OFFSHORE WIND CHINA
SEPTEMBER 2013

QUARTZ+CO
Introduction

In the past five years, offshore wind has grown to become the fastest growing cleantech technology in Northern Europe. Expectations for growth in the industry far exceed anything ever experienced before in the cleantech sector.

Quartz+Co has worked in the offshore wind sector since 2004, and we have assisted some of the largest offshore wind players in Northern Europe with making the most of their offshore wind investments. We have helped government authorities define the right incentives, institutional investors make the right deals and, more importantly, crafted winning offshore wind strategies for some of the largest utilities. Our work has provided us with best-in-class insight into the dynamics and pitfalls of offshore wind and has paved the way for a unique understanding of tomorrow’s winning business models.

We foresee that the offshore wind sector will continue to develop and be one of the key engines for growth and economic prosperity in our region of the world. It is, however, a race against time as the enormous investments and governmental subsidies to fuel growth are pressured by the repercussions of the financial crisis, competing sources of energy as well as significant supply risks.

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One scenario could be: rapid industrialisation which will fuel growth are pressured by the repercussions of the financial crisis, competing sources of energy as well as significant supply risks.

No matter which of these scenarios will play out – one question will arise. What are the opportunities for exporting the capabilities built up in Europe to new high-growth territories?

Offshore wind in China is only in the beginning of the life cycle, and based on what you are just about to read, it seems that the Chinese offshore sector aims to be the next growth centre of the industry while facing some of the similar issues – such as defining a process for consenting, approval and governance in general combined with an immature supply chain – a cocktail full of risks and potential returns!

China will be dedicated to meeting its ambitious targets and offering paths to future growth for the domestic players. But the development towards de-risking and lowering CoE in the Chinese offshore wind sector can be accelerated by introducing European technologies and capabilities.

So whether you are an utility player, a supply chain player or an investor in the European offshore wind sector, we are convinced that you will be challenged by this question; how can you exploit business opportunities in the Chinese offshore wind sector?

This paper offers you a snapshot of the Chinese offshore wind industry and our high-level assessment of the maturity level of the different categories in the value chain. We hope it will contribute to your current or upcoming strategic considerations in an emerging global offshore wind industry.

Quartz+Co

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Offshore wind – global market overview

While Europe has been the leading region within offshore wind development, China is expected to lead the way in the future within this domain. A global round-up of trends and developments in the industry dictates that China is expected to be a clear front-runner in terms of installed capacity of offshore wind and to develop a market comparable to the size of the total European-added capacity for offshore wind.

The global offshore wind installed capacity stood at 5,480 MW at the end of 2012; Europe and China accounting for 90% and 9% of the market share, respectively. By 2020, based on the announced targets, China alone is expected to account for almost 40% of the global offshore wind capacity target of about 70 GW by 2020, more than double that of the United Kingdom.

In the Americas, the United States announced in December 2012 a subsidy of up to EUR 3.1 million per project to promote the offshore wind industry, but future growth is likely to be eclipsed by the discovery and development of low-priced shale gas. Brazil too has intentions of developing a massive project of 11.2 GW in 23 phases by around 2026, but it is only expected to be a wild card in absence of any sanctioned policy.

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The figure highlights the 2020 offshore wind targets of several countries, indicating the expected front-runners and the next-movers by the end of the decade.

The two major factors driving growth of offshore wind for China are its growing energy needs and the adopted policy to promote utility companies to develop at least 3% of their energy portfolio in non-hydropower renewable resources. The attractiveness of offshore wind over other alternatives is also driven by the proximity of major load centres to the large coastline which will not only require less build-out of the transmission network but will also contribute towards greater grid stability.

At the same time, an aggressive build-out of offshore wind capacity presents an opportunity for Chinese companies to play a major role in developing and shaping the global offshore wind industry supply chain.

The key questions that arise are: Is the demand in China growing as per targets? What are the current bottlenecks? How is the industry supply chain maturing? And finally, how should current players adjust to this new era of growth? In the following sections, we explore these questions in detail to build an insight into the opportunities for growth.

1 All currency-related figures in this report have been converted from CNY to EUR and from USD to EUR using the annual average exchange rate: 1 CNY = 0.1231 EUR and 1 USD = 0.7781 EUR

Source: EWEA; MEC Intelligence analysis; Quartz+Co analysis

THE OFFSHORE WIND MARKET IS MOVING FROM EUROPE TO ASIA, AND CHINA IS SET TO BE THE BIGGEST INDIVIDUAL MARKET FOR OFFSHORE WIND INDUSTRY BY 2020 (GW)
Chinese offshore wind industry

China Meteorological Administration estimates that the country has a total potential of developing about 750 GW of offshore wind, of which 200 GW is in water depths between 5-25 metres.

However, owing to restriction in ocean space use due to areas restricted for fish hatcheries, tourism, tidal energy development, etc., the total potential for offshore wind development is more likely to be around 400 GW. Considering this huge potential, China announced the establishment of offshore wind demonstration projects in the 11th Five-Year Plan in 2006. In the 12th Five-Year Plan, in 2010, China set itself the ambitious targets of 5 GW by 2015 and 30 GW by 2020 — requiring a build-out of 5 GW capacity annually post 2015 (equivalent to the current global installed capacity).

The figure highlights the installed capacity by region and provincial plans for future development.

China’s first offshore wind turbine was put in operation in the year 2007 at the Shandong Bohai Offshore Wind Pilot Project and its feed-in was incorporated to an independent oil field power grid. The first demonstration project, Donghai Bridge (102 MW) entered the construction phase in 2008 and was finally commissioned in 2010. In a significant development in the same year, the National Energy Administration (NEA) and the State Oceanic Administration jointly issued a release on “Interim Measures for Administration, Development and Construction of Offshore Wind Power” (NEA New Energy No. [2010]29). Comprising 10 chapters and 38 articles, these interim measures acted as policies regulating the offshore wind industry in China. The coastal provinces were required to submit “plans” for construction of offshore wind farms in their respective jurisdiction. The plans would include the number of farms, their size and their preliminary location. On approval of the plan, the projects were to be allotted via a concession scheme.

As per the policy, it was mandatory for project development entities to constitute at least 51% stake from a Chinese enterprise. Furthermore, the participating developers were to be evaluated on quoted feed-in tariff, their technical capabilities and their performance record. The National Development and Reform Commission was assigned the responsibility to conduct the bidding process and to provide overall project approval.
Oceanic Administration was responsible to provide site clearance approval for offshore wind farms. Moreover, developers were not permitted to begin construction before obtaining grid connection approvals from the onshore grid operator. After winning the tender, developers were given a period of two years to begin construction or their project development right would be revoked.

The first round of concession was planned and held in 2010 for offshore wind farms with cumulative capacity of 1 GW off the coast of Jiangsu – comprising a total of four projects, two each of 200 MW (Jiangsu Dafeng and Jiangsu Dongtai) and 500 MW (Jiangsu Binhai and Jiangsu Sheyang). The allotments under the first concession were initially adjourned due to site clearance issues. The locations of these projects were then changed and construction approvals have been recently awarded in the first quarter of 2013. Construction at Jiangsu Dafeng, Jiangsu Dongtai and Jiangsu Binhai is expected to start in the fourth quarter of 2013. A second concession round, which was planned for awarding projects of a total capacity of 2 GW in 2011, has been delayed pending the issues with the first concession; but with projects under first round already underway, developments are expected to resume soon.

China currently has a cumulative installed capacity of 400 MW. This includes the two operating wind farms (Donghai Bridge and Rudong Inter tidal – connected to the grid in 2010 and 2013, respectively) in addition to several prototypes and individual test turbines. Initial development had been limited to less than 10 km from shore, around the Jiangsu and Shandong provinces owing to the close proximity to key load centres. The projects under the first concession round in Jiangsu were initially awarded in regions closer to the shore (<10 km) but location was later changed as the projects finally got approval in 2013.

However, a new regulation, “Implementation Rules of the Interim Measures for the Management of Development and Construction of Offshore Wind Power”, was passed in July 2011. This regulation laid down the requirements for the construction and operation of offshore wind farms which were to be constructed under the “Interim Measures for the Management and Development of Offshore Wind Power” issued in 2010. The regulations defined the requirements for the planning of offshore wind projects, stages of feasibility studies and the role of various government departments. Most importantly, the regulation prohibited construction within 10 km from shore and at water depths less than 10 metres if the width of the tidal flat is more than 10 km, and in areas which are earmarked for tourism, fisheries and other commercial uses to avoid conflict among various government agencies. This restriction is expected to promote growth in medium-deep sea regions with depths in the range of 10-15 metres and greater than 10 km from shore rather than the intertidal regions which were in focus earlier.

So far, six provinces – Jiangsu, Shandong, Hebei, Zhejiang, Guangdong and Shanghai – have completed the provincial planning for offshore wind development projects while other provinces are in the process of finalising plans to meet 2020 targets. The province of Liaoning is awaiting approval of its development plan. The cumulative plans of these provinces provide preliminary assessment of the potential for offshore development. These provinces have many projects in the planning stage. Jiangsu is expected to have the highest on-ground installed capacity of 2 GW by 2015 while the provinces of Hebei, Shandong, Shanghai, Zhejiang and Guangdong are expected to develop 0.5 GW of installed capacity by 2015. Fujian is expected to reach 0.3 GW in comparison over the next three years.

The shores off Fujian have the highest wind speeds of the order of 10 m/s, (akin to conditions in the North Sea in Europe) and are considered most conducive to high production of electricity from offshore wind. In all other provinces, wind speeds range from 6 m/s to 8 m/s; conditions which are also favourable for harnessing optimum levels of output. The southern provinces of Fujian and Guangdong are characterised by frequent typhoons (about 3-4 every year) and hence development can only be planned in zones not susceptible to frequent bad weather. Jiangsu, Shandong and Zhejiang are considered relatively safer and due to their proximity to major load centers, hold potential for offshore development. These provinces have many projects in the planning stage. Jiangsu is expected to have the highest on-ground installed capacity of 2 GW by 2015 while the provinces of Hebei, Shandong, Shanghai, Zhejiang and Guangdong are expected to develop 0.5 GW of installed capacity by 2015. Fujian is expected to reach 0.3 GW in comparison over the next three years.
Bottlenecks in China’s offshore wind industry

The offshore wind industry is at a nascent stage, with only a few projects having been installed so far. Suppliers and equipment manufacturers are researching new equipment and installation methods to serve the growing needs of this budding industry and to establish a sustainable business model. China is continually seeking to establish a stable policy framework which will go a long way in promoting offshore wind developments.

Low level of co-operation between the project approval agencies

For an offshore wind project to be given consent in China, approval is required from the National Development and Reform Commission and the State Oceanic Administration. The National Development and Reform Commission designates the developer and moderates the agreement on the feed-in tariff rate for a project. The State Oceanic Administration approves the site for construction of the plant proposed by the developer.

A low level of co-operation between the two agencies and a rebuttal on finalising the site of construction had for long adjourned the allotment for projects under the first concession. While the National Development and Reform Commission in its charter has committed to developing offshore wind farms, the State Oceanic Administration has no particular mandate for allotting site approval for offshore wind projects. The lead time for site clearance from the State Oceanic Administration has led to the project consents getting delayed.

The cumulative 1 GW projects awarded through the first concession round in the fourth quarter of 2010 are not to begin construction until the fourth quarter of 2013, as the site initially allotted by the National Development and Reform Commission was not approved by the State Oceanic Administration. The sites were eventually changed after the release of the Implementation Rules in July 2011, and the projects initially got approval in the first quarter of 2013: “A delay in final approval post the concession round in 2010 only added to the planning and cost burden of developers.

To ease the approval process, the State Oceanic Administration must earmark areas in the medium-deep offshore region that are suitable for offshore wind development. As in the case of Europe, a clear definition of development areas would ease the overall process and accelerate growth in the market.

Low tariffs impacting developers’ bottom line

The feed-in tariffs which won the bids for the construction of offshore wind projects in the first concession round are not feasible to develop a sustainable industry. While the winning tariffs were in the range of CNY 0.62-0.76 per kWh (EUR 0.076-0.091 per kWh), they are only around 30% higher than the feed-in tariffs announced for the construction of onshore projects which ranged from CNY 0.51-0.61 per kWh (EUR 0.063-0.075 per kWh). Considering the cost of construction of projects offshore is roughly 2-3 times more than that of an onshore project, it is expected that the developers will lose money on the projects awarded in the first concession, even if these have lower costs by the virtue of them being located in the intertidal regions and not in the deep sea.

The figure highlights the difference between onshore and offshore wind.

Such low feed-in tariffs will not be feasible for sustainable development beyond the demonstration projects, and the local industry is increasingly acknowledging this point.

In early 2012, Li Junfeng, the then Secretary General of China Renewable Energy Industries Association, stated that, “The tender winning feed-in tariffs are too low. Considering construction costs, the offshore concession project developers will lose money.” He continued, “The government will review the first four offshore projects and changes in the
feed-in tariff are likely". The ideal price for development of offshore wind farms is quoted in the range of EUR 0.098-0.148 per kWh and is somewhat in line with the EUR 0.156 per kWh estimated feed-in tariff required to obtain an 8% internal rate of return.

The key reason for the quoted feed-in tariffs to be lower than the required level of tariffs is that the developers intended to gain first-hand experience of constructing and managing offshore wind farms. The winning players intended to leverage the first-mover advantage and the experience to successfully compete for large-scale projects that are currently in the planning stage. The developers’ propensity to trade off project returns with experience in managing large-scale projects led to the significant difference between the CAPEX cost and the feed-in tariffs.

These two bottlenecks indicate that the existing policies need to be amended to ease the location of the projects and to ensure competitive and sustainable feed-in tariffs. With a favourable policy regime in place, the offshore wind industry is expected to showcase a similar trend of accelerated growth as observed in the case of onshore wind. The onshore wind industry in China witnessed a growth rate of over 100% after struggling for 2-3 years until suitable tariffs and policies were implemented. The offshore wind industry is expected to follow suit and economies of scale are expected to bring returns to investors and developers as the industry takes off.
Resolution of market inhibitors

Chinese regulators and industry players have realised the existence of bottlenecks and positively reacted by enforcing changes in policies and strategies. New regulatory measures have been announced and the industry has been accorded a priority status. Issues on tariffs are under discussion between the industry and regulators and a parallel direct approval process has been introduced to ensure that projects are not stalled. A first of its kind consortium for offshore wind development has also been formed to enable industry partnerships.

Release of construction measures and direct approvals

The provisions defining the construction and operation of offshore wind projects in July 2011 have led to significant clarity of project location sites for the developers. Developers have been scouting for projects in provinces which have completed their planning and have been awarded direct approvals by the authorities to conduct studies and begin construction. These “pilot” projects will not only provide experience to developers but will also give the authorities an insight into the challenges of construction of offshore wind projects and required tariffs, and the turbine makers an opportunity to test their technology. Despite the delay in approval of projects awarded under the first concession bidding, the government has adopted the direct approval mechanism to award projects. This has rebounded the flagging growth in this sector and helped bringing various stakeholders up the learning curve of the dynamics of this industry.

Priority status to offshore wind industry and “tariff discovery”

The offshore wind industry has been accorded a priority status by the National Development and Reform Commission in its revised list of industrial categories that are to be encouraged through preferential policies. This would enable developers to have a better access to funding and faster sanctioning of project sites. The release as of February 2013 lists offshore wind construction as well as equipment manufacturing establishments for intended benefits. The revised catalogue, which was effective from May 2013, is expected to boost government benefits towards the complete supply chain of the sector. In the light of the granting of the priority status to the offshore wind industry, the Vice Minister for National Energy Administration, Liu Qi, remarked that the offshore wind tariffs are inadequate and benchmark prices could be established and that the Agency must “take large-scale development of offshore wind power as a priority for China’s wind power expansion”. It would be reasonable to expect that the experience from direct approvals given to developers over the last few years will help the authorities discover the right benchmark prices to sustainably develop the market.

Consortiums being developed to ease financial risk

The offshore wind business model in China is evolving into partnerships amongst major stakeholders in the value chain. In June 2012, nine organisations, including a grid company, a wind turbine manufacturer and independent power producers, formed a joint venture. The goal of the joint venture, South Offshore Wind Joint Development, is to combine efforts of the major players in the energy sector to develop offshore wind specifically in Guangdong. The notable partners include Ming Yang, South China Power Grid, Yuedian Group, China Three Gorges and Guangzhou Development Renewables. Eight companies have an equal stake of 10% each in the joint venture. Combined involvement of the state grid company and several state-owned utility companies and WTGs is expected to allow the project construction, grid connection and payment of tariffs to work smoothly and reduce financial and construction risks associated with the projects. This is likely to improve funding availability for such consortiums and allow for a faster approval process with active participation of provinces. Although it is the first collaboration of its kind for the offshore wind industry in China, if successful, it will set a trend for the future. Furthermore, participation in consortiums like these will also accelerate development of WTG technology in the industry, as the WTG manufacturers obtain a platform from which to test and develop their technology.
We have observed that the Chinese government is sensitised to the bottlenecks that exist in the offshore wind industry and has proactively displayed a positive intent to correct procedural delays and moderate tariffs. We expect a rapid pick-up in the industry, allowing it to move from the demonstration stage to the commercial stage with about 10 projects expected to start construction in 2013. In total, there are 16 projects which have been granted approval, 8 of which are in Jiangsu, and more than 30 projects of an 8.1 GW total capacity have been given early-stage approvals in the provinces of Fujian, Hebei, Shandong, Jiangsu and Zhejiang. This affirms the fact that despite delays, the industry remains bullish about growth and development.

The figure highlights the timeline of important developments in the offshore wind industry in China.

Adjusting ambitions or catching up?

With about 628 MW projects already under construction, 400 MW installed capacity and about 3.4 GW of consented projects, we believe that China will get close to its 2015 target. All consented projects, which are allowed a maximum of two years from concession date to begin construction, will enter the building phase by 2014. Taking into account an average construction time for offshore wind of 1.2 years in China, we expect a realistic target of about 4.5 GW is achievable, hence an annual capacity addition of 1-2 GW. The expected rate of growth is greater than the current annual addition capability by the United Kingdom. While recent policy changes have raised market sentiment, refining project grant procedures and prioritising offshore wind farm construction should speed-track the development.

THE MILESTONE DEVELOPMENTS AND FUTURE TARGETS FOR OFFSHORE WIND IN CHINA

Table 1: Milestone developments and future targets for offshore wind in China

<table>
<thead>
<tr>
<th>Year</th>
<th>Milestone</th>
<th>Capacity (GW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>Renewable Energy Law established</td>
<td>0.2</td>
</tr>
<tr>
<td>2006</td>
<td>Development plan defining offshore zones</td>
<td>0.3</td>
</tr>
<tr>
<td>2007</td>
<td>Provincial development roadmap with non-binding targets</td>
<td>0.4</td>
</tr>
<tr>
<td>2008</td>
<td>Implementation of transitional policies on OW development and construction</td>
<td>1.5</td>
</tr>
<tr>
<td>2009</td>
<td>Shanghai Donghai Bridge 102 MW phase 1 started construction</td>
<td>5</td>
</tr>
<tr>
<td>2010</td>
<td>Shanghai Longyuan Power Group 55 MW OW farm connected in July</td>
<td>1.1</td>
</tr>
<tr>
<td>2011</td>
<td>Jiangsu Rudong intertidal (35 MW) demonstration completed phase I (30 MW) started</td>
<td>1.3</td>
</tr>
<tr>
<td>2012</td>
<td>Shanghai Lingang 102 MW OW farm completed and connected in December</td>
<td>1.1</td>
</tr>
<tr>
<td>2013</td>
<td>Rudong intertidal phase I and phase II (50 MW) completed in November</td>
<td>1.5</td>
</tr>
<tr>
<td>2014</td>
<td>Projects expected to start in 2013 and likely to be completed by 2016</td>
<td>3.0</td>
</tr>
<tr>
<td>2015</td>
<td>1 GW projects assigned in the first concession</td>
<td>3.5</td>
</tr>
<tr>
<td>2016</td>
<td>Shanghai Lingang 102 MW OW farm</td>
<td>4.0</td>
</tr>
<tr>
<td>2017</td>
<td>Jiangsu Rudong 50MW OW Offshore Wind Farm</td>
<td>4.5</td>
</tr>
</tbody>
</table>

* Since first concession projects were approved in Q1 2013, second concession is expected to take place by 2014

Source: MEC Intelligence analysis; Quartz+Co analysis

Investment activity

The number of investors will have to increase to ease requirement of finances for 2020 target

The investment market for the offshore wind industry in China is limited to state-owned utilities (with high cash reserves) and China Development Bank. Major WTGs have also acquired sizeable loans and credit lines from the bank.

In the present scenario, the cash reserves from utility companies along with financial support from the China Development Bank seems sufficient for the investment required for development in the next 2-3 years. However, with about EUR 120 billion required for developing 30 GW, the industry will have to attract a greater number of investors. Recent amendments to the project grant and approval policy are bound to improve the return on investment and make offshore wind projects viable for investors. The collaborative partnership model for region-specific development allowing easy access to funding may set the trend for the future.

At the same time, it remains to be seen if the government authorities in China will promote foreign participation in the development of offshore wind farms. Considering that the high construction risks inherent in offshore wind projects might block a large amount of capital from domestic utilities for an uncertain amount of time, the government would need to take measures to ease and diversify funding opportunities to ensure that the industry is adequately financed.
Construction of offshore wind farms is capital and technology intensive and requires collaboration between project developers, consultants, equipment providers and service providers. Overall, there are eight categories of stakeholders directly involved in the construction, operation and maintenance of an offshore wind farm.

The figure highlights the existing value chain in China and the key players at each stage.

As the current build-out in the industry comprised of the demonstration stage projects, companies have been successful in servicing the demands of the industry by using make-shift equipment to plug supply gaps and building capacity internally. The first-movers in this sector have primarily been state-owned companies. We have noticed that each part of the value chain is concentrated among a few players. There are 5-8 players at the developer category and WTG category, whereas other parts of the value chain have registered presence of 4-5 prominent players until now.

In this section, we will explore these market characteristics and market incumbents to develop an understanding of the maturity of the supply chain, assess the supply demand scenario and outline the factors that are driving or inhibiting participation of players in each part of the value chain.

**Figure 6: China offshore wind value chain and key players**

### Stakeholders Dominated by

- **Government agencies**
  - East China Investigation and Design Institute (mandatory participation)
  - Bureau Veritas (power plant supervision)

- **WTG manufacturers**
  - China Longyuan Power Group
  - China Datang
  - Guadian Nuclear Power Holding Corp.
  - China National Offshore Oil Corporation
  - China Three Gorges
  - China Huadian Group

- **Fabrication**
  - Marine engineering
  - Design specialist co.

- **Foundation manufacturers**
  - Foundations
  - Offshore WTG manufacturers

- **OEMs/WTG manufacturers**
  - United Power
  - Sinovel
  - Xinjiang Goldwind
  - Mingyang
  - Dongfang Electric
  - United Power
  - Siemens/Shanghai Electrical
  - Vestas

- **Cable supplier**
  - Nexans
  - Qingdao Hanhe Cable
  - Shanghai Fujikura Cable
  - Ningbo Orient Wires & Cables

- **Project developers and WTG companies**
  - China Longyuan Power Group
  - Guangdong Nuclear Power Holding Corp.
  - Siemens

*Currently, all offshore projects are near-shore and are directly connected to onshore grids; hence, offshore wind projects in China have not utilised offshore substations yet. ABB is the major player servicing the offshore oil and gas industry in this segment in China. Source: Mondaq, China: China Issues Offshore Wind Farm Regulations, 2010; GL, Asian Wind Energy Market, 2011; Offshorewind.biz; MEC Intelligence analysis*
Developers

Developers are primarily state-owned utilities. The regulation mandating at least 51% local ownership for developers will provide an advantage to domestic companies. Due to their offshore experience, state-owned companies are likely to remain the dominant players in the future. To beef up their positioning in the market, these developers have formed partnerships with local WTs and invested in various parts of the value chain. From a foreign company/investor’s perspective, partnerships with local players will be key to participate in projects in China.

The chart alongside also indicates that the developer segment is currently expected to be dominated by state-owned utilities in China.

By 2020, China Longyuan Power Group (China Guardian Corporation), China National Offshore Oil Company, China Huanong Group, Datang Corporation, China Huadian Group and China Three Gorges are likely to be the top developers in terms of installed capacity and planned capacity.

Utility companies have an interest in developing offshore wind as they are required to have at least 3% non-hydro power renewable source in their energy consumption portfolio. The utility companies participating in the offshore wind market are not only cash rich but are also supported by funds from the China Development Bank, which is acting as chief financier across the value chain.

There has been limited involvement of foreign companies at the developer stage, largely due to the regulatory requirement capping a minimum of 51% ownership for Chinese firms. In addition, the delay in the declaration of a clear policy which outlines the roadmap and process to achieve the targets in offshore wind led to scepticism.

Domestic developers have been largely ingenious with the overall project management and technologies used. However, recent news of a partnership between Furnas, a subsidiary of Eletrobras, Brazil’s largest utility company, and China Three Gorges to jointly invest in and develop offshore wind farms in China and internationally is expected to drive future trends. Foreign utility companies seeking to gain experience within development of offshore wind projects could look at forming similar kinds of partnerships with Chinese companies to invest and gain experience to replicate the model in other geographies.

The table below illustrates the offshore wind experience of developers in terms of installed capacity and planned capacity:

<table>
<thead>
<tr>
<th>Developer</th>
<th>Installed capacity</th>
<th>Planned capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>China Three Gorges</td>
<td>695</td>
<td>1,250</td>
</tr>
<tr>
<td>China Longyuan Power Group</td>
<td>2,075</td>
<td>232</td>
</tr>
<tr>
<td>China Datang Corporation</td>
<td>700</td>
<td>102,175</td>
</tr>
<tr>
<td>China Guangdong Nuclear</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>China National Offshore O</td>
<td>950</td>
<td>905</td>
</tr>
<tr>
<td>China Huadian Group</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>China Huaneng Group</td>
<td>492</td>
<td>254</td>
</tr>
<tr>
<td>China Yudean Group</td>
<td>200</td>
<td>194</td>
</tr>
<tr>
<td>China Huadian Group</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>China Yudean Group</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>China South Oil Joint Development</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Presence in supply chain

- No: No involvement in supply chain
- Yes: Involvement in supply chain

Note: Company plans include loans taken to develop future offshore wind farms in addition to the projects already in planning/consent/construction stage

** Turnover figures according to the latest available year

Source: GWEC; MEC Intelligence analysis

China National Offshore Oil Company has begun the first phase of a 1 GW wind farm in Bohai Bay and has received a funding of EUR 1.7 billion from the Chinese government. Its foray into the offshore wind industry comes as no surprise since it is familiar with offshore technical and engineering issues by virtue of its rich experience in oil and gas exploration.

As opposed to the situation in Europe, developers are mostly operating individually with the goal of learning the ropes. However, South Offshore Wind Joint Development is the first of a kind collaboration between nine enterprises to collectively develop offshore wind farms in the Guangdong province. This partnership not only allows the developers to gain experience in managing offshore projects but also in mitigating risks that stem from a weak supply and demand chain. An effective collaboration would increase access to public and private funding and increase chances of developement.

While the joint venture was formed in June 2012, collaborations among some of the members were visible a month earlier. In May 2012, two offshore wind projects in the Guangdong province with a cumulative capacity of 246 MW were granted consent. The developers – China South Power Grid, Guangdong Yudean Group and the WTG supplier Ming Yang – are all part of the joint venture. Hence, the collaboration among the players in the joint venture is already active, even though the consortium has not won a project yet.
Wind Turbine Generators (WTGs)

The European WTGs have been able to develop 5-6 MW capacity turbines, which are considered superior in technology to their Chinese counterparts. However, the Chinese WTGs operate on a cost-effective model and the Chinese have shown their intent to aggressively research and develop high-capacity 10 MW turbines. The race to develop high-capacity turbines and the low cost base of manufacturing in China are expected to induce competition between Chinese and foreign WTGs in the medium to long term. On the other hand, the Chinese WTGs, impacted by low profits in the onshore wind industry, would be keen on avoiding an unsustainable low-margin pricing model for offshore turbines. Understandably, foreign WTGs will have to contend with the competitive pricing of domestic WTGs, but the margins are expected to be on par with the European offshore wind industry and the Chinese onshore wind industry. Hence, foreign players will have to capitalise on their advantage of superior technology to combat the cost competitiveness of domestic players by forming partnerships with Chinese companies.

The main opportunity for foreign WTGs and component manufacturers to invest in the Chinese market lies in production and supply of downstream products such as control systems and power converters. Chinese WTGs have so far been unable to address downstream quality issues. While Chinese companies ramp up their production to meet future demand, support from other downstream suppliers will help appease any quality concerns. Benefits may be twofold, as foreign suppliers may look to service the local Chinese market and also to establish a global manufacturing hub in collaboration with local companies to provide competitive products in future offshore wind markets.

Chinese WTGs have dominated the market for offshore wind projects in China. At present, there are only two foreign players – Vestas and Siemens. So far, Vestas has had limited success in bidding for orders for the Chinese offshore wind market. Siemens, won part orders for the Rudong intertidal project (21 turbines of 2.3 MW) in early 2011, bringing the European technology into China’s local market directly. Interestingly, later that year Siemens formed two joint venture firms (with a 49% stake in both entities) with Shanghai Electric. One of these joint ventures was aimed at R&D and wind turbine equipment manufacturing, while the other was aimed at sales and distribution of turbines in the Chinese market. The joint venture firms have helped both companies strengthen their foothold in the Chinese wind market by complementing each other’s strengths; Siemens is a world leader within advanced technology, offshore know-how and has experience within project management, execution and service, while Shanghai Electric has been able to provide the alliance with great access to the Chinese wind turbine customers. Moreover, Siemens’ intention may have been to integrate China with its global supply network of WTG manufacturing. The supply of Siemens turbines reaffirmed the adaptability of European technology to Chinese conditions and allowed Siemens to benchmark the performance of its product against local alternatives.

For the first offshore wind project, the 102 MW Donghai Bridge project, the authorities retracted from awarding a contract to REPower due to a dispute on technology share rights on control systems. REPower quoted EUR 3.7 million per turbine which was higher than the alternatives. For the same project, a Chinese company, Sinovel, responded by bidding for a 3 MW alternative which it developed jointly with a United States-based company named American Semiconductor (AMSC). Sinovel retained the intellectual property rights, which were contested by AMSC and the dispute is now in litigation.

The figure gives an overview of the position of the WTGs in the Chinese offshore wind market in terms of turbine capacity and also their development focus.

It is reasonable to expect that the larger-sized turbines being developed by Chinese WTGs will not only serve the domestic market but will also compete with foreign players’ WTGs for international projects. The 6 MW turbine prototypes of several domestic WTGs are currently being tested, and most of them are expected to be commercially available by 2015. Additionally, a prototype of a 10 MW turbine is under
development and is planned for testing by 2015. The Chinese government has stated its intention to help develop 10 MW turbines in its wind power science and technology development five-year plan. It has awarded a EUR 5.2 million grant to Sinovel to accelerate development of the 10 MW turbine. Sinovel has further added EUR 34.5 million from its own cash reserves to meet the target. This level of commitment by the government and WTGs should help China reach its goal of producing next generation turbines. In contrast, European WTGs currently lead the market by virtue of their ability to develop 5-6 MW capacity turbines, but still have a long way to go in their efforts to develop 10 MW capacity turbines.

Meanwhile, Ming Yang (the only major private WTG serving the offshore wind industry in China) has recently partnered with multiple developers with the vision to test its technology and ensure future orders. This move is highly strategic, as the current level of competition is not too high to expect partnerships across WTG companies, but it indicates the level of competition within WTGs foreseen in the future. Ming Yang has formed individual strategic partnerships with developers such as China Guangdong Nuclear and Yudean Group for provincial offshore wind development. It has also obtained a preferred supplier status from China Three Gorges for development in the Guangdong province.

The Chinese supply chain is relatively immature to provide high-quality downstream components such as control systems and power converters. Most of these components are currently being sourced from foreign players. The concerns about the quality of domestic downstream technology were exacerbated when Sinovel’s wind turbines in a pilot intertidal project required replacement of several parts due to rusting. However, in order to build confidence in being able to compete in global markets, Chinese WTG manufacturers are expected to ensure stringent quality checks and to apply for international certifications that endorse their products. Considering that Chinese WTGs are still in the early stage of development, they would need to source quality components from foreign companies. Goldwind has already announced its intention to increase international component sourcing to about 50% of its needs. Such collaborative plans provide a significant opportunity for foreign companies that provide downstream components to expand to China’s market.

As WTGs scramble to service an industry demand which seeks to grow at a CAGR of 25% from 2015 to 2020, it only adds to the opportunity. Moreover, an entry into the Chinese offshore market could open doors to further opportunities in other Asian countries that are looking to explore offshore wind.

In an overall industry roundup, eight existing WTGs are currently serving the offshore wind market in China and these seem to have sufficient supply between them to meet demands up to 2015. However, the picture up to 2020 remains unclear with a requirement of over 6,000 turbines to meet the target. The challenge is to manage availability of high-tech, high-quality downstream components. Commercialisation of larger-capacity turbines will be a major factor in keeping turbine supply in line with demand.
In the offshore cables industry, we have noticed a coexistence of international and local suppliers. These suppliers have a comparable technology and the total production is sufficient to meet the demand of the industry. Offshore substations have not been utilised in China’s offshore wind industry so far, but the presence of international companies like ABB and the experience of Chinese companies with the domestic offshore oil and gas industry will work in their favour, should a demand arise in the future. However, the market is likely to witness a shortage in the case of cable laying vessels.

The cable segment of the offshore wind value chain in China is dominated by Chinese companies. So far, state-owned Jiangsu Zhongtian Technologies has provided cables for all connected offshore wind farms in China. The other incumbent players, which provide medium/high voltage AC/DC cables, are currently providing cables as per orders, largely owing to the limited demand. They have no immediate plans to scale production capacity dedicated to offshore wind in the short term.

CABLE COMPANIES HAVE TECHNOLOGICALLY ADVANCED PRODUCTS THAT ARE SUITABLE FOR USE IN THE OFFSHORE WIND INDUSTRY

<table>
<thead>
<tr>
<th>Submarine cable category</th>
<th>Medium voltage</th>
<th>High voltage</th>
<th>Offshore wind experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies</td>
<td>20-35 kV</td>
<td>-30 kV</td>
<td>-220 kV</td>
</tr>
<tr>
<td>Jiangsu Zhongtian Technologies (ZTT)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Qingdao Hanhe Cables</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Ningbo Orient Wires and Cables</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Nexans</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Fujikura Shanghai Cables*</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>

*Product portfolio taken from the Japan-based parent company Fujikura Ltd. Source: Company websites; MEC Intelligence analysis; Quartz+Co analysis

Foreign players such as France-based Nexans and Fujikura Shanghai Cables are focusing on the offshore wind industry in China with a goal to serve expected future demand. Back in 2011, Nexans formed a joint venture with Shandong Yanggu Cables Group by purchasing 75% of the shares in the company. The joint venture was part of Nexans’ move to gain a foothold in China’s growing energy infrastructure market. The group has plans to upgrade facilities for offshore cables and increase its production capacity. It also plans to foray into the high-voltage cable market as demand grows and subsequently establish itself as a turnkey solutions provider. Fujikura Shanghai Cable, a joint venture between Japan-based Fujikura Group and China-based Shanghai Cable Works, formed in 2005, manufactures ultra-high voltage submarine cables. The parent company, Fujikura Group, is now developing cables for large-scale offshore wind power generation.

The figure highlights the product portfolio of the major submarine power cable providers in China.

Currently, all active offshore projects in China are directly linked to the onshore grid without any offshore substations. The first phase (32 MW) of the Rudong intertidal offshore wind farm (total: 232 MW) was connected via a 35 kV submarine power cable from Zhongtian Technologies to an onshore substation, where it was stepped up to 220 kV. While this has worked out well so far, future projects farther out into the sea will require offshore substations and high-voltage cables. Companies, including international players such as ABB, serving the offshore oil and gas industry in China, have the capability to design and install such substations.

Cable supply seems sufficient to meet the demands for achieving the 2015 target. The current annual domestic production capacity is about 3,000 km of submarine cable, while the annual demand from offshore wind farms up to 2015 is about 620 km. Incumbent players can manage this demand with the existing facilities by optimising production. However, beyond 2015, production units of submarine cables will need to be expanded to meet the increased scale of demand. As existing suppliers are capable of ramping up production, it is assessed that the cable supply will not be an impeding factor despite the high demand, even in the long term.

Cable laying vessels, which are shared from the telecommunication and oil and gas industries, do not seem sufficient in number for long-term development. Moreover, as China’s offshore industry is increasingly shifting to deep waters, larger cables will have to be laid down. This will prompt requirement for larger, custom-built vessels. Hence, availability of cable laying vessels is seen as a greater concern compared to supply of cables even for meeting the 2015 target.
Foundations

Chinese companies have had to face no major threats or challenges for laying foundations for offshore wind industry. Most projects so far have come up in the regions closer to shore that require multi-pile foundations (due to muddy seabed) compared to projects in Europe where mono-pile foundations are typically used for shallow-water establishments. Since new developments in China are going to push offshore development in deeper waters, the needs of the Chinese offshore industry will converge with European foundation technologies – jackets and tripods. This creates potential for joint collaboration on developing foundation technology and business.

The figure compares the use of foundation types in the offshore wind industry in Europe and China and also highlights the expected change in usage of foundation type by 2020 in both regions.

Various types of foundations – including multi-piles, mono-piles and jackets – have been tested in demonstration projects. The Chinese seafloor is characterised by a soft seabed, which makes the use of mono-piles unsuitable. The soft seabed requires foundations that provide lateral stiffness and mono-piles are structurally unfit to provide the necessary strength to the structure. The expected commercial use of larger turbines of 5-6 MW capacity also reduces scope for mono-pile foundations. Of the commercially available alternatives, jackets and multi-piles hold promise as technologies for offshore projects in China. Multi-piles provide better fatigue resistance and are suitable for water depths of less than 30 metres. Hence, by 2020, multi-pile technology is expected to be used predominantly for projects that are being constructed at water depths of less than 30 metres. In addition, jackets, which are used extensively in the offshore oil and gas industry, are more suitable for even deeper waters. However, the foundations used in the oil and gas industry will need to be modified as the offshore wind foundations are designed for fatigue compared to foundations for the oil and gas industry, which are designed for maximum load.

The fabrication segment of the foundations segment of the value chain is dominated by domestic players. This does not come as a surprise, since China is known as a fabrication hub mainly due to its cost-effective production capabilities. On the other hand, the design segment is limited to a handful of domestic players. Developers have to assume the responsibility of obtaining designs and subcontracting the fabrication work and often have to employ foreign companies for creating designs.

The foundation market is concentrated among 3-4 players. Jiangsu Longyuan Zhenhua Marine Co., a joint venture between China Longyuan Power Group (developer) and ZPMC (ship construction company), was formed to provide overall offshore wind farm construction equipment and services including foundations and logistics. Currently, the joint venture is only catering to China Longyuan Power Group’s project needs. China Offshore Oil Engineering Corporation (COOEC) is the offshore engineering and construction arm of state-owned China National Offshore Oil Company and has extensive experience in the foundations segment of the offshore oil and gas industry. Nantong Ocean Water Conservancy Engineering also provides logistics and installation services apart from foundations. Jiangsu Daoda Heavy Marine Industry (DDHI) considers the offshore wind construction business as a core growth area. It has provided and installed a suction bucket foundation in a test project in 2010. DDHI owns fabrication facilities, which can be ramped up to compete with the incumbent players in the offshore wind industry.

In terms of demand, the Chinese offshore wind industry requires about 1,500 foundations to meet its 2015 target. Cost-effective manufacturing is China’s forte and with companies such as COOEC at the forefront of the foundation laying business, China is expected to cover its demand for 2015 targets. However, in order to meet the 2020 targets, the industry would require about 6,000 foundations within a span of five years. The projected demand might not be met with the current set of suppliers. Hence, the industry would require entry of new players or that incumbent players boost their production capacity and set up new fabrication units to match industry growth targets. Based on interaction with several industry players, we believe that Chinese companies are capable of quickly expanding infrastructure to meet the demand. However, fabrication companies have low design capabilities and it may pose a challenge for them to build a sustainable offshore wind infrastructure. Moreover, foundation designs will have to keep pace with the increasing size and capacity of the turbines. This presents an opportunity for foreign companies to partner with the fabricating companies or with developers to provide superior design services.

Multi-piles are most likely to replace high-rise pile caps as preferred foundation types for offshore wind in China. By 2020, similar foundation types are expected to be used in Europe and China.

<table>
<thead>
<tr>
<th>Foundation types</th>
<th>Current use</th>
<th>Future use (2020)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Europe</td>
<td>China</td>
</tr>
<tr>
<td>Mono-piles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-piles (tri-pile, ground-pile, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tripod</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jackets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravity base-concrete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-rise pile cap</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: EWEA, European Offshore Wind Industry, 2013; MEC Intelligence analysis; Quartz+Co analysis
In the logistics part of the value chain, the Chinese players leverage their extensive experience in the offshore oil and gas industry and are expected to rely on local floating vessels for installations. By contrast, jack-up vessels are extensively used in Europe for offshore establishments. However, the growth in demand for vessels leaves tremendous scope for foreign companies to serve the Chinese market. China Datang Corporation has recently signed a four-year lift-boat charter contract with Singapore-based Ezion Holdings for offshore wind development, which is a testament to opportunities for foreign players. The best approach for foreign companies to enter China’s market in this segment is to partner with local companies. The existing offshore wind farms in China have used floating cranes along with barges to transport and install wind turbines and foundations.

Owing to the soft seabed conditions, jack-up vessels are not suitable for installation in the upcoming regions of development. Hence, floating cranes are expected to remain the primary vessels used for future installations. Offshore wind farm construction companies have used re-fitted cable laying vessels from telecommunication and oil and gas industries. The logistics and installation market for offshore wind in China is unstructured with no clear market leaders. Just as in the case of other parts of the value chain, domestic companies dominate the logistics/installation space due to low scale of development. The domestic companies are leveraging their knowledge from the offshore oil and gas industry to serve the offshore wind industry. At the global level, there is an absence of a healthy cushion of available vessels. The logistics and installation market is currently concentrated among few domestic players. The best approach for foreign companies to enter China’s market in this segment is to partner with local companies. The existing offshore wind farms in China have used floating cranes along with barges to transport and install wind turbines and foundations.

### THE LOGISTICS AND INSTALLATION MARKET IS CURRENTLY CONCENTRATED AMONG FEW DOMESTIC PLAYERS

<table>
<thead>
<tr>
<th>Logistics players</th>
<th>Installed capacity MW</th>
<th>Planned capacity MW</th>
<th>Turnover EUR millions</th>
<th>Presence in other parts of the supply chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCC Third Harbor Engineering</td>
<td>113</td>
<td>800</td>
<td>33,773</td>
<td>No</td>
</tr>
<tr>
<td>S.B. Submarine Systems</td>
<td>0</td>
<td>0</td>
<td>128</td>
<td>No</td>
</tr>
<tr>
<td>Nantong Ocean Water Conservancy Engineering</td>
<td>247**</td>
<td>200</td>
<td>N.a.</td>
<td>Yes</td>
</tr>
<tr>
<td>Daoda Marine Heavy Industry***</td>
<td>3</td>
<td>N.a.</td>
<td>N.a.</td>
<td>Yes</td>
</tr>
<tr>
<td>Jiangsu Longyuan Zhenhua Marine</td>
<td>247**</td>
<td>N.a.</td>
<td>N.a.</td>
<td>Yes</td>
</tr>
<tr>
<td>Sinohydro Bureau 7 Co. Ltd.****</td>
<td>8</td>
<td>100</td>
<td>N.a.</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* Turnover for parent company – CCC  
** Jointly developed by NTOC and Jiangsu Longyuan Zhenhua Group, including prototypes  
*** SBSS will focus on cable laying and is yet to procure vessels. Turnover is for parent company Global Marine System  
**** Daoda Marine Heavy Industry possesses wind turbine installation vessels and has completed tests on a 2.5 MW pilot project  
***** Sinohydro Bureau 7 Co. Ltd. installed a total of 75 MW in Xiangshui Intertidal Pilot Project  
Source: Company websites; Offshorewindchina.com; MEC Intelligence analysis
vessels specially intended for offshore developments. Hence, if foreign vendors plan to service the Chinese market in the medium to long term, they may have to free their existing vessels from current jobs or order new vessels. Due to the planned growth in Europe and vessel operators’ non-familiarity with the working conditions in China, there is limited chance that players choose to invest in China over Europe. Hence, the foreign players are advised to monitor the development in China and Europe to plan for the right business model to enter the market.

Overall, the supply-demand scenario is stable up to 2015 with a number of installation vessels already existing in the market and few more likely to enter the supply chain this year. Beyond 2015, increase in scale and requirement of purpose-built vessels will require efforts from industry players to boost supply. The current demand can be reasonably met due to the presence of ship construction companies with advanced production facilities capable of churning out a large number of purpose-built vessels for the offshore wind industry.

In terms of supply, there are six wind turbine/foundation installation vessels and one cable laying vessel currently in the offshore wind market in China. This is to be supplemented by six more turbine installation vessels, which are currently under construction. Out of these, four will be ready for use by mid-2013. Since the expected demand for the number of turbine installation vessels by 2015 is around 11, supply is expected to meet demand. Post 2015, as size of turbines increase with commercialisation of greater capacity turbines, larger purpose-built installation vessels may be required. China’s ship construction companies such as ZPMC and COSCO have extensive production capacities and are experienced in building vessels for the global offshore wind market. In a broader view, the future supply scenario for installation vessels looks secure. The supply of cable laying vessels may present an opportunity, as annual offshore wind additions are expected to reach 2 GW. Currently, only S.B. Submarine Systems has plans to build specialised cable laying vessels specifically for the offshore wind industry in China.

The overall supply and demand scenario towards the next horizons

The supply scenario in each part of the value chain is stable in the short term with either existing capacities or strong capabilities of companies expected to meet the foreseen demand. Considering the picture up to 2015, there are currently over eight major WTGs in the market for nearly 400 turbines required annually, a number of players offering advanced fabrication infrastructure to build an equal number of foundations, a total availability of 10 installation vessels (by the end of 2013) which is sufficient to handle the expected demand and local cable suppliers who are capable of meeting an annual demand of about 620 km of submarine cable required for the construction. This provides a strong picture of the supply chain given the small scale. Yet, there are key areas in the supply chain where the supply needs to be augmented. Technology to manufacture high-tech downstream WTG components, designing of offshore wind foundation and experience in overall project management are a few areas that present a scope for improvement for Chinese companies. The shortage of specialist cable laying vessels is a greater threat than shortage of cables. This shortage of cable laying vessels should temporarily be dealt with by make-shift vessels as projects are closer to shore.

In contrast, the picture after 2015 is completely different. With massive growth planned in the installed offshore capacity, the economies of scale are expected to push all supply verticals to their limits. The demands at each stage of the value chain for the period between 2015 and 2020 will spike – about 6,000 turbines, an equal number of foundations with strength to support larger-capacity turbines, purpose-built vessels and roughly 8,000 km of submarine cable will be required. Key areas of concern will be the supply of quality downstream WTG components, purpose-built cable laying vessels and foundation design. In addition, the developers’ know-how of managing large-scale supply chains will be tested and they will come under pressure from the perspective of investments required. The expected increase in demand alone indicates that each part of the value chain will have to undergo a considerable reform.
Is the Chinese offshore wind industry an attractive market place for foreign players or will it be “self-sufficient”?

Considering the developments in the onshore wind industry where low feed-in tariffs and lack of grid connection have curtailed the industry’s growth, we foresee market entrants to have a cautious approach towards the Chinese offshore wind market.

However, we believe that the offshore wind industry will develop independently of onshore wind and will take into account the learning from onshore wind. Also, players would need to chalk out a measured strategy and develop co-operative business models along with the right timing to maximise the opportunity offered by the offshore wind market in China.

Evolving policy

The Chinese government has shown its intention to make this industry sustainable. Recent developments indicate that there is a cognisance of this fact and the government is evolving its policy with regard to the supply chain. Offshore wind has recently been given priority status and it augurs well for the development of the industry. The government has taken the first step towards rectifying the problem of low tariffs by trying to discover benchmark prices through direct approvals rather than the tendering process. It is expected that competitive benchmark prices (as in onshore wind) will be introduced to allow investments and technological development in this sector. Furthermore, the government has extended its learning from onshore wind and has introduced a grid connection approval mandate before construction begins to avoid curtailment due to lack of grid connection.

Know-how would be the key to unlock potential

Offshore wind is a capital and technology-intensive industry. Experience and know-how are pivotal to successfully build out the offshore wind capacity in China, and since China’s supply chain is at a nascent stage, the opportunity for foreign companies is immense.

The figure compares the Chinese maturity level in terms of experience and quality of service/products to European companies at various stages of the offshore wind supply chain.

Chinese companies that are currently servicing the offshore wind industry lag behind their European counterparts mainly at the project management (developer), foundation and WTG stages of the value chain.

European players’ know-how in terms of project management, design and sophisticated technology of the key components is highly desired by the Chinese companies, especially since a majority of the construction will happen between 10 km to 30 km from shore – which is considered a sweet spot for the European developers.

CHINESE OFFSHORE WIND INDUSTRY MATURITY BENCHMARK AGAINST EUROPE

Source: MEC Intelligence analysis; Quartz+Co analysis
There is a concrete opportunity for foreign developers to share contracting/subcontracting models as the scale of projects increases in China. This can significantly help the Chinese developer companies bridge the gap and understand supply chain intricacies and to optimise processes and rapidly reduce the cost required to set up an offshore wind plant.

Interestingly, the market has already seen a partnership between the domestic utility China Three Gorges and Brazil-based Furnas, a subsidiary of Eletrobras. This partnership allows the inexperienced company Furnas to enter the offshore wind industry, and might ease the path for China Three Gorges to enter Brazil’s offshore wind industry in the future. This model creates a win-win scenario for both parties where mutual co-operation leads to reduced financial burden, better access to technology and better understanding of local market conditions.

In WTGs, although Chinese companies have a fairly developed domestic supply chain in onshore wind, there are areas of co-operation on the manufacturing of sophisticated control systems for offshore wind turbines and optimisation of higher scale turbines as is the focus in Europe.

In foundations, Chinese soil conditions require development of multi-pile and jacket solutions, which is also the focus of development in Europe, and joint co-operation on the technology would help players from both industries accelerate the development and commercialisation of technology – compared to the pace at which they could do it individually.

A co-operative business model is a win-win situation for both the Chinese companies – which require the sophisticated knowledge – and the European players – which have the experience and the technologies required.

This co-operation will enable European companies to leverage China’s capability to serve as a manufacturing hub of the world and to be a part of the Chinese energy story.

Scale requires co-operation but caution

It goes without saying that the sheer scale of offshore wind build-out in China is attractive in itself for any supplier in the industry. Incumbent players in the industry gain from developing a low cost base in China to serve both the Chinese and European markets and eventually expand to other geographies.

At present, the scale of development in China is small compared to the country’s ambitious targets. As the industry and authorities come up the learning curve, the scale will increase, and Chinese developers and downstream suppliers will be hard pressed to single-handedly manage the capital and technology-intensive construction and will require external inputs to build a mature and quality-proven supply chain.

However, the timing of the foray is important. Experience in onshore wind informs us that the European WTGs were out-competed by the Chinese WTG players in the local Chinese onshore market over a span of 5-7 years, after the Chinese WTGs got around 25%-30% market share. The incumbent foreign WTG players in China lost market share, even when they had the first-mover advantage. This was primarily because the Chinese players were able to offer very low prices (bordering around 40% discount over European prices per MW in some cases). Thus, a well-defined entry-growth-consolidation model will go a long way in helping new entrants take stock of the Chinese offshore wind market. Late entrants find it even harder to profit from the market as Chinese companies have a credible propensity to scale production. Moreover, the Chinese local players evolve rapidly on cost and technology and the business model should be optimised to take advantage of the growth opportunity and the rapid maturity.

The challenge will be to understand and cope with local market conditions and gain access to local customers, which makes formation of joint ventures with local companies the most suitable option for foreign companies.
The Quartz+Co wind practice team (+30) consists of highly experienced partners, project managers and consultants that all have extensive “hands-on” experience from projects in the offshore wind sector including:

- Experience within offshore wind from projects for companies across the entire value chain
- Knowledge building through our strong network of relations with industry experts which allows for proprietary input on all of the eight key supplier industries
- Library of high-quality offshore wind data collected by our Business Intelligence department over the course of numerous projects
- Market research across all current and potential offshore wind markets through our research company MEC Intelligence (Marine, Energy, Cleantech)

The practice team delivers a wide range of services from due diligence, corporate strategy and sourcing strategies to category management, organisational transformation and execution support.

Quartz+Co, est. 2002, is firmly rooted in the traditional, professional values of high-end management and strategy consulting, as the founding partners all originate from the well-known top-tier companies in the industry. However, the ambition has always been to create something else – a Nordic original where clients are met with less standard methodologies and more listening, in order to tailor solutions to the clients’ specific challenges and opportunities.

At Quartz+Co, we emphasise rigorous analysis, but also the ability to induce behavioural change – as both these aspects are vital in delivering sustainable results. We deliver both analytical insight and impact through pragmatic and co-operative work processes, and pride ourselves with providing clients with unified, talented and prepared teams, consisting of people who see consulting as a profession rather than an early stepping stone on the career path.

Put simply, our clients can expect us to tackle and solve complex business issues, but also to engage and motivate all relevant people within the client’s organisation. They can also expect more experts than junior consultants, more flexible co-operation and less fixed procedures, more focus on making things work specifically and less focus on theoretical and historical best practices.

Quartz+Co is a 200-FTE company (2013) with offices in Oslo, Stockholm and Copenhagen, and while strategy development has always been the cornerstone, Quartz+Co today works extensively within transactions as well as with commercial and operational excellence programmes. We deliver these services to companies and organisations in a range of industries. Besides the energy/offshore wind practice, these include private equity, shipping, pharma/medtech, consumer/retail, government, etc. Approximately 40% of our work is outside Scandinavia.

Quartz+Co offshore wind practice

Anders Roed Bruhn
Head of OSW practice, Quartz+Co

Anders has worked in Quartz+Co for more than 14 years with a focus on large industrials and private equity funds in the European market.

Anders heads engagements with large supply chain players within the energy sector, especially offshore wind.

Quartz+Co: The Nordic original in top-tier management consulting

Thomas G. Arentsen
Head of Energy practice, Quartz+Co

Thomas has 17 years of experience in management consulting. In Quartz+Co, Thomas has primarily worked with strategy and transformation within the energy sector.

Thomas is experienced in both upstream and downstream across different energy sources.

Anders Roed Bruhn
Head of OSW practice, Quartz+Co

Niels Reiff Koggersbøl
Senior Partner, Quartz+Co

Niels has 21 years of experience from management consulting in the Nordic countries, the UK and the US for leading national and multi-national companies.

Niels is experienced within issues of strategy and operations – primarily for funds and clients within energy and industrial.

Sidharth Jain
Managing Director, MEC Intelligence

Sidharth heads MEC Intelligence (owned by Quartz+Co). He has more than 10 years of experience in the market research industry.

Sidharth was responsible for setting up the first dedicated strategic consulting research desk in Evalueserve and has worked extensively with top clients within the Maritime, Energy and Cleantech sectors.

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