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Insights

Adverse ground conditions in offshore wind projects

21/08/2023

Adverse ground conditions pose significant risks to EPCI contractors installing fixed bottom offshore wind farms. It is public record that some leading offshore contractors have suffered huge losses on projects due to problematic ground conditions in recent years.

The common law position is that adverse ground conditions which hinder a contractor's performance of its contracted scope, are a contractor risk. Whilst it is common for parties to allocate that risk in the contract terms, there is no one single approach that has been adopted across the industry. Some of the clauses which may be used to alter the common law position include clauses addressing:

- Rely Upon Information - the developer can provide (often limited) soil data which, to a greater or lesser extent, it warrants the accuracy, completeness and sufficiency of.
- Obligations to verify Site Data. Contractor is sometimes obliged to verify (and thereby absorb some of the risk of inaccuracies in) the Site Data in accordance with good offshore wind industry practice (typically with limited practical opportunities or time to do so).
- Clauses dealing with pile penetration refusal and related mitigation measures which include provisions on the extent to which Contractor is entitled to additional time and costs in respect of such circumstances.
- Clauses requiring the Contractor to accept the risk of adverse ground conditions unless it can prove them to be reasonably 'unexpected'.

In this article we consider the factors at play which expose fixed bottom wind installation projects to the problems of adverse ground conditions.

Data quality

To an oil company, identifying what is under the ground is core to its business (forgive the pun). An oil company will require and procure detailed knowledge of whole provinces of a reservoir, recognising that the quality of its data is key. The survey data will be poured over to gauge the commercial viability of a well. A contractor performing an installation on an oil & gas project can expect the benefit of mature data, verified over some period of time and perhaps during the engineering and drilling of exploration, appraisal and development wells.

By contrast, windfarm developers are interested in the resource in the air, the strength and direction of the wind, and not with what is underground. As a result they do not approach the procurement of soil data from the same perspective, and a windfarm developers' knowledge of the soil in the area it leases is typically far less comprehensive. Subsea surveys are often carried out at the early stages of a wind project, when the developers are principally concerned with obtaining environmental consents and thus on identifying protected marine species and habitats on the seabed. Consideration might be given to where turbines will be sited and obstructions on the seabed surface might be looked at in that regard, but a developer's focus is not on gathering sufficient data to inform the installation. What is under the seabed is secondary at best.

A comprehensive approach to ground conditions data would involve undertaking a broad low-resolution seismic survey of the entire site, which would show the layers in the soil. This would be followed by higher-resolution surveys in areas of particular interest at installation locations. The aim being to increase confidence in the data in those areas, and more generally. Geotechnical core sampling would then take place at each installation location and the cores would inform the interpretation of the seismic maps and the composition of the layers identified. In German offshore wind projects, we understand it is obligatory for the developer to procure core samples at each installation location. But in jurisdictions where it is not compulsory, some developers seek to avoid the relative expense of geotechnical cores and work solely with seismic data. They may also seek to save costs by using algorithms rather than experienced geophysicists to interpret them. Some may take some core samples at relatively few locations and extrapolate, which assumes the chosen core locations are representative of the installation locations generally.

Interfaces with the soil

In contrast to an oil & gas installation, a wind project involves multiple interfaces with the soil over a larger area. In the course of an installation there might be piling and drilling activities at hundreds of pile or jacket locations, vessels jacking-up or laying out mooring spreads at each one, plus the inter-array cables and export cable to be laid, all across several square miles of seabed. If the soil data interpretation is wrong in one location, then there is the potential that it will be wrong at all of them, with the impacts on cost and schedule multiplied across the wind farm. For example, if an inadequate hammer was specified due to poor soil data, there will be problems at each location. And it might not be an answer simply to procure a larger hammer, because the contractor may be constrained by availability, noise limits, or by the pile's design and energy limits. That pile design may well have been conceived using the same problematic site data.

Size also matters

The modern wind turbine foundation monopile is very large, and conically shaped. Pile diameters have increased from 6m piles at older windfarms to 10.5m piles at farms in the coming years. These weigh in the region of 2500MT and can be 100m long. As the size of piles increases, the risk of difficulties caused by soil conditions increases too. There is a greater likelihood of disparity in the soil conditions across a larger pile circumference, and the chances of the pile striking an obstruction such as a boulder increase with it. Where problems are encountered, the size of the piles can mean that remediation is difficult. There are very few commercially available drills, if any, that exceed 10m in diameter, so drilling and then driving through a problematic layer/boulder may not be viable. And extraction of such a large pile, even at its self-weight penetration depth, can be impractical/impossible.

In case of problems, for example where a monopile meets premature refusal, the contractor also faces challenges evidentially. The Contractor is operating in the dark and under tens of metres of water and several metres of seabed. Differentiating between pile deformation at the toe or an obstruction, is difficult. So too is identifying the nature of any obstruction and how and where it is acting on the pile. In that context, the Contractor might feel that arguments as to the foreseeability of boulders in the ground miss the point. Contractor would not wish to bear the risk of cost/schedule overruns which arise through no fault of its own, even if the soil data did show a reasonable possibility of subsurface boulders.

Conclusion

We expect the focus on ground conditions clauses and Rely Upon Information regimes to continue. Despite the industry maturing there remains no consensus on how best to allocate such risks or which clauses to use as a good reference point, despite efforts of industry bodies such as IMCA to develop and establish contracting principles.

Naturally, windfarm developers wish to de-risk so far as possible and to rely on the installation expertise of specialist contractors to identify and overcome any difficulties posed by ground conditions. In turn, the contractors consider that it is the developer which is the most appropriate party to bear the risk of what lies beneath the seabed, because it is the developer that chose and surveyed the site, and who stands to enjoy the commercial benefit of the installation for its design life.

The authors are interested to see whether the risk allocation shifts in favour of contractors as the costs of contractors absorbing this risk become clearer and the technical challenges involved in installing ever larger structures increase.

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