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This is why Norway must prioritize bottom-fixed offshore wind as soon as possible

Paal Norheim in Stationmar is of the opinion that there is a crisis in the Norwegian offshore wind industry. Here is his way to solve the problem.



In this debate post, Pål Norheim writes that he believes that an energy policy adjustment is needed. - Namely prioritization of bottom-fixed offshore wind farms, and that as soon as possible. Photo: Pixabay / Privat

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This is a debate post at the expense of the article author.

By Paal Norheim, CEO of Stationmar

In the undersigned's opinion, the Norwegian offshore wind industry is in a crisis, and in no way ready to take part in the green transition that is taking place at sea in the countries around us, and in the world in general.

The expectations that someone managed to build up that Norway, due to its experience from the offshore oil and gas industry, have all the prerequisites to become a leading offshore wind nation in the green shift, with the help of floating turbines, is about to fade away.

In the recent "Debatten" programme on NRK, there was talk of a need for state subsidies of up to NOK 150 billion, while much larger figures have also been put forward by others. Before the framework conditions have been established, with a clear plan for the scope, location and timing of tenders for future offshore wind farms, few dare to invest in technology and build up the necessary organizations and expertise.

"We must use the southern parts of the North Sea where we have the shallowest sea areas"

This was stated by Christian Rynning-Tønnesen, chief executive of Aker's investment company Industry Capital Partners, at the "Havvindskonferansen 2024" in Oslo recently, where he also said that the most important thing for Norway is *"to get profitable projects in the south, and to make these financeable"*. Rynning-Tønnesen was completely clear on what he believes is needed to make Norwegian offshore wind profitable; *Focus on bottom-fixed offshore wind, hybrid cables and tax revenues from oil and gas.*

In the undersigned's opinion, it is reasonably clear that more and more people in the industry believe that such an energy policy adjustment is needed, namely prioritizing of bottom-fixed offshore wind farms, and that as soon as possible.

The first adjustment that needs to be made is that NVE must be instructed as soon as possible to prioritize the 7 possible bottom-fixed offshore wind park areas in the ongoing impact assessment of 20 relevant areas, of which 13 are for floating farms, so that this can be completed before the summer 2025, as the plan is now. It is no point in prioritizing assessment of all the 13 areas allocated for floating wind parks now, as it is completely uncertain whether there will be any such parks at all. Possibly eventually one park in Utsira Nord with a capacity of 500 MW, but there Odfjell Oceanwind has a big lead, with its state-supported Goliatvind project.

In the event of Goliatvind being completed before Utsira Nord, with its five floating 15 MW turbines, Odfjell claims that the costs for Utsira Nord can be reduced by 30%! In terms of time, this must mean that one must first gain experience from Goliatvind, which may be available closer to 2030, before proceeding with Utsira Nord and eventually other floating parks.

So here there is probably some kind of flaw in the logic, as the authorities say that they hope that a call for tenders for Utsira Nord can come as early as 2025. Otherwise, this probably also means that if a wind park developer other than Odfjell is chosen for Utsira Nord, then this will result in the development being 30% more expensive. And what if it turns out in the further development and testing of Odfjell's solution that this technology does not work satisfactorily in our harsh environment waters? It is also not likely that Odfjell will share its learning and experiences with Goliatvind with the 11 other competitors who have announced that they will participate in the Utsira Nord competition?

So, what do we do now?

Talk about offshore Energy Parks, not offshore Wind Parks! And start with the bottom-fixed ones.

The offshore wind discussion on the “Debatten” program on NRK recently, and all the comments, among other things on LinkedIn, after Europower published my two previous debate posts, highlight and make my points in the posts valid:

In order to obtain profitable development of offshore wind in our waters, we must also utilize the wave forces in addition to the wind forces. In other words, develop offshore Energy Parks instead of offshore Wind Parks. And, start with several bottom-fixed parks first, where the technological risk is the least, also by combining the use of wind and waves in one and the same structure, and make the best possible use of the infrastructure associated with the parks, and utilize as small seabed areas as possible.

In such offshore energy parks, one can also install pure wave energy structures (without rotor blades on top) in the areas between the wind turbine structures, caused by the distances necessary to handle the wind shadow effects between the wind turbines.

By the Norwegian renewables industry thinking a little outside the box, by also utilizing the other natural condition we have in the sea, namely the frequent presence of high waves / swells, this can become our niche in the green transition!

Change of term

It is precisely this that we must utilize to our advantage, and talk about offshore energy and not offshore wind.

As I mentioned in my two previous debate posts, we at the company Stationmar are 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 with a 20-meter drop height, in pipes down to a turbine inside the column itself for the wind turbine, similar to those used for typical well-proven hydropower plants on land, typically with so-called Kaplan turbines. In other words, wind power, wave power and hydropower are utilized in one and the same construction.

Preliminary calculations, based on the plenty of wave data available for the North Sea basin, and experiences with land-based hydropower plants, show that at a significant wave height of, for example, 2.1 metres, which is typically the average wave height in the Norwegian part of the North Sea basin, and which occurs for around 23 % of the time, will be able to generate more than 5 MW from the hydropower turbine. At wave heights of 4.5 meters and above, which statistically occurs 31 % of the time, it will be possible to produce from 10 MW and up to a maximum production of 15 MW. As there are often relatively large swells even with little wind, this energy production can be phase-shifted in relation to the production from the wind turbine.

Norway's experience with pumping hydropower plants should be utilized at sea

Our wave/hydropower energy technology can in many ways be compared to a land-based pumping hydropower plant, which is a type of hydropower station where the water is pumped back up, from a lower reservoir to an upper reservoir, here using excess electricity in the network, before the water is released once again into a turbine to again generate electricity.

In Norway, we are therefore well positioned to use such offshore hydropower plants, which can also produce electricity when there is little wind, but still often relatively large swells present. In Norway, hydropower plants are being built with as little as five meters of drop height, while our system is based on a twenty meter drop height.

Wind theft and area efficiency

Recent somewhat alarming reports that several offshore wind farms may have their capacity reduced by up to 30 percent per turbine, due to the shadow effect from other turbines, up to 100 km away, make the technology we develop in Stationmar even more relevant. This is because it will be possible to have pure wave/hydropower turbine structures, without rotor blades and a wind generator on top of the column, which can produce electricity of up to 15 MW, in the areas that come in the shadow side.

The expertise in this phenomenon, referred to as the "wake effect", or wind shadow and wind theft, which is about the turbulence effect from nearby turbines, states that just on the initiated bottom-fixed offshore wind project Sørlige Nordsjø II, according to new model calculations, the loss can amount to 20 % for the entire wind farm , if an offshore wind farm in the Danish sector is developed as planned. What's more, this tells us that we have a lot to learn from bottom-fixed offshore wind farms in the North Sea basin, which we are just getting started with, before we invest in the massive development of floating offshore wind farms along our coast.

With a combination of such pure wave/hydropower structures and bottom-fixed wind turbines with built-in wave power stations, far less area will be required for the offshore wind farms. Or, by using the planned areas, one could produce up to 15–20 GW from the bottom-fixed parks in the North Sea basin, which are also about to become an energy-hub for the whole of Europe. This technology will also be able to be used by our neighboring countries on the other side of the territorial border, where there is a correspondingly good combination of high wind and high waves.

Without access to early-stage risk capital, the technology development will stop.

In Norway, there is a huge need for risk-taking capital for ground-breaking innovation, such as we believe our wave energy generation system is, especially for those of us who did not get a share of the state funds available a couple of years ago, before demands were made for at least 50 percent equity when awarding project support. At this time, it was also much easier to get hold of private capital for the green shift, which everyone thought would come with record speed.

Providing sufficient equity capital is difficult for entrepreneurs and start-up companies, also because private investment players are reluctant to step in, as the future of Norwegian offshore wind is extremely uncertain. This is reinforced by the fact that the politicians who decide focus mostly about what is worth saying now, considering the next election coming up.

And, in the meantime, those players who were early adopters can continue to use the straw into the Norwegian state funding, without having demonstrated that they have technology for floating turbines that will work sufficiently in our harsh waters. This is due to the fact that the government believe that it is in the floating offshore wind industry that Norway has the best conditions for success, and that we today already have such technology available and fully developed.

Finally, I would like to return to the wise statements from Rynning-Tønnesen at the recent “Havvindskonferanse 2024”. Here he stated that there will probably be a need for some government support also for a bottom-fixed offshore wind project number two, i.e. the one after Sørlige Nordsjø II. But, that we have to get to the point where we can create a profitable industry, and that "*there are no financing methods that work if the underlying business is not profitable*".

Rynning-Tønnesen stated that this also applies to floating offshore wind, but that since bottom-fixed are much more affordable today, this should be prioritized first.

Another, but not insignificant, challenge in floating offshore wind is that there are currently around 120 new concepts for floating offshore wind turbines, most of which are not Norwegian. In other words, there are many who fight for both private and state capital, and EU funds. A frightening large number of these claim that they have the technology that will work for Norwegian floating offshore wind farms, and that the only challenge now is industrialization and mass production of the turbines.

When we in Stationmar have eventually demonstrated that we can neutralize the movements of a floating offshore wind turbine, we will also be able to apply our wave energy system to floating foundations, both with and without the rotor blades on top, so that we can also develop profitable floating offshore energy parks.