

Co-use in offshore Windfarms

Summary of a research report by Pondera

The Netherlands has the aim to reduce emissions by 55% by 2030 in comparison to 1990 and to become climate neutral in 2050. To reach these ambitions the Dutch government wants to promote solar- and wind power, specifically offshore wind. The Dutch government has doubled the offshore wind energy goals towards a capacity of 21 GW by 2030, if this fits in the ecological capacity of the North sea and the current energy system.

Offshore *Windpark Hollandse Kust Noord*, expected late 2023, will be the last windfarm relatively close to the coast. The consecutive offshore windfarms will be built at increasing distances. While the current average distance to the coast is 30 km, this will increase to 60, 80 and even 100 km distances for newly appointed areas.

More and more large offshore windfarms also create space for co-use that benefits from the space between wind turbines. Currently, co-use projects are very rare because the research, financing and realizing takes a lot of time and large offshore windfarms are still relatively new. Co-use is discussed in the new series of tenders published by the Dutch Government, with main themes being floating solar panels, hydrogen production and nature development, topics that also surface in area passports.

Area passports

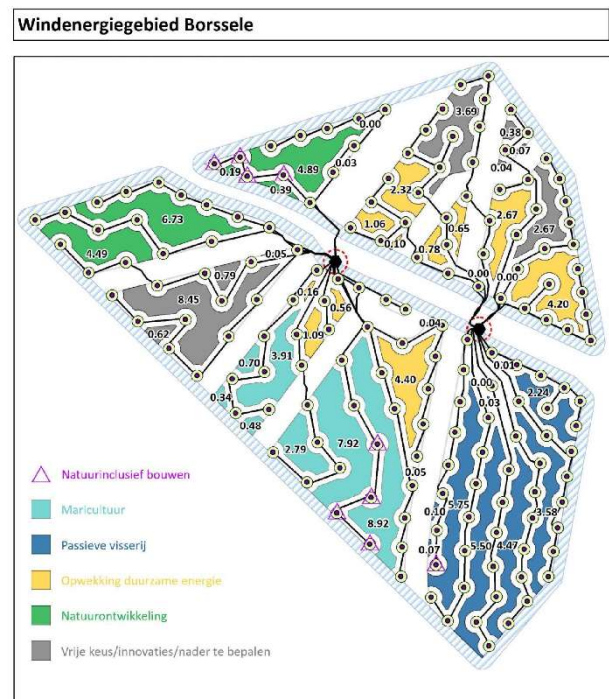
The Dutch North Sea agreement that was made in 2020, includes the rule that every offshore wind energy site requires an 'area passport'. An area passport gives clear boundaries for where co-use can be implemented and provides an overview of the options to fill empty areas. As an example, Pondera was responsible for constructing the area passport for *Windpark Borssele* in cooperation with Rijkswaterstaat. This passport can be found in its entirety on the website of the Noordzeeloket.¹ On the right you can see the zoning map of this area passport.

The lay-out within an area passport is based on the available space between the planned wind turbines, including the installation and placement of cables and other physical objects. Additionally, the natural qualities of an area, including the surface depth, seabed composition, sea currents, wave swell and the distance from harbors, play an important role.

Research into co-use further offshore

In 2022, Pondera was commissioned by Rijkswaterstaat (ministry of infrastructure & water) to conduct a study on the effects on the possibilities of co-use of an increasing distance from the coast for wind energy areas. This study looked at the effects of distance from the coast on the following forms of co-use:

1. Food supply
 - Marine and aquaculture (including shellfish, fish farming and seaweeds)



¹ <https://www.noordzeeloket.nl/publish/pages/188385/handreiking-gebiedspaspoort-borssele.pdf>

- Passive fishing (including line fishing and creels for crabs and lobsters)
- 2. Other forms of renewable energy generation and storage (including solar and wave energy)
- 3. Nature-stimulating projects (including oyster restoration, fish hiding places, artificial reefs)

This study included a literature review and interviews with relevant stakeholders in the three sectors of co-use.

This study found that there are currently no large-scale examples of commercial co-use, either in the Netherlands or abroad. There are, however, a number of projects in test phases where major development steps are being taken, especially in the fields of marine- and aquaculture as well as solar energy production. Distance from the coast definitely affects the possibilities for co-use in offshore wind energy areas. Specifically labor-intensive co-use, such as marine and aquaculture, is much less promising when areas are further from the coast. Passive fishing also has fewer opportunities because the revenues are unlikely to outweigh the fuel costs of transport. Grid connection is a determining factor for energy generation, floating solar energy is more feasible far off-coast than wave energy, due to maintenance requirements. For nature development projects, distance from the coast makes no difference.

In addition to coastal distance, there are a number of different issues that arise

- Scale. Currently, there are no projects where large-scale co-use can take place. For smaller projects with less surface area, it can often be difficult to make co-use profitable. For example, seaweed farming needs about 1000 hectares before the business case becomes commercially interesting.
- Facilitations. Initiators of co-use require better support during permit procedures and more space in current laws and regulations. It is also important to plan for anchoring and future connections on offshore substations, specifically for other forms of energy production aside from wind energy.
- Process. Currently, the place of co-use in offshore wind energy areas is often unclear. It is important to define the role of co-use early in the planning of a windfarm and to include the required infrastructure in the design process beforehand.
- Laws and regulations. Licensing procedures are still unclear and there is no unambiguous certification for a number of products including seaweed. The Dutch Electricity Act is a specific obstacle for additional forms of energy production as it contains the provision that only wind energy may be produced at sea. This is currently being addressed by the Dutch government.
- Risks. Allowing co-use may increase the risks of damages and may lead to higher insurance costs for windfarm owners. There is still a lack of proper risk management and a clear legal framework around risk and damage claims. Setting up such a framework should be a joint effort between the government, owners and potential co-users.
- Research. In general, it is important to understand the bigger picture of the North Sea, at which locations co-use is desirable and what types of co-use would fit which locations.

Opportunities

The study also revealed two new opportunities. The first was the possibility of creating an artificial island to serve as a hub for, in particular, more labor-intensive forms of co-use. There are ideas for a hub to connect different windfarms and countries and probably also for hydrogen production. This has several benefits for cooperation and can provide space for share use requirements, such as seaweed drying for a seaweed farm. A hub could be the storage place for maintenance equipment and tools. It could also act as a refuge for boats in case of emerging storms and a recharging point/hydrogen refueling station for ships.

The second option that emerged is the idea of a 'maripark', a defined area at sea where various forms of marine- and aquaculture can co-exist. For a maripark, a single overarching license could be granted which reduces the pressure of licensing and monitoring. In addition, a maripark could provide a number of facilities, including the anchoring needed for co-use offshore. If these peripheral issues are well taken care of, developers and initiators can focus on the production process and important barriers to scale increase are removed.

Recommendations

So, what needs to happen to increase the options for co-use?

- If island/energy hub concepts are to be developed further, it is important to include the facilities of co-use.
- Include co-use at the beginning of a tender phase, including conversations between the windfarm operator and initiators for co-use. The government can take a leading role by designing the tender process accordingly.
- The government can also facilitate co-use by supporting licensing procedures and maripark development. It would be valuable to carry out more research into the realization of a maripark and the accompanying anchoring and licensing.
- More space should be made available at offshore substations to connect other forms of renewable energy (besides wind). More research is also needed into the integration possibilities of, among others, solar- and wind energy at sea as well as hydrogen production.
- Joint agreements should be made between government, owner and co-users about insurance costs and damage claims. This requires good risk management and an established legal framework.
- North Sea-wide research into nature development/ecology is required, with a focus on ecological connections with new and existing nature areas. This should also consider the positive and negative effects of co-use such as aquaculture on the ecosystem.

To summarize, co-use is still in a starting phase, but there are many opportunities for co-use in wind energy areas, even when these are further away from shore. However, it is a requirement that this co-use is discussed early in the development process and that room is made available in laws and regulations.

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