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IX.56 Developing an offshore electricity grid: European and US approaches

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Abstract

With a growing number of offshore wind farms being constructed increasing distances from the shoreline, different approaches to connecting offshore wind farms must be considered. It is in this context that the development of an offshore electricity grid, connecting offshore wind farms and delivering additional benefits for the system, may be considered – and is the rationale behind such developments being investigated in both Europe and the US. The legal framework for offshore grids depends on the law of the sea and on how states make use of the competences they have at sea. In Europe, EU law provides a general framework for the interoperability of the grids in different countries and sets standards for maritime spatial planning. Other topics are addressed through the national law of the coastal states. In the US, offshore is a federal competence, with an open-door procedure for parties interested in developing offshore transmission.

Keywords

Offshore electricity transmission infrastructure, jurisdiction, submarine cables, wind farm connection, UNCLOS, offshore grid, electricity backbone

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² Hannah Müller's contribution to this chapter is based on her PhD thesis, see Müller (2016). The opinions and views expressed are the author's own and do not reflect the views of the ACM.

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IX.56.1 Introduction

With a growing number of offshore wind farms being constructed increasing distances from the shoreline, different approaches to connecting offshore wind farms must be considered. The approach most often taken for connecting wind farms close to shore is the ‘radial connection’, a direct connection from the wind farm to the nearest onshore landing point. However, in several states, a trend towards ‘clustered’ wind farms with a shared connection to the onshore grid, is visible. The next step is to extend the grid connection between offshore wind farms to more than one state, thereby creating an *offshore electricity grid* serving both the evacuation of offshore-generated electricity and the trade of electricity between different states. Additional benefits from this development are increased grid reliability and security of supply for the connected states.³

The offshore electricity grid – the network of electricity transmission cables between offshore wind farms and at least two states – has been a topic of interest to North Sea coastal states for over a decade. They have expressed their interest with a Memorandum of Understanding signed in 2010,⁴ and a political declaration in 2016.⁵ States party to these documents have committed to cooperating in the field of offshore wind energy and to facilitating the interconnection of North Sea countries, with the aim of further integrating electricity grids. In the Baltic Sea, Danish and German TSOs have initiated a cross-border windfarm connection. This type of project can serve as a building block for an offshore electricity grid. In the US, the construction of an ‘electricity backbone’ connecting offshore wind farms between New York, New Jersey and Virginia has also been discussed.⁶ In Asia, the Chinese State Grid is developing a ‘supergrid’, though for now this does not seem to include offshore connections.⁷ As other parts of the world do not have significant offshore grid developments yet, this chapter will focus on the EU and US approaches.

Given the increasing interest in offshore electricity transmission infrastructure in Europe and the US, this chapter aims to provide an overview of the legal situation of offshore electricity grids. Section IX.56.2 discusses the rights and duties of states under international law, regarding offshore electricity transmission infrastructure. This forms

³ Woolley, Schaumberg and St. Michel (2012) 181.

⁴ North Seas Countries’ Offshore Grid Initiative Memorandum of Understanding, signed by Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Sweden, the United Kingdom and Norway, see for example <http://www.benelux.int/files/8113/9625/9202/MoU_NSCOGI.pdf> accessed 20 November 2019.

⁵ ‘Political Declaration on energy cooperation between the North Seas Countries’ (adopted 6 June 2016) <http://www.benelux.int/files/9014/6519/7677/Political_Declaration_on_Energy_Cooperation_between_the_North_Seas_Countries.pdf> accessed 20 November 2019.

⁶ Woolley, Schaumberg and St. Michel (2012) 182.

⁷ P Fairley, ‘China’s Ambitious Plan to Build the World’s Biggest Supergrid’ (*IEEE Spectrum*, 21 February 2019) <<https://spectrum.ieee.org/energy/the-smarter-grid/chinas-ambitious-plan-to-build-the-worlds-biggest-supergrid>> accessed 20 November 2019.

the basis for the competence of coastal states to adopt a specific legal framework for offshore grids. Following this, the legal framework and challenges for offshore electricity grids both in Europe and in the US are addressed. Section IX.56.3, on the European approach, looks at both EU and national legal frameworks. Moreover, in this section, the practical example of the Kriegers Flak Combined Grid Solution (the first offshore grid) is investigated. In section IX.56.4, which focuses on the US, only the federal level is addressed, as offshore developments are a federal competence.

IX.56.2 International law

For activities taking place on land, states have territorial jurisdiction. For activities taking place at sea – such as the construction of an offshore grid – the rights and duties of states are governed by international law. It must therefore be ascertained which rights and duties the coastal states have concerning the development of (cross-border) offshore wind farms and infrastructure.⁸

The key rights and duties of states at sea are codified in the 1982 United Nations Convention on the Law of the Sea (UNCLOS). UNCLOS separates the sea into different maritime zones, which also affect the rights of the states. For the development of offshore wind, the territorial sea and the exclusive economic zone (EEZ) are most important.

UNCLOS has been signed and ratified by 167 states (including all North Sea and Baltic Sea coastal states), as well as by the EU.⁹ The US, however, has not ratified UNCLOS. The US is still a party to UNCLOS's antecedent, the 1958 Geneva Conventions on the Law of the Sea – but has, in practice, asserted jurisdiction claims reflecting acceptance of the rules as codified in UNCLOS (with the exception of rules related to the deep seabed).¹⁰

IX.56.2.1 Maritime zones

The competences of coastal states to regulate activities at sea depend on the maritime zone and on the activity.¹¹ Regarding offshore wind connections, coastal states have the right to establish installations and structures in their EEZ.¹² It is generally accepted that the (radial) connections between offshore wind farms and the onshore grid are also covered by the coastal state's exclusive right to construct offshore windfarms. However, when exercising their sovereign rights, coastal states must consider the rights and duties of other states.¹³ In the EEZ, some of the freedoms of the high seas apply – such as the

⁸ See: Müller (2016).

⁹ 'Chronological lists of ratifications of, accessions and successions to the Convention and the related Agreements' (*United Nations*) <https://www.un.org/Depts/los/reference_files/chronological_lists_of_ratifications.htm> accessed 20 November 2019.

¹⁰ US Commission on Ocean Policy (2004) 5.

¹¹ See: Chapter 45 of this volume.

¹² UNCLOS art 56(1)(b); Aust (2010) 285. Most offshore wind farms are in the EEZ. For wind farms located in the territorial zone, coastal states have full jurisdiction for both the offshore wind farm and the cable connection.

¹³ UNCLOS art 56(2).

freedom to lay submarine cables and pipelines.¹⁴ Coastal states thus must allow for transit cables or pipelines to be laid through their EEZ.

IX.56.2.2 UNCLOS and cross-border projects

Considering potential cross-border offshore wind connections, the legal situation is less clear. Cross-border connections of offshore wind farms had not yet been considered at the time of UNCLOS's adoption¹⁵ – and so it is understandable that rules on such connections are not explicitly mentioned in UNCLOS. For two or more coastal states deciding to jointly construct offshore electricity transmission infrastructure (with this infrastructure subsequently connected to the involved states), it is necessary to understand the legal situation under international law.

In such a scenario, it would be the right of a coastal state to lay cables in its own territorial sea or EEZ to connect offshore wind farms. While other states have the freedom to lay transit cables in another state's EEZ, the coastal state may exercise its jurisdictional authority by establishing laws pertaining to those cables, in order to ensure that it can still exploit its own resources, access shipping lanes and military areas, protect existing cables and pipelines, and protect the marine environment. Yet, per Article 56(1)(a) of UNCLOS, these sovereign rights do not entitle a coastal state to completely impede the laying of submarine cables in its EEZ.¹⁶

The legal framework governing cross-border offshore electricity transmission infrastructure involving two states' EEZs thus involves competing jurisdictions. The coastal state may legislate on transit cables in its EEZ to a limited extent, whereas other states have the general freedom to lay cables, and may exercise some jurisdiction based on general principles of international law. States may apply different standards, and their rights are subject to interpretation. States connected to an offshore grid may then also have different interpretations regarding their rights and duties over electricity transmission infrastructure.

UNCLOS's lack of provision of a coherent framework for submarine cables results in a lack of clarity regarding the scope of the rights and jurisdiction concerning cross-border projects. This has led to legal uncertainty, and a patchwork of rights, with different parts of each project coming under different jurisdictions. For potential transnational offshore grids, there is no clarity on which rights respective states have. Given that many parts of such grids are subject to the jurisdiction of more than one state, this lack of certainty may constitute a challenge for the development of cross-border offshore wind projects between several states. However, this uncertainty could be mitigated by additional (bilateral or multilateral) agreements between the states that wish to construct an offshore electricity grid together.¹⁷ In the EU, the relations between coastal states are also regulated by EU law.

¹⁴ UNCLOS art 87, in conjunction with art 58.

¹⁵ For possible parallels with the oil and gas sector, see: Müller and Roggenkamp (2014).

¹⁶ Cf UNCLOS art 79(2).

¹⁷ Woolley (2013) 91.

IX.56.3 The EU approach: an offshore grid in the North Sea and Baltic Sea

Mitigating climate change is an increasing concern of EU member states (MSs). To reduce CO₂ emissions,¹⁸ North Sea and Baltic Sea states use offshore wind energy as a source of renewable energy. Although the generation of offshore wind energy is currently more costly than onshore wind, offshore wind is considered due to the lack of space onshore and the higher wind speed and full-load hours offshore.¹⁹ These wind farms are connected to the onshore grid of the respective coastal state. Coastal states have been investigating the possibility of connecting offshore wind farms to a multilateral offshore grid in the North Sea and Baltic Sea since 2009.²⁰

IX.56.3.1 The regulation of an offshore grid under EU law

Most countries around the North Sea and Baltic Sea are MSs of the EU or the European Free Trade Association (EFTA).²¹ As EU law influences and impacts the electricity sector significantly, it is important to understand where EU law is relevant for the regulation of an offshore grid.

The EU can only act as far as it has received the competence to act, with competences set out in the EU's treaties.²² For an offshore grid, there are two relevant competences. Firstly, there is a specific competence for energy: EU policy shall aim specifically to 'ensure the functioning of the energy market, ensure security of supply in the Union, promote energy efficiency [. . .] [and] *promote the interconnection of energy networks*'.²³ Secondly, there is a specific competence for trans-European networks, which also encompasses 'energy infrastructures', including electricity transmission networks.²⁴ With the latter competence, the EU is able to create policy for technical standardisation and interoperability, and for the funding of trans-European network projects of common interest, with EU MSs and also with third countries.²⁵

As regards substantive EU law, the most important principle of EU law relevant for (offshore) electricity grids is the requirement to provide non-discriminatory access to energy networks – a measure adopted in order to promote the internal energy market. One of the rules stemming from this principle is unbundling – the separation of the transmission and distribution of electricity from generation and supply.²⁶ With regard to

¹⁸ For a general overview of renewable energy law and policy of the EU, see Chapter 33 of this volume.

¹⁹ For the general benefits of offshore wind, see: EWEA (2007) 8; Esteban and others (2011) 36; MacKay (2009) 60; Windenergie-Agentur (2012) 6–7; NASA, 'Ocean Wind Power Maps Reveal Possible Wind Energy Sources' (NASA, 9 July 2008) <<https://www.nasa.gov/topics/earth/features/quikscat-20080709.html>> accessed 21 November 2019.

²⁰ Energinet.dk, Svenska Kraftnät and Vattenfall Europe Transmission (2009).

²¹ EFTA countries (except for Switzerland) adopt EU energy law via the Agreement on the European Economic Area [1994] OJ L 1/3.

²² Consolidated version of the Treaty on the Functioning of the European Union [2008] OJ C115/47 (TFEU), art 5(2).

²³ TFEU art 194(1) [emphasis added].

²⁴ TFEU arts 170–1.

²⁵ TFEU arts 171(1), 171(3).

²⁶ In economic terms, the 'natural monopolies' are separated from the market-based activities. The degree of unbundling varies per country, from full ownership unbundling to separating the

a future offshore grid, this means that the assets connecting offshore turbines to the grid should be separately operated (and often also owned) from the wind farms themselves. However, this rule only holds for assets classified as the ‘transmission grid’ and does not extend to all electricity cables. Cables between wind turbines inside an offshore wind farm are not considered to be part of the transmission grid, instead being considered part of the wind farm itself.

The operation of the electricity market and the interoperability of cross-border networks is also key to the success of an offshore electricity grid. Measures on this topic are based on EU Regulation 2019/943 (which provides the framework for electricity market rules), and on the EU Network Codes (which provide for more detailed market rules²⁷ and for technical standardisation).²⁸ The existence of common standards is invaluable to the development of an offshore grid, as different parts of the grid need to be compatible with each other and there needs to be a level playing field for the different parties connected to the offshore grid.

EU environmental law and spatial planning law is also relevant for the development of an offshore grid. At the EU level, the Maritime Spatial Planning Directive and Maritime Strategy Framework Directive prescribe that MSs should have maritime spatial plans. While cables buried in the seabed do not have a large spatial impact once *in situ* (though construction of a subsea cable does require sufficient space for a cable-laying ship to pass), offshore converter stations do have an impact and must be taken into account in maritime spatial plans.²⁹ An Environmental Impact Assessment (EIA) is also required for these installations.³⁰

Governance issues may be addressed at EU level, but only if MSs agree. Moving forwards, it is important to establish how matters relating to third party states connected to the offshore grid will be dealt with. If the governance of the offshore grid depends entirely on EU law, and not all states connected to the grid are EU MSs, issues relating to market rules or the interoperability of different parts of the grid may arise.

EU law was not designed with cross-border offshore electricity infrastructure in mind. Therefore, there are various specific issues that remain unclear about the application of EU law to a transnational offshore grid. An example is whether offshore cables that are part of the offshore grid are classified as interconnectors or whether another legal status is possible.³¹ This issue will need to be addressed before large-scale offshore grid developments can take place.

organisational structures within the same mother company. See Chapter 47 of this volume for more information on natural monopolies.

²⁷ See: Commission Regulation (EU) 2015/1222 [2015] OJ L 197/24 (CACM); Commission Regulation (EU) 2016/1719 [2016] OJ L 259/42.

²⁸ Technical network codes are: Commission Regulation (EU) 2016/631 [2016] OJ L 112/1 (Network Code on Requirements for Grid Connection); Commission Regulation (EU) 2016/1447 [2016] OJ L 241/1 (HVDC Grid Code); Commission Regulation (EU) 2017/1485 [2017] OJ L 220/1; and Commission Regulation (EU) 2017/2195 [2017] OJ L 312/6 (Network Code on Electricity Balancing).

²⁹ For information on the environmental impact of subsea cables, see: Merck (2009).

³⁰ An EIA is required when an installation is deemed to have a significant impact on the environment. Council Directive 85/337/EEC [1985] OJ L 175/40 (EIA Directive), as amended by Directives 97/11/EC and 2003/35/EC.

³¹ Müller (2016) 140–2; Nieuwenhout (2018) 106.

IX.56.3.2 The regulation of an offshore grid under national law

With many policy choices available to MSs, it is understandable that national laws regulating offshore grids may differ significantly. The factual circumstances (*i.e.* the distance between potential wind farm areas and their proximity to other countries) partly determines which legal choices are made – for example whether wind farms are connected radially or in clusters. However, the legal framework, once it exists, also shapes the way in which an offshore grid is constructed and how it develops. Further development of the grid may in turn create a need to change the legal framework. Moreover, the offshore grid is also influenced by technological developments, such as the introduction of new technical components that facilitate the construction of larger grids or the connection to new countries. Thus, the development of national legal frameworks governing offshore electricity infrastructure depends on the factual circumstances and may change over time. As fewer states are involved in changes to national laws than in changes to EU or international law, national laws can be amended occasionally to accommodate any necessary changes.

A key issue to be addressed by national law relates to the precise scope of the offshore grid – establishing where it begins and where it ends (specifically the connection points). This determines whether the concept of an ‘offshore grid’ is even possible in the legal system of the country involved. Some states assume that offshore wind farms and the cables are inseparable, with the cable connecting an offshore wind farm to the onshore grid considered part of the offshore installation. This is currently the case in Sweden and Norway.³² Other countries, such as Germany and Denmark, rule that such connections are part of the onshore transmission system.³³ In the Netherlands, the connections are part of a separate offshore transmission system, which is nevertheless owned and operated by the same entity as the onshore transmission system. The legal categorisation of cables as part of an offshore wind farm or part of the onshore grid also determines which national and EU legislation is applicable to these subsea electricity cables.

Despite the existence of network codes containing market rules, legal questions relating to the ownership, operation and remuneration of the offshore grid remain. As mentioned previously, the offshore grid may be owned by the onshore transmission owner. Alternatively, (parts of) the grid could be owned by the parties connected to it, *i.e.* the installation owners. This system is similar to the upstream pipeline system for natural gas in the North Sea. A third option is third party ownership. Under this option, any party that is not an onshore TSO or the windfarm operator connected to the grid may bid for the right to own part of the offshore grid. Such a system is used in the United Kingdom. It is generally known as the ‘OFTO’ (Offshore Transmission Owner) system.³⁴

There is a large degree of diversity in the permitting and licensing systems for offshore wind and submarine cables. These differences exist due to differences in the general environmental or construction law of the coastal state, often without the specific application

³² Energimyndighet (2017) 56. This system was also used in the early phase of offshore wind development in the Netherlands and Germany.

³³ Energy Industry Act (Energiewirtschaftsgesetz vom 7 July 2005) (DEU), as amended by Artikel 1 des Gesetzes vom 27 January 2017, art 17a; Denmark: Promotion of Renewable Energy Act (lov om fremme af vedvarende energi, LBK nr. 1288) (DNK), art 30.

³⁴ Müller (2016) 183. Electricity Act 1989, ss 6C–6D.

of offshore electricity infrastructure in mind. For the offshore grid, as cables often cross (sea) borders, it is important that the permitting processes of the countries involved are adjusted to one another.

Important environmental requirements may also be reflected in national law. Provisions to protect the marine environment are usually included in the permits and licences required for constructing and operating an offshore grid. Another issue of environmental law pertains to the decommissioning of the offshore grid itself following the decommissioning of the offshore wind farms that it connects, with questions relating to the repurposing of the infrastructure and the extent to which unused cables must be removed as yet unaddressed in the literature.

IX.56.3.3 The first step towards an offshore grid: Kriegers Flak Combined Grid Solution

Although the legal framework for a cross-border offshore grid remains unclear, an attempt to construct such an offshore grid has emerged in the Baltic Sea. The project involves a 'hybrid' electricity cable between Germany and Denmark, and entails connecting two existing offshore wind farms in the German EEZ (Baltic 1 and Baltic 2) with an offshore wind farm (Kriegers Flak) in the Danish EEZ. These wind farms are not only connected to one another, but also to the German and Danish onshore electricity grids. Together, they form the 'Kriegers Flak Combined Grid Solution'.

This project demonstrates the legal difficulties inherent with 'hybrid' assets.³⁵ In this instance, hybrid means that the asset can serve both the need to evacuate electricity produced by the offshore wind farms, and the need to facilitate electricity trade between the two countries. In the latter case, the cable also operates as an interconnector. It means that the operators of the cable, on the basis of wind energy production predictions, must reserve capacity on the cable to evacuate the electricity produced. The remaining capacity is then offered to the market. When the predictions change, the available capacity will also change. By doing so, the grid operators guarantee sufficient grid capacity to facilitate the operation of offshore wind farms. This is interesting from a legal point of view. If this cable is classified as an interconnector under EU law, reserving capacity for the connected offshore wind farms is prohibited, due to non-discrimination rules and the fact that the maximum capacity needs to be offered to the market.³⁶ The Kriegers Flak Combined Grid Solution is an interesting test case, not only from a technical point of view but also from a legal point of view: through this project, the legal framework for hybrid projects, the building blocks for an offshore grid, can be developed.

IX.56.4 The US approach: an offshore grid on the East Coast

In the US, the area of the sea from three nautical miles to the outer limit of the continental shelf is governed under federal law.³⁷ The Bureau of Ocean Energy Management (BOEM) is the authority responsible for authorising offshore developments, such as

³⁵ For a detailed overview of the legal framework concerning this infrastructure, see: Nieuwenhout (2018).

³⁶ Regulation (EU) 2019/943 [2019] OJ L 158/54, art 16(4).

³⁷ Woolley, Schaumburg and St. Michel (2012) 193. An exception to this rule is the Gulf Coast of Texas and Florida, where the jurisdiction of states is approximately nine miles.

the construction of offshore wind farms and related infrastructure, as well as for cables in the continental shelf.³⁸ For an offshore electricity grid, a developer needs a Right of Way (RoW) and Right of Use and Easements (RUE) grant. The RoW is needed for the construction of the cable infrastructure, whereas the RUE is needed for the use of a designated portion of the continental shelf to support renewable energy activities. The RoW stretches the full length of the cable and has a breadth of 200 feet (61 metres)³⁹ – sufficient for the cable itself plus a safety zone. The RoW is distinct from the wind energy leases, but should be considered as supporting infrastructure for renewable energy.⁴⁰ When a party is interested in constructing offshore electricity transmission infrastructure, it has to express its interest to the BOEM by applying for a RoW and RUE grant.⁴¹ The BOEM will then publish a ‘Request for competitive interest’, which allows other parties to compete with the original applicant.⁴² This is a typical ‘open door’ approach, in which any party can express interest in developing an offshore grid.

Electricity grids in the US are regulated by the Federal Energy Regulatory Commission (FERC) under the Federal Power Act 1935 (FPA).⁴³ However, costs for the connection to the onshore electricity grid should be borne by the (private) developer of the offshore wind farm.⁴⁴ This is similar to the system adopted by Norway and Sweden. When the infrastructure also has benefits for the onshore transmission system – which is the case for a recently proposed offshore ‘backbone’ – developers may seek to share the costs with other users of the transmission system.⁴⁵ However, this would require inclusion in the regional transmission plan, which entails an extensive stakeholder process.⁴⁶ Nevertheless, if developers succeed, tariffs may be based on negotiated or cost-price rates, depending on the choice of the developer.⁴⁷ Moreover, when the project benefits consumers by increasing reliability and reducing the cost of delivered power by reducing transmission congestion, the FERC may grant incentive-based rate treatment for the transmission of electrical energy. This could also be applicable to offshore backbone structures.⁴⁸ It is interesting that the US thus has two parallel regulatory frameworks for offshore cables, depending on whether the cable is a radial cable or a cable that has wider system benefits. This could be considered a building block for an offshore grid.

³⁸ Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf, 74 Fed. Reg. 19638 (29 April 2009) (codified at 30 CFR pts 250, 285, 290). These regulations became effective on 29 June 2009.

³⁹ *ibid.*

⁴⁰ *ibid.*

⁴¹ See, for example, Anbaric Development Partners (2018).

⁴² See, for example, Federal Register Vol. 84, No. 118, June 19, 2019 – Notices, Docket No. BOEM–2018–0067.

⁴³ 16 USC ss 824–825r.

⁴⁴ Woolley, Schaumberg and St. Michel (2012) 201.

⁴⁵ *ibid.*

⁴⁶ *ibid* 202.

⁴⁷ *ibid.*

⁴⁸ 18 CFR s 35.35, section 219 of the FPA, 16 USC s 824s.

IX.56.5 Conclusion

This chapter has shown that various legal issues need to be addressed to facilitate a cross-border offshore electricity grid. Although UNCLOS provides coastal states with regulatory competences and does not prevent such cross-border projects, the legal situation is still uncertain. Nevertheless, both in Europe and in the US, there is significant interest in the development of an offshore grid.

In Europe, coastal states of the North Sea and Baltic Sea are investigating the construction of an offshore grid. EU law facilitates the development of an offshore grid by safeguarding market rules and interoperability. Nevertheless, some issues related to the regulation of offshore cables remain unclear. In Europe, coastal states also regulate various issues relevant for the offshore grid through their national law. Examples are grid ownership, connection responsibilities, the classification of the assets and permitting rules, as well as (in the longer run) the potential of decommissioning the cable infrastructure.

In the US, offshore electricity transmission infrastructure falls under federal competence. Cable developers need several licences, which can be provided through an open-door procedure. The cable to connect an offshore wind farm to the onshore grid is typically constructed and owned by the wind farm developer, and costs are passed on through the price of the electricity. Nevertheless, if the cable also serves as an 'electricity backbone' with more general system benefits, tariffs may be imposed on the users of this grid. While there are several hurdles to this approach, there is competitive interest in developing such an electricity backbone off the East Coast. As this is a federal competence, developing an offshore grid off the coast of the US will probably be less complicated from a legal perspective than in the North Sea.

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