Specialist Vessels a Worthwhile Investment for Deep Offshore Wind Farms

The demand for offshore wind vessels is steadily increasing, and is projected to be high over the next several decades as various regions push to reach ambitious offshore wind farm installation goals. For instance, KPMG estimates that 37 new installation vessels and 15 cable laying vessels will be required just to keep the European offshore wind farm requirements from 2020. The requirements for smaller vessels for use throughout the survey, installation, and maintenance phases are in addition to these requirements.[i]

Unfortunately, in many cases, the functions required of these vessels for the highly unique nature of deep sea offshore wind turbine installation and maintenance has largely not been integrated into existing vessel designs. Consider that, though more than 60% of the planned German offshore wind farms will utilize large, heavy turbines of more than 3.6 GW each, and will be located in waters of 25 meters deep or more, only three of the existing jack-up installation vessels in the European market are capable of meeting the requirements for these projects.

Thankfully the ships scheduled to go into service in 2014 should be capable of operating in waters deeper than 25 meters, but whether they have the functionality to meet the special requirements of the larger turbines in a timely fashion has yet to be determined.[ii] Similar vessel shortcomings in other countries may prove a limiting factor if they are not designed with a long-term strategy in mind.

Lessons in Shipbuilding from the Oil & Gas Sector

Up to this point, the offshore wind industry has largely resisted collaboration with the oil and gas sector in the design and building of their deep sea vessels, despite the fact that the fossil fuel sector has tested and proven many technologies that would be of use in the wind energy

industry. These barriers will need to be overcome if the deep sea offshore wind energy sector is to speed the design and deployment of specialist vessels for turbine installation and maintenance.

For instance, experience in the oil and gas sector for offshore installations suggests that assembling turbines close to shore and deploying them fully complete is more efficient than attempting to assemble them at sea. This is due largely to the fact that there are significant complexities of constructing and planning turbines in a marine environment. At sea, there is higher risk for installation than there is on shore. Not only that, but shipping wind turbine sub-assemblies and then attempting assembly offshore results in more expensive offshore hours.

Nevertheless, offshore assembly is the current preferred method of installation in the offshore wind industry. A transition to onshore assembly would benefit the industry as a whole, but in order to accommodate this mode of installation, bespoke vessels capable of transporting fully assembled wind turbines is therefore required. This would require a concurrent development of specialized ports in order to accommodate the various aspects of the supply chain – from blade assembly to tower assembly to cable manufacture. However, doing so may result in fewer bespoke vessels being required, which could reduce risk for vessel owners and increase the likelihood of investment.

Another queue from the oil and gas sector is that of deploying more floating wind turbines rather than monopile installations. Not only are floating turbines easier to deploy because they require fewer specialist vessels, they also reduce the need for dedicated equipment. By reducing logistic costs and simplifying the installation process, floating turbines could also lower the number of bespoke vessels required throughout the industry. This is especially true for deep water installations as depth would no longer be a limitation.

Purpose Designed Cable Installation Vessels

A relatively common hurdle for offshore wind turbine installation has traditionally been cable damage. This is due in large part because the vessels used for this type of installation are not designed specifically for the task of laying offshore wind farm cabling. In general, current practice is to use barges for cable installation. But these ships are slow to reposition and therefore less than ideal in terms of scheduling.

Cable installation vessels used by other industries have also been used for wind turbine cable laying, but typically these are not wide or long enough, and cannot carry the 7,000 tonne cable carousels used for wind installations.[iii]

Here the wind industry could take some queues from transatlantic cable-laying history. When these cables were originally being laid, specialist cable ships were designed specifically for this purpose. Cable was manufactured for the job and then loaded directly onto specialist ships. The entire process was relatively integrated and helped to minimize the chance of cable damage.

The lesson offshore wind can take from this history is that of integration. All aspects of the cable supply chain – from manufacture to loading to installation – should be integrated, and then combined with specially designed vessels. This would lower costs and produce higher reliability of installations.

Schedule, Safety Benefits of Purpose-Built Vessels for Offshore Wind Development

Building offshore wind vessels is a costly affair for sure. On average, a new vessel costs in the neighbourhood of €250 million.[iv] Even at such a high price, these vessels may not have the required specialist capabilities for deploying deep water, large scale wind turbines. As a result, specialist vessels may fetch an even higher price tag than normal.

As a result, costs for chartering installation vessels are a concern. Day rates typically add 2% to the cost of an offshore wind farm project's capital expenditures.[v] Depending on the duration and period of time, daily hire rates for wind turbine installation vessels (WTIVs) in Germany, for instance, are €125,000 and €165,000 ($158,000 and $209,000)/day.[vi]

But more important than the price of the use of these offshore wind farm vessels is their performance. The more efficiently and safely these ships can perform during the course of an offshore wind farm installation, the faster the project will be completed within design specifications.

As a result, the wind industry should turn more and more toward purpose designed vessels that can deliver significant schedule advantages. Though specialist vessels may require higher initial capital expenditures as well as higher day rates for chartering, studies have shown that these bespoke vessels more than pay for the additional costs. That's because specialist vessels are able to prevent overruns, thereby reducing the risk of schedule problems and increasing project returns.

Overcoming Financial Barriers to Bespoke Vessel Use

Investments in the manufacture of specialist vessels are highly dependent on the availability of financing. Traditionally, vessel manufacturers have chosen to downplay the specialization of their vessels in order to reduce risk aversion from financing institutions. This has resulted in the design of vessels with broader capabilities that often cost more to construct and deploy.

Experts recommend that in order to overcome the hesitance toward the construction of specialist vessels, the industry needs to learn how to better quantify and communicate the value and benefits of specialist vessels. At present, the tendency is toward measuring vessel costs based on individual day rates for installation (for instance). But this doesn't provide a clear picture of the overall costs to the project. If a generalist vessel results in a longer installation process and even project delays, these costs need to be taken into consideration.

The most effective method for overcoming this communication challenge is to present investments in terms of the £/MWh of power generated over the project life cycle. This holistic view helps to keep the focus on the maximum project life cycle value of a specialist vessel. Up-front investments in these more bespoke ships given these calculations should prove to be well worth the additional costs. Penny wise, pound foolish is the maxim to be avoided here.

Additional Challenges to Spurring Growth in the Specialist Offshore Wind Vessel Sector

Clearly the potential for speeding the growth of offshore wind involves applying lessons learned from other sectors such as the oil and gas sector. However, the process of developing appropriate bespoke offshore wind vessels will require a vast workforce of highly skilled individuals.

Unfortunately, attracting talent is one of the barriers faced by the wind industry in competition with more traditional energy industries. Since the oil and gas sector is an established and often lucrative sector, project managers, engineers, and labourers are often more attracted to working for them than for the younger wind industry. For the wind sector, there's more risk, less funding, and often less work, which causes some to shy away from getting involved. This is an area of weakness for the wind sector and one that will need to be overcome if they are to design and develop the specialist vessels they require.

Nevertheless, the deployment of specialist vessels for offshore wind farm installation – especially those in deep waters – has the potential to have a very good return on investment and is therefore a worthy investment in terms of talent and time. In fact, the estimated savings due to optimized installation methods through the use of bespoke vessels is expected to be 3% to 4% by FID 2020.[vii] Let's hope the industry overcomes its qualms about collaborating with other industries and embraces the benefits of this type of vessel use.

Images via Flickr: Global Marine Photos 1 and Global Marine Photos 2

Maryruth Belsey Priebe

A student of all things green, Maryruth has a special interest in cleantech and green buildings. In recent years, Maryruth has worked as the senior editor of The Green Economy magazine, is a regular blogger for several green business ventures, and has contributed to the editorial content of not one, but two eco-living websites: www.ecolife.com and www.GreenYour.com. You can learn

more about Maryruth's work by visiting her site, www.jadecreative.com.

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