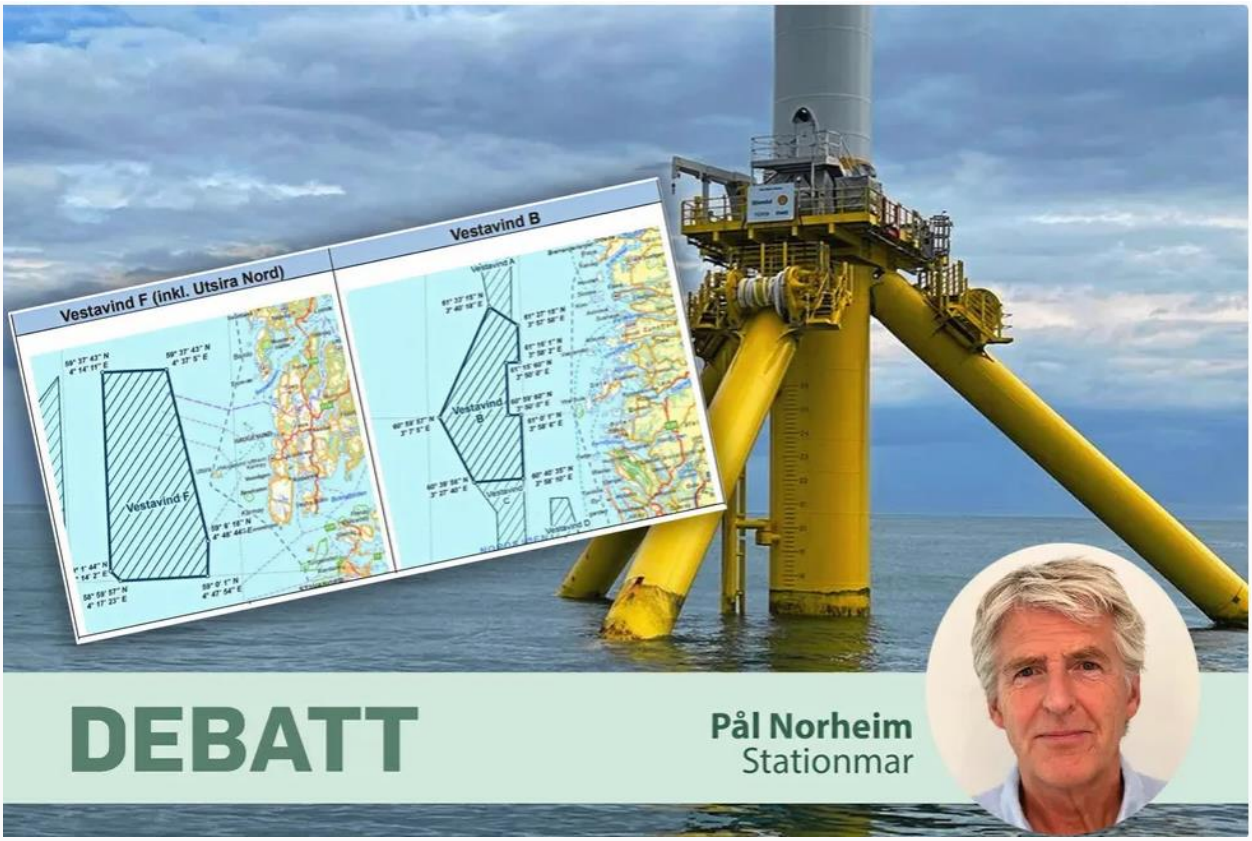
EUROPOWER 10.09.24 (English translation):

Offshore wind: - Norway must harvest low-hanging fruit first

In order for the government to come close to achieving its goals in offshore wind, we must continue to announce and develop bottom-fixed offshore wind farms, writes Paal Norheim in this article.



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This article represents the opinion of the author

By Paal Norheim, CEO at Stationmar

The Ministry of Energy has put out for consultation a memorandum dealing with proposals for support schemes for the first floating, commercial offshore wind farms to be announced in

Norway, referred to as Vestavind B and Vestavind F, and which includes the so-called Utsira Nord project.
The plan is that these areas, which include a sea area of close to 5,000 km², will be announced in 2025. The consultation document describes a so-called two-stage model, where in the first phase a few selected companies will be allowed to develop technology for floating offshore wind turbines, because this technology, as described in the note, today is immature. This phase is therefore referred to as "a period of project maturation".

In other words, the first indications of whether there are at all technologically satisfactory solutions that are believed to work in our harsh waters, and what they may cost, will not be available for several years.

Will take many years

After the maturation phase, and assuming that reliable floating technology is demonstrated for the wind turbine foundations, auctions will probably be carried out with the selected companies, and areas will be allocated based on which companies need the least governmental funding support, but where a ceiling is set for total support that can be obtained for each project.
In other words, it will be many years after the maturation phase is awarded in 2025, until we know whether these projects can be realized at all. And, if they are realized, which technology will be used, and who will take the technological risk that the chosen solutions will work over the lifetime of the fields.
Based on the many uncertainties surrounding the development of floating offshore wind farms in the Norwegian sector, the author of the article is convinced that the government must adjust the energy policy direction for offshore wind as soon as possible.

If one in any way shall be close to meeting Norway's ambitions of 30 GW of offshore wind by 2040, one must immediately continue what has already been started, namely a large-scale development of bottom-fixed offshore wind farms in the North Sea basin, where today there are already proven and safe development methods.

In other words: harvest the low-hanging fruit first, and try to get Norwegian companies on board, so that we can learn to crawl before we go.

This is what we did in the oil and gas industry, by first developing areas in the North Sea basin, where bottom-fixed solutions could be used, before many years later we moved out into deeper water with floating installations. Of the twenty new areas that NVE/DNV now are assessing for suitable wind park developments in the Norwegian sector, there are as many as seven areas in the North Sea basin that are suitable for bottom-fixed solutions, but in the government's plans only one of these is considered to be annonced in 2025, namely a minor expansion of the Southern North Sea II area, which was recently awarded to the Belgian/Swedish company Ventyr.

Development of Norwegian technology

One of the government's stated goals is for Norway to become a world leader in offshore wind technology. Therefore, one should also invest in developing Norwegian technology and services that can make bottom-fixed offshore wind turbines more profitable.

As mentioned in an article in Dagens Næringsliv 09.10.23, we are in Stationmar developing a system that also utilizes the wave forces to generate electricity, so that the total energy production from each bottom-fixed offshore wind turbine can in most cases be doubled, and also ensure more predictable and stable delivery of power to the grid. This is done by using the wave forces to lift seawater up to a water reservoir that encloses the wind turbine column itself, and then lead the water in pipes down to a turbine inside the column for the wind turbine itself, similar to those used for typical well-proven onshore hydropower plants.

In other words, wind power, wave power and hydropower are utilized in one and the same installation. There are also other Norwegian companies that are developing improvement solutions for bottom-fixed turbines, among other things to be able to use such for water depths of up to 100 meters. In this context, it is also worth noting that more and more European countries are now working together to develop the North Sea basin into Northern Europe's energy hub, with the use of bottom-fixed offshore wind farms, and here it is important that Norway does not lag behind.

Floating wind experiences

At the same time as developing the North Sea basin with bottom-fixed turbines, there must also be a large-scale investment in technology for floating turbines, which can function satisfactorily in our waters.

Here one must ask what experiences from the operation of floating turbines exist today, or will be available within the next few years, and how relevant these are to be able to announce a large-scale development of floating offshore wind farms in the Norwegian sector as early as 2025.

In the reference project mentioned in the consultation note from the government, the assumptions for the costs have been based on each floating offshore wind turbine being equipped with turbines with as much as 22 MW capacity, and that floating turbines with a "semi-sub design" are envisaged. This means that the foundations for the turbines should be based on the same design principles as the semi-submersible drilling rigs used in oil drilling today.
What if it turns out that such solutions, with moving large amounts of ballast water and using complicated anchoring systems for stabilization, are not the way to go in our harsh environment waters?

As a reference to exiting experience with floating offshore wind technology, the consultation note refers to Equinor's Hywind Tampen project, which with its 11 turbines of a modest 8 MW capacity, placed on top of a monotower concrete structure, has been in operation for less than two years, while failing to mention experience with other floating offshore wind turbines.

What about Equinor's Hywind Scotland project, with its five turbines with only 6 MW capacity, all of which had to be shut down this summer, after only five years of operation, for extensive maintenance? Or the Kincardine project in the British sector with its 5 x 9.5 MW turbines with a "semi-sub design", with a claimed lifespan of 25 years, where two of the turbines already have had to be towed to shore for over three months of maintenance, only after one and two years in operation?

And all these turbines are very small compared to the assumptions made in the consultation document, which are based on massive turbines of 22 MW size, with a 30-year lifespan, in order to be close to achieving any form of profitability.

"The world has not yet seen the technology that Utsira Nord will be developed with"

This statement came from the head of Odfjell Oceanwind during an arrangement in Arendal recently, after they had received NOK 2 billion from the state to further develop a possible project with 5 x 15 MW floating turbines of "semi-sub design" in the Barents Sea.
Exactly! A big salute to Odfjell, which has obtained so much funding for a technological solution that has not yet received "DNV Basic Design Approval", nor been the subject of any kind of scaled pilot testing.

But, if this project is to fly, there will probably be a need for considerably more government support, and arrangements which mean that the government takes a lot of the technological risk, which comes in addition to the risk of fluctuating electricity prices.

And, assuming that a way is found to make this project profitable, one cannot in any case expect any relevant operating experience from the project until the 2030s, that is long after the call for tenders in 2025 mentioned in the consultation note. The clever people at Odfjell have also received NOK 300 million in risk capital from two Japanese offshore wind players, who thought it was fine that Norway spend NOK 2 billion and perhaps more on developing floating technology, which they could possibly use in their own waters.

Until it has been demonstrated that we have floating technology that works, then surely we can't start to equip our beautiful coastline with hundreds of large floating offshore wind turbines?

- Do not underestimate the loading environment

At Stationmar, we believe that one must not underestimate the load environment that occurs when you have to handle the forces from typically three rotor blades of lengths of at least 150 meters each, which act on the turbine tower typically 175 meters above sea level, and combine these forces with the hydrodynamic forces that arise from the sea.

For floating turbines, we have therefore in recent years been developing a technology we call HMN - Heave Motion Neutralization, where we neutralize the movements of the floating turbine foundation. This technology, which until now been patented in the USA and South Korea, among others, after extensive and year-long processes, we believe is the right way to go for floating turbines, at least in our harsh environment waters. By neutralizing the movements and counteracting the environmental forces, so that floating turbines can be about as stable as bottom-fixed turbines, it is avoided that turbine components are exposed to unnecessary acceleration forces, with which we already have negative experiences today, even for "small scale turbines" with a short operating time.

And furthermore, that one can, among other things, use simpler fiber-based taut-leg mooring systems, instead of long, complicated chain-based anchoring systems for 30 years of operation, which today still have challenges for short-term use for drilling rigs. The last reported anchor line break occurred as recently as March 2024 (the author of the article speaks here with some experience, having been technical manager for 15 years in a drilling company that has operated with "semi-sub design" drilling rigs all over the Norwegian shelf, including 6 years in the Barents Sea).

The technology must work satisfactorily

With several offshore wind players, there is talk today only of scaling up, standardizing and industrializing existing floating concepts for efficient economic mass production, but surely it must be even more important that the technology should work satisfactorily after the turbines have been installed?

The challenge with new technology, however, is access to capital to complete the concept development work. Without a "rich uncle" (or risk-averse Japanese capital), it is currently not possible to gain access to government support schemes, because 50 per cent equity is required, and preferably pilot testing of the technology has already been carried out.

Therefore, the authorities - while harvesting the low-hanging fruit from bottom-fixed wind parks, and trying to make them less dependent on subsidies through the use of new technology - must make capital available for the further development of floating concepts for companies such as Stationmar, which do not have all the world's equity available.

Often this does not involve formidable amounts, but rather smaller capital injections in the order of NOK 5 to 15 million, in order to carry out so-called third-party de-risking activities, in order to be able to convince and create confidence in the many skeptical investor circles that the risk of spitting in capital is not too large. This can concern DNV technology qualification (statement of feasibility), simple pool tests (proof-of-concept model tank testing) and concept simulations for technology verification.

Moreover, the authorities' stated wish is for Norway to become a world leader in offshore wind technology. Then a broader investment in Norwegian technology development must be prioritized immediately!