# Scaling Floating Offshore Wind

## How a two-stage allocation process for European floating offshore wind can contribute to accelerating innovation and value chain development

**Floating offshore wind is essential for reaching Europe's energy targets, given the limitations in suitable locations for bottom-fixed offshore wind. However, floating offshore wind is still in a pre-commercial phase. To support the technology's potential in relation to the European transition, three main tasks must be addressed on both a national and EU-level:**

**a) An accelerated development of floating offshore wind, surpassing the historical bottom-fixed development pace, is needed**

**b) A specialized value chain for floating wind based on industrialized production processes must be developed**

**c) Sufficient project scale at an early stage is vital to ensure an efficient development path with regards to infrastructure, methodology and skillset**

**However, achieving these three tasks' simultaneously is challenging. Investing in a market that is developing industrial scale infrastructure *and* the associated value chain, carries an inherent risk related to the ultimate cost of projects for potential investors. Without compensating measures, three distinct market failures can occur: inflated project costs, reduced competition, and lack of innovation.**

**Today's existing support mechanisms for offshore wind, which in different variations involve financial competition in the early stages of projects, take little consideration to this barrier. As such, an adaptation to such mechanisms is needed to effectively accelerate the development of floating offshore wind in Europe, enabling its crucial role in achieving Europe's climate goals.**

**In this paper we have explored how the announced two-step auction procedure for offshore renewable energy at Utsira Nord by the Norwegian government in 2023 address these barriers. We find that the proposed scheme gives the three awarded developers both time and incentives to develop their concepts and supply chain before making a financial bid. A crucial part of the scheme is the fact that the developer who does not secure state support in the second auction round, secures a significant value of their respective project design through exclusive rights to further develop the awarded area in future tenders. Thus, the proposed scheme can foster both efficient innovation and technological maturity by providing positive learning effects for floating technologies, which can benefit the entire European floating offshore industry. The two-step auction procedure stands in contrast to several other auction designs available today for offshore wind in Europe but has been explored earlier. For example, the need for maturity was taken account for in the auction for bottom-fixed offshore wind in Poland, when the European Commission granted an exemption from a competitive bidding process in the current guidelines for Energy & Environmental State. There are also several similarities between the proposed Norwegian scheme at Utsira Nord and the ScotWind process, where developers bid for areas in a first leasing round followed by a competitive auction for state support.**

In this document we discuss the role of floating offshore wind in the European transition, the main barriers facing the industry at its current stage, and how support mechanisms need to be designed in order to address these barriers.

The document is structured as follows: First we discuss why floating wind is needed in a European context. Secondly, we present the three main tasks to ensure a sufficient development of floating offshore wind. Chapter three discusses the challenges of achieving these three tasks simultaneously given the current design of support schemes in Europe. In chapter four we discuss the proposed methodology for floating offshore wind in Norway which differs from the established schemes in the EU before we present our concluding remarks in chapter five.

## 1. Expanding Beyond Bottom-Fixed: The Necessity of Floating Wind for Achieving European Goals

The EU has set ambitious targets for the expansion of offshore wind power and has developed strategies to achieve these goals. In 2020, the European Commission launched a strategy for offshore renewable energy, which was put forward to help meet the EU's ambitious energy and climate goals. The strategy emphasized that the value chains for offshore energy must be significantly strengthened for the EU to be able to meet its offshore wind targets. In January 2023, EU member states agreed on new long-term goals offshore renewable energy in each of the EU's five sea basins, with intermediate objectives to be achieved by 2030 and 2040. The combined figures give an overall ambition of installing approximately 111 GW of offshore renewable generation capacity by the end of 2030, which is an increase from the previous 60 GW set out in EU's offshore strategy from 2020.[1] The revised target is a result of key provisions in the TEN-E regulation, which aims to coordinate long-term integrated offshore grid planning. Cumulatively, these targets amount to 109-112 GW by 2030, 215-248 GW by 2040, and 281-354 GW by 2050. If we include Norwegian and British offshore wind targets, this will raise the cumulative amount to 450 GW by 2050.

Even though few countries have defined to what extent they will install floating or bottom-fixed technologies to reach their ambitions, this is largely determined by each country's spatial and technical constraints. Floating technologies have a considerably greater potential for development than bottom-fixed technologies, as they are not limited by water depths. Furthermore, bottom-fixed technologies could be further constrained by areas with poor seabed quality that are unsuitable for bottom-fixed installations, and by stricter requirements to sustainability, such as ecological protection.

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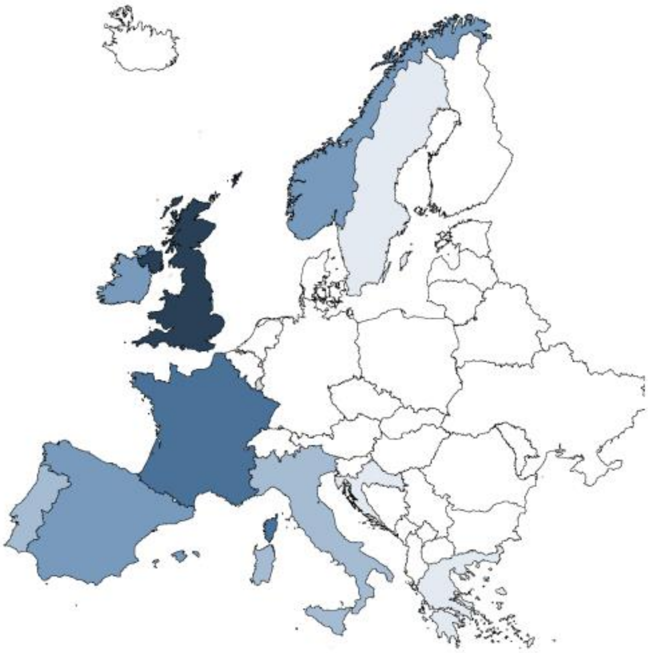
[1] *European Commission (2023). Member States agree new ambition for expanding offshore renewable energy. Available here.*

**Figure 1: Illustration of which European countries are considered the most promising with respect to the development of floating offshore wind towards 2035. Darker shades indicate higher market potential. Source: Menon Economics (2022).**



So far, Northern Europe has emerged as the centre for the offshore wind industry. This is reflected both in the location of existing parks today and is evident in analyses of where the potential for future offshore wind development in Europe lies. For instance, BVG Associates, in a study for WindEurope, estimates that 85 percent of offshore wind development by 2050 will be located in Northern Europe, more specifically in the North Sea, the Baltic Sea, and the Atlantic Ocean. In many of these areas, especially in the North Sea, the technical potential is primarily present for floating technologies.[2] The map above illustrates the potential for development of floating offshore wind in various European countries. The potential is also reflected in the development scenarios below. However, as the figure illustrate, pace is vital, both with regards increasing the portfolio of technologies (more projects) and the scale of the projects being developed. In the following section we discuss why this is vital for the European transition.

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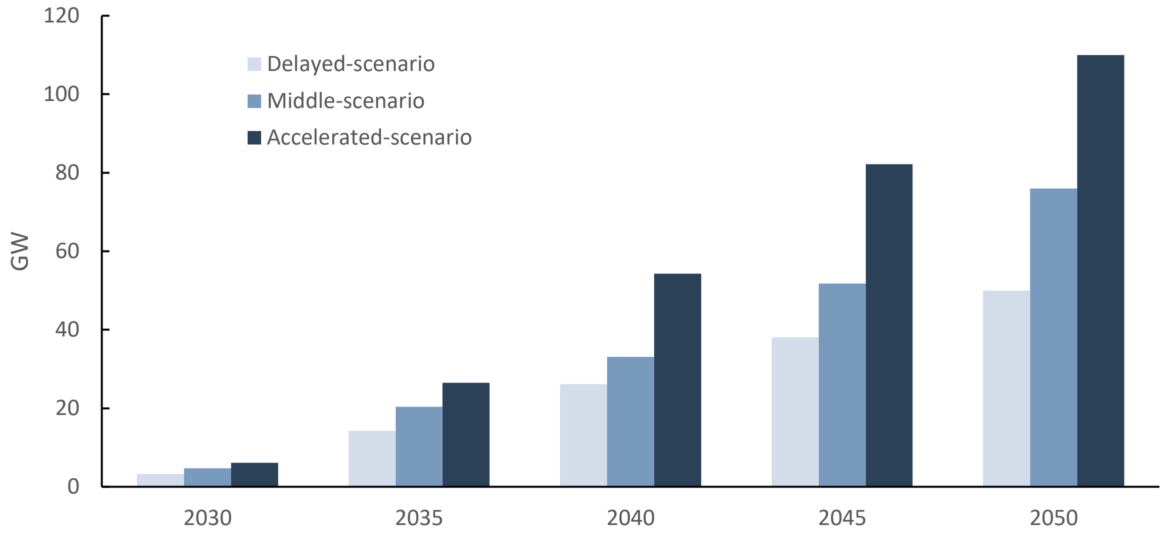
[2] *Wind Europe (2019). Our Energy, our future. Available here.*

**Figure 2 Different development paths for floating offshore wind in Europe towards 2050. Source: Menon Economics, based on Menon (2022), DNV (2023) and 4C Offshore.**[3]



## 2. Three main tasks emerge to ensure a sufficient development of floating offshore wind in Europe

Considering the renewable energy ambitions, the spatial constraints for bottom-fixed offshore wind and the technical potential for floating offshore wind in Europe, it is imperative to establish market conditions that ensure a sufficient development of floating offshore wind. Key barriers for this development are especially related to costs, where the objective is to make floating offshore wind an affordable technology so that it can contribute to both emission reductions and the development of competitive new green industries in Europe. A large-scale development of floating wind can boost cost reductions and will be necessary to ensure a just and efficient economic transition. According to DNV, the current LCOE for floating offshore wind is approximately EUR 250/MWh, which is more than three times the current LCOE for bottom-fixed offshore wind (EUR 74/MWh).[4]

In order to reduce costs, there is a need for a maturation along the entire value chain at the same time as a significant increase in capacity within the supplier segment. This is because the development of technology, value chains, and infrastructure, respectively, is closely interconnected and rely on one another. Currently, input factors and suppliers from adjacent value chains (fixed-bottom offshore wind, oil and gas) are being utilized for floating wind projects, but the production of floating foundations will need its own specialized value chain in order to ensure scale. Furthermore, there is a need to scale projects quickly to ensure efficient infrastructure and skills development. The latter is closely related to the cost structure of floating offshore wind, where the floating foundation itself accounts for 39% of total CAPEX. To unlock the potential for floating installations, it is therefore essential to realize economies of scale and

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[3] *The estimate for 2030 has been calculated by Menon based on our previous analysis as well as new input from DNV's Energy Transition Outlook from 2023, and data from 4COffshore. Figures for 2040 and 2050 are taken from DNV's analysis.*
[4] *DNV (2023). Energy Transition Outlook. Original numbers are stated in USD (270 USD/MWh and 80 USD/MWh), and we have used the exchange rate 0,92 to convert to EUR.*

utilizing automated processed for manufacturing/assembling, i.e., industrialized manufacturing based on fabrication and more automated production lines.

In the following section, we will go further into depth on three main tasks that is vital to unlock the potential for floating offshore wind.

- A need for an **accelerated development** of floating offshore wind, surpassing the historical bottom-fixed development pace.
- A need to develop a **specialized value chain** for floating wind based on industrialized production processes.
- A need for sufficient **scale at an early stage**, to ensure an efficient development path for floating wind.

## A need for an accelerated development of floating offshore wind, surpassing the historical bottom-fixed development pace

The market for floating offshore wind is significantly less mature than fixed-bottom offshore wind. Up to now, mainly pilot projects and pre-commercial projects have been developed. Hywind Scotland was the first park of a significant size with five turbines and a total capacity of 30 MW. This was followed by, among others, WindFloat Atlantic (Portugal) in 2019 with an installed capacity of 25 MW and Kincardine (Scotland) in 2021 with 50 MW. As of 2022, the largest and latest operating floating offshore wind farm is Hywind Tampen in Norway (95 MW).

Bottom-fixed offshore wind has since the first park was installed in 2002 in Denmark, grown to be a multinational industry, and is, relative to floating wind, a much more mature and developed technology. In 2022, the total capacity of bottom-fixed offshore wind globally was 68 GW.[5] The largest bottom-fixed offshore wind farms that have been commissioned in Europe recently have been in the range of around 800 to 1400 MW.[6] Furthermore, the world's largest offshore wind facility with a total capacity of 3500 MW, the Dogger Bank Wind Farm, is currently under construction off the Northeast coast of England.

Floating offshore wind is currently at the development stage that bottom-fixed offshore wind was at in the very early years. If the development of floating offshore wind follows the same pace as bottom-fixed offshore wind has historically, we will first see larger floating wind farms in the late 2030s/beginning of the 2040s. With regards to the offshore wind ambitions of European governments and the EU’s climate targets, large scale floating wind farms must be established at an earlier date, and thus an accelerated development of floating offshore wind is needed.

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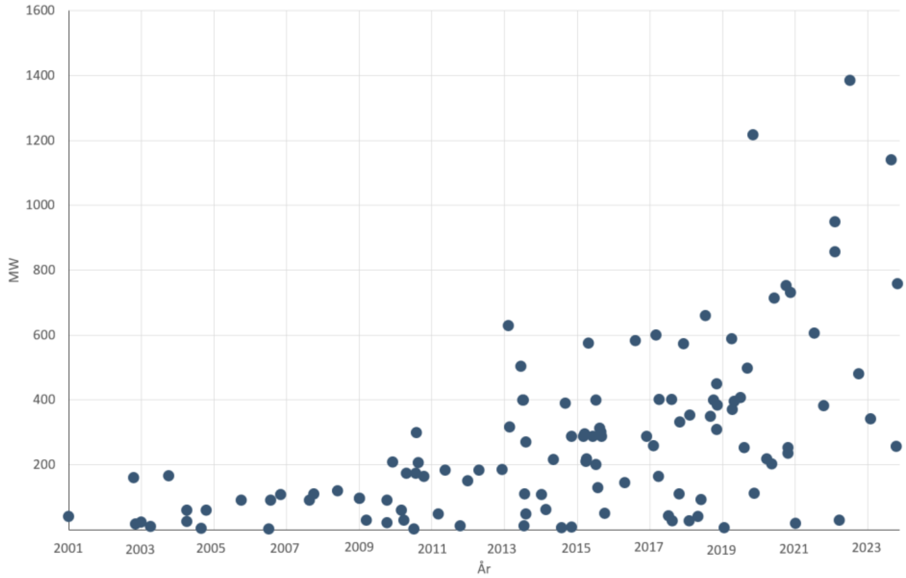
[5] *DNV (2023). Energy Transition Outlook 2023.*

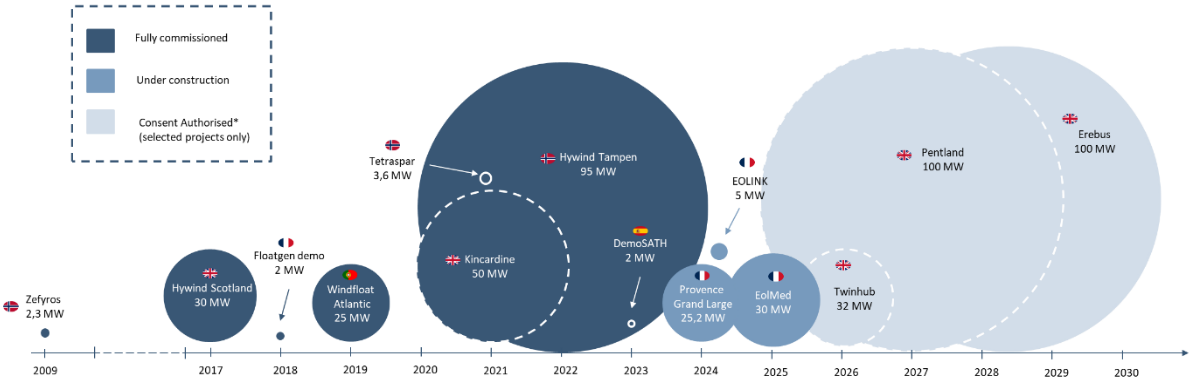
[6] *For example, Hornsea Project Two (1386MW, 2022), Seagreen (1140MW, 2023), Moray East (950MW, 2022), Triton Knoll (857MW, 2022), Hollandse Kust Noord (759MW, 2023) and Borssele 3 and 4 (731MW, 2021).*

**Figure 3: Scatterplot of fully commissioned European bottom-fixed offshore wind farms, with regards to size (MW) and the date the parks where fully commissioned. Source: Menon Economics, based on 4COffshore.**



Over the next three years (towards 2027), several floating offshore wind farms are expected to enter into their operational face. However, these parks vary significantly in size. Some are pilot projects to demonstrate specific technologies, whereas others are being developed as larger parks (around 100 MW), which is significantly smaller than today's installed capacity in bottom-fixed offshore wind parks. This is illustrated in the figure below, where fully commissioned (operating) offshore wind turbines/parks are marked in dark blue, projects under development are marked in medium blue, and selected projects where consent is authorised are in pale blue. The scale of projects has progressively expanded over the years and is expected to continue increasing, as evidenced by the growth since the first floating demonstration project in 2009.

**Figure 4: Floating offshore wind development in Europe towards 2027. Fully commissioned (operating) offshore wind turbines/parks are marked in dark blue, projects under development are marked in medium blue, and selected projects where consent is authorised are in pale blue. Source: Menon Economics, based on 4COffshore.**



The difference in cost composition of bottom-fixed and floating offshore also has consequences for how the scaling up of production can take place. See the textbox below for more details.

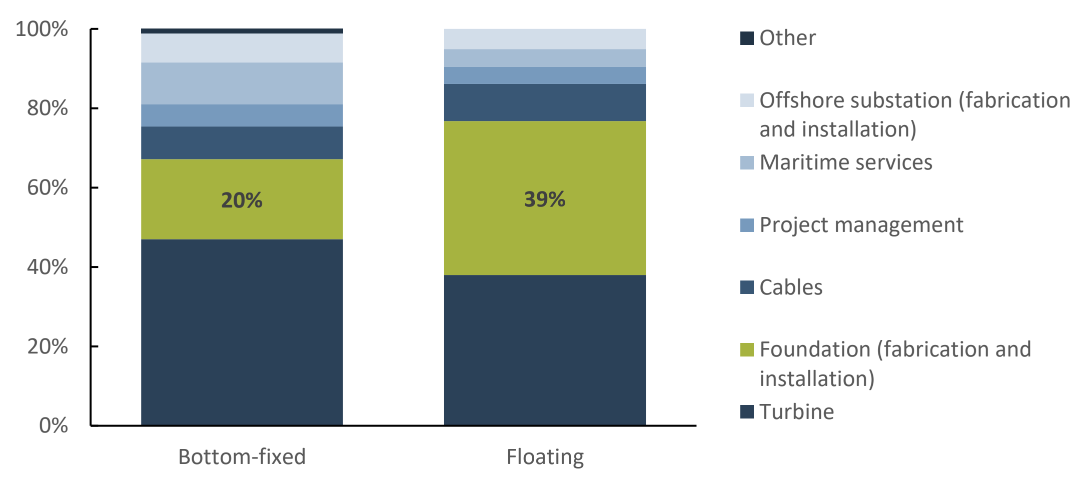
## Textbox 1: The difference in cost structures of floating and bottom-fixed offshore wind turbines[7]

In order to evaluate and compare the cost of electricity production from different technologies and at different locations, the LCOE (Levelized Cost of Electricity) term is well suited. The LCOE is comprised of, among others, the capital expenditure (CAPEX) of an offshore wind farm. The CAPEX of an offshore wind farm can be broken down into several cost categories, and thus used to compare the cost structure of a floating and a bottom-fixed offshore wind farm.

The cost structures of a floating and bottom-fixed offshore wind turbine differ, as illustrated in the figure below. For a floating offshore wind turbine, the costs associated with the foundation and its installation make up a larger part of the total costs relative to bottom-fixed installations. In absolute values, the cost per installed MW for the foundations for bottom-fixed (0.43 million GBP/MW) are around one third of the foundation cost for floating (1.33 million GBP/MW). Thus, the cost of floating offshore wind is currently driven by a high cost of floating foundations. Floating technology is more expensive and complex, but at the same time they allow for economies of scale, which offers significant potential for cost reductions. This will be elaborated on later.

The current existing technologies for floating foundations have only been tested in demonstration projects and pilots, and not on a commercial scale yet. Therefore, commercially viable supply chains for these technologies (fabrication factories, suppliers of components, assembling and installation ports, maintenance ships etc.) have not been developed yet. Because the cost structures differ between the two offshore wind technologies, a different set of measures to reduce costs for floating offshore wind than for bottom-fixed is needed.

**Figure 5: CAPEX breakdown of floating and bottom-fixed offshore wind installations. Source: BVG Associates et al (2023), processed by Menon Economics**



*Please note that the cost breakdown in only used as an example to illustrate the relative size of the different cost components between a floating and a bottom-fixed offshore wind park. There are differences in the size of wind turbine, the year and other aspects, which must be taken into consideration.*

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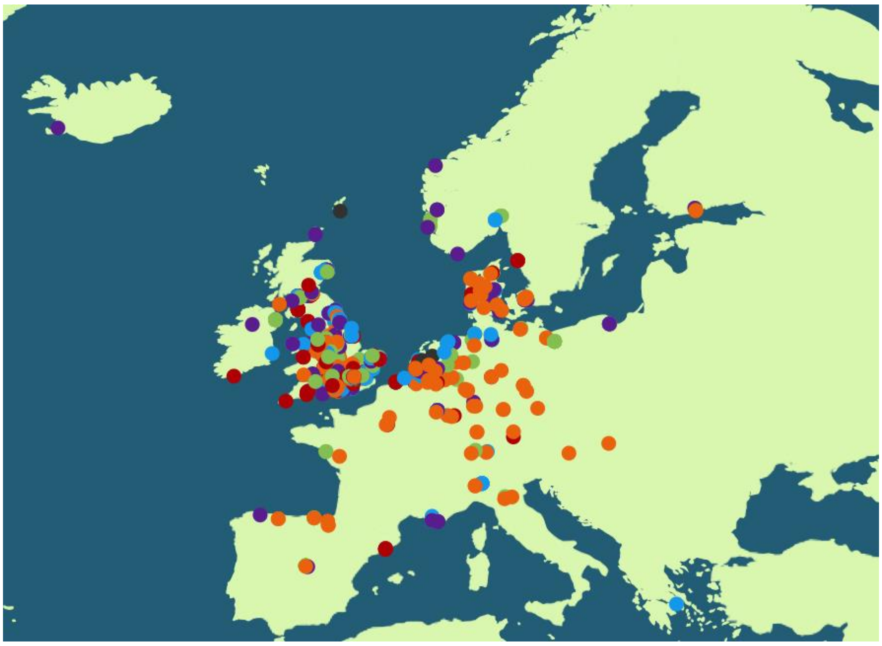
[7] *BVG Associates et al (2023). Guide to a Floating Offshore Wind Farm. Available here. BVG Associates, et al (2019). Guide to an Offshore Wind Farm. Available here.*

## A need to develop a specialized value chain for floating wind based on industrialized production processes

To reduce the high costs that we observe today for floating offshore wind, developing specialized value chains for floating offshore wind is crucial. Currently floating projects are heavily reliant on the existing supply chain associated with offshore oil and gas as well as the bottom-fixed and onshore wind industry. While these supply chains offer expertise that can be used to develop the floating industry, the lack of a dedicated supply chain implies that the components specific to floating wind, such as foundations, to a large extent need to be ordered customised, specific to each project. This is a stark contrast to the bottom-fixed value chain where turbines, foundations, substations, and cables are mass-produced in factories and assembled at sea with specialized ships. Today, there exists a variety of bottom-fixed technologies that have become established market standards. Several suppliers and fabricators provide these technologies on both the European and global market. In many cases, developers utilize a "off the shelf" approach for a large part of their projects. The figure below shows different parts of the established value chain in Europe for UK bottom-fixed wind today wind farms.

**Figure 6: Supply chains for UK bottom-fixed wind farms. Source: BVG Associates et.al[8]**



Compared to the bottom-fixed market, floating offshore wind is more reliant on developing a specialized value chain. In addition, floating offshore wind has several components which differ from other offshore industries, such as dynamic cables, where bottom-fixed wind in many cases can use similar cables as developed for exporting electricity offshore. As described in the textbox above, the fabricating and assembling of the floating foundation, makes up a higher share of total costs compared to bottom-fixed offshore wind. This differentiates the floating offshore wind value chain from the mature land-based and maritime value chains which have been available to the bottom-fixed wind industry. In terms of

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[8] *BVG Associates, Catapult, The Crown Estate, Crown Estate Scotland and Floating Offshore Wind Centre of Excellence (2023). Guide to an Offshore Wind Farm. Can be downloaded [here.](#)*

constructing and assembling large floating foundations (in ports/on shore), the oil and gas industry have more similarities with the floating offshore wind industry. However, for offshore oil and gas, each specific installation is designed and constructed on a per-project basis, with an aim to optimize each construction to the specific site and purpose.

For floating offshore wind, the assembling processes need to be repeated for each turbine for each project, as large-scale wind farms consist of many turbines. As an example, the Dogger Bank wind parks are projected to consist of 277 turbines. Thus, to achieve sufficient cost reductions it is essential to move from customization (based on the oil and gas value chain) to industrialized processes which utilizes automated processed for manufacturing/assembling. This transition could be compared to the difference between custom-shop production processes which are defined by assembling components in a workshop, such as auto repair shops, and production processes relying large-scale production lines, such as producing components for cars. As an "end-game", each standardized floating foundation technology (e.g. sparbuoy, spar-submersive,) needs to have its own dedicated process for fabrication and a method for design and production that can be established across a wide range of geographical areas. Thus, country specific development will have an impact on the development potential both on a European level and globally. Streamlining operations from material-sourcing to turbine-assembly will facilitate a rapid expansion of floating offshore wind capacity. Without innovation and industrialization of the fabrication processes, substructures will however continue to be fabricated on a per-project basis, to very high costs compared to other renewable technologies and without development of the competence needed in fully commercial market.

## A need for sufficient scale at an early stage, to ensure an efficient development path for floating wind

To ensure sufficient competence development, infrastructure development and pace, large scale projects are needed at an *early stage*. Due to the difference in cost structures between floating wind and other offshore markets, different measures are needed to reduce costs and scale up production for floating wind. For example, since floating foundation technology is more expensive and complex, they allow for economies of scale which offers significant potential for cost reductions.[9] Furthermore, scaling is a vital part of the innovation path for floating offshore. Below we highlight the four most important elements with regards to scale and how it affects the pace of the commercial and technological development at the market's current stage.

**Scale ensures efficient investments and an accelerated development pace**. To facilitate increased production volumes and efficiency gains through economies of scale, substantial investments in infrastructure is imperative. However, the commitment to such sizable capital expenditures is dependent on the existence of a demand side. Without this, it will not be possible to justify long-term investments in production facilities, and therefore not securing a sufficient capital allocation to the floating wind sector.

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[9] *Economies of scale are cost advantages taken by companies when their production becomes more efficient. This happens because costs are spread over a larger number of goods, and when learning by doing makes the cost of each produced good cheaper.*

At the market's current stage, such volumes are only possible to secure through scaling up the short-term pipeline of projects. Without sufficient scale there is a significant risk for suboptimal investments both with regards to investment levels and the type of infrastructure that will be developed.

**Sufficient scale ensures development of relevant skills and knowledge**. Scale and high quantity production promotes the development of essential skills and knowledge, such as expertise in automation of manufacturing and fabrication processes. This skill and knowledge development takes time, as it is significantly different from the existing capabilities for bottom-fixed and onshore wind. As the industry expands, the demand for such specialized knowledge intensifies, ensuring that the workforce evolves to meet the technical challenges of large-scale production. The largest projects in the current pipeline of projects will yield important learning effects on project development and design. However, to ensure investment that facilitates the development of a value chain that is specialized in industrial processes for floating offshore wind, the scale needs to be further increased.

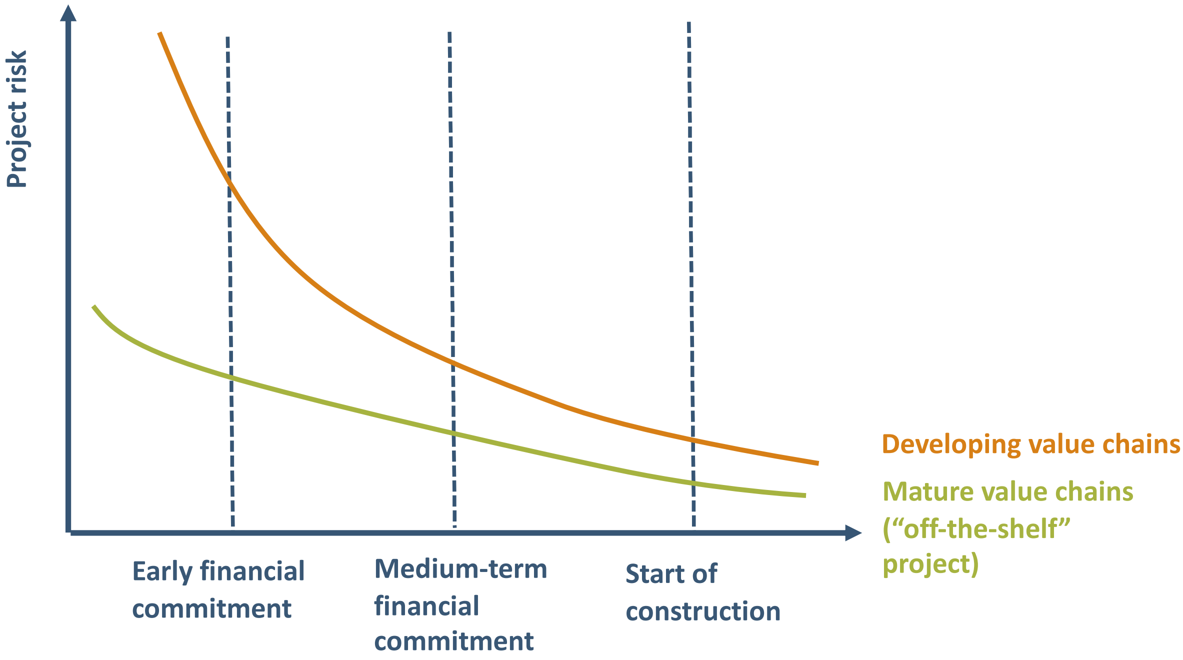
**Large scale manufacturing facilities ensure cost efficient innovation processes**. Economies of scale also play a pivotal role in driving efficient innovation in production processes. When operations scale up, firms can spread fixed costs over a larger number of units, invest in more advanced technology, and optimize production processes. This creates an environment conducive to innovation, as companies can allocate more resources to research and development. Further, larger production volumes provide a greater incentive to innovate and improve product offerings to maintain a competitive edge in the market.

**Scale ensures attractiveness from the existing supply chain.** Today there is competition between wind energy developers to ensure suppliers and components in the existing supply chains. This constrained capacity in the existing value chain and supply market will most likely continue to be a challenge towards 2035, due to the ambitious targets for wind energy in Europe. If floating wind projects increase their scale, the floating wind industry enhances its appeal to suppliers such as turbine manufacturers. The reason for this is that supplying components to small and medium-sized projects is often perceived as less lucrative compared to the opportunities presented by larger-scale projects. Consequently, smaller projects may face competitive disadvantages, potentially missing out on preferred supplier agreements or negotiating less favourable terms in comparison to their larger counterparts.

## 3. Challenges to scaling efficiently

The points discussed above presents a high-level blueprint for the commercial development path for floating wind. Investing in a market that is simultaneously scaling up floating technology *and* developing the value chain carries inherent uncertainty and risk regarding the ultimate cost of projects. This is due to the fact that the floating turbine foundation technology is still relatively immature. Today, there are more than 50 different designs for floating substructures currently being proposed by technology innovators, but only a handful of these have been demonstrated. This means that there is still limited experience with these technologies, with regards to their suitability, performance, fabrication and installation. In such an investment environment the financial risks borne by investors in project ventures are closely related to the stage of financial commitment. Consequently, the closer to the start of construction of a project, the more information/certainty the investor and developer has about the total costs of the project. The figure below illustrates the relationship between the financial risk (vertical axis), and the stage of financial commitment (horizontal axis). The closer the investor is to the date of construction start, the more knowledge they have of the final costs of the project, and thus the financial risk associated with uncertainty of the project cost falls. Furthermore, it can be argued that the financial risk is higher in the stages of early financial commitment in the case where value chains are under development (orange line), compared to a case where value chains are more developed (green line) and components can be acquired more or less "off the shelf". In this case, the risk associated with the final cost of a floating wind project is much lower at an early stage, reducing the effect of postponing a financial commitment compared to a situation with less developed value chains.

Figure 7: Financial risks and development of value chains for novel technologies. Source: Menon Economics



Without any compensating measures, this inherent uncertainty potential investors face can result in three distinct market failures:

1) **Inflated cost.** High financial risks can pose challenges for obtaining efficient debt financing due to high costs. This implies that an early financial commitment, which is demanded in a competitive financial auction process, will yield a higher risk premium which increases the project cost and the respective bids, compared to a financial commitment being made at a later stage.
2) **Reduced competition.** Some developers do indeed highlight that a financial commitment at an early stage of a project with high financial risks can result in a lack of access to debt financing. If this is the case, the competitiveness in a financial auction could be weakened as only certain type of developers, e.g., developers who have more financial flexibility, will be able to develop a financial plan supporting their bids.
3) **Lack of innovation.** Another consequence of high financial risk is that investors could demand that projects use safer, less innovative technologies, resulting in sub-optimal solutions. Reducing the innovative elements of the project reduces risk of the final cost outcome of the project. Less

innovation, however, will also reduce the potential cost reduction, both on a project (short term) and market (long term) basis.

The high financial risks associated with the value chain for floating offshore wind today suggests that developers need time to mature both the technology and the value chain for floating offshore wind, before they can attract sufficient financing to ensure viable projects. Furthermore, sufficient economic incentives are vital to ensure that innovative solutions are develop while projects are maturing.

Today's existing support mechanisms for offshore wind, which in different variations involve financial competition in the early stages of projects, take little consideration to the developers and suppliers' risk in the early face of the respective projects. Therefore, a form of adaptation to the current support mechanisms is needed, to ensure both innovation, infrastructure and value chain development, and a competitive process for financial aid.

## 4. A competitive two-step process addresses the main barrier for developing floating offshore wind

Today, variants of auctions are being developed and announced for offshore wind across Europe. Generally, these involve competition for state support in the form of auctions, where Contracts for Difference (CfD) are often used. Both the auction procedures for bottom-fixed offshore wind in Sørlige Nordsjø II in Norway and for two floating offshore wind farms in the Gulf of Lion are examples of such auctions.[10] In the EU, CfDs are envisaged to be the standard scheme for public funded projects for renewable energy.[11] However, auction schemes which demand competition for state support straight away, regardless of payment structure (CfDs etc.), does not reduce the inherent financial risks developers of floating offshore wind face, nor do they offer sufficient economic incentives for developers to develop new and innovative infrastructure.

The two-step auction procedure for offshore renewable energy at Utsira Nord, announced by the Norwegian government in 2023, is an example of an auction design that have been developed to address the need for maturity in the value chain and technology. The Utsira Nord area has a capacity of 1,5 GW, which will be allocated to three projects of 500 MW each, with a possibility of increasing the capacity up to 750 MW for each project. Due to the sea depth of the Utsira Nord area, floating technologies will be developed. Utsira Nord will, together with the Sørlige Nordsjø II auction be the first large offshore wind projects in Norwegian waters.

The announced scheme for floating wind in Norway is designed such that in the first step, three defined areas at Utsira Nord will be awarded to three actors on the basis of qualitative criteria. Among other things, the criteria will facilitate for innovation and technology development, as bidders must demonstrate that

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[10] *4C Offshore (2023). French EUR 4.12 billion Floating wind Tender for 2024. Can be downloaded here.*

[11] *In December 2023, the Council and the European Parliament reached a provisional political agreement on the Electricity Market reform. One of the Council's main elements is to make making contracts for difference mandatory for public funded projects on both renewable and low-carbon nuclear energy. Can be downloaded here.*

they plan to promote innovation and technological developments for future floating offshore wind projects, capable of (i) reducing costs, and (ii) distribution and scale-up of their technology.

After the areas have been awarded, the developers will conduct an impact assessment and mature the projects further, *before* the second step of the auction process is carried out, which is a competition for state funding.[12] The project that does not receive state funding will retain the right to the area for a period of time and may use the public support system and will be able to participate in possible future competitions such as state funding for offshore wind.[13]

The suggested auction procedure for Utsira Nord ensures the developers time to further mature the awarded areas, *before* the second step of the auction process is carried out. The suggested auction procedure gives the market more time to develop the needed specialized and industrialized value chains. Without this cost reduction, it will be challenging for developers to have projects mature enough to compete for state support. The rewarded areas, which the developers will keep regardless of the outcome of the auction for state aid, also provide the developers more certainty about the future value of their project, which makes it easier to attract resources in the early stage of the project development, including supply chain development. The latter is vital in terms of incentivizing innovation in large scale infrastructure and entails that there is an important difference between the Norwegian scheme and those auction designs which are based on a qualitive pre-qualifications, followed by a competitive auction.

This variant of a two-step auction has been explored earlier. For example, the need for maturity was taken account for in the auction for bottom-fixed offshore wind in Poland, when the European Commission granted an exemption from a competitive bidding process in the current guidelines for Energy & Environmental State (see the textbox below). There are also several similarities between the proposed Norwegian scheme at Utsira Nord and the ScotWind process, where developers bid for areas in a first leasing round followed by a competitive auction for state support.[14]

### Textbox 2: Offshore wind auctions in Poland. Source: European Commission[15]

In 2021, the European Commission granted an exemption from a competitive bidding process in the current guidelines for Energy & Environmental State in the first phase of the support scheme in Poland (point 126 a). This was based on a series of arguments from the Polish authorities, for which all would lead to a very limited number of projects sufficiently eligible to participate in a competitive bidding process. The low number of eligible projects were due to the fact that LCOE for offshore wind installations in Poland were higher than the ones observed in other EU countries (such as in the UK and the Netherlands), where the bottom-fixed offshore technology had matured.

Furthermore, the Polish government argued that there would be a need to build the national offshore industry from scratch, including supporting infrastructures. At the time, offshore wind was effectively

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[12] *More specifically, the state funding will take the form of a 15-year, two-sided Contract for Differences (CfD).[12] Later on, the government will propose a preposition to Parliament with a proposal for a cost framework and a commitment authorization, proposing that one project does not obtain state funding.*

[13] *Norwegian Government (2023). Announces the first competitions for offshore wind. Can be downloaded here.*

[14] *Crown Estate Scotland (2023). Briefing: ScotWind Leasing for offshore wind. Available here.*

[15] *European Commission (2021). State Aid SA.55940 (2021/N) - Poland Offshore Wind scheme*

unproven in Poland at commercial scale. There were no commercial offshore windfarms in Poland, and the required supply chains, port infrastructure and relevant experience did not yet exist. These would be essential for financing, developing, operating, and maintaining the projects Poland aims to see developed in future.

To allow for alternative or complementary policies to auctions in a situation where it is desired to promote innovative or immature renewable energy technologies, have already been part of policy discussions in the EU. In earlier works from the AURES project for the European Commission, recommendations highlighted the following: *"There are a few situations in which an auction may not be appropriate and alternative or complementary policies should be considered. There is a strong empirical basis for considering alternatives in situations where reasonable competition cannot be expected, project costs are especially uncertain or policy goals other than lowest cost, such as actor diversity, are being pursued. These criteria are often met when policy makers are seeking to promote immature or innovative RES technologies".*[16] In the case of developing floating wind at Utsira Nord, the proposed auction framework does indeed ensure a competitive bidding for financial aid. However, this competitive bidding comes at a later stage (second step), after the developers have had time to mature their projects. As highlighted in chapter three, we also argue that a two-step process could strengthen the competitiveness (in the first stage) by ensuring that a more diverse specter of developers being able to enter into the competition.

## 5. Concluding remarks

To conclude, floating offshore wind will be a necessary energy source for achieving European ambitions and goals, due to constraints in areas eligible for bottom-fixed installations. However, floating offshore wind is still in a pre-commercial phase. To achieve necessary cost reductions for commercial viability, there must be an acceleration in the development of floating offshore wind technologies, a scaling up of production volumes, and an establishment of a specialized value chain for this sector. Without the development of value chains specialized for an industrialized streamlined production of floating components that can feed into a repeated assembling of turbines, scaling will be very challenging. On the other hand, without scaling up of projects, the establishment of such value chains is also challenging. This specific situation, where scaling up of production volumes and the establishment of value chains must happen simultaneously, poses a large financial risk for potential investors. This risk is due to the uncertainty of what the final cost of projects will be and enhanced by the fact that the floating technologies have not yet matured.

The development of value chains and establishment of suppliers who can provide floating wind technologies at competitive costs will reduce these financial risks over time. Current support mechanisms for offshore wind, which typically involve financial competition early on in project development, fail to adequately address the high financial risks related to scaling and developing value chains simultaneously. Therefore, these mechanisms require adaptation to effectively accelerate the development of floating offshore wind in Europe, enabling its crucial role in achieving Europe's climate goals.

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[16] *AURES (2017). Auctions for renewable energy support – Taming the beast of competitive bidding.*

The Norwegian government's proposed two-step competition process for developing floating offshore wind in Utsira Nord will play a crucial role in facilitating the establishment of a robust value chain and fostering efficient innovation and technological maturity for the European floating offshore industry. The design of the auction proposed for Utsira Nord takes into consideration the developers and suppliers’ need for maturing a specialized value chain, and thus reducing the hight financial risks of the projects. This stands in contrast to several other auction designs for offshore wind in Europe, which often involve financial competition in the early stages of the auction process.

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