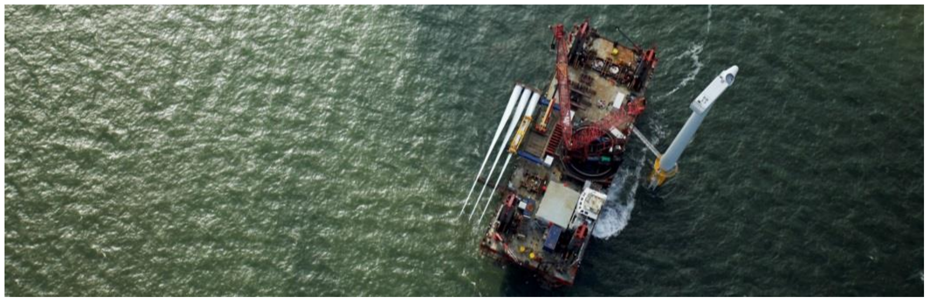
Offshore wind transmission, US

September 24, 2020

Financing offshore wind transmission

Offshore Wind Transmission, US

Table of contents



1. Introduction

Offshore wind developments in the US

I. After almost twenty years, the US offshore wind market is finally poised to explode

II. Experience from Europe shows that the grid connection framework significantly impacts the bankability of offshore wind projects

III. Different models of grid interconnection have been considered for the US

IV. This document gives a high level overview of grid connection practices in European offshore wind markets and potential conclusions for the US

V. It has been prepared by Green Giraffe, a specialist renewable energy advisory boutique

1. Green Giraffe – The renewable energy finance specialist

We get deals done

Deep roots in renewable energy finance

- Launched in 2010 by experienced finance specialists with a **strong and proven track record** in renewable energy
- 100+ professionals with offices in Boston (USA), Cape Town (South Africa), Hamburg (Germany), London (UK), Paris (France) and Utrecht (the Netherlands)
- Multi-disciplinary skillset including **project & corporate finance, M&A, tendering, contracting, and legal** expertise

High-quality, specialized advisory services

- Focus on projects where we can actually add value
- We can provide a holistic approach and are able to include sector-specific tasks in addition to traditional debt or M&A advisory (such as contracting, tender advice, strategic advisory, and development services)
- Widening geographical reach beyond Europe, with a growing presence in the Americas, Africa, and Asia
- Priority given to **getting the deal done!**

Close to **EUR 30 billion** funding raised for renewable energy projects in **10 years**

100+ professionals in **6 countries** on 3 continents

Involved in **~200 renewable energy transactions or projects** with a total capacity of **~60 GW**

1. Today's speaker

Randy Male – Head of Office

Project experience

- Gordon Butte, 400 MW, US, storage
- Progression Energy, 400 MW, US, float.
- Undisclosed, 1.2 GW, US & JP, floating
- Undisclosed, 300 MW, US, solar
- Trident Winds, 1 GW, US, floating

Randy joined Green Giraffe in 2019 and heads the Boston office

Randy led the sale of Absaroka's 400 MW Gordon Butte pumped storage hydro project in Montana, USA, to CIP. He was also actively involved in arranging the financing and sale of Progression Energy's floating offshore wind project in Hawaii and Trident Wind's floating offshore wind project in California

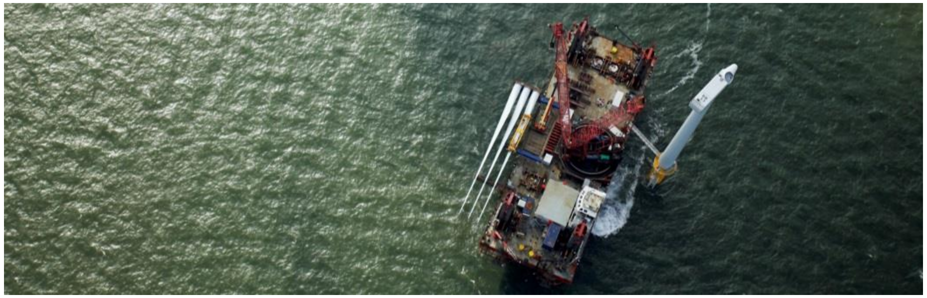
Before joining Green Giraffe, Randy spent several years leading renewable energy investment banking assignments at a boutique advisory firm in Boston. He has led M&A and financing assignments across the renewable energy technology spectrum including, offshore wind, onshore wind, solar and storage. He has also been a renewable energy developer and CFO of several companies

He is a registered broker dealer representative and holds the following securities licenses: SIE, Series 24, 63, 79 (Investment Banking), and 82 (Private Placements)

Randy holds a bachelor's degree from Skidmore College and an MBA from Cornell University

Offshore Wind Transmission, US

Table of contents



2. Background

Offshore wind worldwide – Leading geographies

Europe is market leader in offshore wind, with over 80% of total capacity installed

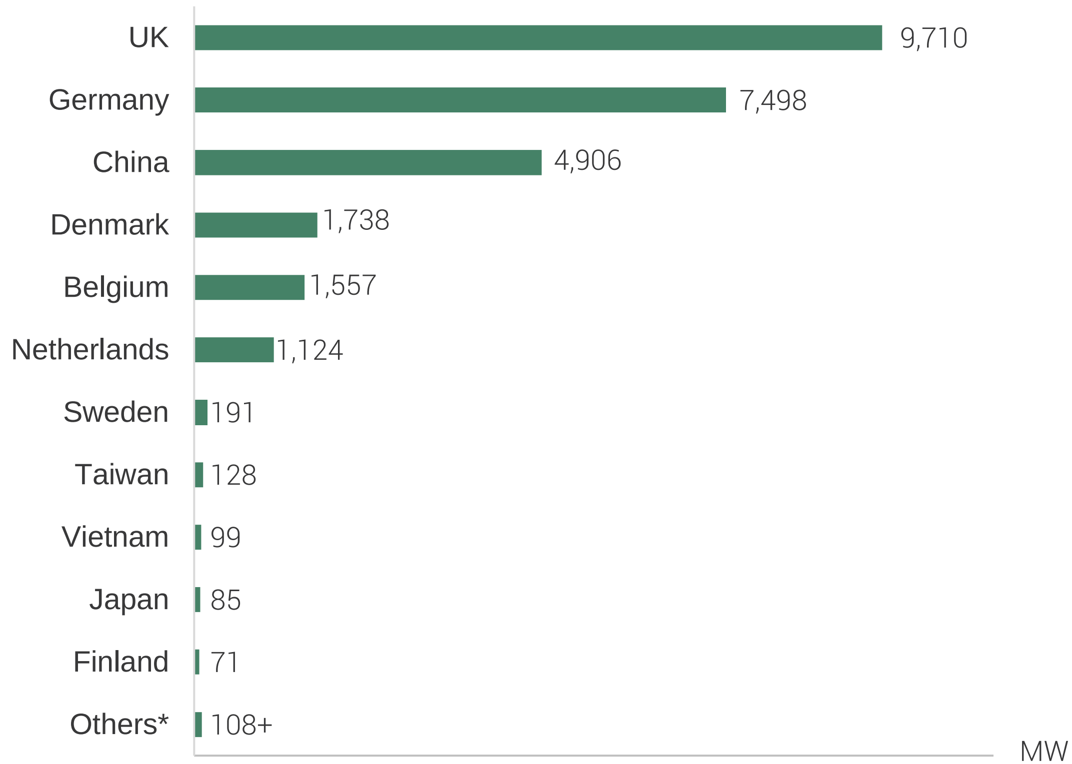
- UK is the leading country, with most operational offshore wind to date
- Germany was a first mover and developed steadily to become second largest market

China recently made a major leap forward, reaching third position

- China installed 1.6 GW in 2018, and had 3.7 GW under construction in 2019
- Doubts remain as to the operating performance of the installed base
- Other Asian countries (Japan, Taiwan, Vietnam, South Korea) are also actively developing their offshore wind activities

US counts only one operational project of 30 MW to date, but is developing a significant pipeline (incl. floating wind)

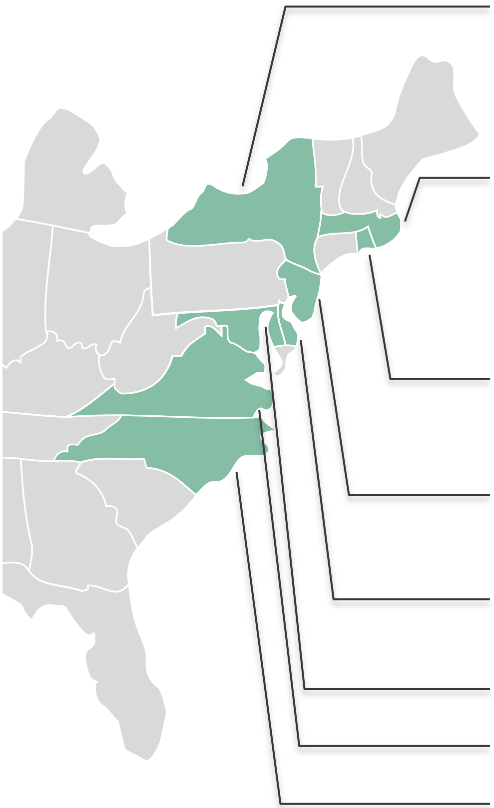
Cumulative offshore wind capacity in operation (end 2019)



* South Korea, US, Ireland, Spain, Norway, France
Source: WFO, Global offshore wind report (Feb 2020)

2. Background

East coast active commercial leases



State	Acres	Price USD '000	Award	Lease	Associated project(s)	Developer(s)
NY	80 k	42,500	2016	OCS-A-0512	Empire, Boardwalk*	Equinor
MA	188 k	281	2015	OCS-A-0500	Bay State	Ørsted, Eversource
	167 k	150	2015	OCS-A-0501	Vineyard 1, Park City	Avangrid, CIP
	128 k	135,000	2019	OCS-A-0520	Beacon Wind	Equinor
	127 k	135,000	2019	OCS-A-0521	Mayflower MA/CT	Shell, EDPR
	132 k	135,100	2019	OCS-A-0522	Liberty	Avangrid, CIP
MA/RI	98 k	3,100	2013	OCS-A-0486	Revolution, South Fork	Ørsted, Eversource
	67 k	749	2013	OCS-A-0487	Constitution, Sunrise	Ørsted, Eversource
NJ	183 k	1,000	2016[1]	OCS-A-0499	Atlantic Shores	Shell, EDFR
	161 k	881	2016	OCS-A-0498	Ocean Wind	Ørsted, PSEG
DE	70 k	24	2012[2]	OCS-A-0482	Garden State	Ørsted, PSEG
	26 k	n/a	2018[3]	OCS-A-0519	Skipjack	Ørsted
MD	80 k	9,000	2014[4]	OCS-A-0490	MarWin	US Wind
VA	113 k	1,600	2013	OCS-A-0483	Virginia Wind	Dominion
NC	122 k	9,000	2017	OCS-A-0508	Kitty Hawk	Avangrid

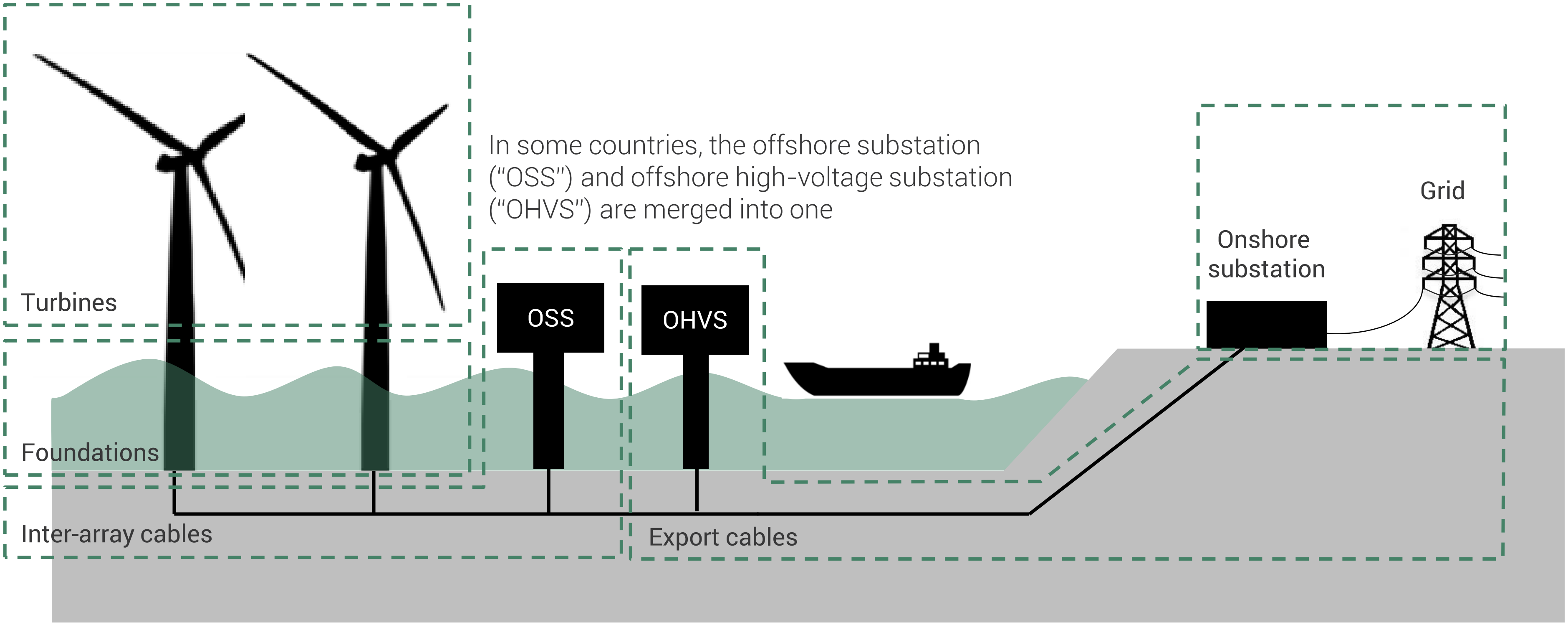
[1] Assigned from US Wind to EDF in 2018
[2] Assigned from Bluewater Wind to GSOE in 2016
[3] Date segregated from lease OCS-A-0482
[4] Amended to be merged with OCS-A-0489 in 2018

* Boardwalk Wind project is located in OCS-A-0512 but will deliver its electricity to NJ

2. Background

Components of an offshore wind project

The offshore grid connection includes the onshore connection point, export cables (offshore/onshore), and sub-station(s)



Who owns, constructs and operates the grid connection is dependent on the applicable regulatory framework

The grid connection is a key component and a large capital expenditure part of the projects. If included in project costs, the grid connection can represent ca. 20-25% of capital expenditure

2. Background

The key feature – Who builds the grid connection

Who builds the offshore wind grid connection is the biggest driver of risk allocation and mitigation for projects

Grid connection built by the TSO

- The TSO is responsible for the connection of the projects to the onshore grid, including the responsibility for the design and construction of the transmission assets. It then typically remains the owner and operator of the assets
- The TSO commits to a certain completion date of the grid connection. The essential risk mitigation element here is the compensation to be paid to projects in case of a delay
- The projects commit to construct the wind farm in a timely manner to meet the deadlines set by the TSO

Grid connection built by the project

- The project is responsible for the design, financing, and construction of the transmission assets. Once completed, the assets may remain in the ownership of the project or be tendered for sale to third parties

Grid connection built by a third party

- A third party is responsible to build the grid connection
- This option exists in the UK, but has never been used to date

The first two options are currently acceptable to financiers as long as the risks and responsibilities in case of construction delay are clearly defined and allocated

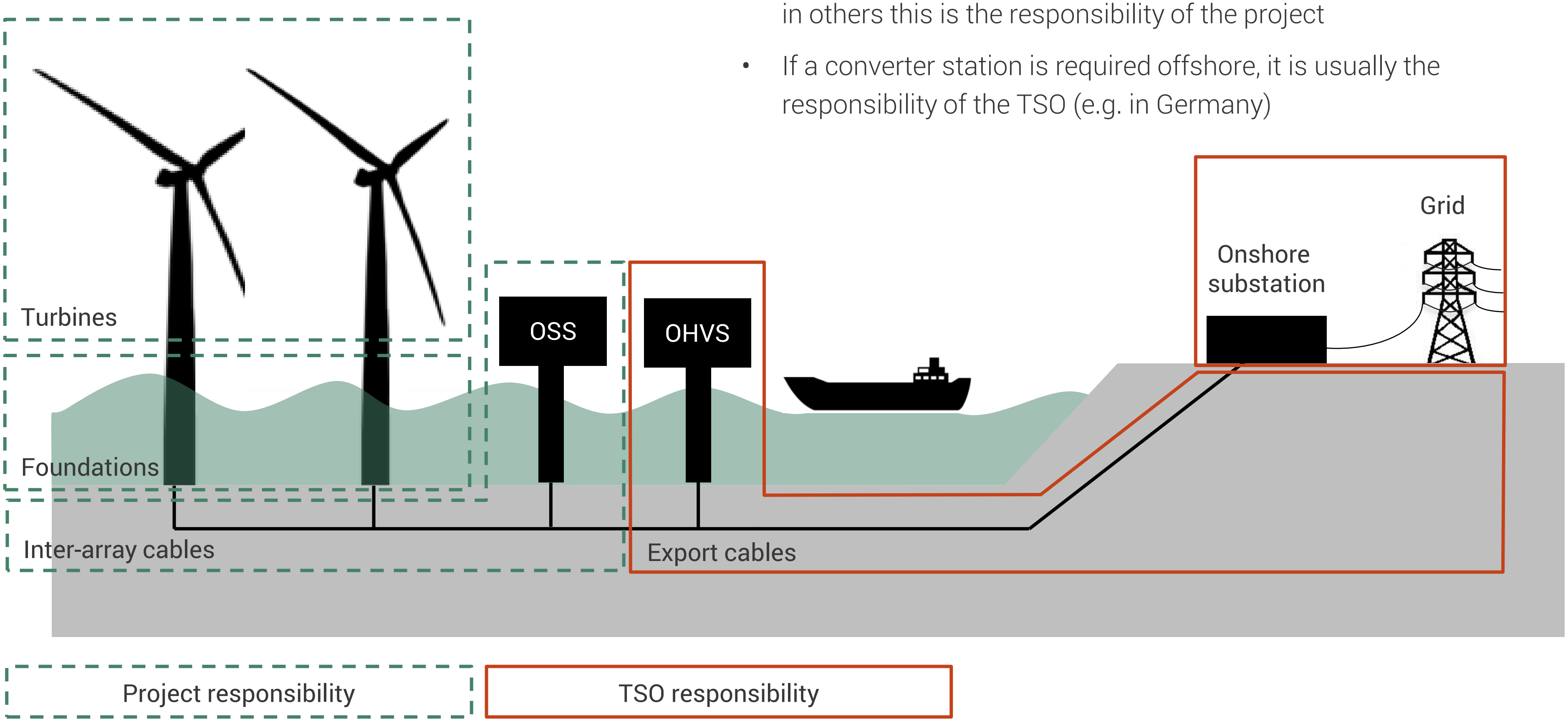
Green Giraffe
The renewable energy financial advisors

2. Background

Grid connection built by the TSO

The TSO is responsible for the onshore grid connection, including onshore substation, export cables, and OHVS

- In some countries, the TSO is also responsible for the OSS, while in others this is the responsibility of the project
- If a converter station is required offshore, it is usually the responsibility of the TSO (e.g. in Germany)

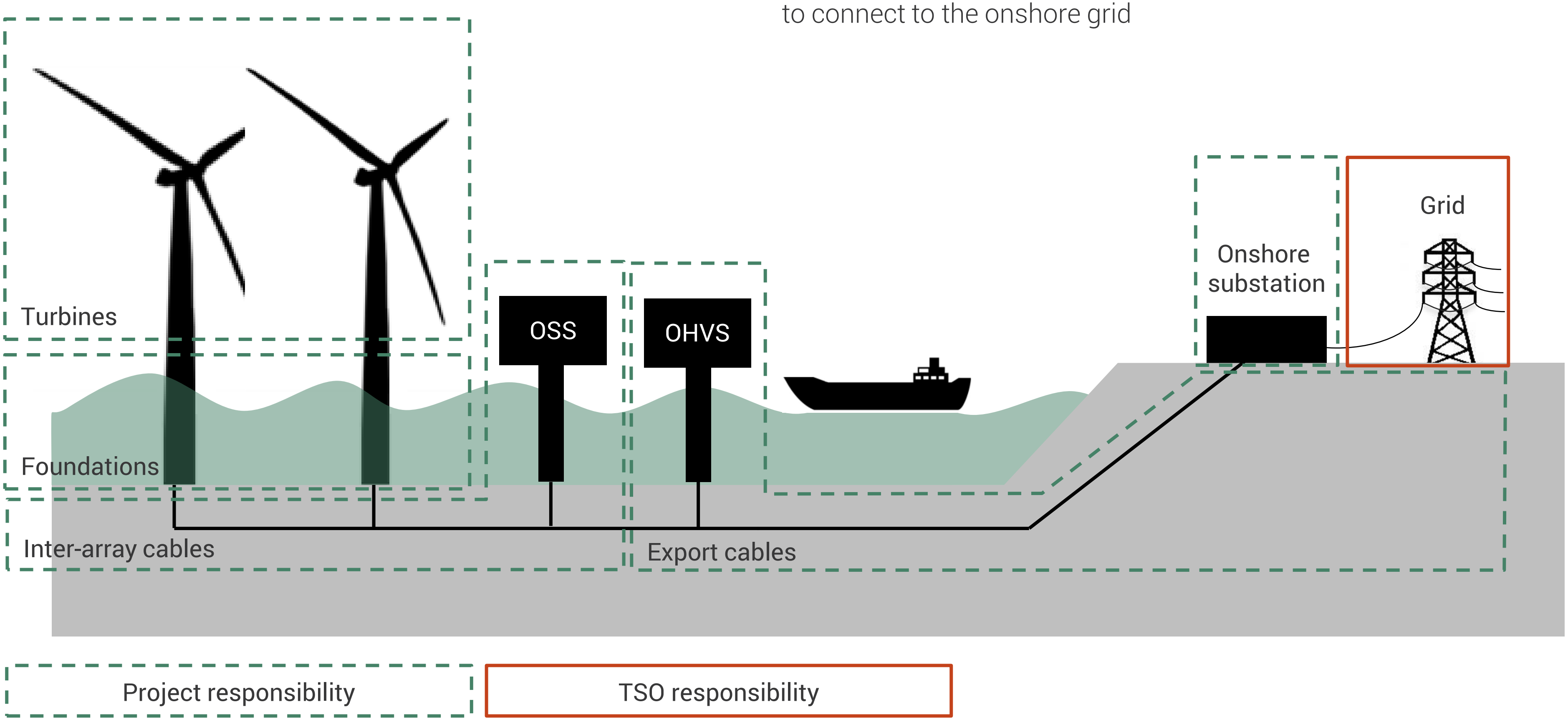


2. Background

Grid connection built by the project

The projects build all generation and transmission infrastructure, up to the grid connection point

- The TSO will usually provide the technical specifications required to connect to the onshore grid

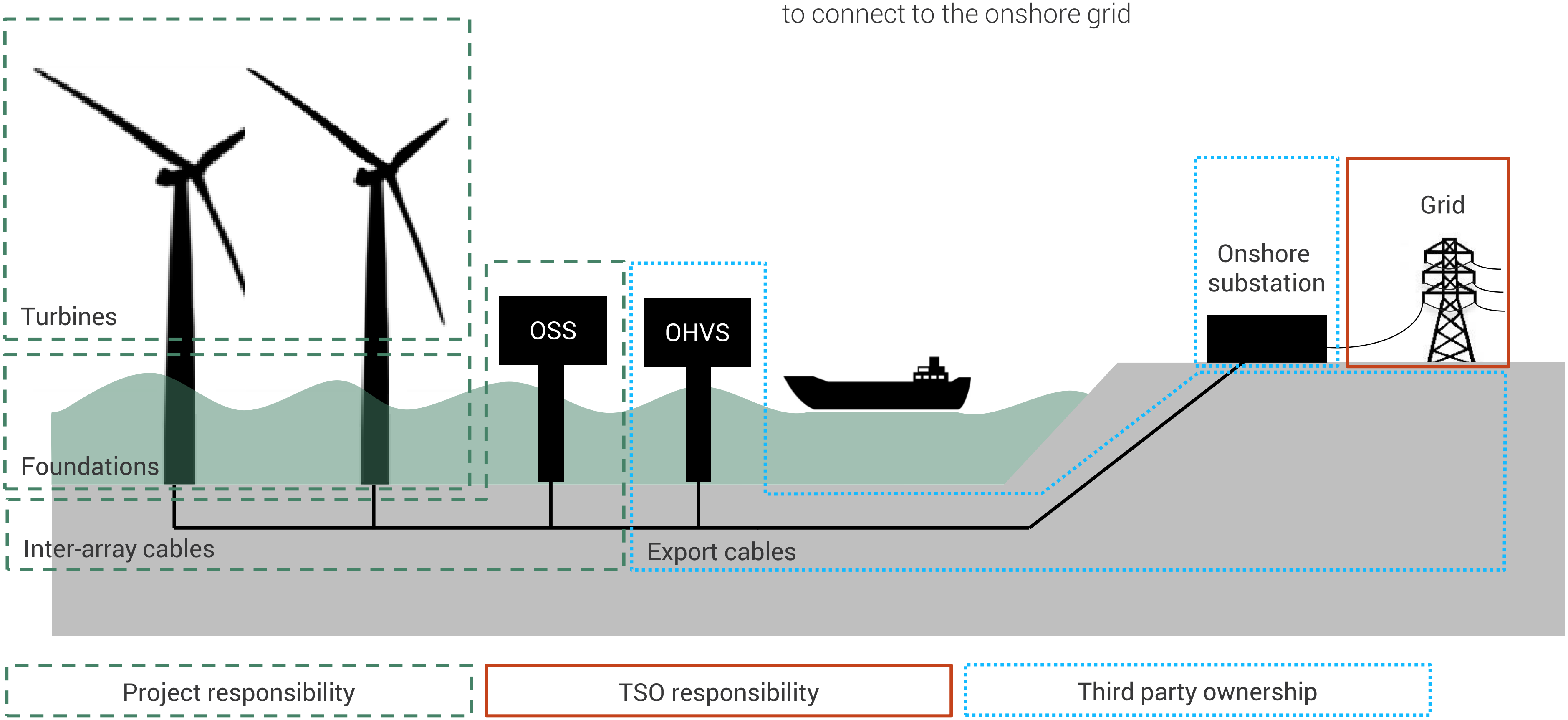


2. Background

Grid connection built by a third party

A third party builds the transmission infrastructure, from the OHVS up to the grid connection point

- The TSO will usually provide the technical specifications required to connect to the onshore grid



2. Background

Several options are possible for the operational phase of the grid connection

The TSO owns and operates the transmission assets, and is responsible for all maintenance

- Projects may or may not have to pay transmission fees, depending on the regulatory framework applicable
- In case of grid interruptions, the TSO has to compensate the projects for lost income. Compensation formulas vary but are usually based on a percentage of the expected revenue of the project

A third party owns and operates the transmission assets, and is responsible for all maintenance

- The third party receives a fixed stream of revenues which covers O&M costs, financing costs and the investor return on equity
- Such revenues can be paid by the project or by the TSO and are usually dependent on the overall availability of the transmission assets (with penalties to apply if the availability falls below a predefined level)
- Revenues may or may not be linked to the project's actual export volumes

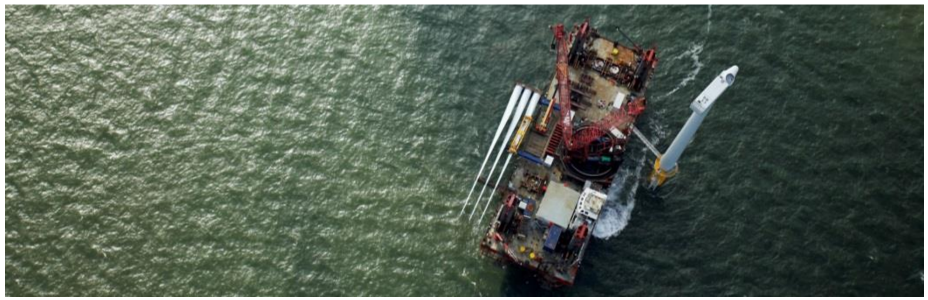
The project owns and operates the transmission assets, and is responsible for all maintenance

- The cost for the construction and operation of the transmission is generally included in the tariff that the projects receive for the generated electricity
- The risks related to any offshore grid interruption are borne by the project

Ownership structure during operation can differ from that during construction

Offshore Wind Transmission, US

Table of contents



3. European experience

Denmark – Grid connection built by the TSO

Responsibility of the TSO

- Deliver the transmission assets in a timely fashion. This includes the financing, construction and operation of the offshore substation, the export cables and the onshore substation
- Commit to a completion date of the grid connection. Compensation is paid to projects in case of delay
- During operations the risk of grid interruptions rests with the TSO and compensation is paid to the projects for lost revenue

Remuneration and transmission tariff

- The projects do not pay for the transmission. The costs are paid for by end-consumers through the regulated levies for transmission services on their electricity bills

Compensation mechanisms

- In case of grid interruption: the TSO must compensate the project, to the extent it is practically possible, for any losses sustained in connection with the interruption, i.e. the project must be placed in a situation where revenues are "no better no worse" than in the reference situation without grid interruption
- The sources of data and formulas underlying the calculation for the compensation mechanisms are clearly defined

3. European experience

Germany – Grid connection built by the TSO

Initially the relevant TSOs had to guarantee a grid connection for any project with a permit, which led to significant delays in the construction of grid connections in 2011-2013 as multiple projects required simultaneous connection. Germany then changed to a system where the grid connections are allocated and scheduled by the TSOs. The procedure is driven by the Offshore Grid Development Plan which has to be regularly published by the TSOs and approved by the national grid authority

Responsibility of the TSO

- Deliver the transmission assets in a timely fashion. This includes the financing, construction and operation of the offshore converter station, the export cables and the onshore substation
- Commit to a completion date of the grid connection. Compensation is paid to projects in case of delay
- During operations the risk of grid interruption rests with the TSO and compensation is paid to the projects for lost revenue

Remuneration and transmission tariff

- The projects do not pay for the transmission. The costs are paid for by end-consumers through the regulated levies for transmission services on their electricity bills

Compensation mechanisms

- In case of grid interruptions: TSO to pay 90% of the lost revenue (100% in case of intentional unavailability)
- Lost energy production calculation mechanisms and grace (deductible) periods for the TSO are clearly defined
- Compensation is counter-guaranteed by the German state

France – Grid connection built by the TSO

In France, the responsibility for grid connection for offshore wind projects falls to the grid operator, RTE

Responsibility of the TSO

- Deliver the transmission assets in a timely fashion. This includes the financing, construction and operation of the offshore substation, the export cables and the onshore substation
- Commit to a completion date of the grid connection, and pay compensation to projects in case of a delay
- During operations the risk of grid interruptions rests with the TSO and compensation is paid to the projects for lost revenue

Remuneration and transmission tariff

- The projects do not pay for the transmission. The costs are paid for by end-consumers through the regulated levies for transmission services on their electricity bills

Compensation mechanisms

- Grid delay and interruption: compensation is capped at 0.3 EUR/W/year, for a maximum of 3 years. The calculation of the amount up to this cap is based on a formula that is dependent on different factors (e.g. capacity, grid availability etc), but is generally perceived as generous

3. European experience

Netherlands – Grid connection initially built by the project, now built by the TSO

The early projects (Q7 and Egmond an Zee), and the SDE+ projects (Gemini and Luchterduinen) built and owned their own grid connection. Since the introduction of the SDE tenders in 2015, the grid connection is provided by the TSO TenneT

Responsibility of the TSO

- Deliver the transmission assets in a timely fashion. This includes the financing, construction and operation of the offshore substation, the export cables and the onshore substation
- Commit to a completion date of the grid connection, and pay compensation to projects in case of a delay
- During operations the risk of grid interruptions rests with the TSO and compensation is paid to the projects for lost revenue

Remuneration and transmission tariff

- The projects do not pay for the transmission. The costs are paid for by end-consumers through the regulated levies for transmission services on their electricity bills

Compensation mechanisms

- In case of grid delays: lost revenue is compensated based on 66% of the CfD premium, and 75% of the market price (paid by the TSO). The support mechanism period is extended accordingly
- In case of grid interruption: lost revenue is compensated based on 29% of the CfD premium, and 100% of the market price
- Lost energy production calculation mechanisms and grace (deductible) periods for the TSO are clearly defined
- The TSO TenneT is owned by the Dutch state, so an indirect guarantee exists

3. European experience

Belgium – Grid connection initially built by the projects

Belgium changed the grid connection framework from projects to the TSO. The below applied to the first generation of projects (C-Power, Belwind, Northwind and Norther) where the projects built their own grid connection

Responsibility of the projects

- Financing, construction and operation of the grid connection up to existing onshore substations

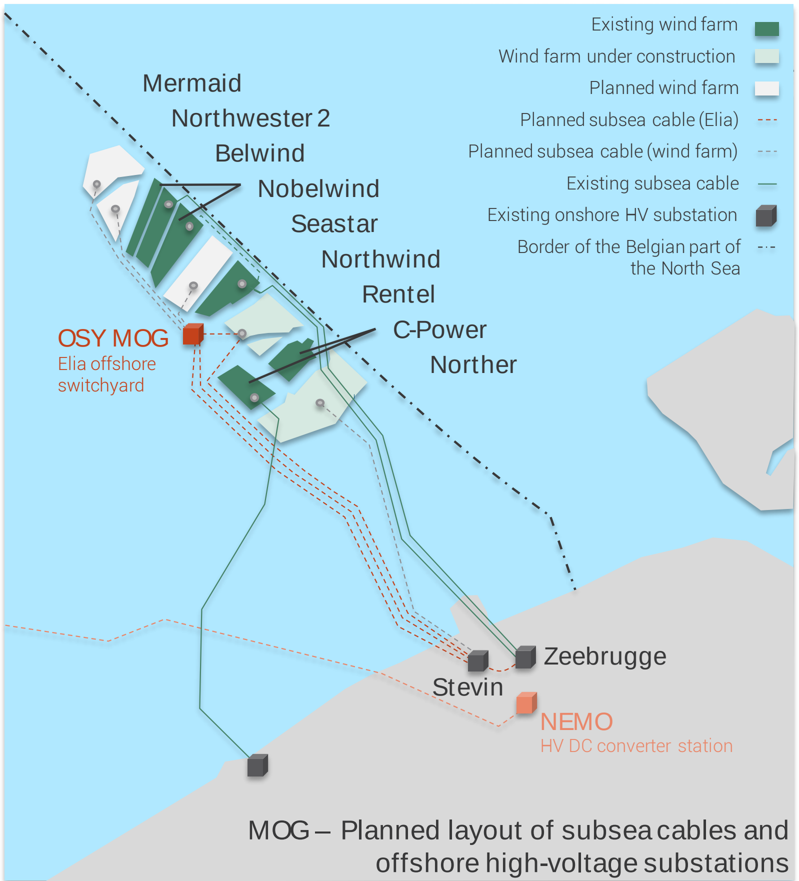
Remuneration and transmission tariff

- Elia, the Belgian TSO, provided a construction subsidy of up to EUR 25 M per project (which only covered part of the cost)
- There was no separate payment for the transmission of the electricity. However, tariffs were set taking into account the grid connection costs to be incurred by projects beyond the agreed subsidy

Compensation mechanisms

- All risks related to construction and operation of the transmission assets, including maintenance and availability, were the responsibility of the project

Belgium – Grid connection now shifted to the TSO



Source: Elia

As Rentel is further advanced in its development process, it was agreed that it would build its transmission assets itself, which would later be sold to Elia and become the backbone of the modular offshore grid ("MOG")

- The transmission assets consist of an offshore substation, which was designed to be larger than required for the Rentel project alone to allow use from other projects
- The MOG now combines the export cables from four wind farms – Rentel, Mermaid, Northwester 2 and Seastar – and transports the energy from these projects to the main land via a shared transmission system

Remuneration and transmission tariff

- The projects do not pay for the transmission. The costs are paid for by end-consumers through the regulated levies for transmission services on their electricity bills

3. European experience

UK – OFTO framework – Grid connection built by the project

Until 2009, the grid connections were built, owned and operated by the projects. Since then the offshore wind transmission owner ("OFTO") mechanism applies

Responsibility of the projects

- Financing, construction and operation of the grid connection up to existing onshore substations
- Upon completion, the transmission assets must be sold to an independent party via a tender run by Ofgem, the UK regulator
- The bids are submitted based on the "transfer value", which is assessed by Ofgem to represent the economic and efficient capital expenditure incurred by the project, and a tender revenue stream ("TRS"). The projects have to take the risk that some of the capital expenditure for grid assets will not be recovered via the OFTO sale

Remuneration and transmission tariff

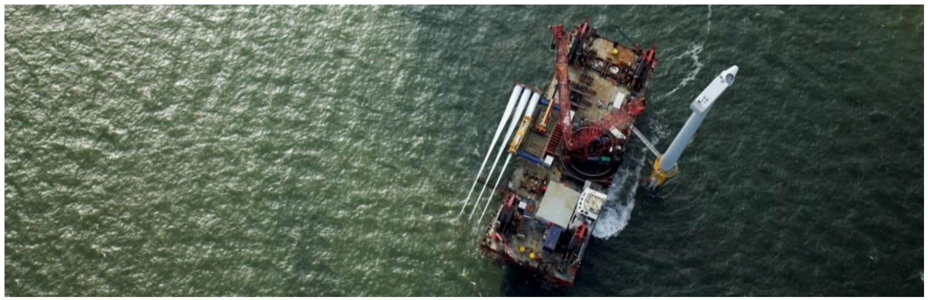
- The OFTO receives the 25-year TRS, which is partially or fully indexed (depending on the bidder's decision), and is paid upon achieving a minimal target level of availability (98%), below which the OFTO is subject to a penalty.
- The project pays transmission network use of system ("TNUoS") fees to the TSO throughout a pre-determined period

Compensation mechanisms

- For OFTO owners, it is irrelevant whether the project is generating electricity. If the OFTO assets meet the availability requirements, Ofgem will continue to pay the OFTO owners even if no power is generated by the project
- Projects are not compensated for grid unavailability but are protected indirectly as OFTO owners are penalised in that case

Offshore Wind Transmission, US

Table of contents



4. Lessons from Europe

Construction delay risk

The lack of a clear allocation of the construction delay risk will prevent the financing of offshore wind projects

- Projects who build their own grid connection can get their financiers comfortable by entering into ad hoc construction contracts for the grid assets, under their direct supervision, with significant time and budget buffers
- Financiers also accept grid connections built by TSOs if the regulatory context explicitly contemplates compensation for delays under acceptable pre-agreed formulas
- The lack of acceptable compensation mechanisms makes the construction of grid assets by third parties virtually impossible to finance

Clear compensation rules are essential

- The early German projects were financed on the basis of an implicit commitment by the TSO and the government to provide compensation. When delays occurred, it turned out that this was not sufficient and severe disputes occurred (as actual compensation levels were significantly lower than expected, for some projects as low as 60% to 70% of planned revenues)
- Parameters that were not clearly defined included the consideration of the wake effect, details of the calculation of the correction factor, availability and reliability of the wind data, a lack of the definition of "ready to operate", calculation of deductible periods, and exclusion of further claims
- The law was changed to make calculation rules more precise and the new framework has been seen as acceptable by the finance community

Compensation commitments are indispensable and calculation rules need to be clearly defined

4. Lessons from Europe

Investment incentives

The option to invest in offshore transmission assets separately can attract additional capital from the investor community

- Since the OFTO regime was launched in 2009, it has attracted GBP 6.5 bn of investment in 23 offshore transmission assets from a variety of debt and equity investors of different types, and of different geographical backgrounds
- Investors in the transmission assets include equity investors, such as infrastructure funds and strategic investors, the EIB, as well as a wide range of commercial banks. Both equity and debt financing conditions were comparable to those achieved by public private partnerships
- The OFTO model has shown that by separating grid asset revenues from offshore wind risk it is possible to attract cheaper capital to the sector, as they offer solid returns on a relatively low risk

Complex structures require the management of tender processes and many different stakeholders

- A significant effort is required to initially set up the licence allocation mechanisms of OFTO, and the overall management of the process is time consuming and costly for the regulator
- The risk for the projects that some percentage of the transmission capital expenditures will not be covered by the OFTO sale necessarily offsets some of the benefits from being able to raise low-cost financing.

OFTO provides for investment opportunities but has proven to be rather complex to administer

4. Lessons from Europe

Changing grid connection frameworks, de-risking projects and reducing costs

Changing systems is possible, and has been done before

- Both Belgium and the Netherlands started their offshore wind development with the first projects building their own, direct grid connection, and later changed to a TSO managed framework
- A transitional solution, such as for Rentel in Belgium where the project builds and then sells the grid connection, can be beneficial as it allows the TSO to align project plans with its own long-term strategy, and allows the projects to maintain ownership of their construction schedule, and financial security on the capital investment required for the grid connection

De-risking the development process and achieving record low bids

- Thanks to the well structured auctions, including the reduction of the development risk, and the provision of the grid connection, the Netherlands were able to attract record low bids in the recent Dutch offshore wind tenders
- If the grid connection is provided by the TSO the regulated tariffs awarded to the projects are lower. This can improve public perception, but can equally give rise to allegations that projects are subsidised since they do not pay for their full costs

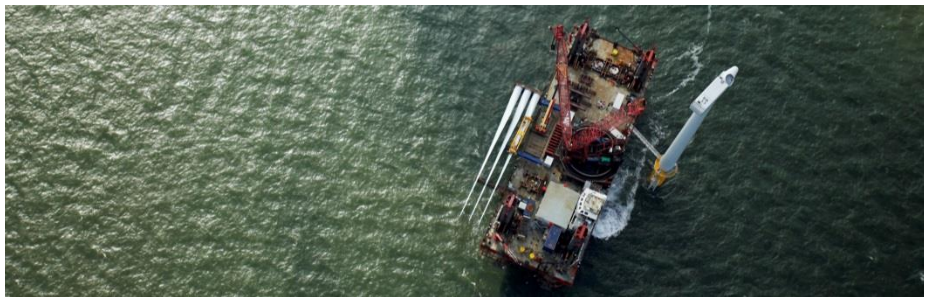
The grid connection has been shown to have a direct impact on installation volumes

- Germany is a good example where access to grid connection became the main gate for projects to be built or not. In Belgium the inability to connect the projects onshore lead to significantly delayed projects

A clear policy and credible plans for the grid connection are an essential part of the project's risk assessment

Offshore Wind Transmission, US

Table of contents



5. US observations

Grid connection in the US

In Europe there is a general trend towards a TSO coordinated approach for offshore grid connections

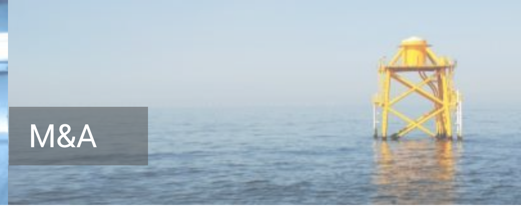
- Coordinated and bundled grid connections of several offshore projects improve overall efficiency
- This approach requires a clear, reliable development path of all projects considered for connections – not yet the case here

Initially US projects will build their grid interconnection

- Desire to maintain control of schedule and construction risk
- Onshore connection capacity generally available – for the first projects – so no extraordinary requirements onshore

After initial projects are built we may see further evolution – as we did in Europe

- Sale of OSW transmission assets to third parties – institutional financial investors with low cost of capital
- TSO/Third party grid connection on bundled basis for multiple projects possible particularly for multi-phase projects developed by one sponsor - requires clear consistent compensation mechanism
- Onshore transmission upgrades needed for future projects may promote more efficient coordinated grid connections – either partnering among project sponsors or in collaboration with TSO/Third party sponsor
- TSOs could take over grid interconnection as seen in Europe – may be tied to onshore grid upgrades to optimize cost efficiency since even currently planned projects may outstrip available transmission capacity along the north east coast



Green Giraffe

The renewable energy financial advisors

BOSTON • CAPE TOWN • HAMBURG • LONDON • PARIS • UTRECHT

green-giraffe.eu