China gets serious on offshore wind

EVEN WITH DOWNGRADED EXPECTATIONS FOR CHINA’S OFFSHORE WIND MARKET, THERE IS STILL A MAJOR OPPORTUNITY FOR THE COUNTRY TO POWER UP ITS COASTAL REGIONS FROM TURBINES AT SEA. AND SO, EVEN AS SOME INDUSTRY LEADERS STRESS THE NEED TO TREAD WITH CAUTION IN VENTURING OFFSHORE, LITTLE SEEMS SET TO DETER THE POWER HUNGRY NATION FROM DOING JUST THAT, AS GAIL RAJGOR REPORTS.

While China has forged ahead aggressively in developing wind power onshore in recent times, for years it was widely believed the greater energy generation potential lay in deploying wind technology offshore. The commonly held forecast for offshore, which had been based on a long-standing ‘preliminary’ assessment, had been for a staggering 750 GW, compared to 250 GW onshore.

Of course, over the years some have disagreed, arguing that the potential for offshore was far less. While some predicted far more. It all comes down to the methodology used to conduct an assessment, as Li Jungfeng, Deputy Director-General of the Energy Research Institute of NDRC & director of the China Renewable Energy Industry Association pointed out at a recent conference in Manila, the Philippines.

But it is the official national wind power resource assessment for the country that most eyes look to for guidance and the latest one, published late last year, slashes the 750 GW forecast by some 550 GW.

Conducted by China Meteorological Administration’s Wind Energy and Solar Energy Resources Evaluation Centre, the current forecast puts the country’s offshore wind potential at 200 GW, based on deploying turbines at water depths of 5-25 metres.

While offshore has been downgraded though, the onshore potential has sky-rocketed under the latest assessment. China, it says, has the potential for 2380 GW of class 3 wind power (average wind power density >300 W/m²) and 1130 GW for class 4 (average wind power density >400 W/m²).

With onshore wind farm development far cheaper than offshore, the increased forecast for onshore can only be good news, assuming the potential can be exploited and issues like grid infrastructure limitations overcome. The downgraded – although perhaps more realistic forecast for offshore however – is not necessarily a blow to the country’s ambitions either: “It still indicates that the wind resource in China is abundant,” Li says.
And those offshore resources are concentrated near the heaviest demand centres along China's east coast – unlike the bulk of the country's onshore exploitable potential, which is largely based in remote locations with difficult terrains, such as Inner Mongolia. So the possibility of installing offshore turbines along its coastline remains a big pull for leaders of this power hungry nation.

Plans to 2020

So far, China has just one operating offshore project, the 102 MW Shanghai Donghai Bridge wind farm, comprising 34 Sinovel (3 MW) turbines off Shanghai's coast. Last year, at the request of the National Energy Administration (NEA), the country's coastal provinces each drew up an offshore development plan to 2020, identifying the potential for inter-tidal projects (at water depths less than 5 m) and offshore (water depths 5-50 m).

Under their plans, Shanghai, Jiangsu, Zhejiang, Shandong and Fujian all hope to have a combined offshore cumulative installed capacity of some 10.1 GW by 2015 and 30 GW by 2020.

This year the Government has moved further forward in exploiting the potential offshore. In January it introduced offshore regulations, confirming that projects will be allocated via a state concession tendering process to determine who will develop the wind farms, as well as the price to be paid for the power generated. Under the regulation, only majority Chinese-owned ventures can undertake offshore project development.

The NEA issued the first tender call in May. This invited bids to develop four pilot projects totalling 1 GW in Jiangsu, with the results due to be announced in September. Two of the projects, Dafeng and Dongtai, are inter-tidal. Both will be 200 MW in capacity. The other two, Binhai and Sheyang, classified as fully offshore, will be 300 MW each.

Representing an expected investment of CNY20 billion and with expectations high that a further tender for another 5 GW is likely to be issued within the next few years, there has been a flurry of interest and activity from developers and equipment suppliers alike. China's leading wind developer, China Longyuan Power Group, is one of the known bidders in the 1 GW tender, while other domestic giants like Guangdong and China Power Investment Corporation are also expected to be contenders.

Longyuan has also set up an offshore wind manufacturing 50:50 joint venture (JV) in Nantong City, Jiangsu, in partnership with Zhenhua Heavy Industry Company. The new venture, called Jiangsu Longyuan Zhenhua Marine Engineering Company, will focus on the manufacturing and installation of steel structures, while also offering full construction, installation and maintenance services for offshore wind farms, including the provision of foundation systems and subsea cables.

Meantime, local and overseas turbine manufacturers are already busy battling it out, promoting their offshore technology and expertise. Leading domestic firms like Sinovel, Goldwind and Dongfang all plan to secure a big slice of the offshore market. Sinovel already has its 3 MW offshore units working at Shanghai Donghai Bridge, giving it a head start over its local rivals in terms of offshore construction and operational experience. Sinovel is also continuously developing additional products for the market, including a 5 MW offshore machine, the first prototypes of which it hopes to deploy later this year.

Goldwind has established the Goldwind & Dafeng Offshore Wind Industrial Base in partnership with the Dafeng Government, while Dongfang signed an agreement in January to develop a similar offshore base with the Government of Nantong city, and hopes to offer a 5 MW offshore unit to the market from 2012.

Other local firms busy preparing for business offshore include Shanghai Electric and Shenhua Group, XEMC (which has merged with Europe's Darwind in the hope of supplying turbines to the market), CSIC, United Power, and Yinhe Avantis Corporation.

Foreign suppliers are also stepping up. Siemens already has a blade facility in Shanghai and is hoping to establish an offshore turbine manufacturing centre in Weihai, Shandong Province.

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Global market leader, Vestas, officially launched its latest product, the V112 3.0MW, to the Chinese offshore market in June. The Danish firm, which already has a strong foothold in China and extensive manufacturing facilities there, said it is “proud to participate in China's development of offshore wind energy” and is “ready to develop China's rich offshore wind resources with its abundant experience in offshore wind energy and cutting-edge technology.”

The company’s Offshore President, Anders Søe-Jensen, warned delegates at June’s Offshore Wind China 2010 conference and exhibition in Shanghai that going offshore needs careful planning and the right expertise: “Offshore wind energy projects require far more thorough planning than onshore projects;” he said. “At sea, no infrastructure is in place, so the logistical challenges as well as challenges related to cabling need to be dealt with, while being attentive to safety, costs and the time schedule of the project.”

Unlike many of its Chinese turbine supplier counterparts, the company is fully capable of delivering on the first offshore projects in China, Vestas added. “By virtue of our many offshore projects from Europe, we have strong capabilities in planning, designing, executing and maintaining offshore wind parks,” said Vestas China President Jens Tommerup.

Dose of reality

Meantime, the sudden growth of the market has prompted some wind industry leaders to sound a stronger note of caution. Shi Pengfei, Vice-
Sinovel already has its 3 MW offshore units at work at Shanghai Donghai Bridge, giving it a head start over its local rivals in terms of offshore construction and operational experience.

President of China Wind Energy Association and veteran of the industry, Shi, is among them. China needs to see how the four pilot projects go before it makes any further decisions about going offshore, he says. Cost is a major factor and if it proves too high then China, he believes, should keep its focus firmly onshore.

Globally, project costs for the fledgling offshore wind industry typically run to at least double those for onshore, although the energy yield that results is far greater. But while China has proved a master at significantly driving down onshore costs compared with its global competitors, the same will not necessarily be true when it comes to the more difficult terrain offshore.

And the worry is that China will put its pride and ambition to be world leader ahead of facing reality. "More caution is needed when talking about offshore development in China," says Liming Qiao, Policy Director of the Global Wind Energy Council (GWEC), agreeing with Shi. But this does not, she stresses, have to be interpreted as a call to "postpone or delay" current offshore development – simply that "before massive offshore development, some serious discussions are needed."

In China, she explains, there is a cultural tendency to focus on quantity and be the champion in any given field. ‘Big’ and ‘ambitious’ are two words regularly used to describe the country’s onshore wind plans and already there are signs that offshore development is going this way. While onshore development has consistently surpassed even the most ambitious expectations, the sector globally is far more mature. The same cannot be said for offshore and in China right now "not enough attention is focused on the difficulties, mainly technical, such as grid integration," says Qiao. The focus is too much on talking about ambitious plans, she says.

The same is true to some extent of the offshore wind sector globally, Qiao adds: "In terms of offshore turbines, there is simply a tendency towards developing bigger machines," she says. "Even 5 MW [units] seem not to satisfy some."

Is bigger better?

Qiao has a point. Just days after she spoke to Renewable Energy Focus, Chinese turbine manufacturer Goldwind announced its intention to add a 6 MW direct-drive offshore turbine as part of its product offering. "The company’s 6 MW turbines will be developed, based on the proven operations of the 1.5 MW and 2.5 MW projects," it says. Furthermore, the company reckons it is “confident about the efficiency and reliability of the higher-capacity turbines.”

Goldwind is aiming to have its designs for the new turbine ready by the end of next year, with the first installation expected in the first half of 2012. And yet, the company has only just completed preliminary research work on a 5 MW unit, which it hopes to launch to market by the end of the year. The company cites the take-off of the Chinese offshore industry, increasing competition in the marketplace and the need to catch up with the global trend for bigger machines as the reasoning behind its decision to pursue the design of a 6 MW turbine so soon.

Goldwind’s two major domestic competitors, Sinovel and Dongfang, are also working on designs for 5 MW offshore units, and no doubt have plans for larger machines further down the line. Globally, too, some companies are already working on massive 10 MW turbines specifically for the offshore market, including American Superconductor (AMSC), a major component supplier to both Sinovel and Dongfang, as well its turbine design partner Windtech – which is an Austrian, wholly-owned subsidiary.

While the US firm is also working with Korea’s Hyundai on a 5 MW offshore machine, the 10 MW SeaTitan, being designed solely by AMSC Windtech with a view to eventually licensing the technology to other companies, is where the company believes the future of offshore wind lies.

“One of the challenges of the offshore demand is that the bulk of the cost is not the actual part where the turbine is, but the foundations and the offshore construction that with go with it,” says Tim Poor, AMSC’s Senior Vice President of Global Sales and Business Development. “So to the extent that you can effectively get more power on top of every tower [means] the economics can improve significantly for an offshore wind farm.”

But as GWEC’s Qiao says, ‘bigger is better’ cannot be China’s only focus: “We are very happy to see that there is lots of interest in offshore development in China. And we also welcome the Government rule on offshore management in China introduced in January, the ambitions of the manufacturers developing offshore models, and the coastal regions’ local plans,” she says. “But, in the meantime, it would be very useful to maintain a cautious spirit and go through some very serious discussion before massive development.”

As she points out, China only completed its first offshore wind farm earlier this year and is therefore lacking in any real experience in offshore wind management: “There is no experience on how offshore wind farms will
offshore wind/China

while potentially attractive from a cost point of view (thanks to the lower transmission costs that will come from their proximity to load centres), there is “virtually no international experience” when it comes to building inter-tidal offshore projects.

Located in muddy flat areas closer to the shoreline, China is keen to pioneer development of inter-tidal wind farms, with Li pointing out that Jiangsu province alone has the potential for 8-10 GW of such projects. To minimise costs, he believes China needs to focus on developing suitable foundation construction and turbine erection methods for these zones.

Further out to sea, he acknowledges that cost also remains an issue as it does everywhere else around the world. However, for traditional offshore there is “significant international experience to develop upon.” But here too, foundation construction remains an uncertainty and a significant risk, just as it does internationally for the sector, along with ensuring a good supply of appropriate vessels for installation and maintenance.

Climate considerations

For China specifically, a significant factor that affects the potential for offshore wind farms is the very nature of its climatic conditions, and it is this that makes exploiting the potential offshore resource more problematic than for other regions. Its coastal mean wind speeds are generally lower than the strong 9 m/s typically found across Europe. This means it will require more efficient turbines to get the same results, and projects costs that are lower overall to make a project economically viable.

But Chinese project developers, turbine designers and equipment suppliers have more to consider than just the low mean wind speeds. “Typhoon risk may be high in south China,” Li notes. This is another reason that the immediate next phase of offshore development is concentrated in Jiangsu. The province is least prone to typhoons. For deployment in other provinces, and further out to sea, the ability of turbines and their supporting structures (foundations, jackets, etc) to withstand the impact of a typhoon needs to be a major priority for equipment suppliers, whilst suppliers of maintenance vessels face similar challenges.

Taken together these factors could, Shi warns, push the costs of offshore wind farm construction, operation and maintenance, beyond the realms of economic feasibility for China.

Whether that will deter the global superpower from pursuing its offshore wind ambitions at full speed remains to be seen. So far the firm indication is never in a million years. After all this is not a country that will easily admit defeat. So if anyone is going to find a way to bring offshore wind costs down and overcome the technical hurdles facing it, the smart money has to be on China.

And as AMSC’s Poor says there is a “tremendous opportunity” to be had: “What we see from our perspective is that they are pursuing the offshore market very strongly. Whether [the potential is] 750GW, 600GW or 200GW, it’s going to be a very significant part of the overall wind market in China going forward.”

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