THE COMMODITIZATION OF THE OFFSHORE WIND MARKET

@Vestas

1. The offshore wind industry

Fuelled by the energy transition, the offshore wind sector is rapidly growing. The capacity installed in Europe grew from a few MW in 1990 to 34 GW in 2023 and is expected to hit 270 GW by 2030. Particular front runners come from the North Sea countries as the conditions[1] there, are perfect for bottom fixed offshore wind. Already by 2030 the sector is expected to provide 73% of (current) electricity needs for the Netherlands, 25% of electricity needs in Germany and more than 80% of electricity needs in Denmark to only mention a few.

Those ambitious offshore wind targets, set by the individual governments and the European Union, provide a steady new influx of projects but also lead to a highly competitive environment. In general the offshore bottom-fixed wind supply chain can be separated into several subsegments:

[1] Low water depth, strong winds, reasonable low wave climate, sandy sea floor, etc

1) Turbine blade and tower manufacturing
2) Electrical infrastructure
3) Foundation manufacturing (monopiles or jacket structures)
4) Ships required for installation operation & maintenance

Next to the supply chain subsegments the following stakeholders are involved in the discussion around commoditization as well:

5) Project developers
6) Governmental authorities
7) NGOs & Academia
8) Society

Analyses done by key players in the field (e.g. RWE, Van Oord) show that various parts of the mainly European supply chain, even considering their targeted growth patterns, will not be able to provide more than 50% of the ships, turbines, blades and other components to reach the 2030 targets. Some parts of the supply chain claim that missing commoditization, which results from standardization and usually results in lower prices, is the reason for this dim outlook. Other parts of the supply chain are highly worried to commoditize as they fear losing market share to new entrants (especially Chinese ones).

Since the early 2010s China has become a more and more dominant force in this sector too. In the beginning they mainly imported European technologies and know-hows but in the 2020s this shifted and Chinese supply chain companies are entering the European market. And even though this could help mitigate the supply chain issues, it at the same worries European policy makers considering that the entrance of cheap Chinese supply chain companies destroyed the domestic market of solar panel manufacturing in the early 2010s.

2. Commoditization signs, context and barriers

The growth of offshore wind was sustained by ever larger offshore areas and ever bigger offshore turbines. Larger offshore areas do not directly impact the supply chain as it just requires more units of the same product

accommodating commoditization. Bigger turbines on the other side are disrupting the entire supply chain every time they scale up as the required ships, electrical infrastructure and foundation change completely. While offshore turbine size in the early 2000s was the same as in onshore wind (~2 MW at ~ 80m tower height) they quickly grew 2-fold in height in the 2010s (9 MW at 160m height) and are currently approaching 220m and 15 MW. This development was driven by a higher cost-efficiency per kWh produced by bigger turbines. Many turbine suppliers are already talking about a scale of 20 MW or more with tower heights approaching 300m. However, the cost reduction due to upscaling vs the standardization and subsequent commoditizing is currently under a heated discussion between ship operators and other supplies on the one side and turbine manufacturers on the other side.

Supply chain wanting to commoditize: Ship operators are the heaviest influenced by ever greater turbines as ships who can handle the largest turbines are very rare (< 5 ships worldwide owned by DEME, Boskalis and Van Oord) and constructing new ships who are capable of doing so are extremely expensive (~200-500 Mil€) and have a long lead time (~5 years). Other manufacturing companies are also pushing for more standardized components to upscale their production lines but are not as heavily influenced by the ever increasing turbine size as the ship operators. Companies providing the core electrical components for wind parks also need to reinvent certain aspects with the shifts in current (AC/DC) and voltage levels (HV) which are directly and / or indirectly influenced by the size of the individual turbines and the governmental regulations.

Competitive environment & resistance from the offshore turbine manufacturers: Offshore turbine manufacturers, in the western world dominated by Siemens Gamesa, Vestas and GE who have bought up any other serious competition over the last 20 years. Those three companies have used the continuous upscaling as a competitive edge towards any new competitors, as the cost of entering this market has reached the bn€ range. As previously described, there are Chinese manufacturers who have got a strong foothold through state-aid and the enormous upscaling of offshore wind in China. Those manufacturers are extremely price effective but have currently still a lower perceived quality due to the shorter track-record and some incidents in China. In 2024, the European Commission started to investigate the state-aid for those Chinese manufacturers.

The high R&D budgets and interesting engineering challenges caused by the continuous upscaling also allows Vestas, Siemens and GE to keep excellent personnel, which might not stay in a commoditized market. However, the margins for producing offshore wind turbines are notoriously low which caused several industry failures in the late 2010s and early 2020s. Siemens Gamesa for example is under continuous scrutiny and has been reincorporated fully into Siemens Energy. The low profit margin might be resolved due to the commoditization followed by cost reductions and less R&D, but the entrance of new competitors, the missing challenges for their top engineers and the required change in their organisational set-up lead to them not being too favourable for standardizing and commoditization.

One last aspect for the turbine manufacturer is a first-mover (dis)advantage: It might seem that the technology developer who first commoditizes by developing the most low cost structure for turbines would have a strong competitive advantage. However, governments have yet to commit to put regulations in place to limit the scale of the turbine size. In the Netherlands, there is a push for such regulations, but the last offshore tenders still only provided a minimum turbine size (14 MW) but no maximum. This approach leads to contradicting market signals as any company who is going to commoditize going more into a prize-seeker structure would require a significant reduction of R&D budgets while investing heavily into the machinery to produce one size of turbines. This in turn could lead to other players overtaking one if the turbine sizes are further increasing and keeps the manufacturer in a limbo.

Governments and society: Based on this limbus there is a clear role from governments as only proper regulation and long-term clarity can lead to a commitment for the manufacturers on changing their current business model. The regulation could be two-fold. On the one hand, governments which provide tenders for offshore wind development could provide a maximum turbine size in the tender description and communicate this upfront for multiple years to come. On the other hand, governments could ask for increased standardization regulations on turbines.

Governments[BL8] and society at large are mainly worried about managing the energy transition in the most low cost way for the end-consumer while providing energy security. Standardization and commoditization can, through a more straightforward supply chain, allow for a successful energy transition. However, countries with a strong industry representation of turbine manufacturing (DK, DE, ES, etc.) are less

likely to enforce ruling on maximum turbine size as long as the manufacturers are opposed to it.

Project developers and utilities are mainly concerned about the optimal business case for their large scale installation. Their two main key performance indicators for offshore wind project development are (1) the revenues obtainable due to spot price market sales and PPAs and (2) the levelized cost of electricity (LCOE) of offshore wind. The latter is strongly influenced by the cost of the turbines and their installation. So far the continuous growth of turbine size has reduced the cost due to more energy production per turbine, less installations, etc.. However, several academics are forecasting a tipping point on those cost reductions before reaching 20 MW. At which point the turbine transportation and installation cost per turbine increases disproportional to the cost reductions achieved by installing less turbines overall. Especially private developments will favour this cost optimized turbines. The only deviation will be projects which are developed as a reply to a public tender, which at this time at least still provide minimum turbine sizes.

Players / Root causes	**Signs for commoditization**	**Barriers to commoditize**
Supply chain (excluding turbine manufacturer)	Most of the supply chain companies. Especially ship providers are strongly in favour due to the large, long term investments.	Some supply chain companies might also benefit from ever increasing turbine sizes.
Turbine manufacturers (in Europe & US)	Aligning the business case to increase the profit margin.	Commitment to commoditize could (a) reduce attractiveness of business to engineers; (b) provide new competitors with an edge; (c) could be detrimental to the business if timed wrong (e.g. other turbine size becomes standard)

Governments	Some countries like the Netherlands are looking into standardization.	Public offshore wind tenders still require an ever increasing minimum turbine size.
Society	Large pressure on electricity price influencing the full value chain.	
Project developers & utilities	Turbine reach maximum cost reductions due to size (transportation cost; efficiency vs cost; etc.)	Governmental tenders asking for minimum turbine sizes.

Table 1: Summary on root causes influencing the commoditization in one or another way.

Nota Bene: New features are unlikely to play a significant role in the offshore wind turbine market. The turbine design needs to be as long-lasting, resilient and environmentally friendly as possible. Features which improve these factors, for example circular blades or innovations which make the design more nature inclusive will definitely play a role as governments around Europe are requiring those aspects. Many of which might potentially benefit from standardized and commoditized turbines, while at the same time giving the turbine manufacturers different R&D focus points than the size. The latter point could contribute to them keeping their excellent engineers and a certain competitive advantage. However, the number of features and directions this development could go to are limited and highly uncertain.

3. Conclusion

The commoditization of offshore wind turbines appears to be certain as more and more countries are supporting the standardization and as there seems to be a maximum size which makes technologically and economically sense. Even though, predictions of the late 20th century forecasted that wind turbines will never be larger than MW scale, so any forecast here needs to be taken with a grain of salt. Additional features besides the efficiency, lifetime and sustainability of the turbines are playing a minor role, which might lead to an extreme price competition after

commoditization. The two best strategies for the turbine manufacturer might therefore be to whether:

1) Understand the most likely turbine size as quickly as possible and adopt the business case accordingly. Moving from an R&D and continuously changing market to a price leader. To do this the organization needs to maximize how lean it operates. Vestas, due to its pure focus on turbines, might be well equipped for this move. This resembles a higher volume, lower margin positioning. The biggest risk here are entrants from other countries with even lower prices, however recent local content and energy security policies mitigate this risk. Vestas could additionally benefit from already having a well established name in the industry.
2) Establishing their brand as the highest quality one with the best life time, sustainability and circularity. This would allow it to still provide more R&D opportunities and offer complete solutions with several parts of the supply chain integrated in the package. Siemens Gamesa (Siemens Energy) and GE might be better suited for this strategy as they have several parts of the supply chain integrated in the organisation. This will be a lower volume, higher margin positioning. The biggest risk here is to lose substantial market share to the competitors as the project developers (customers) are more focused on cost reductions.

The main learnings from this analysis about the commoditization of the offshore wind turbine markets are that any commoditization inside a multi-stakeholder environment faces several barriers and that the organisations who could suffer from the commoditization might go far in their lobbying and perception building efforts to prevent it as long as possible. The analysis also shows that the fight against commoditization is an uphill battle and the main thing they can do is to delay it from happening, especially if the industry is very used to commodities like the energy industry.

The requirements of key value chain players, like the ship providers and the recent movements inside governments show that the sector might already approach the commoditization phase now (2024) even though it could still take a decade or longer for offshore wind to become fully commoditized. It stays exciting and it will be a critical decision making point for any offshore wind developer when to adopt the business case to facilitate commoditization and at which turbine size.

For more information

Dutch Marine Energy Centre (DMEC)

Benjamin Lehner, CEO
T +31 6 21351985
benjamin@dutchmarineenergy.com
www.dutchmarineenergy.com

Simon Stark, CTO
T +31 683 551 504
simon@dutchmarineenergy.com
www.dutchmarineenergy.com