A new Norwegian industry adventure?

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In the wake of the alarming reports from IPCC, policy makers all over the world have recognized offshore wind power to become an essential contributor in the future renewable energy system and battling of climate change. However, many countries including Norway lack extensive areas of shallow water suitable for conventional offshore wind, hence an interest for deep offshore solutions in the form of floating wind power has arisen.

One of these solutions is the first floating offshore wind turbine Hywind, installed of the Norwegian coast in 2009. Today, several other prototypes of floating wind power exists, with a few full-scale concepts deployed worldwide. The most developed concepts can be seen in Figure 1.

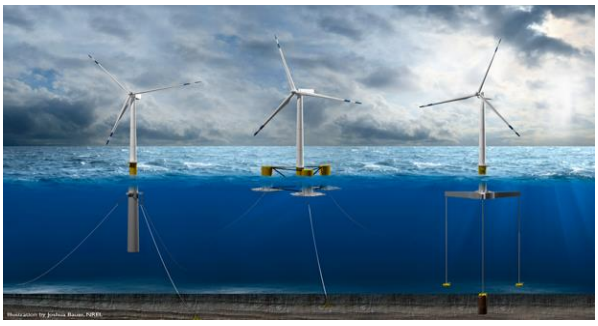

Figure 1. Three different floating wind power concepts. From left to right: The Spar Buoy, the Semi-Submersible and the Tension Leg Platform (TLP). The main difference is the way stability is achieved for each of the platforms. The TLP is mooring stabilized, the Spar is ballast stabilized and the semi-sub is buoyancy stabilized

However, no offshore wind projects are being developed in Norway due to the lack of economic incentives. Furthermore, the Nordic power system is heading towards an oversupply and with an almost CO_2 – free power production in Norway, the motivation is limited. However, by engaging in offshore wind, Norway could use its extensive offshore expertise and address the worries and concerns connected to the expected reduced oil revenues.

Floating wind power holds great potential

With limited constraint to water depths and soil conditions, floating wind power opens a path to exploit the vast wind resources of deep water areas and play a vital role in the energy transition towards a sustainable future. With a majority of the world's wind resources located in deep water areas together with the fact that many countries lack large areas of shallow waters, floating wind power has a tremendous potential for energy supply. With a projected rapid growth of a global floating wind power market, there is currently a window of opportunity to become a first mover and pioneer as no large scale projects are erected as of today.

A Norwegian test park

A highly suitable location for a floating wind power test park has been identified outside the Norwegian oil capital, Stavanger. Here the conditions are excellent with a strong heritage of offshore industry and some of the best wind resources in the world. Such a park with a proposed installed capacity of 288 MW could supply roughly half of the yearly electricity demand of the city. As the technology is still maturing, the cost of the test park would be high and correspond to around 1 billion euros, depending on which of the concepts that is chosen for the park as seen in Figure 2.

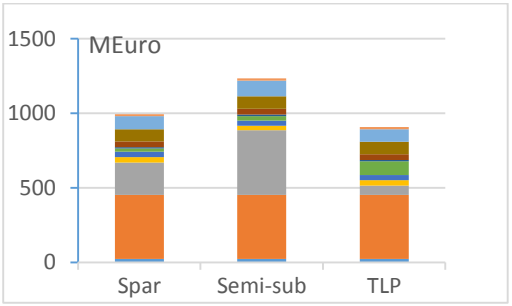

Figure 2. The total capital cost for the studied test park for the different possible solutions.

However, building this park would make Norway the industry leader and make them benefit from future worldwide development and enable a new major line of Industry.

Studies show that Norway has a great potential to achieve a high level of national value and job creation when developing floating offshore wind projects. Moreover, a company survey showed that the development of new industry is very important in order for Norway to diversify its heavily oil influenced economy.

Furthermore, a development of a floating wind power test park in Norway could enable new applications for the industry, where it could become an important part of the electrification process of the Norwegian oil & gas industry.

For some specific processes like water injection, seen in Figure 3, floating wind power could already today be an economically viable alternative.

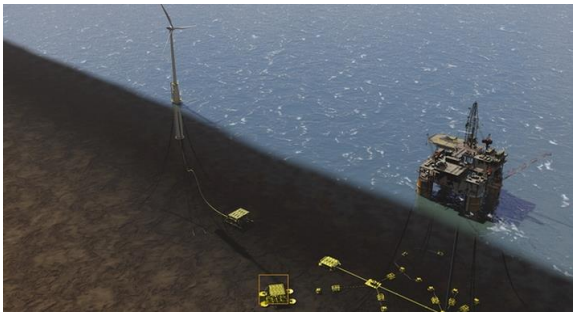

Figure 3. Floating wind power can be used to power the water injection pump raising the pressure of the oil reservoir and thereby increasing the potential oil extraction. Such an application could dramatically reduce the CO_2 emissions of offshore oil & gas activities on the Norwegian continental shelf.

Long term plans needed

Today many Norwegian companies are already involved in offshore wind activity at some level. Several of these are smaller companies that have a hard time competing on the rapidly expanding international offshore wind market. They are requiring the development of a home market which could enable testing of their product and services and enable the development of a complete supply chain for offshore wind in Norway.

In order for Norwegian suppliers to continue and expand their offshore wind business, a more long term plan and support scheme is needed.

Studies show that the electricity price and green certificates, which currently corresponds to the expected revenues of an offshore wind project in Norway, will not be sufficient in order to make projects profitable. A learning effect is however expected with increased development of floating wind power which could reduce the price level dramatically. Therefore new and generous subsidy schemes could be used to get the industry going and make floating wind power a viable alternative in the future Nordic power system.

Summary

It's clear that the potential for the future of floating offshore wind is great and that many nations will rely on this new technology as a part of their transition towards a greener energy system. If Norway wants to be a part of this development a stronger commitment is needed in forms of economic support and long term planning. The benefits of doing so are many including the following:

- Diversification of the Norwegian economy
- Value and job creation
- Export of supply chain
- Reduced impact of dry years
- Reduced greenhouse gas emissions

This is a summary of the master thesis: *Analysis of opportunities and challenges for Norway to establish a floating wind power industry*, by Anders Westin and Daniel Nilsson at Lund Institute of Technology, LTH.

For additional information the full report can be seen at: https://www.iea.lth.se/publications/pubmsc.html