



Installation hurdles for the US in offshore wind

GustoMSC SEA-3250-LT design suitable for installation of the current range of turbine sizes at minimal capital investments.

Since the beginning of this year, US states together have committed to approximately 8,200 MW of offshore wind by 2030. This is a substantial amount of work and provides a visible pipeline of work justifying investments in dedicated and efficient installation solutions. Are these the right conditions to invest in a new build installation jack-up? PES explores the opportunities and hurdles with GustoMSC, a design and engineering company of mobile offshore units and equipment.

There is an increasing interest from companies looking to participate in the US offshore wind installation market. Various parties are investigating and preparing in order to be able to invest in the construction of a wind turbine installation jack-up in the future. Parties are considering designs, potential shipyards and discussing with developers and turbine manufacturers.

There have been several announcements but to date no company appears to have made a solid commitment to build yet. What are the bottlenecks why are commitments not forthcoming?

Last year, the States of Massachusetts, New York and Rhode Island published a report 'U.S. Jones Act Compliant Offshore Wind Turbine Installation Vessel Study'. GustoMSC has been working on this report for the New York State Energy Research and Development Agency (NYSERDA). The report is aimed at understanding what is required for a wind turbine installation vessel on the US East Coast from both the technical and financial perspectives.

Technical aspects

Currently there is no equipment available in the US that is capable of installing present and future heavy foundations and turbines, due to insufficient carrying and lifting capability, in terms of both capacity and height.

In very nice weather we have seen tower and blade components, for 6 MW turbines, being feedered by US liftboats. With planned turbine sizes of 8+ MW for the upcoming US projects this will be increasingly difficult as the size and weight of components are larger and heavier.

Furthermore, for projects with an increasing number of turbines, robustness margin in terms of allowable installation conditions, becomes more and more important. For an efficient installation campaign, the weather windows cannot be too tight. Liftboats were not designed for sailing with cargo, in heavy sea conditions and have very limited payload capacity.

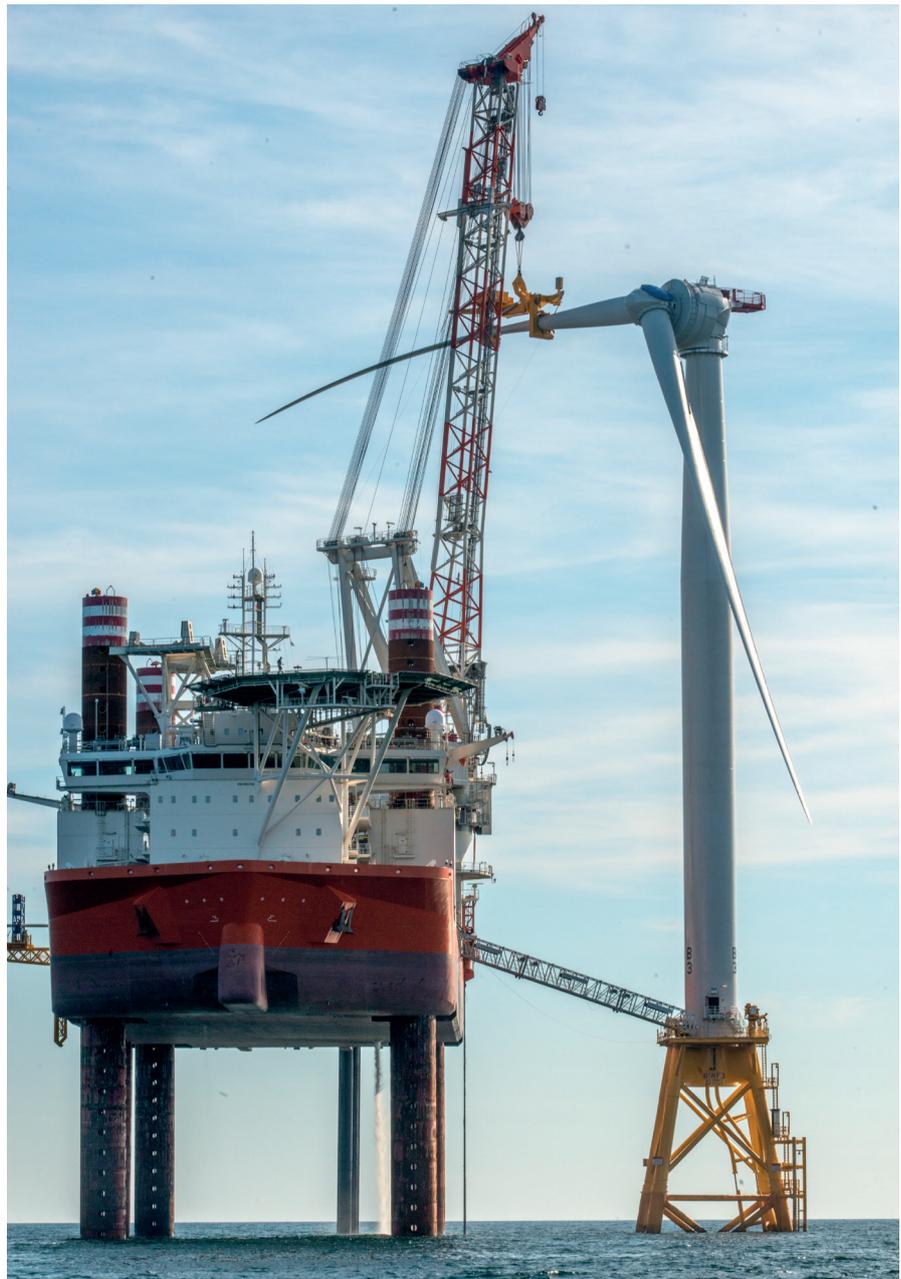
But when it is decided to build new vessels, construction of a suitable jack-up will take roughly 2.5 to 3 years from signing to delivery, depending on the type of jack-up. The earliest developments have planned delivery dates from 2020 onwards and increasing in volume from around 2022-2024 and onwards. This means that a new-build jack-up may not be available for the first wave of US projects but may become available at a later time when activity is expected to pick-up.

Developers cannot wait for a dedicated jack-up to become available and so will be forced to go for alternative installation solutions by means of a non-Jones Act compliant jack-up, as there is no suitable equipment in the US market available.

Currently sufficient European units appear to be available and able to install US wind turbines. Whether this will still be the case in the future will depend on global market conditions and requirements, with respect to foundation weights and turbine sizes. Larger turbines, or a raised activity level on the European wind market, heavily affects the availability of suitable European installation jack-ups for the US East Coast projects.

Financial aspects

Further challenges in the US arise with port and supply chain availability and suitable



Fred. Olsen's GustoMSC NG-9000C design Brave Tern safely installing the first wind turbines in the US (picture: courtesy Fred. Olsen)

shipyards. A state-of-the-art wind turbine installation jack-up is a large and complex unit to build. US yards have no recent experience in building these large self-propelled, self-elevating vessels which have very large & high reach cranes.

The number of available shipyards to build such a large jack-up is limited. It is expected that US yards will be more expensive than yards that have previously built similar jack-up designs in Europe, the Middle East and Far-East. Yard capability to build these larger Jones Act compliant jack-ups to the future requirements and for the right price is going to be important for the offshore wind market in the US and might trigger solid commitments to build new vessels.

Moreover, when in the absence of suitable equipment available in the US, European installation vessels need to be mobilised to transit across the Atlantic, considerable costs are added to the project. In addition feeder units need to be taken into the equation. Therefore a dedicated Jones Act compliant new build jack-up vessel may be more competitive.

GustoMSC US compliant equipment and design solutions

Offshore wind turbine Installation is a logistical challenge requiring the transportation and installation of a high number of expensive, large, delicate and heavy components on very large heights, in



GustoMSC NG-9800-US design, the most capable and efficient wind turbine installation jack-up for the US market.

a hostile offshore marine environment. Therefore it is key to maximise safety, efficiency and minimise downtime by reducing the number of steps involved. Success has been achieved in the past by combining transport and installation into a robust purpose built jack-up.

The Brave Tern is such a success story. The GustoMSC NG-9000C design, was initially designed at a time when 3 to 3.6 MW turbines were the standard and soon larger turbines of 5 to 6 MW came on to the market. With upgrades the four NG-9000C units operating in Europe today are able to install the largest turbines of 8 to 9.5 MW. This Brave Tern also installed the first offshore wind turbines in the US.

Two years ago GustoMSC evolved the design to the NG-9800C-US. Designed to operate in the American offshore wind waters, the NG-9800C-US is the most capable and efficient wind turbine installation jack-up for the US market. The NG-9800-US can be built at several shipyards in the US making it Jones Act compliant and it is therefore able to operate freely from US ports and shorebases. This design allows entry to the port of New Bedford, which houses the first facility in America designed to support the construction, assembly, and deployment of offshore wind projects on the US East Coast.

Based on the proven technology and unique performance of the NG-9000C series, this jack-up is capable of providing fully loaded transits to offshore locations

and installing future turbines in the North East coast. Like the other GustoMSC NG jack-ups, the NG-9800C-US is a four-legged, self-propelled, self-elevating unit that moves autonomously, without the need for tug assistance.

This US workhorse features a continuous hydraulic jacking system providing high redundancy and flexibility during jacking. It is characterised by a large versatile open deck space, a leg encircling crane with a high reach and capacity and includes an accommodation with state-of-the-art facilities. The design is fully compliant with ABS or DNV GL Class requirements and with SNAME recommended practices.

The NG-9800C-US however requires a more substantial investment and commitment than design solutions with a lower threshold, such as the NG-3750C feeder jack-up and the SEA-3250-LT installation jack-up. The latter being a low cost alternative able to install the current range of turbine sizes but at minimal capital investments. The smaller jack-ups will be simpler and cost less time to build. This also means that there would be more US yards able to build such a unit.

However, to cope with the expected increase in turbine size, weights and hub heights, and to ensure process efficiency in the repetitive character of wind turbine installation, the company sees sufficient potential for the larger installation jack-ups, possibly even at deeper waters.

This would typically necessitate truss leg

jack-ups with Rack & Pinion jacking systems, for enhanced survivability at deeper water and for the most stable solutions. When the number of wind turbines to be installed per year increases, the focus shifts from low capex per jack-up towards low capex per turbine installation. This requires modern, state-of-the-art installation tools, such as the newest generation of wind turbine installation jack-ups. These units are fully adapted to efficient and safe installation in a harsh offshore environment.

Future outlook

Confidence in the future of US offshore wind appears to be growing due to important steps that have been taken over the past months. Developers have to show and commit on a solid pipeline to the market. In Europe in 2009 we were in the same situation. Since history seems to repeat itself in the emerging US offshore wind market, GustoMSC introduced a full range of design solutions to resolve the bottleneck for the US offshore wind market based on different operational and financial scenarios.

The availability of suitable large installation jack-ups is decisive for the way US wind farms are going to be developed and the cost and risk at which this will be done. Conversions of vessels/barges to jack-ups have proven to be unsuccessful. Typically this results in too heavy jack-ups, and thus limited variable load, and poor performance due to lack of robustness and rigidity.

The latter may result in considerable residual horizontal motions of the jack-up, which in turn leads to movements of the crane and load in the hook. This effect can lead to safety issues, weather restrictions and so extra downtime. Especially for the repetitive character of the installation of tens of wind turbines, extra downtime, and potentially missing the favourable installation season, can have very serious consequences.

Therefore, especially for the larger turbines, increased installation heights and deeper waters, GustoMSC focuses heavily on robust, well balanced solutions, with proven track records. Reliability of jacking systems, legs and hull are most important in order to have a safe and efficient operating unit for efficient installation campaigns.

It is still unclear how the future will unfold, but it is clear we are at a decisive point in time for the US offshore wind market. GustoMSC plays a pioneering role in the offshore wind installation market, delivering designs and equipment for a wide range of jack-ups and other vessels responsible for close to 80% of the installations within this market. And now the company is committed to use its experience and expertise and provide the US market with safe, solid and stable solutions for the successful development of US offshore wind.

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