Offshore Wind Logistics brief report 6

- Strategies of supply chain lead companies and logistics service providers in offshore wind

Supporting organizations

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This *Offshore Wind Logistics brief report 6* is part of a series of brief industry-focused reports on the key conclusions from the global wind energy shipping and logistics PhD research project. The reports have been crafted by the Panticon team during the months of January through December 2019 in order to crystalize the main findings from the academic research project in a non-academic language and style which would support industry in implementing the key changes proposed as a result of the PhD research project. The report has been created primarily based on the PhD research project output, i.e. the PhD thesis and the academic publications produced by Thomas Poulsen during the PhD research project. Where necessary, additional data sources have been utilized as well in order to ensure that the findings are relevant and up-to-date (see Reference section).

The report contains forward-looking statements, which by their very nature, address matters that are, to different degrees, uncertain as they pertain to the future. These, or any other uncertainties, may cause the actual future results to be materially different than those expressed in the forward-looking statements as contained within this report. At Panticon we do not undertake to update our forward-looking statements, nor do we assume any liability for actions or dispositions made by firms, organizations, and/or individuals based on information contained in this report.

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Table of contents

1. Introduction

This *Offshore Wind Logistics brief report* is the sixth in a series of eight short industry-focused reports. The goal of the *brief reports* is to make the latest research in the market for logistics within the global offshore wind industry more accessible and usable for a wide range of constituencies on a global basis. The *brief reports* can be read consecutively or individually.

This *sixth report* in the series compares the strategies of the offshore wind supply chain lead companies to the strategies of offshore wind logistics service providers.

2. Offshore Wind – A unique industry

Offshore wind farms have exceptionally long life-cycles of 30 years and possibly more. The long offshore wind farm life-cycle comprises four life-cycle phases – *Development & Consent*, *Installation & Commissioning*, *Operations & Maintenance*, and *De-commissioning*. Each such life-cycle phase has supply chains that are unique from the other life-cycle phases. The companies involved in each of these life-cycle phases are in some cases the same but in most cases not. Moreover, whereas most of the supply chains of other established industries have a structure with one main supply chain lead, the supply chains of the offshore wind industry have a more distributed supply chain lead structure.

When compared to industries such as automotive, truck assembly, construction, oil and gas, or similar turn-key project industries, the wind energy industry, particularly the offshore wind industry, is less industrialized. Factors that explain the offshore wind industry's lower level of industrialization include the following:

- Until 2009, there was no real momentum in the offshore wind industry. Annual capacity installations averaged 150MW or 60 turbine units, and roughly three offshore wind farms per year.
- The first two decades of the offshore wind industry were characterized by a slow pace of development thanks to limited investment (in research and development along with assets such as installation vessels) as well as limited political support. In effect, the industry has only gained industrialization momentum in the last decade, a very short period when compared to industries such as the automotive industry which has had 100-plus years of industrialization.
- Most offshore wind projects have been concentrated to a limited geographical area namely in Europe in the North Sea and, to a comparatively lesser extent, the Baltic Sea.

Such factors influence the way the main offshore wind supply chain lead companies craft their strategies as well as their logistics strategies. In turn, this influences how offshore wind ***logistics service providers*** (port, maritime, shipping services, including ***Equipment, Procurement, Construction, & installation*** companies) craft their strategies.

Meanwhile, reducing the levelized cost of offshore wind energy is an ongoing theme of the offshore wind industry story. In addition, it is a key driver of an increasingly holistic view of the offshore wind supply chain. The strategic focus of the offshore wind supply chains has, in general, been expanding beyond product innovation, e.g. *Wind Turbine* or *Balance of Plant Components*, to process optimization

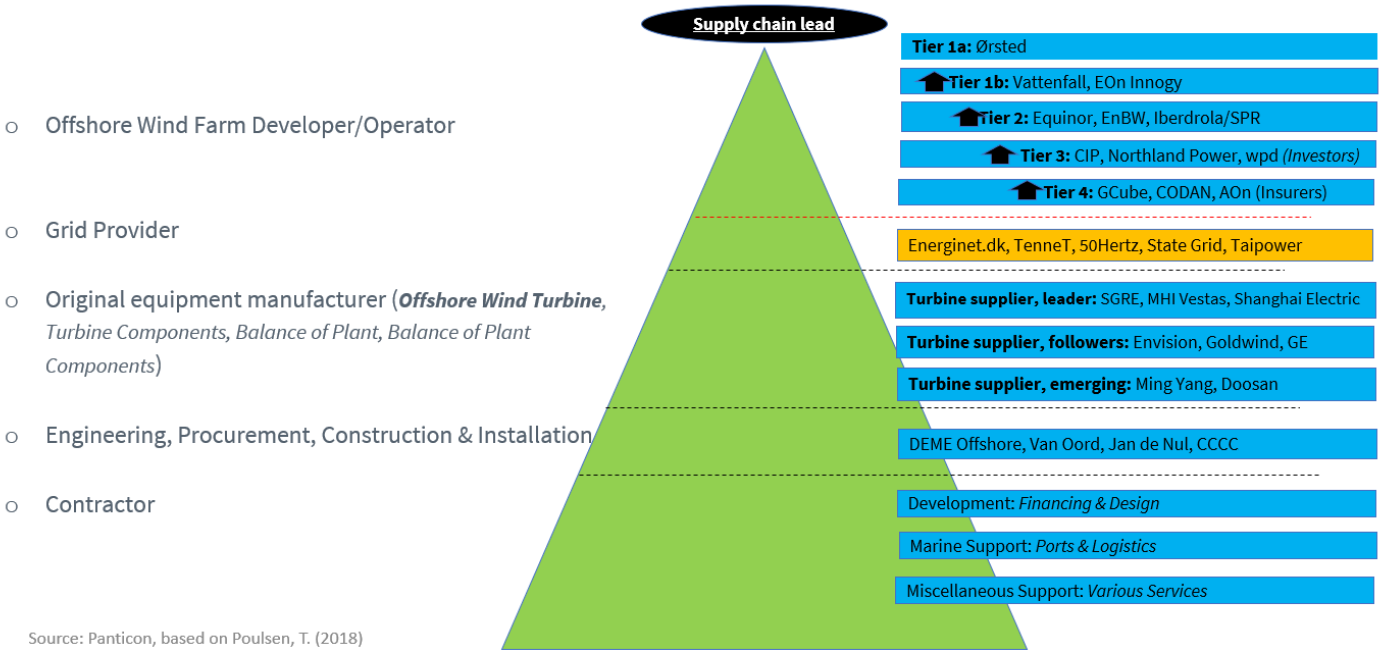
optimization, e.g., shipping and logistics. Logistics transcends all the four life-cycle phases of an offshore wind farm. The research established that logistics accounts for 18% of the levelized cost of offshore wind.

3. Supply Chain Lead Companies in the Offshore Wind Farm Supply Chains

In terms of initiating procurement of contracts (i.e., for components and services, including logistics services) across the entire offshore wind farm life-cycle, the closest that the offshore wind industry comes to a main supply chain lead company is the ***Offshore Wind Farm Developer*** and (or alongside) the ***Grid Provider***. Next is the ***Offshore Wind Turbine Supplier*** followed by the ***Equipment, Procurement, Construction & installation*** company.

Figure 1 shows the hierarchical relationships of the main supply chain lead companies of the offshore wind farm. Tier 1 companies have the highest control of the supply chain while Tier 4 companies have the least control.

Figure 1: Supply chain lead companies



Source: Panticon, based on Poulsen, T. (2018)

3.1. Offshore Wind Farm Developers

The ***Offshore Wind Farm Developers*** are the ultimate supply chain lead companies within offshore wind. In some markets like France, Taiwan, the UK, and the USA, the ***Offshore Wind Farm Developer*** is responsible for the construction of the offshore wind farm and transmission assets. In other markets, e.g. Denmark, Germany, and the Netherlands, the ***Offshore Wind Farm Developer*** is only responsible for the offshore wind farm while the ***Grid Provider*** (typically state-owned) is responsible for the transmission.

transmission. In either case, the ***Offshore Wind Farm Developer*** occupies the most supply chain leading role in the networks of offshore wind farm supply chains.

However, ***Offshore Wind Farm Developers*** vary in how they use the supply chain lead role. This is reflected in their strategies. Within the *Installation & Commissioning* and the *Operations & Maintenance* life-cycle phases of an offshore wind farm, ***Offshore Wind Farm Developers'*** strategies can be understood across a spectrum of dimensions, with Tier 1 at one extreme end and Tier 4 at the other extreme end, as outlined in Table 1 below.

Table 1: Typical characteristics of Tier-1 and Tier-4 Offshore Wind Farm Developers

Dimension	Tier 1	Tier 4
Company type	State-owned utilities	Pension funds, infrastructure funds
Number of players in tier	Very few	Many
Market entry	Early mover	Late mover
Investment objective	Construct and operate offshore wind farm assets	Long-term investment opportunity
Staff dedicated to offshore wind	Many	Few
Offshore wind farm track record	Significant	Limited
Offshore wind farm portfolio	Significant	Limited
Procurement strategy, incl. logistics	Multi-contracting, dealing with many suppliers; *de facto* ***Equipment, Procurement, Construction & installation*** companies	Single contracting, dealing with few suppliers
Service contracting to *Offshore Wind Turbine Manufacturers*	Short-term, e.g. for three years	Long-term, e.g. for 15 years
Primary revenue stream	Offshore wind farm operations	Offshore wind farm operations or selling stakes in projects either before or after construction
Approach towards risk reduction	Direct involvement in projects, sometimes acquiring suppliers to avoid supply chain bottlenecks or acquiring companies with adjacent technologies, e.g. energy storage or energy trading, to optimize revenue from operations; take more responsibility to create knowledge repository	Indirect, delegating much responsibility to ***Equipment, Procurement, Construction & installation*** companies
Involvement in offshore wind farm life-cycle	All life-cycle phases	Selective, primarily *Development & Consent* life-cycle phase
Logistics focus / competences	High	Low

Source: Panticon

In between the above described two extremes of ***Offshore Wind Farm Developers*** are various shades of developers whose strategies are a hybrid, i.e., neither multi-contracting nor single contracting but a combination of aspects from both multi-contracting and single contracting. The logistics strategies reflect this spectrum, namely from multi-contracting to single-contacting of diverse logistics services.

These descriptions largely apply to offshore wind in European countries and recent developments indicate that the new markets of Japan, Taiwan, and the US will become similar in structure. Localization requirements and the novelty of new business environments may coerce Tier 1 ***Offshore Wind Farm Developers*** to adopt less of the multi-contracting strategies into hybrid contracting, including logistics, in order to share risk. Strategies of developers in China display somewhat different characteristics. For example, whereas Denmark's **Ørsted** divested from its turbine installation joint-venture **A2Sea**, state-owned **CHN Energy** in China has subsidiaries engaged in turbine manufacturing as well as *Engineering*, *Procurement*, *Construction, & installation*, including *turbine installation*, among others. Indeed, some Chinese ***Offshore Wind Turbine Manufacturers*** have announced ambitions to diversify into offshore wind farm development. This points to multi-contracting logistics strategies whereby the ***Offshore Wind Farm Developer*** takes a coordinating role and deals with individual ***logistics service providers***.

3.2. Grid Providers

Unlike the other main supply chain lead companies, ***Grid Providers*** are not necessarily driven by commercial interests. They are typically state-owned. ***Grid Providers*** install, manage, and maintain the electrical grids in a given country or country region, including ensuring stability, balance between supply and demand, import and export of electricity, and connecting customers to the grid. In countries where the ***Offshore Wind Farm Developer*** is not responsible for construction of transmission assets, the responsibility falls on the ***Grid Provider***. The ***Grid Provider***'s choice of procurement strategy is determined by its offshore wind experience. The most experienced ***Grid Provider*** typically pursues a multi-contracting strategy for the offshore substation and export cables. The lesser experienced follows either a hybrid-contracting strategy or a single-contracting strategy (similar to an ***Equipment, Procurement, Construction & installation*** company). Subsequently, the contracting for logistics becomes the responsibility of the experienced ***Grid Operator***, the ***Equipment, Procurement, & Construction*** company or the ***Equipment, Procurement, Construction & installation*** company (discussed in Section 3.4).

3.3. Offshore Wind Turbine Manufacturers

Basically, ***Offshore Wind Turbine Manufacturers*** are supply chain lead companies in relation to ***Turbine Component Original Equipment Manufacturers*** both during the *Installation & Commissioning* and *Operations & Maintenance* life-cycle phases of the offshore wind farm. The leading ***Offshore Wind Turbine Manufacturers*** combine in-house and outsourced manufacture (mainly wind turbine blades) of ***Turbine Components***. They often concentrate nacelle assembly in few locations.

For the *Installation & Commissioning* life-cycle phase, ***Offshore Wind Turbine Manufacturers*** have dedicated staff who manage or are directly involved in logistics of Turbine Components from manufacturing or assembly plants to the construction sites. In Europe, the ***Offshore Wind Turbine Manufacturers*** are typically responsible for offshore turbine installation while in China it is generally the responsibility of the ***Offshore Wind Farm Developer***. However, in 2019, ***Offshore Wind Farm Developer*** Ørsted made an exception to this norm when it contracted DEME Offshore, and not the ***Offshore Wind Turbine Manufacturer*** Siemens Gamesa, to install turbines for the 1.2 GW Hornsea 2

project in the UK.

Taking a cue from developments in the onshore wind industry, where profit margins from turbine supply have shrunk in recent years, ***Offshore Wind Turbine Manufacturers*** are increasingly relying on the *Operations & Maintenance* life-cycle phase for revenue growth. In general, the logistics strategy is in-house (managing and coordination level) as well as outsourced when it comes to land, air and sea transport (e.g., installation vessels, crew transfer vessels, service operation vessels, etc), and construction as well as operations and maintenance ports. Factors such as distance from shore or proximity of other under construction or operational offshore wind farms affect, for example, whether the ***Offshore Wind Turbine Manufacturers*** employ a land based (crew transfer vessels) or a sea-based (service operation vessels) strategy for the *Operations & Maintenance* life-cycle phase.

3.4. Equipment, Procurement, Construction, and installation companies

As offshore wind farms have increased in size (more turbine units per project) and moved farther from shore into deeper waters, the engineering, procurement, construction, and installation scope expanded and became more complex. Among other things, it required investment in specialized and more expensive vessels. The pioneering ***Equipment, Procurement, Construction, & installation*** companies, typically small- or medium-sized, could not cope. Therefore, very large companies with significant risk appetite, strong balance sheet, insurance coverage, and experience from other similar offshore turn-key industries have emerged to meet this demand. The emergence of Tier 4-like ***Offshore Wind Farm Developers*** with strategies that prefer minimum risk via minimum supplier-interface has added momentum to the large ***Equipment, Procurement, Construction, & installation*** companies' space.

Table 2: Global work scope of Engineering, Procurement, Construction, & installation (EPCi) companies

EPCi contract relationship	EPCi contract scope	Wind Turbine & Balance of Plant components	EPCi work scope*	Logistics scope	Logistics assets	EPCi use of logistics service providers
Offshore Wind Farm Developer	Balance of Plant	Foundations, array cables	Engineering, design, planning, procurement, manufacturing (sometimes in-house), construction, installation	Tendering, procurement, planning, and execution across different logistics chains (inbound to manufacturing, manufacturing, outbound to site, installation at site	In-house EPCi vessel / crane assets supplemented with third party port and land-based assets	Yes
Grid Provider	Balance of Plant	Substations, export cables, onshore civil works				Yes
Offshore Wind Turbine Manufacturer	Offshore wind turbine	Blades, hub, nacelle, towers				Yes

*Primarily *Installation & Commissioning* life-cycle phase; increasingly moving into the *Operations & Maintenance* as well as *Decommissioning* life-cycle phases

Source: Panticon

4. Logistics Service Providers

Logistics service providers in the offshore wind industry provide diverse services across the entire logistics definition spectrum as defined in the first report of this brief reports series. The scope of ***logistics service providers*** includes port management, land transport, sea transport, air transport as well as other services such as marine coordination using special software, transport equipment, warehousing at construction or operations ports, weather forecasting, lifting equipment, and many others. The strategies of ***logistics service providers*** are primarily reflected in those of their main customers, namely the different types of contracting structures defined by the supply chain lead companies across different markets. ***Logistics service providers*** have been adapting their strategies to the demands from the supply lead chain companies as follows:

- The emergence of Tier 2, Tier 3 and Tier 4 ***Offshore Wind Farm Developers***, which prefer to contract large ***Equipment, Procurement, Construction, & installation*** companies, has put pressure on "pure-play" ***logistics service providers***. That is, the ***Equipment, Procurement, Construction, & installation*** companies, thanks to huge scope (which encroaches into the ***logistics service providers*** space) and the ensuing economies of scale, can outcompete "pure-play" ***logistics service providers*** on cost. The result is that ***logistics service providers*** are increasingly collaborating with other ***logistics service providers*** to provide larger packaged logistics solutions. For example, in May 2019, Dutch company **Marlow Offshore**, which specialises in recruitment, crewing, and human resource services, and compatriot **SeaZip Offshore Service**, which specialises in maritime and logistics support, formed a joint-joint venture, **MarZip Offshore Personnel**, to offer a single contact service concept for project-based, international offshore staffing solutions. ***Logistics service providers*** are also partnering with non-logistics service providers, e.g. guard services providers, to add supplementary services that are convenient for the supply chain lead companies.
- Before, supply chain lead companies would typically not involve ***logistics service providers*** at early stages of project planning, e.g. front-end engineering and design. The result was that avoidable logistics bottlenecks were only noticed at later stages of the project, thereby leading to project delays and cost overruns. ***Logistics service providers*** are taking a more holistic view of the offshore wind farm life-cycle and looking beyond the most lucrative *Installation & Commissioning* and *Operations & Maintenance* life-cycle phases. This trend is growing especially as ***Offshore Wind Farm Developers*** in new offshore markets such as France and South Korea increasingly bid for projects in alliances.
- As the offshore wind markets internationalize beyond Europe, new opportunities have emerged for ***logistics service providers***. For example, ***logistics service providers*** with a global presence can proactively leverage their global scope to provide competitive solutions to ***Offshore Wind Farm Developers, Offshore Wind Turbine Manufacturers*** and ***Equipment, Procurement, Construction, & installation*** companies.
- Within Europe, as offshore wind turbines come out of warranty, particularly for offshore wind farms linked to the Tier 1 and Tier 2 ***Offshore Wind Farm Developers, logistics service providers*** are expanding the scope of their *Operations & Maintenance* services in order to provide extensive

multi-year framework agreements.

5. Buyer-Seller relationships between Supply Chain Lead Companies and Logistics Service Providers

The increasing size of offshore wind farms, among other factors, will lead to Tier 1 and Tier 2 ***Offshore Wind Farm Developers*** awarding logistics contracts of bigger scope to "pure-play" ***logistics service providers*** with considerable scope in specialized logistics segments. Meanwhile Tier 3 and Tier 4 ***Offshore Wind Farm Developers*** will increasingly single-contract logistics to ***Equipment, Procurement, Construction, & installation*** companies as part of the expanded scope offered by these companies. This buyer-seller relationship will be similar for ***Grid Operators***. ***Equipment, Procurement, Construction, & installation*** companies, for their part, will sub-contract some logistics tasks to "pure-play" ***logistics service providers*** particularly to add capacity, even out cost levels, and enter new international markets.

Consolidation in the ***Offshore Wind Turbine Manufacturer*** segment since 2010 has left only two-to-three companies in Europe, a picture that is in the process of being replicated in the offshore wind markets outside Europe where turbine manufacturing takes place. Therefore, the segment is homogenous. ***Offshore Wind Turbine Manufacturers*** will, as priority, award logistics contracts of bigger scope to "pure-play" ***logistics service providers*** which have considerable scope in specialized logistics segments before reaching out to the ***Equipment, Procurement, Construction, & installation*** companies.

The "pure-play" ***logistics service providers'*** segment will continue to collaborate and consolidate in order to increase service scope and address new challenges, such as, less preference for crew transfer vessels as offshore wind farms move farther offshore and hence the need to invest in vessels with accommodation capabilities. Another challenge is the demand for "green" logistics in response to **environmental, social, and governance** (ESG) standards, hence the need to invest in "green" vessels to service the offshore wind industry.

6. Conclusion

As the strategic focus of companies across the offshore wind industry supply chains continues to expand beyond product innovation to process optimization, logistics will continue to be a key aspect of the industry. This is more so primarily because logistics accounts for at least 18% of the levelized cost of energy of offshore wind. Furthermore, as infrastructure funds, pension funds, oil & gas companies, and utilities with limited offshore wind track record enter the Tier 2, Tier 3 and Tier 4 ***Offshore Wind Farm Developer*** space, the key logistics customer portfolio is changing. These developers' preferred strategy is to increasingly delegate responsibility to ***Equipment, Procurement, Construction, & installation*** companies. The result is that ***Equipment, Procurement, Construction, & installation*** companies' share of the logistics customer portfolio is increasing. Therefore, "pure-play" ***logistics service providers*** need to adapt and adjust their service offerings to match this shift in key customer portfolio, the evolving procurement strategies of the main supply chain lead companies, as well as the increasing focus on a holistic view of the offshore wind farm life-cycle. In addition, as the offshore wind markets internationalize beyond Europe, ***logistics service providers*** with a global presence can proactively leverage their global scope to provide competitive solutions to, ***Offshore Wind Farm Developer*** and ***Equipment, Procurement, Construction, & installation*** companies.

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About Thomas Poulsen

Mr. Poulsen is a seasoned professional who has specialized in crafting strategy coupled with generating both tactical organic and strategic M&A driven growth for companies and organizations, mainly based on his experience in the shipping, transport, logistics, offshore wind, and supply chain industry. During his 30+ years in the business, Mr. Poulsen has lived in 8 countries namely his native Denmark, Indonesia (Jakarta), People's Republic of China (Shanghai), Singapore, Hong Kong (before hand-over to PRC), USA (New Jersey, California, and Florida), UK (London), and the United Arab Emirates (Dubai).

Abstract about Thomas Poulsen's PhD: Logistics in Offshore Wind

The PhD thesis is about offshore wind and focuses on logistics, broadly defined. As such, the research pertains to the offshore wind supply chain from the perspective of transportation and logistics tasks on land, through ports, at sea, and in the air. In addition, the research has dealt with logistics costs seen in relation to levelized cost of energy throughout the entire lifespan of an offshore wind farm project. The research has also dealt with the globalization of the offshore wind market, using China as the main example.

The results of the research have shown that logistics makes up a significant cost item within offshore wind. The results also revealed that it is important to organize logistics in an effective manner within those firms and organizations participating in the offshore wind industry. The eight academic articles which have been published as part of the PhD research project have been framed in the context of strategic management as well as the mergers & acquisition efforts forming part of the offshore wind industry as the market consolidation intensifies.

The research has been conducted in close collaboration with a series of leading offshore wind organizations and companies. The research was funded by Aalborg University and the Danish Maritime Foundation (Den Danske Maritime Fond) through grant number 2012-097.

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