North Sea
Wind Power Hub

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REQUIREMENTS TO BUILD

Post-2030 planning is needed now

NSWPH | June 2019

The Consortium

The North Sea Wind Power Hub consortium has joined forces to realise climate goals. The consortium her work is based on research, stakeholder interaction and experience from earlier projects.

Port of Rotterdam

Biggest port in Europe with a strong ambition to become the most sustainable port in the world

ENERGINET

Danish transmission system operator working for a green, reliable and sustainable energy supply of tomorrow

gasunie

European energy infrastructure company serving the public interest and facilitating the energy transition by providing integrated infrastructure services

TenneT

TenneT is a Dutch-German electricity TSO and is one of Europe's major investors in national and cross-border grid connections on land and at sea in order to enable the energy transition.

Executive Summary

Policy makers should consider specific renewable targets beyond 2030, to allow for timely grid planning and spatial planning of offshore wind farms.

Developing these plans should consider the many North Sea stakeholders and their interests.

Urgent action is essential to timely shape the boundary conditions that are required to meet the long-term climate goals.

Six concept papers, one storyline

The goal of the concept papers is to inform North Sea stakeholders, and the general public, of the results the NSWPH has obtained working on the modular Hub-and-Spoke concept over the last two years. The six concept papers tell one story: from the challenge to meet the Paris Agreement, through the solution building on the modular Hub-and-Spoke concept, to the next steps required to meet the Paris Agreement timely and in a cost-effective manner.

Six Conceptpapers, One Storyline

Co-utilisation of offshore areas and using a long-term perspective must be seriously considered to unlock the cost reduction potential of an internationally

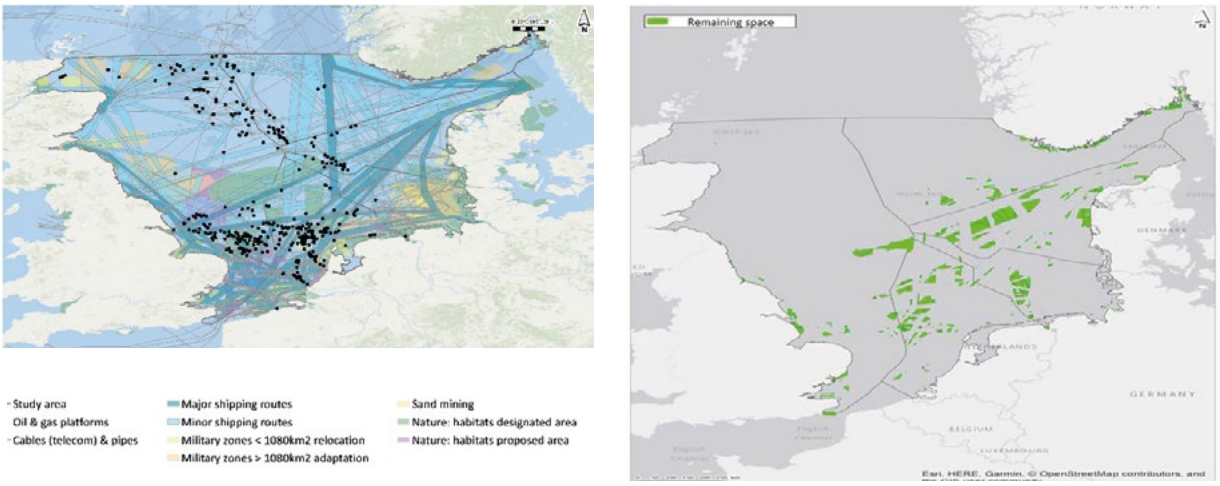
Policy makers should consider specific renewable targets beyond 2030, to allow for timely grid planning and spatial planning of offshore wind farms

To meet the ambitious targets as set in the Paris Agreement, a large-scale roll-out of offshore wind is required, as discussed in Concept Paper 1. An increased spatial use by offshore wind energy and transmission infrastructure is then expected accordingly. The consortium has taken a leading role in exploring technical options to reduce societal costs for the connection of offshore wind farms and interconnectors by a modular Hub-and-Spoke concept. The process is in an early assessment phase with various options under consideration. Preparing for an internationally coordinated roll-out in a robust stepwise approach requires clarity on spatial development areas for energy infrastructure beyond 2030, regardless of the technical options selected. It is important to get timely directions from policy makers on spatial planning given the significant lead times for these types of infrastructure and further increasing offshore wind energy deployment rates foreseen after 2030.

The combination of today's national maritime spatial plans have not caught up with the projected offshore wind capacity increase, mainly by the lack of appointed offshore wind farm areas after 2030. Across the North Sea energy declaration countries only the UK is preparing for leasing seabed for projects to be developed in the early 2030s[i]. For a first Hub-and-Spoke project to be operational in the early 2030s, a formal project decision is needed in the early 2020s, implying specific national post 2030 renewable targets (incl. offshore wind) by 2020. This would allow for national onshore and offshore grid planning to be finalised by 2021. This timeline highlights the need for early action to allow for a development and realisation of the project.

The available offshore area in the southern part of the North Sea is limited[ii] (about 14.000 km^2) and relatively scattered, when considering water depths up to 55m and assuming full exclusion of current use areas (shipping, military, operational and planned wind farms up to 2030, etc.). This would allow for up to 50-90 GW, depending on wind farm capacity density[ii]. Therefore, an exclusion strategy of offshore areas will likely not allow for a full deployment of any conceivable future energy system including offshore wind capacity, green hydrogen facilities, hubs and grid connections. Co-utilisation[1] of offshore areas and using a long-term perspective (e.g. use of areas after decommissioning of oil and gas rigs), must be seriously considered to unlock the cost reduction potential of an internationally coordinated approach, and ensure sufficient area is available.

[1] Use of offshore areas by multiple use functions such as nature, shipping and fisheries.

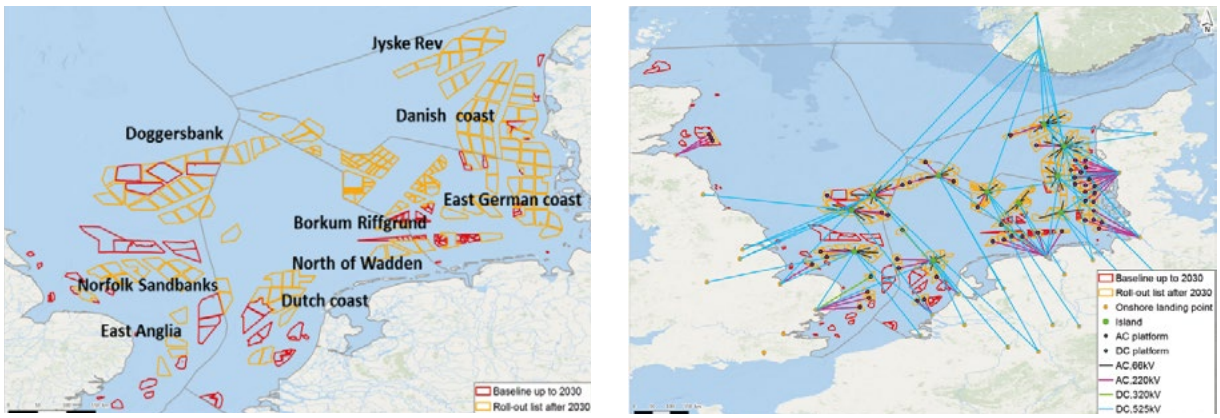


The North Sea is a heavily used area (left), an exclusion approach leaves limited and scattered area (right) available for offshore wind deployment (right)

Currently several processes are ongoing on a national level regarding spatial planning of offshore wind farms, such as the Crown Estates market engagement for Round 4 in the UK and the Flächenentwicklungsplan 2019 in Germany; but they are not integrated. It is essential in these processes to consider all aspects, including synergies for connection infrastructure, on an international level. The European maritime spatial planning directive (2014/89/EU)[iii] already calls for national integrated planning processes which cover all possible activities and are coordinated with neighbouring countries, but so far spatial planning for offshore wind has been nationally oriented. First efforts on more enhanced international coordination are currently being undertaken such as the "Joint statement to further the deployment of offshore energy in Europe"[iv], potential new EU mechanisms for cross-border renewable energy projects[v], and the "Political Declaration on energy cooperation between North Seas Countries"[vi].

Developing these plans should consider the many North Sea stakeholders and their interests

As highlighted, space limitations for the roll-out of offshore wind capacity raises an urgent need for clarity on co-utilisation. Co-utilisation in the North Sea can impact many stakeholders and will have different impacts on the costs of the offshore wind roll-out. A study conducted on behalf of the consortium[ii] sought to identify a first order cost impact of multi-use in offshore areas that currently have a specific use such as nature or fishery. The study identified areas which could be added to the offshore wind roll-out based on their total cost level (incl. costs for multi-use) to ensure sufficient offshore wind deployment. Note that the cost levels of the multi-use areas vary. Borkum Riffgrund is at the lower end. Other areas with relatively higher (+3% - >10%[vii]) levelised cost of energy (LCoE) levels include the Danish coast, Dutch coast, East Anglia, Eastern German coast, Jyske Rev and North of the Wadden, North Norfolk Sandbanks and Dogger Bank.

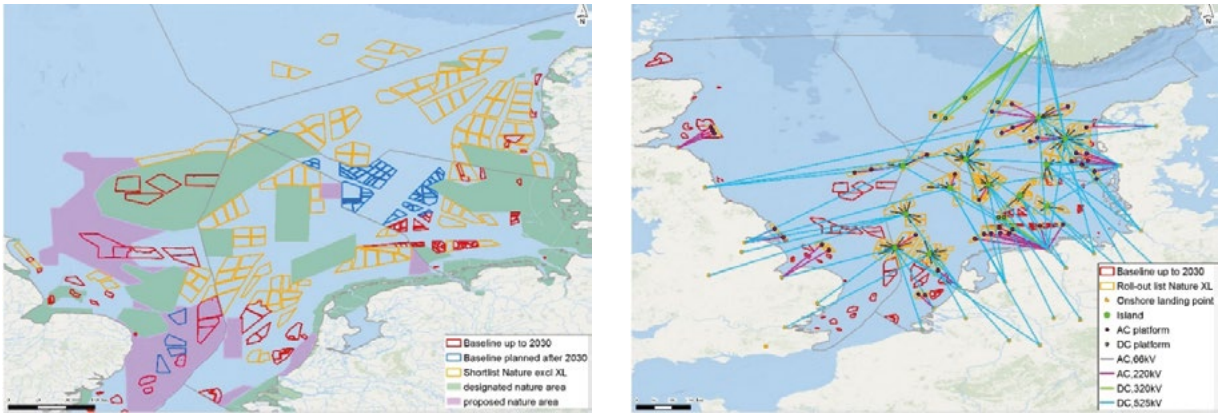


Offshore areas that would be required for the roll-out of up to 180 GW of offshore wind energy in the North Sea, including multi-use areas; area identification is based on a first order assessment of the cost impact of multi-use, and selecting the lowest cost options

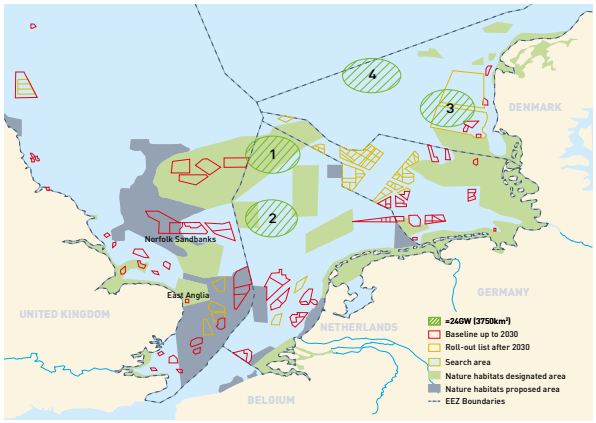
The study initially assumed that the cost impact of multi-use on the total roll-out could be fairly limited with an average cost increase of 1-2%[viii]. When only nature areas are excluded (and e.g. deeper waters have to be sought to meet the required offshore wind deployment), average costs of the total roll-out are found to increase by approximately 3%[ix].

Not all impacts of offshore area use are straight-forward to monetise (especially long-term environmental effects) and all carry substantial uncertainty. These aspects need to be addressed in a spatial planning debate which clearly goes beyond a techno-economic analysis. The cost impact of multi-use as assessed in the study should thus be seen as a conservative estimate, as actual costs may be higher.

Next to environmental and techno-economic studies, the consortium has specifically engaged with NGOs over the past year to consider their input on the Hub-and-Spoke concept. In addition to specific workshops, feedback was gathered through direct interaction. To address the feedback from NGOs the consortium has introduced an additional "investigative location" to its techno-economic analysis of main drivers for the design of a Hub-and-Spoke project. This considers a location in the deeper part of Danish EEZ and part of the Norwegian EEZ, and is a fourth location next to three other locations as discussed in Concept Paper 3.



Post 2030 potential roll-out and connection of offshore wind area and connection infrastructure taking into account multi-use, while excluding nature areas from offshore wind farm development



An additional fourth location is under investigation by the consortium to assess the main drivers impacting the conceptual Hub-and-Spoke project design

The consortium believes it is key to carefully consider the environmental impact of any Hub-and-Spoke project, and the wider offshore wind roll-out. Therefore, it has carried out several environmental and ecological studies including an environmental baseline mapping of the North Sea area. The objective of that study is to inform on potential predominant environmental challenges of a Hub-and-Spoke development in the North Sea at an early stage in the concept development. It provides an overall environmental mapping of the investigation area based on existing, available data and an overview of the potential predominant environmental impacts, including a qualitative assessment of the "investigative locations". Balanced decision making is required by policy makers and spatial planners to weigh the environmental impact of offshore wind farm developments against its techno-economic impact, and the urgency to meet the long-term climate goals.

Urgent action is essential to timely shape the boundary conditions that are required to meet the long-term climate goals

Structured and focused discussions are needed between policy makers, grid operators, market parties and NGOs to define technology specific renewable targets (including offshore wind capacity targets), spatial planning and grid planning for the North Sea countries post 2030. While this is not within its responsibility, the consortium feels an obligation to pro-actively reach out and engage to prevent delays. The consortium stands ready to initiate and facilitate these discussions and can provide the techno-economic perspective of grid developments and system impact to this discussion. Urgent action is required now to ensure the right boundary conditions are in place in time to meet the long-term climate goals against lowest costs, highest societal value and minimum environmental impact.

In addition to the ongoing cross-border marine spatial planning efforts within the EU[x], the consortium is engaging with governmental organisations on a European and national level to bring the need for cross-border cooperation and multi-use of the North Sea spatial use areas to the attention of policy makers. Going forward the consortium wishes to continue and intensify engagement with all involved stakeholders on this topic.

Sources

[i] *HM Government, 2019. Industrial Strategy.* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/784025/offshore-wind-sector-deal-web-optimised.pdf

[ii] *Witteveen + Bos & ECN/TNO, 2018. Cost Evaluation of North Sea Offshore Wind Post 2030* https://northseawindpowerhub.eu/wp-content/uploads/2019/02/112522-19-001.830-rapd-report-Cost-Evaluation-of-North-Sea-Offshore-Wind....pdf

[iii] *EU, 2014. DIRECTIVE 2014/89/EU.* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014L0089

[iv] *WindEurope, 2017. Joint statement to further the deployment of offshore energy in Europe.* https://windeurope.org/wp-content/uploads/files/policy/topics/offshore/Offshore-Wind-Statement-of-Intent-signed.pdf

[v] *EU, 2018. Establishing the Connecting Europe Facility and repealing Regulations (EU) No 1316/2013 and (EU) No 283/2014.* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A438%3AFIN

[vi] *European Commission, 2016. North Seas Countries agree on closer energy cooperation.* https://ec.europa.eu/energy/en/news/north-seas-countries-agree-closer-energy-cooperation

[vii] *Derived from Witteveen + Bos & ECN/TNO, 2018. Cost Evaluation of North Sea Offshore Wind Post 2030, p78*

[viii] *Derived from Witteveen + Bos & ECN/TNO, 2018. Cost Evaluation of North Sea Offshore Wind Post 2030, p60*

[ix] *Derived from Witteveen + Bos & ECN/TNO, 2018. Cost Evaluation of North Sea Offshore Wind Post 2030, p79*

[x] *European MSP Platform, 2019. Cross-border Cooperation.* https://www.msp-platform.eu/faq/cross-border-cooperation

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