MENON ECONOMICS

POLICY INSTRUMENTS TO REALISE FLOATING OFFSHORE WIND IN NORWAY

Executive summary

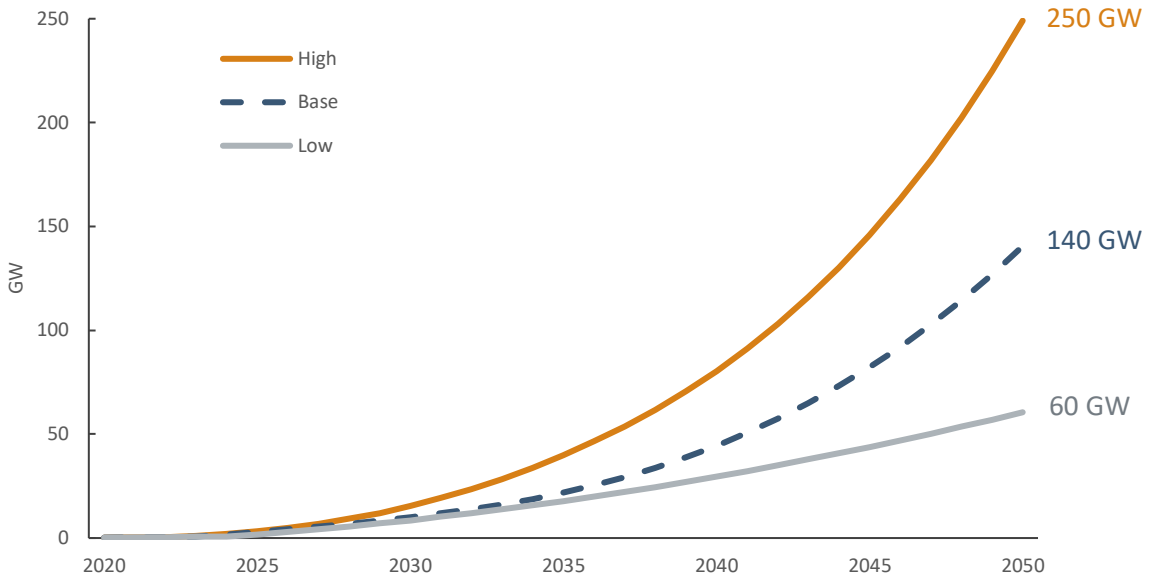
In this report, we have carried out a socio-economic assessment of which policy instruments are most suited to induce private investment in large-scale floating offshore wind on the Norwegian continental shelf. Furthermore, we have assessed the market development over the last 12 months in order to update our 2019-analysis on the prospects for the industry. In our comparative analysis of different support schemes, we point to contracts for difference (CfDs) as the most suitable policy instrument. However, we find that there is considerable political room for maneuver in relation to how to structure these, including the possibility of combining CfDs with complementary solutions. The possibility of combining instruments is an important aspect as there may be political and administrative barriers that hinder implementation, or distributional considerations that weigh heavily. Just as important as the choice of instrument, however, is the design of the solution in question, especially the award criteria. A key objective of the measure is to contribute to green industrial development on the basis of the existing offshore petroleum industry. Positive externalities related to innovation in the value chain indicate that the award criteria should focus on qualitative parameters that contribute to ensuring technological development and learning effects throughout the value chain. Our updated market analysis show that the expectations with respect to the development of floating offshore wind are growing. Thus, the benefits of developing a competitive Norwegian-based industry through measures in the domestic market are higher than in our previous analysis.

Updated market prospects

In the short term, our market analysis has changed in two ways. Firstly, challenges related and bottlenecks in the value chain contribute to slowing down the pace of development. This results in a somewhat lower pace of development in the short term. Secondly, we see that several large-scale projects are being realised earlier than we assumed in our last analysis. This contributes to costs falling faster than expected as significant economies of scale set in. Thus, our base scenario assumes an increase in the growth rate after 2030. Overall, the 2050 production capacity as projected in 2019 has increased by 40 per cent in 2050 in the updated analysis. Similarly, we believe that the upside in the market has increased. This follows from increased expectations of offshore wind in general, and positive signals on the part of the authorities related to floating installations in particular. Increased development puts further downward pressure on prices and contributes to floating offshore wind, towards 2050, being able to become competitive on price in markets where the potential for bottom-fixed installations are more limited. The corona pandemic has both a positive and a negative effect on the projected growth rate in our updated analysis. On the one hand, it introduces significant uncertainty into current market projections, while on the other floating wind might benefit from expansionary fiscal policy measures. It is natural that the authorities are looking to major infrastructure projects related to green transition, such as floating offshore wind.

The figure below shows the potential range of outcomes for our market analysis. In the high-growth scenario, floating offshore wind could account for almost 25 per cent of the total offshore wind market. In such a market scenario, the 2050 revenue of a leading Norwegian-based industry could be as high as NOK 85 billion in fixed price. Even though this is a best-case scenario, it illustrates the economic potential of floating offshore wind in Norway. In comparison, the supplier industry associated with the oil and gas industry had exports of around NOK 100 billion in 2019.

Figure A: Expected development of floating offshore wind worldwide in the long term in the low, base and high scenarios in GW. Source: Menon Economics



Comparative analysis of policy instruments

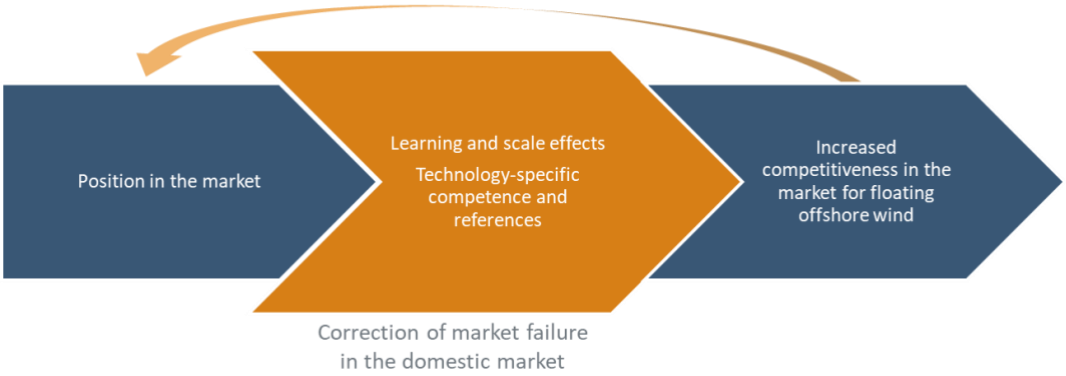
Our analysis of policy instruments is based on a defined policy aim of realising large-scale floating offshore wind in a way that will facilitate technological developments and learning effects in the supply chain. In other words, the goal is industrial development that facilitates export-oriented green growth in Norway. Our mandate has been to carry out a comparative analysis of various instruments from a socio-economic perspective. Thus, we have not considered *whether* a support scheme should be introduced, but *how* this should be done.

The starting point for public intervention in a market such as floating offshore wind is a discrepancy between public and private profitability due to positive innovation-externalities. The development of an offshore wind farm is complex and involves a wide variety of suppliers from which the developer buys goods and services. However, these are free to offer their services to competing operators/developers in the next round, and so the benefits from reduced costs and increased competitiveness among suppliers do not accrue to those who will invest in the park. From a socio-economic perspective, however, these effects are extremely important. The goal of building a Norwegian-based industry includes the entire value chain related to the development and operation of floating offshore wind farms.

Norwegian players who are involved in, or want to get involved in, the floating offshore wind industry point out that an active domestic market is crucial for Norway's ability to take a leading position in the floating offshore wind market. Research literature supports the idea that industrial policy aimed at restructuring the economy in the direction of innovative and environmentally friendly technology can provide export opportunities through an early-mover advantage. Developments in bottom-fixed offshore wind provide an example of this. Without support schemes, however, it is unlikely that Norway will develop a domestic market before the technology is commercialised. Building on Norway's comparative advantage and realising an early-mover advantage in floating offshore wind, is consequently dependent on financial incentives from the state. The figure below illustrates the benefits of correcting for positive externalities in the domestic market. The realisation of increased competitiveness through measures in the domestic market has a self-reinforcing effect by contributing to

strengthened capabilities and competitiveness, which in turn increases the attractiveness of Norwegian suppliers to international developers of floating offshore wind.

Figure B: Conceptual framework for the value of an active industrial policy aimed at floating offshore wind. Source: Menon Economics



Based on current practice and the ongoing debate, we have identified five fundamentally different instruments for inducing investments in large-scale floating offshore wind on the Norwegian continental shelf. The measures which are included in the comparative analysis, are broader than the policies currently used in Europe, where price hedging mechanisms dominate:

- Contracts for difference
- Investment subsidies
- Requirements for electrification on the Norwegian continental shelf
- Improved access to capital through public export financing
- Temporary tax schemes within a resource rent tax regime

In this context, it is important to point out that we are not assessing the neutral part of the resource rent tax regime in the comparative analysis, but the *subsidy element* in a temporary tax schemes. The reason for this is that it is precisely these that affect the investment decision of privat investors. Similarly, the introduction of a neutral resource rent tax is primarily a political issue related to how any *excess return* resulting from access to a scarce natural resource should be distributed in society and can be combined with all the alternative policy instruments.

Economic literature states that socio-economic analysis of policy instruments should focus on whether the measure is **efficient** (*to what extent does the measure contribute to the goal being achieved?*) and **cost-effective** (*to what extent does the measure ensure that the goal is achieved at the lowest possible cost to society?*). However, there are a number of factors that affect the efficiency- and cost-effectiveness of a renewable support scheme. Our analysis is based on five assessment criteria with a total of 13 underlying indicators derived from the two main principles. These are presented in table A below.

Table A: Assessment criteria for the comparative analysis. Source: Menon Economics

Goal achievement	• The measure must have a **triggering effect** • The measure should be **easy to implement** • It mustbe possible to emphasize **scale effects and technology development in the value chain**
Cost-effectiveness (on a project basis)	• The measure should ensure goal achievement in a **socio-economically cost-effective** way • The measure should facilitate the **maximization of revenues** • The measure must provide **economic incentives** for efficient development and operation
Degree of adaptability	• The measure should allow the authorities to **scale** its scope over time • The measure should be **flexible** with regards to design • The measure should minimize **permanent distortionary effects** in the market
Administrative consequences	• The measure should requrire minimal resources in the **implementation phase** • The measure should be **transparent and practical** to administrate • The fewer periodizations, the less resources are needed to follow up the measure
Financing	• The measure should minimize **distortion effects through taxes and charges**

Goal achievement. Both investment subsidies, contracts for differences and temporary tax schemes can be designed so that they help to realise large-scale electricity production. The former two ensure realisation through subsidy schemes that contribute to positive private profitability. Profitability via temporary tax schemes is ensured through higher depreciation rates, introduction of accelerated depreciation and possibly a higher limit for tax-free income, in combination with the possibility of the tax value of losses being paid out to the taxpayer. Investment subsidies, on the other hand, are regarded as the measure that is easiest to introduce, since there is extensive experience with this type of instrument in Norway and there is no need for a new comprehensive study of how the support scheme itself should be designed.

Common to the three instruments is the opportunity to emphasize qualitative considerations in the allocation of areas/support. However, there are several paths to the goal. Qualitative aspects can be included in a pre-qualification, the award of development permits, licenses, or as weighted criteria in a more comprehensive tender process where the authorities define how they will weigh the various considerations between the different qualitative parameters *and* subsidy levels. Given the aim of developing technology and a competitive supply chain in Norway, qualitative parameters are essential for any instrument chosen. Even if project profitability is ensured via subsidies/tax schemes, the economic incentives still lie in minimizing the costs of the project. This can lead to developers choosing "off-the-shelf" products over more immature solutions, even though increased R&D in the long run can result in significant learning effects in the value chain. Synergy effects with the existing set of policy instruments for research and development should also be explored to ensure that one gets the full benefit of the opportunity to develop innovative products/processes on the way to a commercialized market for floating offshore wind. However, the main focus of this analysis has been on instruments related to realising large-scale offshore wind and an active domestic market.

Table B: Assessment of goal achievement. *Plus* indicates an advantage of the scheme, *minus* indicates a disadvantage. Source: Menon Economics

	Investment subsidy	Access to credit	Contracts for difference	Regulation / requirements	Temporary tax schemes
Goal achievement	+ Will realise projects + Simple to set up with regards to time (early mover) + Can be structured for tenders or prequalification in a way that emphasizes qualitative parameters	- Will not realise projects on its own + No implementation cost	+ Will realise projects + Can be structured for tenders or prequalification in a way that emphasizes qualitative parameters + Relatively simple to set up, but requires some further consideration with regards to distribution of risk	+ Will probably realise project - Uncertainty regarding scale - Uncertainty regarding amount - Will not focus on design	+ Will realise projects + Prequalification / license allocation process can emphasize qualitative parameters + Relatively simple to set up, but requires some further consideration to determine the right level for the temporary schemes

Cost effectiveness (on a project basis). Contracts for difference, investment subsidies and the temporary tax schemes can all be arranged in such a way that the cost can be emphasized in the allocation of support. This can be done via tender processes or pre-qualifications followed by pure auctions. Both solutions require sufficient competition for the support scheme. Alternatively, the subsidy can be set via a negotiation process. For tax schemes, this type of design means that the subsidy element, for example the accelerated depreciation, becomes part of the negotiation/bid. However, there are no examples of this practice in current tax regimes. This type of competition contributes to the desired measure being realised at the lowest possible cost. The balance between focus on cost and on qualitative parameters in the award process is important in light of the discussion related to goal achievement and should be investigated in more detail regardless of the chosen instrument.

However, Contracts for difference stand out as it reduces the risk of overcompensation. In a two-way CfD, a "cap" is set at an agreed price. If the market price is lower than the agreed price, authorities cover the difference. In the opposite case, the operator pays the positive difference to the state. Increased public spending entails an additional cost in the form of distortionary taxes. As such this reduces the risk of real cost increases in a socio-economic sense. We also argue that the CfDs reduce the project's exposure to market risk, as the state "*ex ante*" has more information than the investor regarding the medium-term development, which is highly influenced by political constraints and considerations. However, the transfer of risk reduces the owners' incentives for optimisation compared with investment subsidies and temporary tax schemes. A cost-effective design of the differential contracts therefore requires that a certain proportion of production is exposed to the market. This is to ensure that the electricity is sold where the real value is highest, including platforms on the Norwegian continental shelf.

Table C: Assessment of cost-effectiveness in the short term. *Plus* indicates an advantage of the scheme, *minus* indicates a disadvantage. Source: Menon Economics

	Investment subsidy	Access to credit	Contracts for difference	Regulation / requirements	Temporary tax schemes
Goal achievement					
Cost effectiveness (on a project basis)	+ Possibility for project-specific tender processes + Strong incentives for optimization - Risk of overcompensation - No risk relief for the investor's political risk	+ Can reduce capital cost + Project-based allocation + Incentives for optimization - No risk relief for the investor's political risk	+ Possibility for project-specific tender processes + Low political risk (ex ante) related to market development + Low risk of overcompensation + Can be structured to provide good incentives for optimization	- Difficult to set «level for measure» - Locks choice of locations - Weak incentives to maximize values of production - No risk relief for the investor's political risk	+ Possibility for project-specific tender processes related to the level of subsidy + Strong incentives for optimization - Risk of overcompensation - No risk relief for the investor's political risk

Degree of adaptability. Both investment subsidies, contracts for difference and temporary tax schemes have a high degree of adaptability. The first two are project-specific, which means that the support level can be adjusted for each agreement. The scope and (competitive) conditions can also be adjusted continuously, i.e. how the scheme is set up with regard to qualitative parameters and/or trade-offs between incentives and risk relief. These schemes can also be turned towards a greater degree of technology neutrality in the long run (for example between land-based and offshore technologies). By controlling the scope and structure, the risk of lasting market distortions and undesirable fiscal consequences is reduced. Temporary tax schemes have many of the same qualities. They are scalable via making new areas accessible and can be phased out/scaled down depending on technology and market development so that lasting market changes are avoided. In theory, they can also be project-specific, although this is not current practice for the existing special schemes in the petroleum tax regime.

Table D: Assessment of degree of adaptability. *Plus* indicates an advantage of the scheme, *minus* indicates a disadvantage. Source: Menon Economics

	Investment subsidy	Access to credit	Contracts for difference	Regulation / requirements	Temporary tax schemes
Goal achievement					
Cost effectiveness					
Degree of adaptability	+ Scope can be scaled over time + Structure can be optimized + No permanent market changes	+ Will be done on a project basis + Temporary change of mandate may be adjusted + No permanent effect on market	+ Scope can be scaled over time + Structure can be optimized + No permanent market changes	- Little flexibility asa changes in framework conditions will have large consequences for adaptation	+ Scalable by making areas accessible as well as winding down temporary schemes + Structure can be optimized over time + No permanent market changes

Administrative consequences and financing costs. There are smaller differences between the most relevant instruments within these assessment criteria than with the previous three. The need to develop specific award criteria applies to all categories of instruments, as one will have to evaluate different projects against each other regardless of which support scheme is chosen (as well as in the absence of support schemes). The relative differences associated with administrative consequences therefore stem mainly from the complexity of the support schemes themselves. Contracts for difference and temporary tax schemes score lower here than investment subsidies as these will require somewhat more assessment work and involve settlement over a longer period of time. Furthermore, there is considerable room for maneuver in how to finance the various solutions,

which makes the solutions difficult to rank in terms of financing costs. Public guidelines for socio-economic analyses price the distortionary effect resulting from increased taxes, the so-called tax cost, at 20 øre per budget krone. However, financing through taxes and charges in specific markets also entails a loss of efficiency. Financing of investment support and contracts for difference via the power market, where increased supply will push prices down, may potentially have a smaller distortionary effect. This should be investigated in more detail if the distributional effects are acceptable.

Table E: Assessment of administrative consequences and financing costs. *Plus* indicates an advantage of the scheme, *minus* indicates a disadvantage. Source: Menon Economics

	Investment subsidy	Access to credit	Contracts for difference	Regulation / requirements	Temporary tax schemes
Goal achievement					
Cost effectiveness					
Adaptability					
Administrative consequences	+ Easy to implement and broad experience with such schemes + One-time support has low costs for follow up	+ Already implemented + Little need for follow-up. Existing administrative apparatus can be used	- Requires further consideration with regards to risk distribution - Somewhat more administrative work over time as this cannot be integrated into existing schemes	+ Easy to implement provided that this does not entail major political or juridical processes	- Requires further consideration to reduce risk of overcompensation - Some administrative work over time, but very limited as transfers are done via the tax system
Financing	- Financing will result in tax distortions and/or distortions in the market that is charged	+ Assessed on a project basis against alternative use	- Financing will result in tax distortions and/or distortions in the market that is charged	+ Externalities, but already priced	- Financing will result in tax distortions

Overall assessment. Contracts for difference, investment subsidies and temporary tax schemes can all facilitate the realisation of the overall policy vision in our analysis. This means that they can trigger private investments in large-scale floating offshore wind farms on the Norwegian continental shelf and at the same time facilitate technology development and learning effects in the supply chain. From a socio-economic perspective, contracts for difference stand out as it lowers the cost of the support scheme. Such contracts are also, like investment subsidies and temporary tax schemes, flexible and scalable so that lasting market changes can be avoided.

Table F: Overall assessment of the different instruments. Source: Menon Economics

	Investment subsidy	Access to credit	Contracts for difference	Regulation / requirements	Temporary tax schemes
Goal achievement	HIGH	LOW	HIGH	MEDIUM	HIGH
Cost effectiveness	MEDIUM	MEDIUM	HIGH	LOW	MEDIUM
Adaptability	HIGH	HØY	HIGH	LOW	HIGH
Administrative consequences	LOW	LOW	MEDIUM	LOW	MEDIUM
Financing	MEDIUM	LOW	MEDIUM	LOW	MEDIUM

We find no synergy effects of combining individual instruments in our analysis. We see that contracts for difference help to increase the cost-effectiveness of both investment subsidies and temporary tax schemes, but without the two strengthening the qualities of the CfDs. The effect is mainly that the projects can be realised

with a lower strike price than if this instrument stands alone. However, the government finance a proportional amount of the investment costs in these combined schemes. The same rationale applies to credit access and regulation. A combination with contracts for difference ensures goal achievement, but the other effects are only distributional. Neutral categorization of requirements for electrification requires that this is considered an effective climate measure in itself. Alternatively, it will result in unwanted distortionary effects. Our review shows that the political room for maneuver is significant with regard to combining different measures. This is an important aspect as there may be political-administrative barriers that hinder implementation, or if there are *distributional considerations* that weigh heavily. The cost of combining different measures is that complexity and administrative costs increase.

Table G: Illustration of synergies and political room for maneuver. Source: Menon Economics

	Investment subsidy	Access to credit	Contracts for difference	Regulation / requirements	Temporary tax schemes
Investment subsidy					
Access to credit	*Neutral*				
Contracts for difference	*Neutral*	*Neutral*			
Regulation / requirements	*Neutral*	*Neutral*	*Neutral*		
Temporary tax schemes	*Neutral*	*Neutral*	*Neutral*	*Neutral*	

In this analysis, we point to contracts for difference as the most suitable tool on its own, and a prerequisite for a cost-effective solution within the political room for maneuver. Contracts for difference are very flexible with regard to structure, something that is also reflected in current practice. There is a need for individual tailoring that takes into account specific Norwegian conditions and not least the goal of industrial development and international competitiveness for Norwegian players. In the analysis, we account for several key assumptions that form the basis for our assessment. These can be summarized as follows:

- High efficiency, regardless of which instrument we have assessed, requires that qualitative parameters are emphasized in the allocation of the scheme. An example of this is emphasis on technological development that will facilitate increased operator diversity and improve the conditions of competition for more immature solutions.
- To facilitate efficient resource utilization, the contracts for differences must be structured so that the developer and operators have a certain market exposure. This provides incentives to sell the electricity where the willingness to pay is greatest and reduces the socio-economic cost of the project. In this context, it is important that the purchase of electricity, for example via PPAs, is given equal status with other measures related to the energy supply on the Norwegian continental shelf.
- The scheme should be structured as a two-way CfD as this reduces the risk of overcompensation for the authorities. The financing of public measures has a financing cost in the form of increased taxes and charges. If the actors are overcompensated, this has a real socio-economic cost.

Menon analyzes economic issues and provides advice to companies, organizations and authorities. We combine economic and commercial expertise in fields such as industrial organization and competitive economy, strategy, finance, organizational design and social profitability. We use research-based methods in our analyses and work closely with leading academics in most disciplines.

+47 909 90 102 | post@menon.no | Sørkedalsveien 10 B, 0369 Oslo | menon.no