The future of offshore wind in the US
One of these things is not like the other

*Why is the adoption of the European Model not the best path forwards for the US offshore wind market?*

*Arup specialists explore the options.*

Offshore wind has a key role to play in the powering of future generations. The ability to produce utility scale generation within close proximity to major population centers makes the advantages of offshore wind undeniable. The European market has shown that it can achieve parity with legacy forms of power generation. However, we must not proceed by blindly attempting to fit the European model into the growing US market. There are key differences, market and supply chain, that simply must be addressed with a relentless focus on driving down costs. Can it be done?

Absolutely.
Same year, different results

Without a doubt, 2016 was an important year for US offshore wind. Block Island offshore wind farm, the first US commercial project, was energized and ignited a firestorm of activity of local and international interest in the untapped US Offshore wind. At that same time in Europe, reverse auctions and agreements were being completed at unit power rates much lower than anticipated and now, in 2017, reaching zero subsidy or parity with well-established forms of power generation in Europe is a reality or very nearly will be.

In fact the latest 2017 CfD rounds in the UK have returned astonishingly low (as low as £57.50/MWh) LCOE strike prices well ahead of government cost reduction targets, a pattern we see also in Germany and the Netherlands. What is even more surprising is that we are seeing projects being developed and built for prices which follow this downward trajectory.

To have the best chance of success in the US, it stands to reason to use as much of the success from 15 years of development in Europe as possible. This includes technology such as large scale wind turbines, subsea cabling, offshore foundations, installation vessels, but also commercial and finance systems. While this seems logical, it is not in fact a direct fit, as the challenges in Europe are not the same facing the US market.
Commercial maturity—early investments are key to success

Lower European pricing is due in part to contracts for large scale projects with full engineering, procurement, construction and installation (EPCI). These type of contracts put the risk of costs onto the EPCI contractor. This also means the contractor will get the reward for when the project is completed successfully. However, to manage this cost, this type of approach only is reasonable when the development consists of well understood regulatory requirements, proven structures, equipment, markets and designs that the costs are well known. Thus allowing the EPCI to be competitive and limit the amount of cost associated with the risk of the project.

A key challenge for the US market is to get to this state of lower risk as quickly as possible. Currently with just one project in the water, a separate regulatory system for each state, limited to no supply chain, there are significant unknowns heading into each proposed development. Therefore we can expect higher risk and thus making EPCI approach to contracting less advantageous.

Instead, for the initial projects we would expect to see increased amount of engineering, development and management of the project by the developers themselves. This will ensure the unknowns of the project and the risks are managed directly by the owner and there investors. Once these are managed, then the project can procure the needed equipment and structures with much lower risk and therefore lower cost.

Without this early investment, project costs have the potential to increase affecting the ability of the market to establish the much needed focus on lowering costs.
Supply chain—looking beyond oil and gas legacy

A key area unknown to the US market is the supply chain. This applies to all aspects of the development from foundations, materials, turbines, marine vessels, cabling and labor. Much is made of the existing supply chain in the Gulf of Mexico built to service the oil and gas industry. However, the drivers for the oil and gas market are very different to what is needed for offshore wind. It is questionable if this same supply chain can adapt to the needs of the offshore wind market.

No doubt the existing oil and gas supply chain delivered for the Block Island development. Five steel jacket foundations were designed and built in the Gulf. Marine Vessels from the local gulf fleet were used to install the foundations and prepare them for the installation of the Turbines. In addition, while the jacket foundations were fabricated in the Gulf, they then had to be transported from the gulf to the east coast, as well as the offshore vessels to install the foundations. While this approach was suitable for this first ever project, the supply chain will have to find considerable costs savings for future developments, as the market cost of generation supply for this project was several time higher than target US markets.

The European market has spent 15 years to build up its supply chain with relentless focus on driving down costs. Europe also has a well-established Oil and Gas supply chain. Interestingly, this experienced and existing oil and gas supply chain did not participate in offshore wind. Instead the supply chain was built by other marine operators/contractors/designers starting out with only basic knowledge of working in offshore conditions. Perhaps this new group of suppliers is what was needed to have a relentless pursuit of lower costs and innovative ways to standardize developments.

The key consideration is that the US offshore wind market should not exclusively rely on the oil and gas supply chain to achieve the longer term low cost solutions that are needed.

The US Northeast is different…

It’s of no surprise that conditions off the cost of Eastern US are different from key areas of European offshore wind development, perhaps the implications of those differences are not well appreciated. The primary effect is that the use of monopiles, which have been used for 90% of European developments, is in doubt.
Monopiles in their purest form are about as simple and cheap a foundation as can be designed. Effectively, a monopile is a large diameter steel pipe that is hammered or vibrated into the seabed, much like a fence pole.

As monopiles are driven into the seabed, they need a seabed soil that consists of sand, silt, clay or a mixture. Instead of this, the Northeastern US has gravel and random boulders. Random in the sense that they appear anywhere in the soil strata below the seabed.

Boulders and monopiles are not a good match, boulders prevent the pile from reaching its design depth and severely damage the pile making it unusable.

We are not alone in the offshore

If boulders were not enough of a challenge, maybe the abundance of sea mammals is? The East Coast is home to many types of whales, including the endangered North Atlantic Right Whale. Installing monopiles creates significant underwater noise that affects sea mammals and for recent projects the main mitigation is to stop piling operations altogether if a mammal is spotted within a monitored perimeter. This is of course better for the whales, but puts significant risk of delays on the project.

There are other foundation options, principally being self-installing gravity based structures (no piles, no specialized installation vessels, local labor). These potentially represent the best option for the Northeast but still represent a departure from the successful European model.

Choosing a suitable structure in consideration of the seabed, metocean, installation and operational conditions is a crucial decision to make to ensure project success and commercial viability. Selecting wisely can mitigate many project risks effecting project timelines as well as escalating costs.

So how can the US market move forward?

The European market can offer key experience and technologies that can be applied to the US market. However, care must be taken to evaluate and understand the US unique conditions, including commercial, supply chain and technical challenges. Each of these in their own right, will have solutions to be developed and applied for the US. With 80GW resource the US market potential is huge and so it seems no longer a question of if, but who will have vision and ability to marry the best of the European experience with the opportunities of the US.
Contact us

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Cameron Dunn is a professional engineer with offshore and onshore consulting engineering experience. His technical expertise is primarily focused within offshore engineering for energy markets including multidiscipline work including structural, process and systems, due diligence, assessment and design. The work included Conceptual Field Development Studies, Front End Engineering Design, Preliminary Engineering Design, Detail Design and Verification, as well as tender package development and preparation. In addition, he has held key business management roles including responsibilities for the technical execution and assurance project teams, industry participation in technical forums and publishing of research. This also includes Project Director and Project Manager Responsibilities for delivery of work.

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James is an Associate Transaction Director in Arup’s Business and Investor Advisory team with over 15 years’ experience in the energy infrastructure sector. James specializes in the renewable energy sector and has worked extensively offshore wind farm and other offshore transmission projects including, interconnectors, and offshore transmission links in the UK and Germany.

James has lead due diligence assignments on large scale projects and portfolios, including providing advice to Goldman Sachs on Dong’s whole offshore wind portfolio in their acquisition of a substantial minority stake in the business, and advising SDCL on their prospective acquisition of the Green Investment Bank offshore wind portfolio. James recently provided vendor due diligence to Blackstone to support the refinancing and sale of the Meerwind project, and has lead due diligence on a range of onshore wind, solar and hydropower projects internationally.

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We are truly global. From our 85 offices worldwide more than 13,000 planners, designers, engineers and consultants deliver innovative projects around the globe. Arup is working with clients to shape a better world through the efficient, affordable and sustainable sourcing of energy, its dispatch and use.

Arup’s technical, financial, business planning and project management specialists support clients to realize viable offshore wind schemes. Arup has experience working on offshore wind projects from feasibility to structural as well as advising on the sale of operational assets. We aim to reduce programme costs with minimal risk and use our experience gained in the offshore wind, oil and gas industries to provide a coordinated, team-working approach to deliver projects.

Future US wind farms will need to be innovative to reduce costs, whilst managing the overall risk of bringing an improved or new concept into the industry. Arup has a proven track record of developing viable innovative ideas with clients from the initial concept to an installed product. This includes our award-winning ACE platform and our work developing concrete gravity foundations as a viable solution for UK offshore wind farms.