will be a handful in number—so what can today's industry participants do to ensure that they will stand among them?

With the coming commoditization of the industry, narrowing of quality differences, and standardization of technologies, it will be paramount to maintain a relentless focus on driving scale up and cost down. To achieve that, winning customer orders to continue to build volume in the near to medium term is critical. To secure those orders, it will be essential for players to align their value proposition with the key requirements of the segment—for example, by optimizing the mix of price per kilowatt and price per kilowatt-hour for the less windy Class II and Class III sites, which will be increasingly prevalent as the windiest Class I sites have been taken; offering advanced or at least comparable generation technology, such as DFIG or PMSG; and obtaining product certification. It will also be important to maintain close relationships with the decision makers and influencers within the segment's leading project developers, as well as with the NDRC or its province-level counterparts.

Equally important will be attention to the right business scope and profit model to yield sustainable economics amid significant cost pressure. As the universe of local component suppliers continues to expand, the rationale for backward integration, as well as the need to utilize more costly imported components, will weaken, though it's likely that both local and international companies will need to invest significantly in the medium term to continue to develop this local supplier base. The industry's rapid growth has stretched many suppliers to the limit. For example, one leading component manufacturer has a year's backlog of design changes to run through before it will be able to start working on additional new designs from customers, constraining the pace at which its customers can bring new products to market. Adopting creative ways of sharing engineering and other critical talent to support vendors in the medium term, while continuing to closely monitor and nurture vendor quality, will therefore be important.

Domestic companies wishing to export on any significant scale, especially for projects requiring bank financing, will need to obtain certification of their equipment by Germanischer Lloyd or another internationally recognized body. Alternatively (or additionally), as liquidity for project financing is likely to remain tight in many Western markets, should Chinese manufacturers be able to offer equipment financing—directly or in partnership with a Chinese bank—it could give those manufacturers a significant competitive advantage until financial markets recover more broadly.

While the wind power sector is well down the road toward commoditization, considerable differences in product technology remain in use today (for example, in generation technologies and in geared versus

gearless designs), and companies will need to ensure that their technology remains relevant to project developers. (Most of the top-tier Chinese manufacturers maintain a portfolio of potential winning technologies while concentrating their efforts on one.) Trying to gain access to and to influence the grid companies' design institutes, which review and set standards, is also important, as is promoting one's technology to the NDRC and the provincial authorities, in addition to the project developers themselves.

What do these developments imply for the future of today's market participants? For the *largest domestic wind-turbine manufacturers*, the imperative will be to continue their steady march toward global scale and continued cost reduction through further component localization, value engineering, and broader amortization of fixed costs. Continued investment in product quality and service will be important as well, as will maintaining technology parity, at a minimum (which could lead to additional partnerships between these players and international design houses). To open export markets, these companies will need to try to obtain internationally recognized product-quality certifications. Finally, to develop the offshore market, they will need to accelerate the building of their design capabilities, which will likely result in further partnerships with international players in this space.

For the *smaller domestic players*, the race is on to achieve scale and low cost. They may be more likely to sacrifice margin in order to stay in the game and consequently may have a greater need to secure financing to support their "buying scale." Additionally, they may be more inclined to integrate downstream, investing in smaller project developers in order to secure access to project pipelines. They will also need to continue devoting considerable effort to deepening their relationships with the major project developers, the NDRC, and the provincial regulatory bodies, design institutes, and other influential government-related bodies.

For the *international players*, success in the near to medium term will require segment-specific approaches that optimize price and product features with the unique requirements of each segment. Longer-term success will likely come to those companies that have fully localized their supply chains while maintaining a recognized edge in technology innovation and product quality—that is, delivering "European" performance at a "Chinese" price. To achieve this will also require building scale by dominating a particular segment and possibly by merging or partnering with a domestic player. Success may also come to those players that have been able to establish mutually beneficial partnerships with domestic companies in offshore wind, but the top partnership choices are likely to be taken quickly.

For *financial investors*, there will be plenty of opportunities, but only a few will present an attractive risk/reward profile. We will likely see a number of public offerings by first- and second-tier turbine manufacturers, leading component manufacturers, and project developers. Among them, second-tier turbine makers with the potential to leap into the first tier will likely offer an attractive upside. Expanding component manufacturers that demonstrate world-class quality and have a sufficient proportion of their production volume serving the wind sector will likely enjoy a similar upside to the first-tier and successful second-tier players.

Project developers affiliated with provincial governments will continue to see growth prospects in the medium term, though they will decline over time as the national wind bases predominate in the market. Smaller independent project developers will face an uphill battle: many promise attractive project pipelines obtained on the basis of their local relationships but lack the cash to develop them. Particularly careful due diligence is in order before investing in this set of players. Finally, private offerings will likely be made by the second- and third-tier manufacturers as well as by the smaller project developers. They will need to be evaluated with great caution on a case-by-case basis.

Questions for Industry Participants to Consider

While China's wind industry continues to grow at breakneck speed—roughly 25 gigawatts of capacity were installed through 2009, and official plans (which are likely an underestimate) call for 150 more to be installed by 2020—participants would be wise to take a momentary pause and consider their answers to the following questions:

- ◇ In which market segments, and with which customers, can I sustain a competitive advantage?
- ◇ How cost competitive am I today?
- ◇ What is my approach to maintaining competitive scale?
- ◇ How competitive is my technology and equipment performance, and am I investing sufficiently to stay ahead?
- ◇ Where must I partner to succeed, who are my best partner choices, and how will I retain value from the partnership?

International players should also ask themselves these questions:

- ◇ Which technologies and design capabilities should I bring to China?
- ◇ How will I localize my supply chain?
- ◇ What impact will the continuing rise of Chinese players have on my global business, and how does that affect my China strategy?

While these are challenging times for international and smaller domestic players, the game is not yet over. However, now is clearly the time to set the stage for success or failure.

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