



North Sea
Wind Power Hub
Programme

Compatibility of market setups with national legal & regulatory frameworks

Summary report

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Table of Contents

1 Executive Summary	3
2 Objective	5
3 Assessed hub configurations	6
4 Methodology	8
5 Main results	10
5.1 Additional hurdles for hybrid project development	13
6 Conclusion and Next steps	15



1 Executive Summary

Current offshore projects have to comply with the legal and regulatory framework of the Exclusive Economic Zone (EEZ) they are located in. As such, the location of a hub and offshore wind farms (OWF) can be highly decisive for the legal and regulatory framework that the hybrid project and its market setup have to comply with. Market setups¹ for hybrid projects define how offshore wind farms are allocated to specific bidding zones and subsequently how interconnection² capacity between these bidding zones is allocated. Hence, both the market setup and configuration of the multilateral hybrid project are decisive for which national legal and regulatory framework it has to comply with.

Assessed hub-and-spoke project configurations

This part of the analysis determines which regulatory or legal aspects create potential barriers for the implementation of the home market setup and the offshore bidding zone setup considering a certain hub-and-spoke configuration. To date, the North Sea Wind Power Hub (NSWPH) has outlined one type of configuration in which the hubs and all OWFs are located in one EEZ. Another configuration analysed in this report is the distributed hub system: the hub-and-spoke project is distributed over EEZs in line with the cable capacity towards shore. In the home market setup, the sub-hub and the OWFs connected to that respective sub-hub form the respective home market. In the offshore bidding zone setup, the sub-hub and the OWFs connected to that respective sub-hub form a separate offshore bidding zone.

Key findings

The analysis shows that neither the offshore bidding zone setup nor the home market setup is more difficult to implement. Secondly, the distributed hub system encounters fewer hurdles in national legislation and regulation than the centralised hub system as a consequence of that the authority of transmission system operators, national regulatory agencies and governments are EEZ bound. In the distributed hub system, the sub-hubs/home markets are distributed over the EEZs which allow the respective stakeholders to conduct their classical tasks with respect to the offshore bidding zones/ home markets. This is more difficult for the centralised hub system, where treaties between the connected countries and/or legislation and regulation changes are required to expand operational and regulatory responsibilities of the respective stakeholders across country borders. This is only true if the respective stakeholders want to have their share in the roles and responsibilities corresponding to the development, ownership, operation and maintenance of a hybrid project. Hence, when looking at the combination of a market setup and hybrid project configuration, not one combination is preferable over another.

¹ Refer for a full explanation of the Home Market setup and the Offshore Bidding Zone setup to NSWPH, *Market setup options to integrate hybrid projects into the European electricity market – Discussion Paper*, April 2020.

² The terms interconnector and interconnection capacity refers to both infrastructure crossing member state borders and bidding zone borders.



Next steps

More research is required to make firm recommendations with respect to the market setups. In the short-term, an analysis on potential governance models and ownership models is required if you want to allocate responsibilities differently than the status-quo. Furthermore, a treaty can be seen as a short-term solution for the development of centralised hub systems. Generic frameworks might ease the process towards such treaties for complex projects. Further research is required to determine whether a generic framework can ease to process towards such treaties.

This analysis shows, that early participation of governments and national regulatory agencies, amongst others, is needed to discuss all governance and financial related open questions and potential solutions, and to allow for decision-making by policymakers.



2 Objective

Current offshore projects have to comply with the legal and regulatory framework of the Exclusive Economic Zone (EEZ) they are located in. As such, the location of a hub and offshore wind farms (OWF) can be highly decisive for the legal and regulatory framework that the hybrid project, see text box 1, and its market setup have to comply with. Market setups³ for hybrid projects define how offshore wind farms are allocated to specific bidding zones and subsequently how interconnection⁴ capacity between these bidding zones is allocated. Hence, both the market setup and configuration of the multilateral hybrid project are decisive for which national legal and regulatory framework it has to comply with. As such, the objective of the assessment is to analyse the compatibility of Danish, Dutch and German national legal and regulatory frameworks in relation to market setups for multilateral hybrid projects.

Text box 1. The term “hybrid projects” as used by the European Commission, North Sea Energy Cooperation, ENTSO-E and Roland Berger, refers to projects in which the physical development and implementation of offshore wind and interconnection capacity is combined. However, the term hybrid is also used in the context of “hybrid assets” which reflect infrastructure with the commercial dual functionality of internal transmission and interconnection. The latter term only comes into existence when we are talking about a “Home Market” setup where the infrastructure serves multiple purposes at the same time and which therefore requires special regulatory treatment. When applying an “Offshore Bidding Zone” setup to the infrastructure, there are no hybrid assets as there will only be interconnectors and bidding zones.

It is important to not interchangeably use those two terms as they mean different things. To prevent confusion, from now on the term “hybrid projects” will be used to refer to the physical/construction part of projects in which offshore wind and interconnection capacity is combined. The term “hybrid assets” will solely be used to refer to infrastructure assets, which are used for both interconnection and internal transmission, and only exists when

³ Refer for a full explanation of the Home Market setup and the Offshore Bidding Zone setup to NSWPH, *Market setup options to integrate hybrid projects into the European electricity market – Discussion Paper*, April 2020.

⁴ The terms interconnector and interconnection capacity refer to both infrastructure crossing member state borders and bidding zone borders.



3 Assessed hub configurations

To date, the North Sea Wind Power Hub (NSWPH) has outlined one type of configuration in which the hubs and all OWFs are located in one EEZ (see figure 1 and 2 for an example of hub-and-spoke projects with this configuration):

1. **Hub and OWFs are located in one EEZ⁵** (see figure 1 and 2):

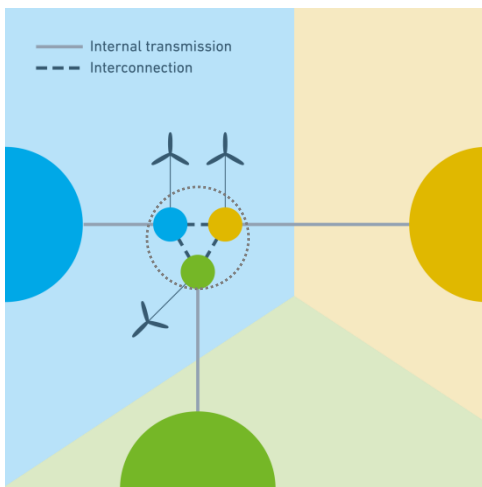


Figure 1. Hub-and-spoke project with a home market setup in which the hub (shown by the dotted line) is split into three home markets. In this figure, all HM zones are located in one EEZ and e.g. the OWFs of the green country are located in the blue EEZ and bid into the green home market.

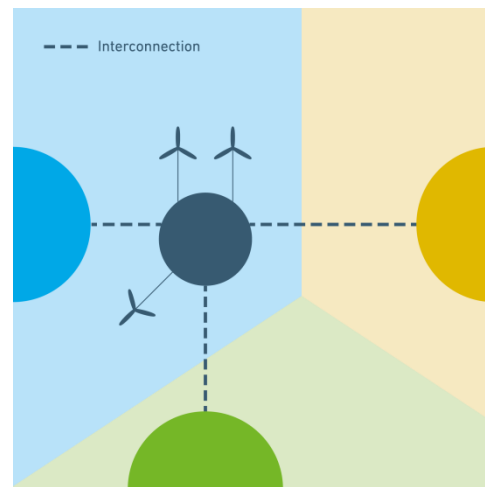


Figure 2. Hub-and-spoke project with an offshore bidding zone setup where the hub and all OWFs are located in one EEZ.

However, this is not the only imaginable configuration for multilateral hybrid projects. Another configuration analysed in this report is:

2. **Hub-and-spoke project distributed over EEZs in line with cable capacity⁶** (see figure 3 and 4): The hub-and-spoke project is distributed over EEZs in line with the cable capacity towards shore. This means that in this example the hub is split into three physically separate "sub-hubs". A sub-hub with a connection of X GW to shore can at maximum have a sub-hub and offshore wind farm capacity of X GW to prevent structural congestion. In the home market (HM) setup, the sub-hub and the OWFs connected to that respective sub-hub form the respective home market. In the offshore bidding zone (OBZ) setup, the sub-hub and the OWFs connected to that respective sub-hub form a separate offshore bidding zone. In this way, three offshore bidding zones are formed.

⁵ From now on referred to as centralised hub system.

⁶ From now on referred to as distributed hub system.

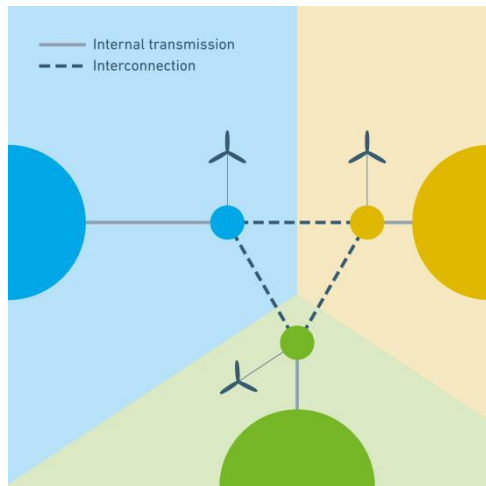


Figure 3. Overview of the home market setup applied to a hub-and-spoke project distributed over EEZs in line with the cable capacity. The home markets are located in the EEZ of their onshore home market.

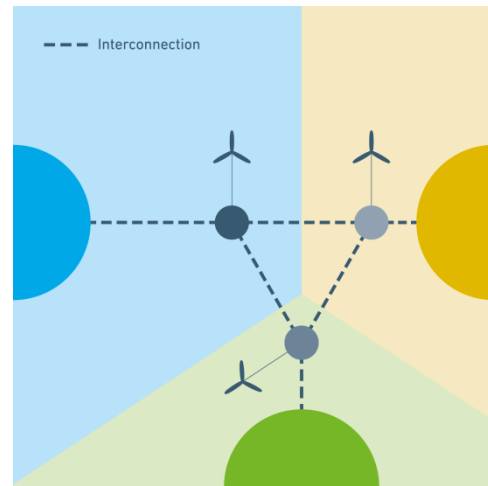


Figure 4. Overview of the offshore bidding zone setup applied to a hub-and-spoke project distributed over EEZs in line with the cable capacity.

It should be noted that the technical composition of both configurations is exactly the same under both market setups. More complex configurations are also possible, i.e. if the hub and the OWF are in different EEZ. However, these are not considered in this report due to their complexity.



4 Methodology

The analysis determines which regulatory and/or legal aspect creates potential barriers/hurdles for the implementation of the home market setup and the offshore bidding zone setup considering a certain hub-and-spoke configuration. These hurdles are identified by assessing different criteria with respect to their compatibility with the national legal and regulatory frameworks.

Barriers/hurdles are considered to be a misfit or incompatibility of regulation and legislation with the market setups given a certain configuration. These misfits or incompatibilities could hamper and slow down development. The barriers/hurdles are not weighed meaning that it cannot be told specifically which is larger and which is smaller, and whether it can be easily solved. The criteria are carefully chosen and clustered among the two overarching pillars governance and finance.

The legal and regulatory framework for offshore hybrid projects can be broken down into two main categories:

1. Governance, and
2. Finance.

The first category 'governance' is related to the architecture of electricity markets and covers how roles and responsibilities are defined in the different countries. The second category 'finance' is defined by aspects as the tariff system, the tax regime and the subsidy scheme. Operational aspects as balancing and transmission aspects are not covered in this analysis as they are out of scope. These areas are included in European regulation and legislation, and therefore similar in all considered countries. Besides, other national aspects that are not included in European regulation or legislation such as decommissioning do not differ between the two market setups and are thus also out of scope. From our view these pillars cover the most relevant sub-criteria which are used throughout this paper.

Table 1. Explanation of analysed criteria.

Category	Criterion
Governance	Asset classification
	Responsibilities
	Applicable national regulatory agency
	Tendering scheme
	Planning
	Existence of multiple bidding zones
	Curtailment regimes
Finance	Regulated revenue stream for transmission system operators
	Taxes
	Subsidy scheme for offshore wind farms

The criterion asset classification has been included in this analysis even though it is not relevant for Germany and Denmark. These countries already built a hybrid asset in the project Kriegers



Flak Combined Grid Solution⁷ and did not encounter potential asset classification related barriers in national regulation and legislation while doing this. The hybrid asset classification criterion is relevant for the Netherlands where a hybrid asset has not been introduced yet, but one – the WindConnector – is being developed in collaboration with Great Britain. Dutch regulation includes clear definitions of onshore, offshore and interconnection assets, but a hybrid asset classification is lacking.

⁷ The Kriegers Flak CGS connects the Danish region of Zealand with the German state of Mecklenburg-Western Pomerania with a hybrid asset of 400MW. The project partners – Energinet and 50hertz – put the project into operation in December 2020.



5 Main results

Hybrid project configuration and location are decisive for hurdles in national regulation and legislation.

The current national legal and regulatory frameworks of Denmark, Germany and the Netherlands do not necessarily form a barrier to the implementation of hybrid projects. It should be noted that premise for the Dutch and German regulation is a one bidding zone configuration. In case of the offshore bidding zone setup, regulation and legislation might need to reflect better that there are two bidding zones, but this is not considered to be barrier from a legal and regulatory perspective. This is for example to allow providing efficient subsidies⁸ in an offshore bidding zone in the Dutch EEZ.

Whether a hybrid project in combination with a certain market setup leads to barriers within the national frameworks is dependent on the configuration and location of the hybrid project. In which EEZ the hub and OWFs are located is directly connected to the perceived regulatory hurdles when implementing a hybrid project with a certain market setup. In the table below, the barriers are summarised for the home market setup and the offshore bidding zone setup per configuration that apply to all the three countries.

Table 2. Summary of the barrier analysis per configuration and market setup that applies to all countries.

	Home market setup	Offshore bidding zone setup
1. Centralised hub system	Governance and finance barriers: treaty required for stakeholders to have authority if home market is located in another EEZ. Interconnectors between the home markets can be managed like existing point-to-point interconnectors.	No barriers ⁹ : responsibility is given to the stakeholders of the EEZ in which the hub and OWFs are located. Interconnectors between the hub and the connected countries can be managed like existing point-to-point interconnectors.
2. Distributed hub system	No barriers: respective stakeholders are allowed to manage and finance the home market in their EEZ. Interconnectors between the home markets can be managed like existing point-to-point interconnectors.	No barriers: respective stakeholders are allowed to manage and finance the offshore bidding zone in their EEZ. Interconnectors between the offshore bidding zones can be managed like existing point-to-point interconnectors.

⁸ Dutch law states that the subsidy amount for electricity from renewable energy sources should be based on 'the' electricity price. It does not reflect the market value of the electricity source, and as such that there may be multiple electricity prices. Minor changes are required to reflect that the subsidy amount for OWFs in the OBZ should be based on the market value of electricity and thus the captured electricity price by the OWFs. Presumably, a new installation category for these OWFs in Dutch legislation is required. Source: Ministerie van Economische Zaken en Klimaat, *Besluit stimulering duurzame energieproductie en klimaattransitie*, valid from 01-11-2020 to date.

⁹ In case the stakeholders of the hybrid project in the OBZ want to share governance and finance responsibilities, similar barriers exist as under the home market setup.



It remains difficult to say that one configuration is significantly better than another. Especially since the idea of "most suitable" differs between member states.

From the table it becomes clear that in case the offshore bidding zone is to be implemented, the centralised and distributed hub system seem to be evenly appropriate from a legal and regulatory perspective. If the home market setup is to be implemented, the distributed hub system might be the most convenient configuration. The main problem of the centralised hub system is that the authority of transmission system operators (TSO), national regulatory agencies (NRA) and governments are EEZ bound. As such, they do not have authority in a different EEZ. This is a barrier under the assumption that under the HM setup the hub stakeholders of the connected countries want to plan and tender the OWFs, own, operate, do curtailment in and maintain their own home market. These stakeholders cannot fulfil their classical roles in the situation that their home market part of the hub is located in a different EEZ. Furthermore, taxes and subsidies are arranged on a national level. No international tax system and subsidy system exists in the European electricity system. However, subsidies do not necessarily form a barrier if subsidies are not required by the OWFs.

This barrier does not apply if all parties agree that only the stakeholders of the EEZ, which houses the centralised hub, are responsible for all roles and responsibilities linked to the hybrid project, and cross-border cost and benefit allocation between connected countries suffices. However, these barriers do also apply to centralised configuration under the OBZ setup if all involved stakeholders - such as the governments, TSOs and NRAs - want to be involved in the co-tendering, co-ownership, co-construction, co-operation and co-maintenance of the hybrid project. Hence, in that situation both the OBZ setup and the HM setup require expansion of operational and regulatory responsibilities across country borders, asking for alignment between governments.

Expanding operational and regulatory responsibilities across country borders for the centralised hub system.

There are two ways to enable this:

1. Treaties; and
2. Regulatory and/or legal changes.

Ensuring a fair distribution of roles and responsibilities for the stakeholders of the involved countries, requires treaties on topics like jurisdiction, operation, safety, inspection or supervision, security arrangement and taxes. Treaties are a possible solution to expand operational and regulatory responsibilities across country borders for the centralised hub system. It is easier to impose additional legislation and regulation than to make exemptions for regulation and depends on the degree of harmonisation within the EU. The treaty between the government of Great Britain and the Netherlands for the BBL pipeline¹⁰ is an example of this. In table 3, the analysed criteria are translated into the responsibilities per actor for the green country in the example of figure 1, and is shown which hurdles can be solved by a treaty. The blue country – the host - needs to plan the hybrid project, but the treaty could include that the green country and the blue

¹⁰ BBL pipeline is a 235-kilometre gas pipeline between Balgzand in the Netherlands and Bacton in the United Kingdom.



country can jointly tender the OWFs under the conditions of the green country. As such, it is also possible to include in the treaty that the OWFs and electrical infrastructure have to comply with the national grid codes of the green country. Furthermore, this treaty can also give the responsibility of the green home market with respect to construction, operation, maintenance, supervision, subsidies and taxes from the hosting blue country to the green country. Further research is required to determine which actions are required per configuration and law or regulation. Fortunately, the Danish, Dutch and German laws are very similar in terms of grid codes, safety and environment and therefore it might also be an option to let the ‘foreign’ infrastructure meet the local requirements.

Table 3. Overview of possible responsibilities listed per stakeholder with and without a treaty for the centralised hub system under the home market setup. This also applies to the centralised hub system configuration under the OBZ setup if the involved stakeholders want to perform their classical roles with respect to the hybrid project.

Stakeholder	Responsibility	Without treaty	With treaty
As green TSO	To plan electrical infrastructure within the green home market	Not possible	Possible
	To own/operate electrical infrastructure in the green home market	Not possible	Possible
	To curtail the OWFs of the green home market	Not possible	Possible
	To plan the infrastructure from the home market to green BZ under the green grid code	Not possible	Possible
	To own/operate the interconnector from the green home market to the other home markets under the green grid code	Not possible	Possible (similar to point-to-point ICs)
As green government	To plan the OWFs of the green home market	Not possible	Not Possible
	To subsidize the OWFs in the green home market	Not possible	Possible
	To tender the OWFs of the green home market <u>under its own conditions</u>	Not possible	Not possible, but can do it together
As green NRA	To supervise compatibility of electrical infrastructure with the home market under the green grid codes	Not possible	Possible
	To supervise compatibility of the OWF of the green sub-hub/home market with the green legislation and regulation	Not possible	Possible
	To supervise compatibility of the interconnector with the green grid codes	Not possible	Possible (Similar to point-to-point ICs)
As green OWF	To pay taxes to the green country	Not possible	Possible



Shared governance and finance responsibilities are business as usual for interconnectors.

With respect to the interconnectors between the home markets or bidding zones, an agreement between TSOs is required concerning the planning, construction, ownership, income, maintenance and operation. This is business as usual for existing point-to-point interconnectors and therefore not seen as a major barrier. This barrier exists regardless of the market setup and configuration due to the hybrid nature of these types of projects which combine interconnection capacity and offshore wind.

European regulation and legislation changes as long-term solution.

Considering the offshore wind target, the required number of hybrid projects and thus the number of treaties could become an in transparent solution in the long-term. The treaties can be considered as a temporal solution and long-term solutions could be based on European regulatory and legislative changes. The latter solution requires time to allow the centralised hub system to work. It is uncertain whether this is manageable with the current timeline for the first hub-and-spoke project.

5.1 Additional hurdles for hybrid project development

The regulation in all three countries does not fully support hybrid project development within the respective EEZs (except if the hub is located outside their EEZ under the OBZ setup when only interconnection development and cross-border cost and benefit allocation might be required). Most projects are currently developed and managed either as an interconnector or an offshore wind farm. Whereas the TSOs are not allowed to plan, develop and tender OWFs, the government does not account for interconnectors when developing new OWFs. TSOs usually have the opportunity to advise the government on the integration of interconnection assets in the offshore wind farm project. However, the assessments which result in the final choice for offshore wind areas exclude the benefits of interconnection and thus reduce the chance of integrating interconnection. As such, hybrid project development is highly dependent on government willingness and the business case they determine. Consequently, regulated cost recovery for interconnectors via the tariffs might get complicated. This did not impede hybrid project development for the existing combined grid solution between Denmark and Germany. Hybrid project development is dependent on government willingness and the business case they determine. For future projects a specific regulatory foundation for hybrid projects may be needed.

Furthermore, adjustments of Dutch legislation and regulation might be required to allow hybrid assets and interconnectors to connect to the offshore grid. In regard to hybrid assets in the home market setup, classification does not exist in current Dutch legal asset definitions. Dutch offshore infrastructure is not allowed to transport electricity that is not produced by the offshore wind farms connected to the offshore grid^{11,12}. Therefore, law needs to be adjusted to allow for the development of hybrid assets. In Denmark and Germany this classification is not necessarily required as mentioned earlier.

¹¹ Ministerie van Economische Zaken en Klimaat, Elektriciteitswet June 2020, Article 15a.

¹² Ministerie van Economische Zaken en Klimaat, *Ontwikkelkader windenergie op Zee – versie voorjaar 2020*, May 2020, paragraph 3.9.



Additionally, the Dutch offshore grid is not part of the national transmission grid¹³ which makes it questionable whether cross-border infrastructure connecting to the offshore grid can be defined as interconnector which couples the transmission systems of two member states. The qualification as interconnector is of utmost importance, because the European regulated congestion rents are directly connected to this qualification. This barrier is independent of the market setup and comes into play when centralised hub system is located in the Dutch EEZ and/or when the sub-hub of the distributed hub system is defined as offshore grid. This barrier has not been identified in the Danish and German national legal and regulatory frameworks.

¹³ Ministerie van Economische Zaken en Klimaat, Elektriciteitswet June 2020, Article 10(1).



6 Conclusion and Next steps

From the national legal and regulatory perspective, it becomes clear that neither the offshore bidding zone setup nor the home market setup is more difficult to implement. The analysis does show that the distributed hub system encounters fewer hurdles in the national legislation and regulation. This is due to that the sub-hubs/home markets distributed over the EEZs allows the respective stakeholders to conduct their classical tasks with respect to the sub-hubs/home markets. However, when looking at the combination of a market setup and hybrid project configuration, not one combination is preferable over another. Therefore, more research is required to make firm recommendations:

- This analysis identified hurdles that might be encountered when developing a hybrid project. Besides the solution with a treaty to allow the classical roles of the stakeholders to be maintained, this analysis has not dived into other options. An analysis on potential other governance models and ownership models is required if you want to allocate responsibilities differently than the status-quo.
- From this analysis becomes clear that multiple ownership and finance options exist. The two discussion papers on market setups describe that benefits are allocated differently between the two market setups. More research is required to determine fair cost and benefit allocation methods for both market setups applied to either of the hub system configurations.
- This analysis showed that treaties might be required for the development of hybrid projects. Generic frameworks might ease the process towards such treaties for complex projects. Further research is required to determine how this framework can be achieved, who should be involved – top down involving European decision bodies or bottom up starting with a few countries only – and what legislation and regulation aspects should be included.
- The interconnection and offshore wind farm development processes should allow for hybrid project development. Further research is required to analyse how this can be aligned or combined.

Early participation of governments and NRAs, amongst others, is needed to discuss all governance and financial related open questions and potential solutions, and to allow for decision-making by policymakers.



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