US Offshore Wind Handbook

2022

K&L GATES

MAINSTREAM RENEWABLE POWER

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Dudgeon Offshore Wind Farm - Courtesy of Smulders

Introduction

In a period of challenge and uncertainty, the offshore wind industry globally has not only stood firm, but against all odds, surged in growth over the last two years. The U.S. offshore wind market was no different, particularly in 2021. After years of lobbying by a number of dedicated key stakeholders, the Administration took a pivotal step to secure the future of the industry by committing to “double” offshore wind lease capacity in the United States by 2030 and deploy 30GW of offshore wind power by the same year. Congress subsequently enacted the Bipartisan Infrastructure Bill, which provides for significant government funding to support offshore wind and introduced a new long-term investment tax credit specifically for offshore wind facilities. In September 2021, Vineyard Wind 1 achieved financial close after securing its final federal permits for the U.S.’ first commercial scale offshore wind farm. News of the approval of South Fork wind farm came soon afterwards in November. In October, the Secretary of the Interior announced seven target areas for offshore wind leases on the east, west, and southern coasts of the lower 48, the first of which took place at the end of February 2022 and saw six new leases awarded in the New York Bight region.

Historically, the U.S. market has been driven by fixed bottom offshore wind on the Eastern Seaboard. However, we are seeing increasing momentum for floating offshore wind projects on the West Coast. This is reflected by California’s enactment of AB 525 in September 2021, which mandates that the California Energy Commission create a plan for offshore wind development in federal waters. In addition, both California and Oregon were listed as target lease areas in the Secretary of the Interior’s October 2021 announcement, with increasing activity from the Intergovernmental Renewable Energy Task Forces in these states in recent months.

Offshore wind as a power source was harnessed more than 30 years ago. Now, the offshore wind industry is set for dramatic global growth. As the industry matures in Europe and developers in Asia, North America, and Australia move to follow Europe’s example, legal and regulatory frameworks are evolving quickly to accelerate project deployment and integrate these resources into the legacy power market. The Global Wind Energy Council (GWEC) reported postponed and canceled auctions in early 2020 due to COVID-19, with the sector bouncing back in the later part of the year and into 2021. According to the latest numbers published by the World Forum for Offshore Wind (WFO), the global offshore wind market commissioned a staggering 15.7GW in 2021. This was strongly driven by China (12.7GW) and helped set a new record for global offshore wind installations. The total cumulative installed capacity for offshore wind is now approaching 50GW worldwide, up 40% from the previous year.

Advances in technology and efficiencies in installation have contributed to huge reductions in the cost of offshore wind power, and this is expected to continue. In addition to the obvious green credentials, offshore wind power is now economically competitive. We are also seeing growth in a multi-level approach to offshore development with off- and on-grid storage being considered and the pairing of offshore wind with hydrogen production, all of which will support wider decarbonization of the power industry.

This handbook is the result of collaboration between Kent, an international leader in offshore wind design, consultancy, and asset management; K&L Gates, a leading international law firm; and Mainstream Renewable Power, a pure-play renewable energy developer. The intent of this handbook is to review the current progress in the U.S. offshore wind market and to outline some of the challenges faced by this dynamic and expanding market.

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Block Island Offshore Wind Farm - Courtesy of Deepwater Wind

1.0 Offshore Wind Overview

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1.1 Introduction

The offshore wind industry was launched in 1991 with the construction of the first offshore wind farm, Vindeby, off the coast of Denmark with 11 450kW turbines. The industry has continued to build on this technology, which has naturally led to Europe being the leader in offshore wind power.

Offshore wind energy is harvested by wind farms constructed in the ocean many miles from the shore, traditionally on a shallow continental shelf. The farms consist of an array of wind turbines (up to 150) sat atop foundation structures secured to the seabed. The development of the shallower, typically up to 60m, water depth coastal areas has utilized traditional fixed bottom foundations and has led to significant cost reduction in recent years. Deep water areas are now also being explored which will utilize floating wind turbines and according to the latest World Bank report, the potential for floating wind technology is double that for fixed bottom offshore wind technology.

Floating technology is on the cusp of commercialization with a number of successful demonstration projects installed around the world. The technology faces the same challenges as fixed bottom technology once did, however. Building an efficient global supply chain and realizing the cost reductions now expected from offshore wind through scale and innovation are going to be important hurdles to clear. That being said, the routes to market are now defined for floating wind and a number of emerging markets are building strong pipelines, such as the west coast of the U.S., Scotland, France, South Korea, and Japan. Significant cost reductions are expected in the coming years as projects progress from demonstration through to full scale commercialisation.

In January 2022, the Crown Estate Scotland announced the outcome of the ScotWind 1 leasing round, which resulted in 17 new sites totalling just under 25GW, with 60% of this capacity for floating offshore wind projects.

The scale of this additional capacity to the Scottish market is a major game changer for the offshore wind industry in Scotland and firmly places Scotland at the forefront of the emerging floating wind market.

A brief recap – why offshore wind?
There are many benefits in the drive for offshore wind:

- Abundance of space offshore to develop capacity at scale
- Higher wind speeds and more consistent wind resource, resulting in more generation and higher capacity factors
- Reduced visual impact due to the distance from populated areas
- Use of larger turbines – bigger and taller turbines can be used offshore, resulting in more electricity generation. Current offshore turbines being installed range from 6MW - 14MW, with larger models being announced and industry sights on 20MW and beyond

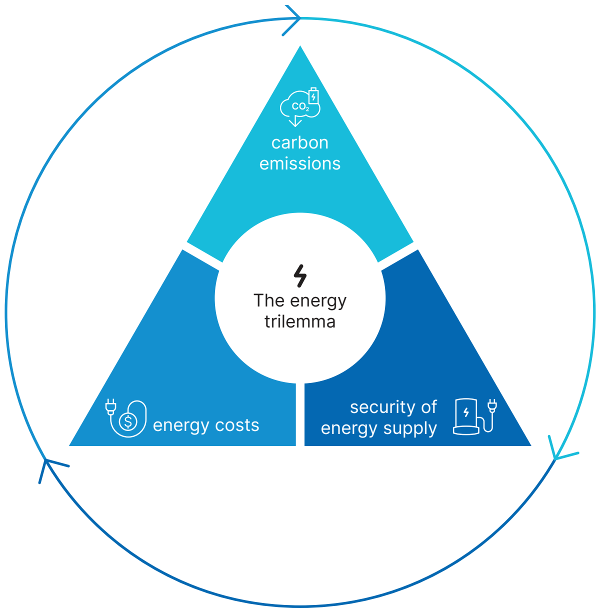
In the early days of offshore wind development, the cost of energy was high (~US$215/MWh), however, in recent years offshore wind costs have tumbled (~US$77/MWh for fixed bottom). The success in reducing the overall cost has come from a number of factors.

- Strong, stable political drivers and support mechanisms
- Larger turbines
- Industry collaboration
- Innovation
- Standardization
- Industrialization
- Market competition
- Better management of risk
- Cheaper finance

1.2 Market Drivers and Cost Reduction

The energy trilemma is a term that is frequently used at political levels to describe the requirement to balance energy security, affordability, and environmental sensitivity. The fundamental drivers for offshore wind globally are oriented around energy security, decarbonization, and industrialization/job creation, and they are likely to grow in importance in the future.

The global demand for electricity is growing and projected to continue this trajectory with the transition to low carbon forms of energy. This has been particularly amplified in recent years with the COVID-19 pandemic and an unprecedented global shift in the energy mix with growing commitments by governments to achieve Net Zero. In 2020, we saw approximately two thirds of the global economy commit to Net Zero including the U.S. Net Zero, commitment by 2050 under the Biden Administration.



The significant cost reductions experienced in recent years are now driving offshore wind development globally with international governments and customers placing more pressure on nations for greener, more secure and cheaper forms of energy. The World Bank has published analysis of the offshore wind potential for 40 more emerging markets around the world, following its report in October 2019, when the potential of eight countries was estimated to be at 3.1TW.

We are also witnessing a fundamental shift in global finance markets with the world's largest financial institutions and investment houses driving calls to phase out financing of new fossil fuel projects. Offshore wind has now become a strong contender in the overall energy mix and recognized as a key enabler for the global challenge to achieve Net Zero, not only in the electricity market but by helping to open up wider markets such as Green Hydrogen.

1.3 Global Market Overview

The offshore wind market continues to grow in both capacity and importance.

Global installed capacity at the end of 2021 reached 48GW. Following the installation of approximately 6GW of additional capacity in each of 2019 and 2020, 2021 saw over double this amount, with an additional 15.7GW of offshore capacity added[1]. These figures are particularly impressive given total global capacity was less than 3GW a decade ago. Notwithstanding slow downs in some jurisdictions during the COVID-19 pandemic, the outlook can only be described as very positive. Global Wind Energy Council's expectations of an additional 70GW of capacity by 2025, rising to 205GW by 2030, illustrate where the sector is heading. Interestingly, capital expenditure committed to offshore wind in 2020 was greater than the investment made in oil and gas[2].

The market in Europe continues to mature and expand. As part of a 10-point plan for a "Green Industrial Revolution," the UK government has targeted 50GW of offshore wind power by 2030. Not to be outdone, the European Commission has made a bold commitment to increase capacity to 60GW by 2030 and 300GW by 2050, with Germany, the Netherlands, Denmark, and Belgium likely to contribute significantly to these targets.

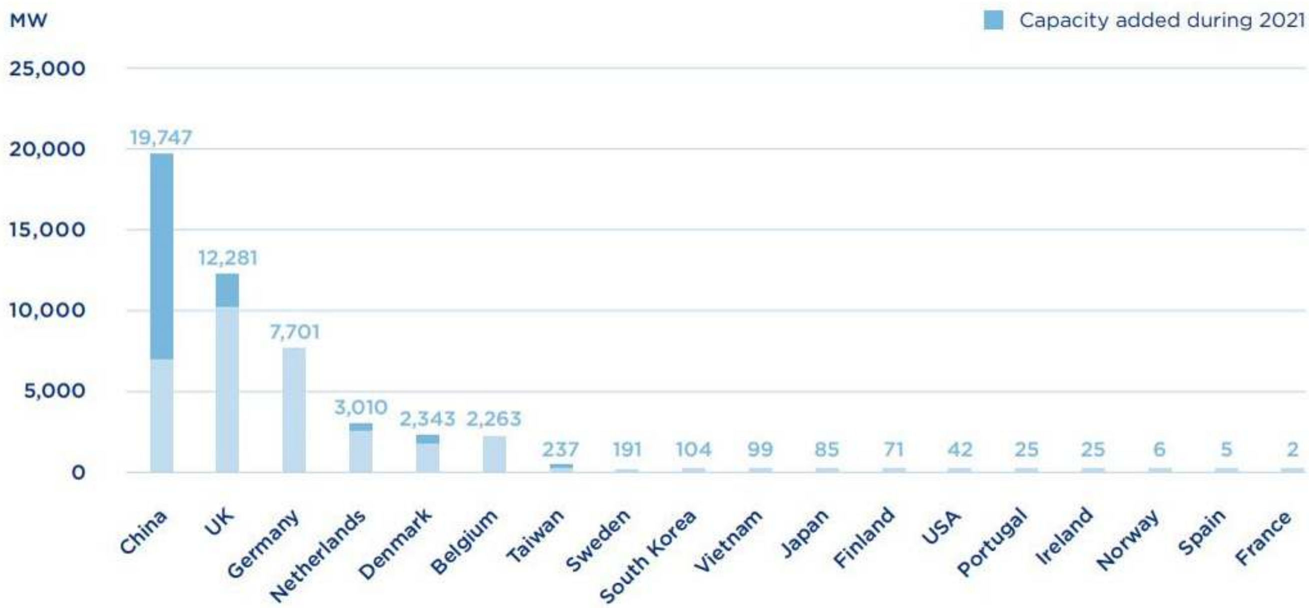
The market in Asia is also developing at pace. China's current operational offshore wind capacity of 19.7GW is by far the largest market worldwide (overtaking the

[1] *Global Offshore Wind Report 2021 - World Forum Offshore Wind*
[2] *https://www.tradewindsnews.com/offshore/-51bn-in-wind-farm-capital-spending-outstrips-oil-and-gas-for-firsttime/2-1-955552*

UK's 12.2GW of capacity). A bumper year of over 12GW of capacity installed during 2021[3] has made a very significant contribution to the close to 60GW targeted by 2030 across China's coastal provinces. Taiwan and South Korea have much smaller current capacity, each with significantly less than 1GW, but, together with Japan, are each targeting 10GW+ of capacity by 2030. In the U.S. there is 42MW of capacity currently, but the first commercial scale offshore wind project reached financial close in September 2021[4] and 30GW of offshore capacity is targeted by 2030.

Many more countries are also taking positive steps to expand and/or develop their own capacity. Rates of growth are expected to vary from country to country, but, generally, policy support is increasing and regulatory constraints are relaxing. Consequently, we anticipate exciting developments in Brazil, Mexico, Australia, Vietnam, India, Ireland, and Poland, to name but a few countries.

The below summarizes total offshore wind installations by country at the end of 2021[5].



The dramatic and continuing reduction in the costs of offshore wind has facilitated the growth of the sector. Increases in scale and technological advances have helped to bring the costs down and this trend looks set to continue wind farms over 1GW in capacity are becoming common and individual turbines of 15MW+ are expected to be in the water in years to come. Other innovations in turbine design, improvements in project design life, and the optimization of operational costs will all contribute to lower costs further. While costs continue to decline and zero-subsidy tenders/bids are seen[67], support for the development of commercial scale projects remains commonplace, with Contract for Difference schemes and a variety of fixed or floating financial support for competitive bid processes in use across different jurisdictions. Such support looks likely to continue across the short/medium term, particularly where countries are striving to promote commercial scale projects and/or where development costs and supply chain issues add to the risk and difficulty associated with project development.

[3] *Global Offshore Wind Report 2021 - World Forum Offshore Wind*
[4] *Vineyard Wind 1 Becomes the First Commercial Scale Offshore Wind Farm in the US to Achieve Financial Close — Vineyard Wind*
[5] *Global Offshore Wind Report 2021 - World Forum Offshore Wind*
[6] *Subsidy-free in the Dutch North Sea: Siemens Gamesa and CrossWind partner up at Hollandse Kust Noord offshore project*
[7] *Zero-Subsidy Bids Rule Offshore Germany, RWE and EDF Named Winners | Offshore Wind*

As more governments, major corporates (including oil and gas companies), and other significant stakeholders commit to achieving carbon neutrality, offshore wind is anticipated to become an increasingly crucial component of the global energy transition.

This includes floating offshore wind, which is now approaching commercialization - installation of the largest floating wind farm, the Kincardine 50MW wind farm offshore Aberdeenshire in Scotland, was completed in August 2021. Floating offshore wind turbines will allow wind farms in areas where water depths and seabed conditions do not permit fixed bottom wind and provide access to deeper waters and the favorable wind conditions that are available further from shore. The growing importance of floating wind is illustrated by the proportion of floating projects that were successful in the ScotWind tender in January 2022, with over 14.5GW of floating projects, making up almost 60% of the total of 25GW of new projects, receiving lease options[8]. Away from Europe, jurisdictions including South Korea and Japan look likely to play leading roles in the further development of this sector. In addition to commercial scale electricity generation, floating wind is also attracting attention in other fields - the use of floating wind turbines to electrify oil and gas platforms is being actively pursued[9] and floating wind is thought to be key to cheap Green Hydrogen production[10].

It is also hoped that utilizing both fixed bottom and floating wind in the production of green hydrogen as part of Power-to-X technology and hybrid marine parks (combining offshore wind with solar and wave energy) will form an important part of the solution to intermittency of renewable energy.

1.4 U.S. Market Overview

After many false starts, the U.S. has firmly taken its first steps into the offshore wind sector. In 2016, the Block Island Wind Farm located off Rhode Island, now owned by Ørsted, marked a milestone as the first offshore wind project in the U.S. The 30MW project is sited in Rhode Island state waters off the southern coast of Block Island. It is comprised of five 6MW Haliade wind turbines manufactured by General Electric, and can produce enough electricity to power 17,000 homes. The development also included laying a power cable to connect Block Island to the mainland grid for the first time, removing the need for diesel generators, which used to provide power to the islands inhabitants. 2020 saw the first turbines installed in federal waters as part of the Coastal Virginia Offshore Wind Farm, owned by Dominion Energy. Two 6MW Siemens Gamesa turbines were installed 27 miles from the Virginia coastline as a pilot for the planned 2.6GW commercial wind farm that will be sited next door.

Today, the offshore wind pipeline in the U.S. stands in excess of 35GW of estimated generating capacity, with approximately 17GW of contracted offtake agreements. Developments on the Eastern Seaboard, particularly the Northeast, continue to lead the way where shallower waters mean tried and tested fixed bottom solutions will dominate.

2021 was a hugely pivotal year for offshore wind in the U.S., both in terms of political support and project development. The year started with the Administration committing to double offshore wind lease capacity and setting its sights on 30GW of offshore wind, both by the end of the decade. The introduction of a new investment tax credit and the Bipartisan Infrastructure Bill further supported realization of these targets. In projects, Vineyard Wind 1 secured its final federal permits and achieved financial close for what will be the U.S.' first commercial scale offshore wind farm. This was quickly followed by the approval of the South Fork wind farm.

The Administration's commitment was further strengthened with an announcement to expand offshore wind capacity by holding seven new offshore lease auctions by 2025 in target areas such as the Gulf of Mexico, California, and Oregon, in addition to further leases on the East Coast. The first, in the New York Bight region, was held at the end of February 2022 and saw six new lease areas (up to 7GW) going to competitive auction. The auction spanned three days and saw fierce competition from a range of renewables developers, culminating in a record-breaking total sale price of US$4.4billion. The auction saw several new developers entering the U.S. market, highlighting the growing confidence in the future of offshore wind in the U.S. These new auctions will help continue investment in the supply chain for fixed bottom technology, as well as kick starting the floating wind market in the U.S. which will be required for the deeper waters seen on the West Coast.

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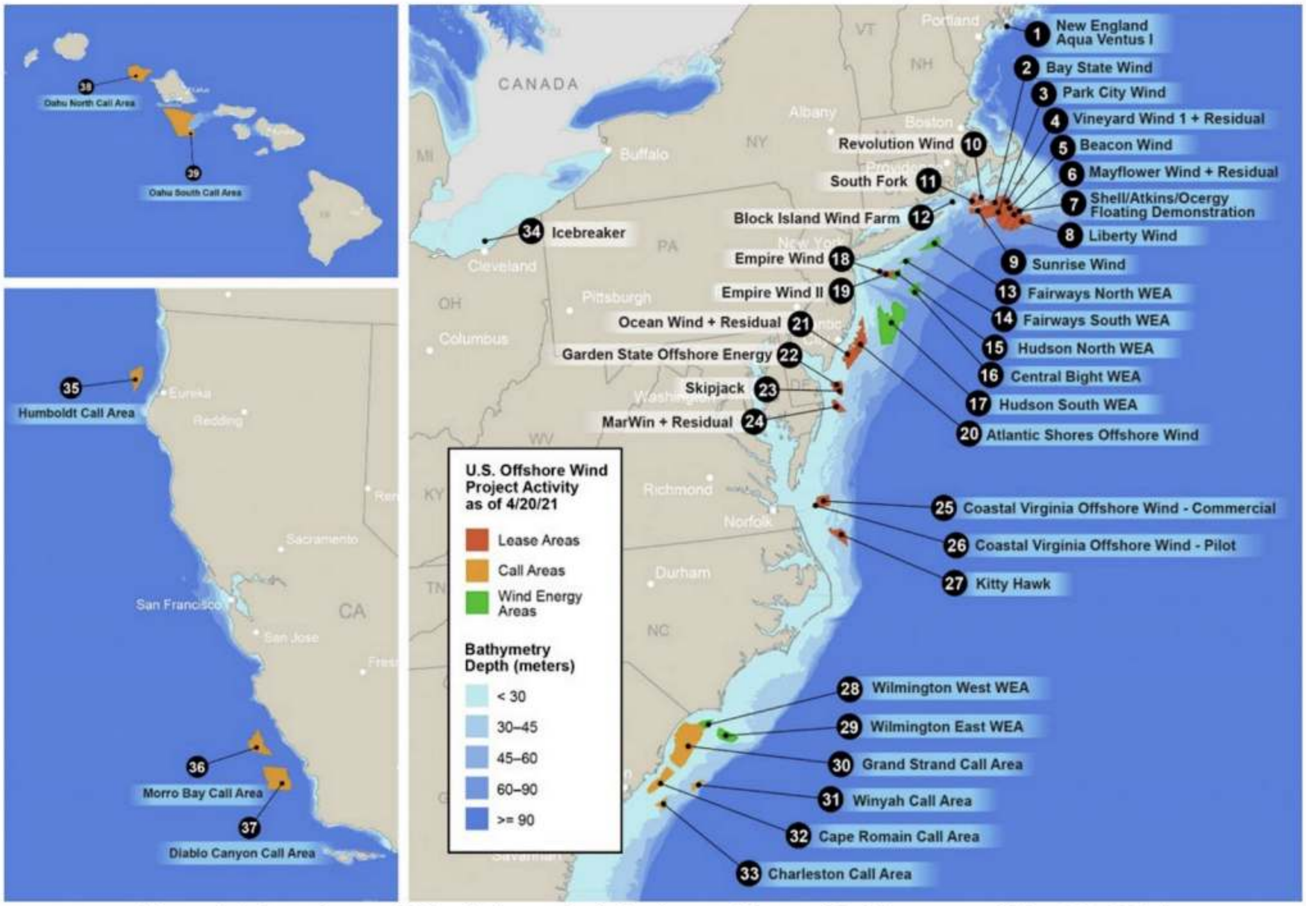
[8] www.rechargenews.com/wind/floating-winds-breakthrough-renewables-industry-hails-scotwind-as-new-offshore-era/2-1-1146383
[9] The Hywind Tampen 88MW floating power project is to provide electricity for the Snorre and Gullfaks platforms in the Norwegian North Sea - https://www.equinor.com/en/what-we-do/hywind-tampen.html
[10] https://renews.biz/70627/floating-wind-key-to-cheap-green-hydrogen-production/



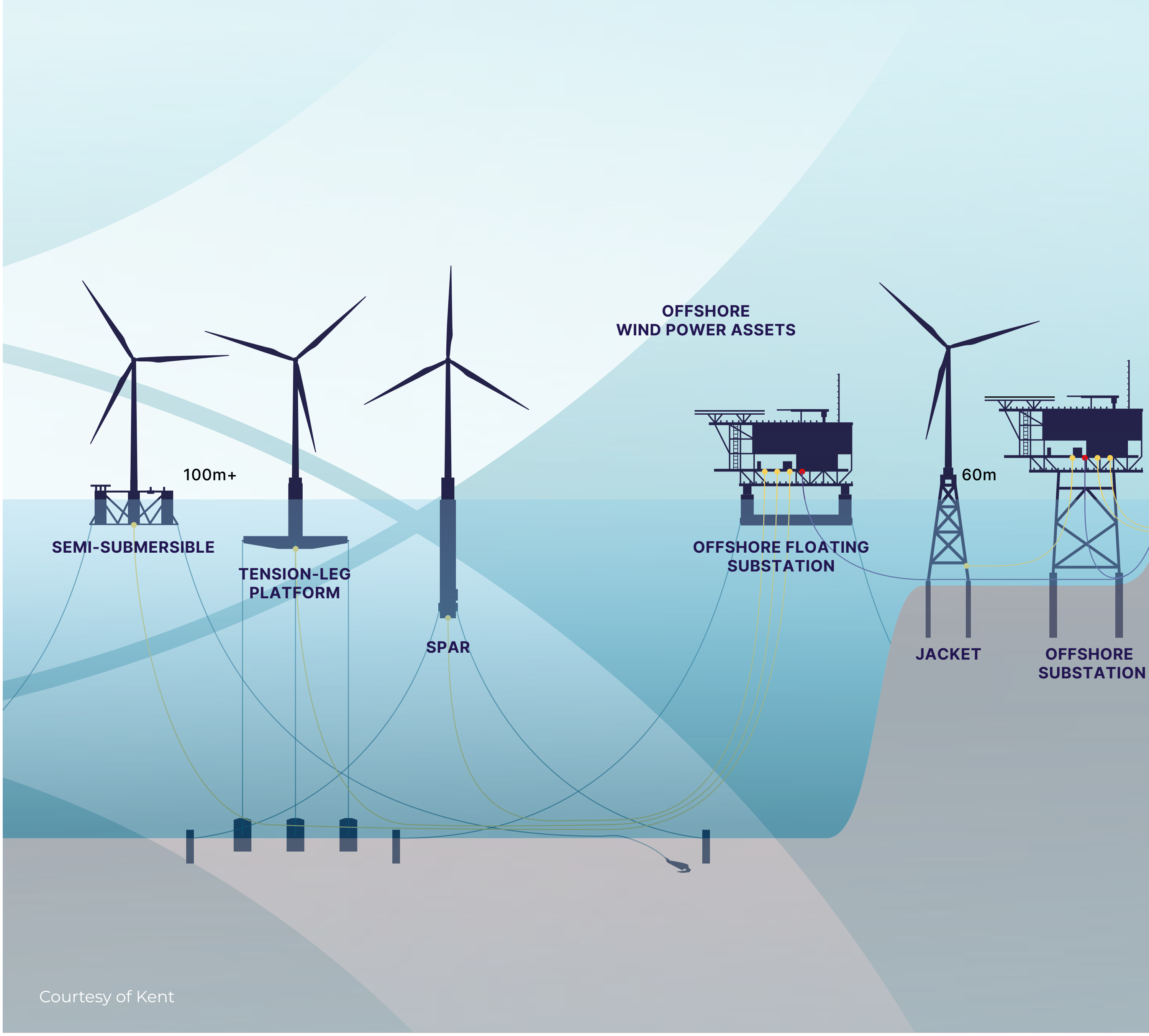
Locations of U.S. offshore wind pipeline activity and Call Areas as of May 31, 2021
Map created by John Frenzl, National Rebewable Energy Laboratory

1.5 Offshore Wind Farm Components

There is no single way to build and operate an offshore wind farm, and indeed, the challenges of scale, water depth, and distance from shore are such that the optimal solutions are invariably site specific. The pace of innovation in the offshore wind industry has been unprecedented by any standards over the past decade, where we have seen the size of the turbines alone increase from 2MW to 14MW, with further growth to 16MW and beyond expected in the very near future. With increased scale comes the opportunity for cost reduction and optimization, however, it does not come without its challenges.

For example, installation; as the turbines grow, so do the blades and so does the total height of the whole structure. These turbines will be pushing and, in some cases, exceeding the limits of many of the installation vessels around the world.

We are also seeing the evolution of floating wind technology in the market with numerous floating wind farms under development, which will help unlock further opportunities for innovation, standardization, and local supply chain, and will increase employment opportunities.

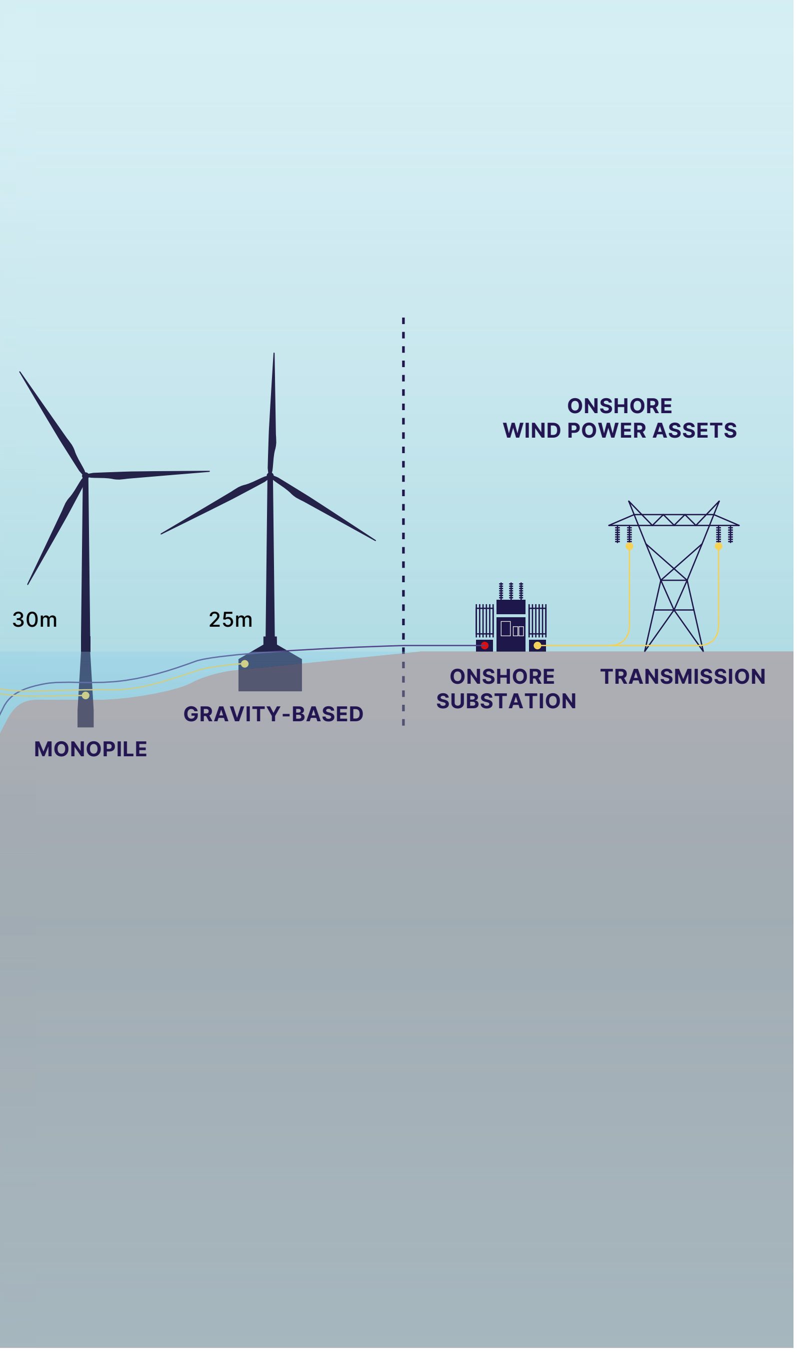


Below is a high-level overview of the key components of an offshore wind farm. These are discussed in more detail in the Offshore Wind Infrastructure chapter.

- **Wind Turbine Generator ("WTG"):** The WTG sits at the top of the structure and converts the wind energy to electrical energy via the mechanical movement of the blades, on the turbine. It consists of a drive drain, hub, blades and nacelle. For offshore wind, the size of the turbines are considerably larger than their onshore relation.

- **WTG Foundations:** These are the structures that support the offshore WTG. These support structures can be either fixed into the seabed, or floating. Many of the foundation structures used for offshore wind are an evolution of the offshore structures that have been used for decades in the oil and gas industry.

- **Fixed Bottom Foundations,** such as monopiles ("MPs") and jackets have been the leading choice for developers to date. The early wind farms were relatively near to shore in shallow water and therefore best suited fixed bottom solutions such as MPs. As the projects became bigger, further offshore and developments moved into more transitional waters (typically 30m to 60m water depths) the industry has seen the introduction of three or four-legged jacket foundations. There are



some alternative concepts, such as gravity based structures ("GBS"), tripods, suction buckets, and hybrid solutions, which have seen limited entry into the market but can be favorable over traditional foundations for certain sites.

- **Floating Foundations,** such as barges, semi-submersibles, spars, and tension-leg platforms, are structures tethered to the seabed that allow turbines to generate electricity in much deeper waters where fixed bottom foundations are not feasible. Concepts which utilize multi-turbine, hybrid wind-wave or wind-to-hydrogen technology are also making an entry into the market.

- **Inter Array Cables:** These are the subsea electrical cables that connect all the turbines together. The majority of sites to date have used 33kV cables, however, the benefits of transmitting at higher voltages are being recognized and 66kV inter array cables are now being used across projects in Europe.

- **Offshore Substation Platform ("OSP") / Offshore Substation Structure ("OSS"):** The OSP, or OSS as it is known in some regions, collects the power from the wind farm, steps up the voltage and transmits it back to the onshore substation for connection to the grid. Depending on the proximity of the offshore wind farm these may be High Voltage Alternating Current ("HVAC") or High Voltage Direct Current ("HVDC") substations.

- **Export Cable:** Power from the wind farm is exported from the OSP via one or more high voltage subsea cables. On making landfall, they continue to the onshore substation for distribution to the grid.

- **Onshore Substation:** This is the land connection point from the OSP where the power is received and then transferred to the grid.

Other technologies are also being explored and introduced in an effort to better integrate offshore wind farms into local grids and support decarbonization efforts. Flexible storage technologies, like batteries, are now being explored as part of offshore wind developments to support better grid integration and increase stability. In recent years we have also seen the introduction of technologies to couple offshore wind with green fuel projects (particularly Green Hydrogen and ammonia), which is referred to as Power-to-X technology. This is seen as particularly important where there are constrained electrical connections, and there is the potential to significantly contribute towards Net Zero targets by decarbonizing sectors such as heavy industry, heat, and transport.

Through the hard-earned progress of industry and political leaders in the U.S. and abroad, we now have a project development landscape with favorable policy and regulatory programs, aggressive state and federal targets, advantageous pricing for proven reliable technology and construction services, and a pool of specialized expertise necessary for successful project development. All of these factors lead to the highly competitive pricing we are now seeing in the power markets, with a likelihood of further cost compression to come. The time is now, and the opportunity is before us.

Block Island Offshore Wind Farm - Courtesy of Deepwater Wind

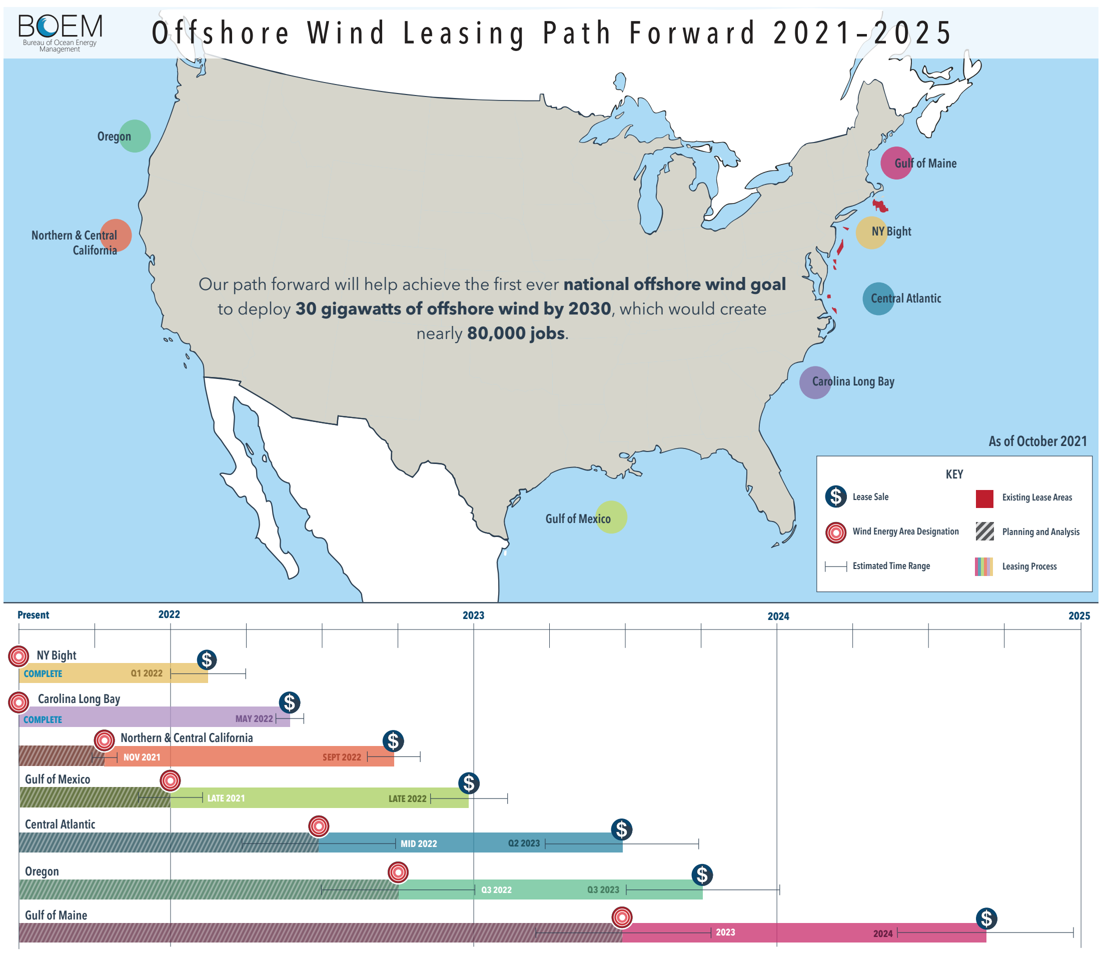
2.0 U.S. Laws and Regulations Shaping Offshore Wind Development

2.1 Federal Offshore Policy and Regulatory Issues

By: David Wochner, Ankur Tohan, Kimberly Frank, Jennifer Mersing, Derek Kelley, Allen Bachman, Bill Myhre, and Jorge Romero, K&L Gates

Federal Offshore Policy

For decades, the U.S. offshore has been the domain of oil and gas exploration and production. In 2005, recognizing the significant opportunity to take advantage of other resources on the federal offshore, Congress passed the Energy Policy Act of 2005 ("EPAct 2005") and included in the act an amendment to the existing Outer Continental Shelf Lands Act ("OCSLA") (43 U.S.C. § 1331 et seq.) providing some clarity regarding the role of the federal government in the siting of offshore renewable energy facilities, including offshore wind power. Specifically, Section 388 of EPAct 2005 gave the U.S. Secretary of the Interior, in coordination with other agencies, authority over offshore renewable energy facilities on the outer continental shelf ("OCS").



Source: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/OSW-Proposed-Leasing-Schedule.pdf

That authority is implemented by the Bureau of Ocean Energy Management ("BOEM"), a division within the U.S. Department Interior ("DOI"), and through the promulgation of a robust set of regulations and siting provisions, they oversee the federal offshore renewable energy siting regime. Since BOEM's issuance of the final regulations establishing the offshore renewable energy program in 2009 (30 CFR § 585), BOEM has made millions of acres of submerged federal land on the OCS available for potential wind power development.

As of early 2020, BOEM had issued 15 active commercial offshore wind energy leases covering 1.7 million acres of the OCS and generating nearly US$500 million in bonus bids. BOEM's Offshore Renewable Energy Program has at least one wind energy lease off every state on the Atlantic Coast from Massachusetts to North Carolina, forming the foundation for an emerging offshore wind industry in the U.S. BOEM is in the planning stages for identifying areas for potential wind leasing offshore the New York Bight, the Carolinas, California, and Hawaii, and it has recently initiated dialogue with federal, state, local, and tribal governments to explore wind energy potential offshore Oregon and in the Gulf of Maine.

As directed by President Biden's January 27, 2021, Executive Order 14008, Tackling the Climate Crisis at Home and Abroad, the DOI has partnered with other federal agencies to increase renewable energy production on public lands and waters — including a commitment to deploy 30GW of offshore wind by 2030 and a target goal of permitting at least 25GW of onshore renewable energy by 2025. During a speech on October 13, 2021, the DOI Secretary, announced plans BOEM to potentially hold up to seven new offshore lease sales by 2025 in the Gulf of Maine, New York Bight, Central Atlantic, and Gulf of Mexico, as well as offshore the Carolinas, California, and Oregon.

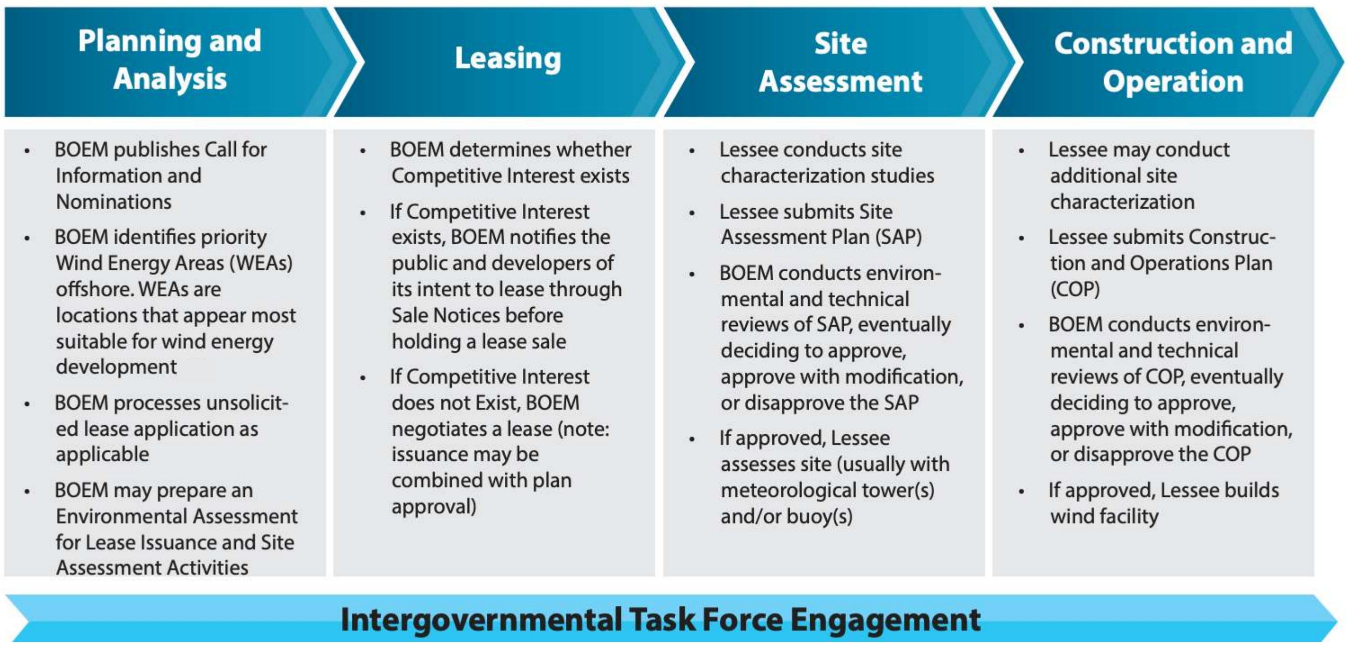
The significant investment and infrastructure required to develop offshore wind projects appears to be increasingly focused in the capital markets on opportunities to move projects forward. But concerns remain regarding potential obstacles to the fulsome development of an offshore wind industry in the United States, including the stability of federal tax credits, the complexity and length of the regulatory review process, and untested legal issues related to the intersection of federal-state jurisdiction. Environmental opposition also will be an issue for offshore wind projects, despite the "clean energy" moniker. As the industry moves forward, resolution of these issues will be critical—failure to resolve these issues could hinder the industry's advancement.

Bureau of Ocean Energy Management

The EPAct 2005 authorized the Secretary of the Interior, in consultation with other federal agencies, to grant leases, easements, or rights-of-way on the OCS and a subsequent memorandum of understanding with the U.S. Federal Energy Regulatory Commission ("FERC") confirmed the exclusive jurisdiction of the DOI over "the production, transportation, or transmission of energy from [non-tidal] renewable energy projects on the OCS," including offshore wind power. Through delegation from the Secretary of the Interior, BOEM is the federal agency responsible for the siting and operation of offshore wind facilities sited on the federal OCS. Importantly, the EPAct 2005 made clear that the authority granted to the Secretary of the Interior has no effect on existing authority or responsibility of other federal or state agencies acting pursuant to another federal law. Thus, as explained further below, a wide range of federal and state agencies are key contributors to the Interior process for the siting and operation of offshore wind power facilities, in particular those agencies acting pursuant to the National Environmental Policy Act ("NEPA").

BOEM has experienced strong interest in offshore renewable energy projects on the OCS. In response, and to help inform BOEM's planning and leasing process, the agency has established Intergovernmental Renewable Energy Task Forces in states that have expressed interest in development of offshore renewable energy. The role of each Task Force is to facilitate coordination and consultation related to renewable energy planning, collect and share relevant information that would be useful to BOEM during its decision-making process and provide updates on regional offshore wind goals and developers activities. To date, fourteen BOEM Intergovernmental Task Forces have been established in California, Delaware, Florida, Hawaii Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Oregon, Rhode Island, South Carolina, and Virginia. Task Force meetings have helped identify areas of significant promise for offshore development and provided early identification of, and steps toward resolving, potential conflicts. A summary of the status of activity in the different states can be found at https://www.boem.gov/Renewable-Energy-State-Activities/. BOEM's OCS work and interaction with other federal statutes is outlined in more detail below.

The regulatory regime established by BOEM is robust and has several distinct phases, including Planning and Analysis, Leasing, Site Assessment, and Construction and Operations.



Source: https://www.boem.gov/sites/default/files/documents/about-boem/Wind-Energy-Comm-Leasing-Process-FS-01242017Text-052121Branding.pdf

Key Components of BOEM Regulatory Process

Planning and Leasing

The Planning and Leasing phases are the foundation of the regulatory program for offshore wind development. BOEM undertakes a number of initiatives to determine whether there is interest in particular OCS areas for offshore wind development, and in the event that there is interest, to begin moving toward a lease process for such areas. BOEM can undertake activities of its own initiative or BOEM also can move forward with offshore wind power projects through an unsolicited application submitted by a potential offshore wind power project developer. Either way (i.e., developer proposed or BOEM proposed), BOEM must establish an Intergovernmental Renewable Energy Task Force for any identified WEAs to consult with state task forces, other state and local representatives, and with representatives of Indian Tribes whose interests may be affected early in the process. Before issuing a lease, BOEM follows a four-step process, issuing a Call for Information and Nominations, completing the Area Identification process, publishing a Proposed Sale Notice ("PSN"), and publishing a Final Sale Notice ("FSN").

The leasing of offshore federal lands under the EPAct 2005 is the heart of BOEM's jurisdiction, which results in BOEM issuing a commercial wind energy lease to a developer. Leases may be issued either through a competitive or noncompetitive process. The EPAct requires that BOEM issue leases on a competitive basis, unless it determines that there is no competitive interest in the proposed lease area. When only one developer has indicated interest following a Request for Information ("RFI"), BOEM may issue a lease non-competitively.

The competitive lease process begins with BOEM publishing a PSN for a lease area including the terms and conditions developed through the EA and stakeholder consultation process. BOEM has detailed regulations addressing the possible formats that BOEM can use (e.g., sealed bidding or multi-factor bidding) for an auction as well as the bidding systems that the agency will employ in evaluating bids (e.g., cash bonus with a constant fee rate or sliding operating fee rate with a fixed cash bonus) (30 CFR §§ 585.220-225).

The PSN has a 60-day comment period during which the interested applicants submit their qualifications to BOEM including evidence that they are eligible to hold a lease and demonstrating their technical and financial capability to conduct the authorized lease area activities. BOEM, then publishes a FSN and identifies qualified bidders who must then submit the bid deposit as specified in the FSN. An auction is held to identify the winning bidder who is then eligible to pay the balance of their bid and execute the lease with BOEM.

As part of the identification of any lease areas or WEAs, and prior to holding any auction, BOEM typically conducts an environmental review and assessment to support its proposed leasing pursuant to NEPA (outlined further below). However, in May 2021, the D.C. Circuit Court of Appeals concluded that NEPA is not triggered at the leasing stage because the BOEM's action had not yet reached "a critical stage of a decision which will result in irreversible and irretrievable commitments of resources to an action that will affect the environment."[1]

The lease does not grant the lessee the right to construct any facilities, but instead grants the right to prepare plans for lease development which must be approved by BOEM in subsequent phases. The Leasing Phase may take between one and two years for completion.

Site Assessment Plan ("SAP") and Construction and Operation Plan ("COP")

Once a project developer has secured a lease, it moves into the third phase, the Site Assessment phase. The purpose of this phase is to allow the lessee to engage in activities on the leased land to assess the actual wind resources and better understand the conditions of the lease area. Specifically, under the terms of the lease, the lessee is required to submit within 12 months an SAP (or a combined SAP and COP) to the agency describing how the lessee will conduct its assessment activities and technology testing on the OCS. BOEM will review and evaluate the SAP, including conducting its own environmental and technical review of the proposed site assessment activities, and ultimately will decide whether to approve, disapprove, or approve with conditions (most common) the SAP. The process to complete a SAP can take up to five years depending on the complexity of the site.

Once the SAP is approved, the lessee will have a five-year lease term to engage in the site assessment activities and during that five-year period also must submit its COP (in the event it was not submitted jointly with its SAP). The COP is the key document in which the lessee outlines how it will construct and operate a wind power project on the OCS pursuant to the federal lease. This document details all activities associated with the construction and operation of the facility, as well as general decommissioning plans at the end of the lease term. Similar to the SAP, BOEM will conduct its own environmental and technical reviews of the COP and will decide to approve, approve with conditions, or disapprove the COP. The process to complete a COP can take up to two years. The figure below identifies (at a cursory level) the potential direct and indirect impacts associated with an offshore wind farm which may require analysis in the COP. Specific COP requirements are outlined in BOEM's Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (May 2020).

[1]*Fisheries Survival Fund, et. al v. Haaland, No. 1:16-cv-02409 (May 20, 2021).*

IMPACTS MATRIX FOR CONSTRUCTION AND OPERATION PHASE OF OSW FARM

	Direct Impacts	Indirect Impacts
Geology and Hazards	• Disturbance to sea floor; Scour	• Instability of turbine structure • Reduced Water Quality
Water Quality	• Turbidity; Accidental releases	• Reduced Water Quality
Threatened and Endangered Species	• Displacement; Disruption to breeding, feeding	
Sensitive Bio Resources/Habitats	• Habitat Disturbance/loss	• Injury • Permanent displacement • Mortality
Avian Resources	• Bird strikes; Habitat loss	
Coastal and Marine uses	• Spatial/temporal conflicts with other authorized users	• Interference with shipping, military, aircraft
Socioeconomics	• Reduced fishing, recreation and tourism activities; Increase in non-local employees	• Decreased jobs/revenue • Increased jobs/revenue (construction) • Reduced housing/services available
Archaeological Resources	• Effects on historic resources: Visual impacts	• Destruction/damage to historic resources or viewsheds
Air Quality/ Climate Change	• Climate change/Carbon emissions	• Construction emissions • Zero carbon emissions (operation)

Once BOEM approves the COP, generally a commercial lease will have a 25-year term that becomes effective as of that approval, though the parties can negotiate a longer term, and lessees can request renewal's of leases in order to extend the term past the original termination date.

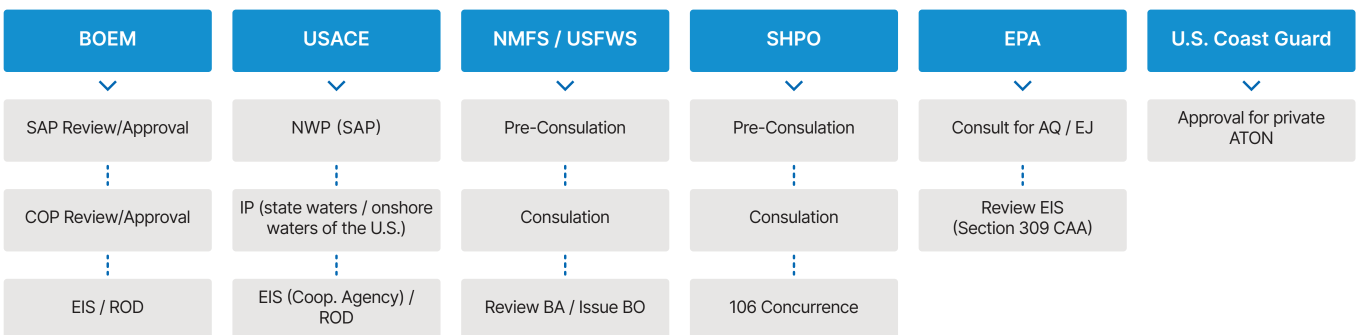
With regard to any infrastructure required for the transmission of the energy generated from the offshore wind facilities located on the leased land, the terms of the lease usually will include the grant of one or more easements for the purpose of installing gathering, transmission, and distribution cables, pipelines, and appurtenances on the OCS, as necessary for the full enjoyment of the lease. As part of submitting a COP for approval, lessees should request one or more easement(s), as necessary. BOEM's approval of the COP will include the grant of the associated, requested right-of-way ("ROW").

BOEM's process is robust and lengthy and requires substantial, continuous and effective engagement by the project developer(s). While familiarity with the process as written in the regulations is important, but the agency does have some degree of discretion so flexibility and adaptability also is required. In the end, offshore wind power project developers should expect to spend 7-10 years in the planning and construction process before commercial operations of the installed offshore wind facilities actually commence.

Other Pre-Construction Permits and Coordination

In addition to the BOEM SAP and COP, there is a complex permitting process that will run concurrently with the BOEM process. These federal activities include: U.S. Army Corps of Engineers ("USACE") permits for impacts to waters of the U.S. (Nationwide Permit [NWP] for SAP and Individual Permit [IP] for COP) pursuant to the Clean Water Act; consultation with the United States Fish and Wildlife Service ("USFWS") for the preparation of Biological Assessment for impacts to federally protected species; consultation with the USFWS pursuant to the Migratory Bird Treaty Act; consultation with the National Marine Fisheries Service ("NMFS") for Incidental Take Authorization pursuant to the Marine Mammal Protection Act; consultation with NMFS for Essential Fish Habitat pursuant to the Magnuson-Stevens Act; coordination with U.S. Coast Guard ("USCG") for Approval for Private Aids to Navigation; Section 106 Concurrence with State Historic Preservation Office ("SHPO") for cultural resources; and Environmental Protection Agency ("EPA") permit for the Outer Continental Shelf Air Regulations. In addition to permits, there is also coordination with other relevant stakeholders, including Department of Defense ("DoD").

At the state level, approvals/permits include a Section 401 Water Quality Certificate, Coastal Zone Management Act consistency determination, and other construction-related permits. Approvals for impacts to state protected species and forest/trees may also be required.



Post-Construction Mitigation and Monitoring

Post-construction monitoring and agency coordination would be required to fulfill mitigation commitments outlined in the COP, BOEM environmental impact statement ("EIS"), and agency permits/approvals that aim to avoid and minimize impacts to natural and socioeconomic resources. The following table provides a summary of the potential mitigation that may be implemented to address potential impacts during operation. It should be noted that monitoring is developed for project and site-specific considerations and the items in the table are not inclusive of all possible mitigation scenarios.

Resource	Mitigation/Monitoring
Water Quality	Implementation of a Spill Prevention, Control, and Countermeasure Plan
Physical oceanography, geology, and sediments	Periodic underwater inspection of turbine foundations, inter-array cables, and export cable to assess aggradation, scour and/or sub-seafloor exposure
Benthic macroinvertebrates	Post-construction surveys for comparison of seasonal and spatial patterns of species abundance compared to pre-construction conditions
Fish	Post-construction surveys to assess local fish community populations compared to pre-construction conditions
Marine mammals and sea turtles	• Protected species observers on vessels utilized during construction and operation to provide visual species monitoring • Post-construction underwater monitoring and analysis of operational noise • Adherence to vessel speed restrictions to prevent vessel strikes of marine mammals
Avian species	Post-construction monitoring (vessel-based, nocturnal, and/or radar-based) during operation to determine bird and avian collision mortality
Threatened and Endangered Species, Essential Fish Habitat,	Post-construction species-specific monitoring if required during by USFWS and NFMS during consultation
Cultural Resources	Implementation of an Unanticipated Discovery Plan during construction and operation to outline procedures to follow in the event that submerged cultural resources are encountered
Wetlands and other waters of the U.S.	• Implement USACE permit conditions • Purchase wetland mitigation credits or implement on-site wetland mitigation as required by the USACE
Commercial and recreational fishing, boating, and diving	Post-construction coordination with stakeholders as needed

Major Components of Federal Environmental Review Process

National Environmental Policy Act ("NEPA")

Passed in 1969, NEPA (42 U.S.C. §§ 4321-4347) is the foundation of environmental policymaking in the United States. The NEPA process is designed to help public officials make decisions based on complete understanding of environmental consequences and take actions that protect, restore, and enhance the environment.

To help further its goals, NEPA established the Council on Environmental Quality ("CEQ") to advise agencies on the environmental decision making process and to oversee and coordinate the development of federal environmental policy. In 1978, the CEQ issued regulations (40 C.F.R. §§ 1500-1508) implementing NEPA. These regulations include procedures for federal agencies to follow during the environmental review process.

In April 2021, the DOI (under which BOEM sits) issued Orders No. 3389 and 3399 (collectively, the "2021 Orders") to implement the review of the DOI actions directed by Executive Order ("EO") 13990 ("Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis") issued by President Biden on January 20, 2021, and to address climate and environmental justice concerns. The 2021 Order revoked prior orders, including Order 3355 to implement Executive Order 13807 and other NEPA improvements, which limited a NEPA EIS to 150 pages, or 300 pages for unusually complex projects, excluding appendices.

In July 2020, CEQ made significant revisions to the NEPA regulations for the first time in more than 40 years. CEQ is now reviewing the 2020 rule pursuant to E.O. 13990 (January 20, 2021). CEQ issued an Interim Final Rule on June 29, 2021, which extended the deadline by two years (to September 14, 2023) for federal agencies to develop or update their NEPA implementing procedures to conform to the CEQ regulations. In addition, on October 7, 2021, CEQ published Phase 1 Notice of Proposed Rulemaking, initiating a 45-day comment period. The proposed rule announced a narrow set of proposed changes to generally restore regulatory provisions that were in effect for decades before the 2020 rule modified them for the first time. CEQ states that it is seeking to better align the NEPA regulations with CEQ and agency expertise, as well as NEPA's statutory goals and purpose.

The environmental review process is complex. As noted above, the decision out of the D.C. Circuit Court of Appeals, concluding that BOEM is not obligated to conduct a NEPA review at the leasing stage, means that public involvement in the NEPA process is delayed. As such, developers in particular should seek to maximize stakeholder engagement (e.g., through engagement with the Intergovernmental Renewable Energy Task Force) to identify potential impacts and concerns before they arise in the formal NEPA process.

Endangered Species Act ("ESA")

Passed in 1973, the ESA (16 U.S.C. § 1531 et seq.) is intended to conserve endangered and threatened species and their habitats. There are approximately 1,930 species listed under the ESA that are found in part or entirely within the United States and its waters. The National Oceanic and Atmospheric Administration's National Marine Fisheries Service ("NMFS") and the Department of the Interior's U.S. Fish and Wildlife Service ("USFWS") share responsibility for implementing the ESA, with NMFS generally managing marine and anadromous species and USFWS managing land and freshwater species. While the USFWS has guidance in place for land-based wind development (available at https://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf), it does not have policies in place for offshore wind development.

Section 7 of the ESA mandates that BOEM and all other Federal Agencies consult with the Secretary of Commerce (via NMFS) and/or Interior (via USFWS) to insure that any "agency action" is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of an endangered or threatened species' critical habitat. The consultation process begins when BOEM provides NMFS and/or USFWS with details on the proposed activity, the ESA-listed species and designated critical habitat in the area, the best available information on effects to species and habitats from the proposed action, and measures which will be required by BOEM to reduce or eliminate the potential for effects to occur (e.g., mitigation and monitoring measures). Formal consultation must occur for any activity which BOEM, NMFS, or USFWS determines may adversely affect listed species or designated critical habitat.

The consultation process ends with the issuance of a biological opinion by NMFS and/or USFWS. This opinion documents whether the action BOEM proposes to authorize is likely to jeopardize listed species or adversely modify critical habitat. It may also provide an exemption for the taking of listed species and may outline measures deemed necessary to minimize impacts. After completion of the consultation process, BOEM will determine whether to issue an authorization for the proposed activity.
If issued, BOEM will require the implementation of needed mitigation measures identified during the consultation

process in addition to monitoring measures meant to detect taking or adverse effects. BOEM will also evaluate the effectiveness of these mitigation and monitoring measures to reduce effects.

Migratory Bird Treaty Act ("MBTA")

Passed in 1918, the MBTA implements the United States' commitment to four bilateral treaties, or conventions, for the protection of a shared migratory bird resource. The original treaty upon which the MBTA was passed was the Convention for the Protection of Migratory Birds signed with Great Britain in 1916 on behalf of Canada for the protection "of the many species of birds that traverse certain parts of the United States and Canada in their annual migration." The primary motivation for negotiation of the 1916 treaty and the passage of the MBTA was to stop the "indiscriminate slaughter" of migratory birds by market hunters and others.

The MBTA was subsequently amended as additional treaties were signed with Mexico (1936, amended 1972 and 1999), Japan (1972), and Russia (1976). The Canadian treaty was amended in December 1995 to allow traditional subsistence hunting of migratory birds. Each of the treaties protects selected species of birds and provides for closed and open seasons for hunting game birds. By implementing the four treaties within the United States, the MBTA protects over 800 species of birds. The list of migratory bird species protected by the MBTA appears in Title 50, section 10.13, of the Code of Federal Regulations (50 C.F.R § 10.13).

Under the MBTA, it is unlawful to pursue, hunt, take, capture, kill, possess, sell, purchase, barter, import, export, or transport any migratory bird, or any part, nest, or egg of any such bird, unless authorized under a permit issued by the Secretary of the Interior. Some regulatory exceptions apply. There are no incidental take permits available for offshore wind projects under the MBTA[2].

In 2009, BOEM entered into a Memorandum of Understanding ("MOU") with USFWS to "strengthen migratory bird conservation through enhanced collaboration between the MMS and the FWS." In assessing impacts to and protecting biological resources, BOEM consults with the USFWS on activities that may affect threatened and endangered species. BOEM also evaluates the effects on migratory birds and important habitats such as offshore and nearshore foraging, staging, molting, and roosting habitats.

BOEM regularly conducts studies that provide information for protection and conservation of migratory birds, including protected species. BOEM uses the NEPA process to evaluate potential impacts of proposed actions and alternatives, including impacts to migratory birds and their habitats. The potential impacts on migratory birds associated with offshore development may include direct effects such as the possibility of attraction to and collision with structures. For example, large numbers of migratory birds have been observed to be attracted to offshore structures and should be evaluated due to potential for collision. Indirect effects may include potential habitat loss through displacement or disturbance. In addition, accidents, such as oil spills, can have short-term, acute, and long-term, chronic effects on migratory birds and their habitats.

Coastal Zone Management Act ("CZMA")

In 1972, Congress enacted the CZMA (16 U.S.C. § 1451 et seq.) to protect the coastal environment from impacts of residential, recreational, commercial, and industrial uses. The CZMA helps states develop coastal management programs that manage and balance competing uses of the coastal zone. Thirty-five state and territories participate in the CZMA. A full list with description of each state's program is available here: https://coast.noaa.gov/czm/mystate/. Alaska withdrew from the CZMA on July 1, 2011, making it the only coastal or Great Lakes state to not participate. In each state, the program is implemented by one or more state agencies, usually the Department of Natural Resources, primary environmental agency, or primary coastal management agency.

Federal agencies, including BOEM, must follow the federal consistency provisions of the CZMA, set forth in 15 C.F.R. part 930. The federal consistency provisions require federal actions that are reasonably likely to affect land or water use of the coastal zone to be consistent with enforceable policies of a state's coastal management plan. Different subparts provides guidelines for different types of activities: Subpart C deals with federal agency activities, Subpart D deals with private activities requiring federal licenses or permits, Subpart E deals with OCS exploration, development, and production activities, and Subpart F deals with federal assistance to state and local governments.

States can review OCS lease sales for federal consistency. In these cases, BOEM produces a "consistency determination" that describes how the sale is consistent "to the maximum extent practicable" with the program's

[2] *Take is defined in regulations as: "pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect." 50 C.F.R § 10.12.*

enforceable policies. BOEM then sends a copy to each affected State for review. The State has a designated time period during which to agree or disagree with the consistency determination. If the State agrees, the lease sale can proceed. If the State disagrees, it must describe the inconsistency and any alternative measures that would allow the sale to be consistent. BOEM tries to resolve any potential problems with the State, but the CZMA does allow BOEM to proceed with the lease sale regardless. BOEM can also seek NOAA mediation.

States can also review OCS exploration and development and production plans. In this case, the OCS lessee prepares a "consistency certification" and "necessary data and information" along with the proposed plan. BOEM then sends a copy of the Plan and CZM information to the affected State's coastal agency for federal consistency review and decision. The State must concur with or object to the lessee's consistency certification within a designated time period. If the State fails to meet the deadline, the plan is conclusively presumed and thus approved. If the State concurs, BOEM approves the plan. If the State objects to an Exploration Plan, BOEM can approve the plan but cannot issue permits. If the State objects to a development or production plan, BOEM cannot approve the plan and the lessee can either choose to appeal the State's decision to the Department of Commerce or amend and resubmit it. The review process is nearly identical for OCS permits.

Maritime Law (The Jones Act)

What is the Jones Act?

The "Jones Act" generally refers to several provisions of U.S. law known as the "coastwise laws," which impose limitations on vessel operations in a number of ways that impact offshore wind projects. The coastwise laws apply not only to the transportation of passengers and merchandise between points in the United States and the Outer Continental Shelf ("OCS"), either directly or via a foreign port, but also impose certain limitations on towing, dredging and fishing activities in U.S. waters.

In order to qualify to engage in coastwise trade, the vessel must: (1) be built in the United States (and have never been rebuilt abroad); (2) be owned and controlled by citizens of the United States; (3) have primarily a U.S. citizen crew and (4) have a Certificate of Documentation with a coastwise endorsement issued by the U.S. Coast Guard.

Under the Jones Act, merchandise is broadly defined to include almost any type of cargo including "goods, wares, and chattels of every description" as well as "valueless material." A passenger is any person carried on a vessel who is not connected with the operation and navigation of the vessel or the ownership or business of the vessel. In order to qualify as a U.S. owner, the corporation or owning entity must be organized under the laws of the U.S., and the chief executive officer, by whatever title, and the chairman of the board, as well as a majority of the board of directors, must be U.S. citizens, and at least 75% of the equity in the entity must be owned and controlled by U.S. citizens.

Application of the Jones Act to Offshore Wind Projects

The coastwise laws generally apply to points in the territorial sea, which is defined as the belt, three nautical miles wide, seaward of the territorial sea baseline, and to points located in internal waters, landward of the territorial sea baseline. The Outer Continental Shelf Lands Act ("OCSLA") established the legal regime for the exploration, development, and production of energy resources on the OCS.

OCSLA expressly extended the laws and civil and political jurisdiction of the United States, including the coastwise laws, to the subsoil and seabed of the OCS and to "all artificial islands, and all installations and other devices permanently or temporarily attached to the seabed which may be erected thereon for the purpose of exploring for, developing, or producing resources therefrom." Congress amended OCSLA in January of 2021 affirming the application of all U.S. laws and jurisdiction on the OCS not only to oil and gas projects but also to non-mineral energy projects, such as offshore wind energy.

Customs and Border Protection ("CBP") is the agency responsible for interpreting the coastwise laws and issues rulings on a variety of operating scenarios. These rulings are limited to the particular facts of the specific case but provide helpful guidance in navigating the applicable requirements for the construction and maintenance of offshore wind projects.

For example, in connection with the construction of meteorological data towers outside the territorial sea and on the OCS to be used in collecting wind speed data useful in determining the site for future wind farm development, CBP ruled that the transportation of construction materials or passengers from a point in the United States to the construction vessel installing the wind tower requires a coastwise-qualified vessel. The construction vessel, however, can be of a foreign flag as long as it remains stationary and does not transport anything between points on the OCS or points in the U.S. and the territorial sea. Neither the drilling nor the pile driving by the stationary construction vessel constitutes coastwise trade.

In a subsequent ruling, CBP addressed the transportation and installation of two wind farms, one three miles and the second some 20 miles off of the coast of Rhode Island. Some turbines were transported to their respective construction sites from Rhode Island on coastwise-qualified vessels whereas others were transported from Germany on non-coastwise-qualified vessels. The turbines were installed by a stationary, foreign-flagged jack-up vessel, which had its legs securing it to the seabed and used its cranes to lift the turbines from the transport vessel and place them directly on to the steel jacket foundation at the project site. Although the crane on the jack-up vessel moved the turbines, the jack-up vessel itself remained stationary, and thus, there was no violation of the coastwise laws. At no time did the jack-up vessel transport merchandise or passengers between any of the installation sites.

Vessels used to conduct maintenance on completed wind turbines will need to be coastwise qualified, as will vessels that may be engaged in related dredging activities or the towing of other vessels. There are certain related activities that can be conducted on foreign-flag vessels, such as cable laying and pipe laying on the OCS or within territorial waters, as well as research activities.

Shortly after enactment of the OCSLA amendment in 2021, CBP published a ruling confirming that the Jones Act applied to renewable energy projects on the OCS, saying that "the plain language of OCSLA Section 4, as amended, extends U.S. law to the physical subsoil and seabed of the OCS, as well as installations and other devices permanently or temporarily attached to the seabed, which may be erected thereon for the purpose of exploring for, developing, or producing resources, including non-mineral energy resources." (HQ H309168) The ruling also affirmed that the pristine seabed was a "coastwise point" for purposes of the Jones Act. However, less than two months after its original letter ruling, CBP issued a rare modification of its first letter ruling (HQ H317289). In the modification, CBP changed its position on the pristine seabed, now stating that the pristine seabed would not be considered a point for purposes of the Jones Act. Instead, CBP determined that at the time of first delivery of scour protection materials to the seabed, there was no coastwise point, but after the first layer of scour protection material was placed on the seabed, a coastwise point was created. CBP has also recently addressed crewing and vessel equipment issues for wind installation vessels (HQ H316313).

Advance CBP rulings are available should there be any question about compliance with the coastwise laws in connection with an offshore wind project. This is particularly advisable given the significant penalties for violations. The penalty for transportation of merchandise on a noncoastwise vessel is forfeiture of the merchandise so transported, or the value thereof. Transportation of passengers in violation of the coastwise laws is US$778 per passenger so transported. In addition, there are daily civil penalties for vessels operating in violation of the Coast Guard documentation regulations, as well as the potential seizure and forfeiture of the vessel and its equipment under certain circumstances.

The navigation laws, including the coastwise laws, can be waived by the Secretary of homeland security under very limited statutory authority when requested by the Secretary of defense and only then to the extent considered necessary in the interest of national defense. Such waivers have been granted in connection with hurricane relief efforts, for example, and other extraordinary circumstances.

Occasionally, Congress will enact special legislation authorizing issuance of a coastwise endorsement for a specific vessel that does not meet the requirements or has lost its qualification through foreign ownership or rebuilding; however, such waiver requests are often controversial and infrequently enacted.

Federal Antitrust Law

The scale and capital needs of offshore wind installations in the United States necessarily require a large degree of cooperation among industry participants. However, in the United States, the Sherman Act, Clayton Act, and FTC Act empower the Department of Justice ("DOJ") and the Federal Trade Commission ("FTC") to investigate and enforce U.S. antitrust laws across all industries, including the offshore wind industry. The DOJ and FTC can sue to block mergers, enjoin contracts with anticompetitive effects, levy fines, and, in the case of the DOJ, even bring criminal charges that result in jail time. In addition, the Sherman Act and Clayton Act permit private plaintiffs—whether customers, suppliers, or competitors—to file lawsuits alleging that business practices violate the antitrust laws, exposing industry participants to often substantial, trebled damages. This section outlines the common circumstances that may incur antitrust scrutiny from the government or private plaintiffs.

Contracts and Exclusive Dealing

Businesses frequently employ exclusivity provisions in supply contracts in order to protect against potential supply chain interruptions or to protect their investments. However, exclusive contracts can raise potential antitrust concerns depending on the number of alternative suppliers available and the parties' market share. Before entering into exclusive contracts, parties should determine whether one of them has a large market share or whether the agreement could somehow prevent a rival from accessing necessary supplies.

Numerous factors may cause a wind farm developer to consider exclusivity provisions in supply contracts. For example, competitive bids to secure offshore rights may require wind farm developers to demonstrate their ability to secure sufficient equipment and supplies necessary to complete a project. Alternatively, wind farm developers may sponsor suppliers' entry into new markets or provide funds to increase a supplier's capacity and wish to obtain the full benefit of their investment.

The antitrust laws prohibit agreements that "unreasonably" restrain trade. Although exclusive contracts are not illegal, they may be unreasonable if they foreclose (i.e., limit or cutoff) competitors from accessing necessary supplies.

Other factors that courts consider when evaluating an exclusive contract include the duration of the agreement; the parties' mutual desire for exclusivity; the extent to which competitors also employ exclusive dealing arrangements; and the extent to which competition is actually injured. Courts balance these factors with procompetitive justifications for the exclusive arrangement, such as improving the services of a supplier who can devote its efforts to one buyer; avoiding free riding; and enabling efficiency-enhancing investments and creating economies of scale.

Thus far, the antitrust agencies have not publicly taken any action against exclusivity provisions in the wind farm space, and we have not seen any private claims filed. However, exclusive contracts that produce the potential anticompetitive effects outlined above could face government investigation or a private antitrust lawsuit by an injured competitor.

Merger Review

Like many emerging industries, the offshore wind industry presents significant opportunities for M&A activity. Industry participants considering transactions may be required to make a Hart-Scott-Rodino ("HSR") filing or other state law filings. Transactions that may substantially lessen competition will often face investigation by the FTC or DOJ[3], as well as potentially from state attorneys general.

Parties to transactions above an inflationary adjusted, statutorily defined purchase price (2021: US$92 million) are required to submit an HSR filing. The agencies have recently changed how they determine whether a transaction meets the filing requirement. For example, they previously did not count retired debt toward the purchase price but have since indicated that retired debt may trigger the HSR filing threshold. Parties should thus consult with HSR counsel to determine whether their transaction meets the HSR filing threshold under the most current FTC and DOJ guidance.

The push toward renewable energy under the Biden administration, as well as a general increase in antitrust enforcement, may result in transactions impacting offshore wind receiving particular scrutiny from the FTC or DOJ. The antitrust regulators will assess whether any merger between competitors may substantially lessen competition in the offshore wind space or produce other anticompetitive effects, such as slowing the transition to renewable energy or increasing its cost. In addition, vertical transactions – such as a developer's acquisition of a key supplier – could result in the antitrust regulators considering whether the developer's competitors would be foreclosed from their necessary supply.

Other Potential Antitrust Risks

The antitrust laws prohibit other conduct as well, which, although not unique to offshore wind, still apply to this industry as they would to any other:

- Market participants at every level of the distribution chain are prohibited from agreeing on prices or services offered. Such conduct is per se unlawful and can result in substantial civil litigation as well as criminal charges leading to fines and jail time.
- Industry participants considering trade association membership cannot use their membership to coordinate pricing or services. Any standard setting must comply with requirements that prevent standards from acting as a sham to stifle competition and protect incumbents.

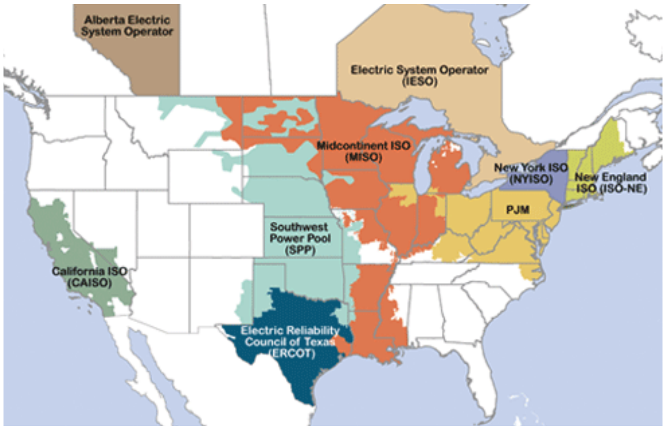
[3] The FTC and DOJ share jurisdiction over merger review and determine which agency will review a merger after receiving an HSR filing. One agency may review every merger involving a certain industry if it has developed particular expertise and knowledge about that industry.

By: Kimberly Frank, Ruta Skučas, Jennifer Mersing, Nathan Howe, K&L Gates

The Federal Energy Regulatory Commission ("FERC") is an independent agency within the U.S. Department of Energy ("DOE") that regulates interstate transmission of natural gas, oil, and electricity. Pursuant to the Federal Power Act ("FPA"), FERC regulates, among other things, the rates and services of the interstate transmission of electricity and the interstate wholesale sales of power; exercises authority and approvals over certain mergers, acquisitions, and corporate transactions; regulates books and records accounting requirements; and oversees compliance with reliability requirements.

FERC's Formation of Regional Grids and Markets; Stakeholder Participation

FERC has issued a number of rulemakings and orders establishing regionally organized markets. In 1996 FERC issued rulemaking Order No. 888 paving the way for the formation of Independent System Operators ("ISOs") to coordinate, control, and monitor the operation of the electric power system and facilitate open-access to transmission service. Later, in Order No. 2000, FERC promoted the formation of Regional Transmission Organizations ("RTOs") to administer the transmission grid on a regional basis throughout North America (including Canada). Today RTO/ISO regions cover a large portion of the continental U.S., with individual utilities remaining responsible for grid administration outside of these areas. The RTOs/ISOs include PJM Interconnection ("PJM"), California Independent System Operator ("CAISO"), Southwest Power Pool, Midcontinent Independent System Operator ("MISO"), New York Independent System Operator, and ISO New England ("ISO-NE"). Most offshore wind development activity is within eastern RTOs/ISOs.



Source: https://www.ferc.gov/electric/power-sales-and-markets/rtos-and-isos

RTOs/ISOs are "public utilities" that operate (but do not own) the transmission grid. In addition to ensuring that open-access transmission services are provided on a non-discriminatory basis, RTOs/ISOs plan transmission expansion projects and manage the interconnection process for new storage, generation, and merchant transmission projects. RTOs/ISOs also dispatch (but do not own or operate) generation and other resources to meet the round-the-clock needs of electric energy customers. They operate competitive markets for energy, ancillary services, and, in some cases, capacity. Through stakeholder processes described below, RTOs/ISOs develop market rule proposals that are submitted to FERC to evaluate for compliance with the FPA. Like any other regulated public utility, RTOs/ISOs must put their tariffs (including market rules) and other agreements "on file" with FERC. To change a filed tariff or amend a filed agreement, the RTO/ISO must make a filing under Section 205 of the FPA and explain the reasons for the change. FERC typically acts on Section 205 filings in about 60 days. RTOs/ISOs also maintain manuals and other documents that set forth detailed procedures governing participation in the markets administered by the RTO/ISO. These materials, which implement but do not take priority over the "on file" tariff, are available on the websites of the RTOs/ISOs.

RTOs/ISOs have implemented orderly rules to facilitate participation by stakeholders in RTO/ISO governance. The importance of stakeholder participation in the RTO/ISO process cannot be understated; the stakeholder process is one of the primary avenues for the development of new market rules and other tariff changes to the already "on file" tariffs. RTO/ISO stakeholders are grouped together in sectors representing major industry participant groups such as transmission owners, generation owners, electric distributors, end-use customers, other suppliers, and the like. RTOs/ISOs have numerous stakeholder bodies where members can bring forth issues for discussion. If the issue or proposal receives majority support, the members can vote to move the proposal through the hierarchy of the RTO/ISO stakeholder process up through Board review. Each participant sector is allocated a share of voting interests in the stakeholder governance process.

In PJM, for example, votes in the two senior standing committees, the Members Committee and the Markets and Reliability Committee, are recorded and weighted by sector to ensure that all interested parties are included in the decision-making process. PJM also has three standing committees that route endorsed packages to the senior committees for approval, as well as subcommittees, user groups, and task forces for preliminary issue identification and stakeholder discussion. Committed engagement in the stakeholder process, particularly at the subcommittee and standing committee levels, enables market participants and others to present proposals, identify issues, and shape market policies.

FERC Rulemakings and Technical Conferences

FERC will issue rulemakings, such as Order No. 2222, that require the FERC-jurisdictional RTOs/ISOs or other regulated public utility to make a "compliance filing" explaining how goals of the rulemaking will be achieved. In most cases, compliance filings present proposed changes to the regulated entity's tariff that would be necessary to implement the rulemaking. FERC is then required to act on the filing. These changes are discussed in the RTO/ISO stakeholder process before the RTO/ISO submits its compliance filing to FERC.

FERC may also engage the RTOs/ISOs and industry stakeholders on important issues by hosting technical conferences. For example, FERC held four technical conferences and solicited post-conference comments in docket number AD21-10 to better understand industry views about the need to modernize electricity market design to address the changing mix of resources. In October 2020, in docket number AD20-18-000, FERC held a commissioner-led technical conference regarding the integration of offshore wind in RTOs/ISOs. Specifically, the conference discussed how the RTOs/ISOs can accommodate anticipated growth in offshore wind generation in an efficient and effective manner that safeguards open access transmission principles, and consider possible changes or improvements to the current participation framework.

Recent FERC Orders on Offshore Wind in the Capacity Markets

FERC's responsibilities include ensuring that rules governing participation in the energy, capacity, and ancillary services markets are just and reasonable and not unduly discriminatory or preferential. It is important that market rules governing entry into RTO/ISO markets do not create barriers to new offshore wind resources. For example, capacity auctions are used by some RTO/ISOs to pay resources for being available to meet electricity demand during peaks and system emergencies. In New England, generators' capacity is bought and sold in one-year blocks, three years in advance, through an auction run by ISO-NE. It can be difficult for a new entrant to meet the administrative requirements and clear the RTO/ISO review process necessary to sell capacity. These barriers to entry can be formidable.

One example of a barrier to entry is the "minimum-offer" or "buyer-side market power mitigation" rules that require prospective new entrants in the capacity market to submit a package of information justifying their minimum price to sell capacity into the auction. If the intended offer price is too low, it is rejected. FERC finally appears to be reconsidering its controversial minimum-offer pricing policy. In late 2021, PJM's proposed minimum offer reforms caused a stir when those went into effect with a deadlocked commission. Petitions for review have since been filed at the federal appellate court. In early 2022, New York Independent System Operator ("NYISO") proposed a package of rule changes intended to better accommodate offshore wind resources developed to fulfill state policy objectives, including minimum offer reforms. By contrast, needed reforms in New England have proceeded at a slower pace. ISO-NE's minimum offer rule applicable to offshore wind technology continues to apply to all new offshore wind entry. Although in 2021 the parameters applicable to offshore wind were challenged at FERC, FERC accepted the ISO-NE proposal to maintain the status quo and thus requiring minimum pricing review for offshore wind through the 2025-2026 commitment period. A two-year transition away from the rule may be proposed to FERC by ISO-NE.

From time to time, FERC is asked to waive a rule in a tariff. The applicant must demonstrate that (1) the applicant acted in good faith; (2) the scope of the waiver requested is limited; (3) a concrete harm will be remedied by the waiver; and (4) granting the waiver will not cause undesirable consequences, such as harm to third parties. Whether FERC grants a request is often dependent on the fourth factor and, accordingly, it is in the petitioner's best interest to seek a waiver on a prospective basis and as soon as possible. In 2019, an offshore wind developer submitted an emergency request to delay the ISO-NE capacity market's annual auction after FERC failed to act on the developer's earlier request to waive compliance with a flawed rule interfering with its ability to sell into the capacity auction. FERC allowed the auction to go forward as scheduled in February 2019, which cleared capacity for the one-year period spanning the 2022-2023 calendar years. Had FERC granted the offshore wind developers initial request, the project could have qualified for preferred status as a "renewable technology resource." Because FERC allowed the auction to go forward without addressing the request, the offshore wind facility secured the sale of only a fraction of its qualified capacity. In late 2020, FERC dismissed the waiver request as moot.

Federal Energy Regulatory Commission: Compliance

Regulatory Compliance

FERC regulates transmission and the wholesale sales of energy in the continental United States (outside of the Electric Reliability Council of Texas region) pursuant to the FPA. Prior to making any wholesale sales of electric energy, capacity and/or ancillary services (including sales of test energy), a project company must receive from FERC either market-based rate authorization or cost-based rate authorization under FPA Section 205 or be exempt from rate regulation by FERC. Offshore wind project companies that will be selling their output, whether to a buyer through contract or into a regional market, will be required to obtain market-based rate authorization from FERC. Sales of environmental attributes (such as renewable energy credits) would fall under the jurisdiction of the relevant state public utility commission.

To obtain market-based rate authorization, a project company will have to apply to FERC and demonstrate that it (and its affiliates) do not have market power. FERC has 60 days to rule on a completed market-based rate application. As the name implies, a project company with market-based rate authority is generally not limited by FERC in the amount it can charge for its wholesale sales of electric energy, capacity and/or ancillary services.

Once a project company has market-based rate authorization, it will be subject to general FERC regulation as a "public utility." As a FERC-jurisdictional "public utility," the project company will, as well as being subject to other regulations, be required to file Electric Quarterly Reports ("EQR") with FERC detailing its power sales and contracts, to report to FERC changes in the information contained in its market-based rate application and to obtain FERC approval under FPA Section 203 prior to certain changes in upstream ownership. A project company will have market-based rate authority until such authorization is canceled (either upon application of the project company or by FERC on its own initiative for noncompliance with the FPA regulations).

A project company may be exempt from regulation under FPA Section 205 if it is a "qualifying facility" under the Public Utility Regulatory Policies Act. To become a "qualifying facility," an offshore wind project (or any renewable project) of 80MWac or less would have to file with FERC a Form 556 Certification of Qualifying Status. Although an offshore wind project up to 80MWac will qualify as a "qualifying facility," only "qualifying facilities" of 20MWac or less are entitled to exemption from most FERC regulation (including the need to obtain market-based rate authorization).

FERC has also implemented accounting and record keeping regulations pursuant to the Public Utility Holding Company Act of 2005 ("PUHCA"). If the project company will be exclusively engaged in making wholesale (and not retail) sales of energy from the offshore wind project, the project company can file a notice of exempt wholesale generator status with FERC and become exempt from most of FERC's PUHCA regulations.

Enforcement and Compliance

Once an entity reaches commercial operations, it must develop a compliance program for ongoing operations. This will include compliance with the market rules of independent system operators and/or regional transmission organizations ("ISO/RTO"), as well as applicable FERC rules. Individual ISO/RTOs may also require entities planning to participate in the day-ahead and real-time markets to prepare a risk manual documenting the company's risk policies.

The FERC Office of Enforcement has authority to investigate failures to comply with market rules, as well as instances of market manipulation. Regulated entities that discover compliance violations are strongly encouraged to self-report the violation to the Office of Enforcement.

Issues which the Office of Enforcement has recently investigated, in the forms of self-reports or investigations, include:

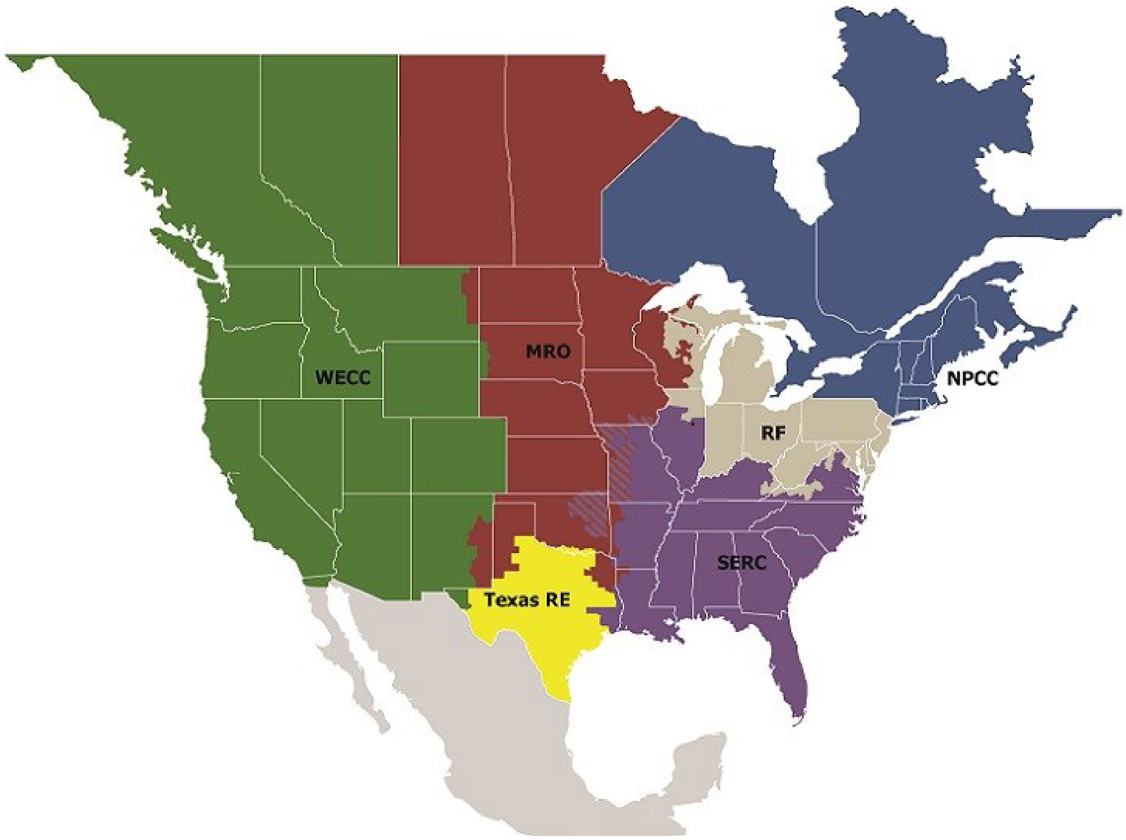
- **Regulatory Filing Violations.** Companies have self-reported failures to timely obtain Qualifying Facility status, failure to timely file EQR reports, and updates to their market-based rate filings.

- **Capacity Market Obligations**. Enforcement staff has investigated several companies for failure to comply with capacity market supply obligations. One recent settlement involved a failure to comply with the market's must-offer requirement, while another involved inaccurate de-list bids.

Ultimately, effective compliance programs remain critical, whereby staff and management are equipped with sufficient training, tools, and other resources to detect and correct instances of non-compliance.

North American Electric Reliability Corporation: Compliance

In addition to market regulation, FERC oversees the reliability of the Bulk Electric System[1] ("BES"). FERC has delegated to the North American Electric Reliability Corporation ("NERC") the authority to create and enforce reliability standards for the BES. NERC, together with its six Regional Entities, comprise the Electric Reliability Organization Enterprise. NERC and the Regional Entities develop, implement and enforce reliability standards, monitor the bulk power system, and conduct audits of registered entities' compliance. NERC and the Regional Entities also register certain owners, operators and users of the BES.



Source: https://www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx

If an offshore wind project meets the criteria for registration, it will be registered, by the applicable NERC regional entity, as a Generator Owner and/or Generator Operator and be required to comply with the reliability standards that apply to those registered functions. The registration criteria includes generating resources connected at 100kV or higher with a gross individual nameplate rating greater than 20MVA or a gross plant aggregate nameplate rating greater than 75MVA. Owners and/or operators of such facilities connected to the electric power grid at 100kV or higher, are required to register with NERC in the appropriate asset class. The owner and/or operator of an offshore wind facility would need to register as a Generation Owner or Generation Operator when the facility nears commercial operations. Registration will bring with it compliance obligations for the applicable suite of reliability standards, related to grid operations, physical security, and cyber security.

[1] *The Bulk Electric System ("BES") is comprised of electric generation and transmission resources and associated equipment, which operates at voltages of 100 kV or higher*

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Federally recognized Indian tribes are independent sovereign nations. In addition to the general body of federal law that applies to all tribes and tribal entities, some tribes have additional rights under treaties and other agreements with the federal government. Given the number of recognized tribes and tribal entities on the West Coast, it is important to keep them, their lands, and other rights they possess as sovereign governments in mind during the development and financing process for offshore wind projects. In the Pacific Northwest, for example, many tribes have treaty fishing rights. To ensure a successful project, developers also must navigate federal consultation requirements and policies. All of these laws and rules may impact both offshore and onshore aspects of project development.

Key among a treaty tribe's rights in Washington and Oregon is the right to access usual and accustomed ("U&A") areas for fishing. These U&A grounds include areas offshore of the Washington coast that could be suitable for wind development. For example, federal rules describe U&A fishing areas within the U.S.'s exclusive economic zone off the coast of Washington for certain treaty tribes (e.g., Makah, Quileute, Hoh, and Quinault). In addition to access, the treaty right to fish includes the right to a fair share of the catch and protection of fishery habitat from human caused environmental degradation. Tribes are protective of their treaty fishing rights and materially impacting a tribe's ability to fish in its U&A constitutes a treaty violation. As a result, offshore projects (as well as supporting infrastructure such as transmission lines and onshore support) cannot include permanent structures that would displace a treaty tribe's fishing practices within its U&A absent an agreement with the impacted tribe.

Tribes have used their treaty fishing rights to successfully block required authorizations for projects in the past, including the Lummi Nation's blocking of a deep water export facility at Cherry Point, Washington, the Lummi Nation's blocking of a federal permit for a fish farm comprised of net pens in the Puget Sound, and the Muckleshoot Indian Tribe's opposition to a marina in Elliott Bay in Seattle, Washington. Each project would have denied the affected tribe access to locations where they exercised treaty fishing rights.

In addition, in all areas of the country, federally recognized tribes have consultation rights under federal law, including under Section 106 of the National Historic Preservation Act ("NHPA") and various executive policies and orders. Section 106, which is often implemented through the National Environmental Policy Act ("NEPA") review for a proposed project, requires federal agencies carrying out projects to consult with tribes that attach historical and/or cultural significance to properties potentially affected by those projects. Consultation must be conducted in a sensitive manner respectful of a tribe's status as a sovereign governmental entity, and include an evaluation and the development of measures to avoid and/or mitigate impacts to culturally sensitive areas.

Finally, there are many other factors that should be taken into consideration when working with tribes in the United States. For example, state taxation laws apply differently on trust lands and tribes generally have their own power to tax. In addition, under current law, tribal ownership of renewable energy property can complicate structuring for project finance. (We note that pending legislation may mitigate some of these factors). Parties contracting with tribes also must consider a number of other factors, from sovereign immunity and dispute resolution to governing law and jurisdictional considerations, as well as many others.

The United States Department of the Interior, Indian Affairs, releases an annual list of federally recognized tribal entities. The most recently released list (January 2022) may be found in the Federal Register at: https://www.govinfo.gov/content/pkg/FR-2022-01-28/pdf/2022-01789.pdf

2.4 State Offshore Wind Policy and Regulatory Issues

By: Buck Endemann, Kenneth Gish, Kimberly Frank, Nathan Howe, Maeve Tibbetts, Jennifer Mersing, Molly Barker, David Wang, K&L Gates

A number of eastern states have taken action to support the development of offshore wind projects, with some enacting new laws and regulations to facilitate competitive procurements that provide winning bidders with long-term offtake arrangements to sell output and/or renewable attributes produced by these resources. Through these states' programs, more than 11.5GW of this important carbon-free electric power source, serving major population centers including New York City, is anticipated to achieve commercial operation by the end of 2028. These state programs are to be credited for providing a stable, competitive platform necessary for developers and financiers to develop these important projects. States' offshore wind programs are redeveloping local economies, revitalizing ports and manufacturing hubs, and providing commercial opportunities across the supply chain.

States have adopted different approaches to support the development of offshore wind. Some states like New York, New Jersey, and Maryland have incorporated offshore wind into their renewable portfolio standards ("RPS") by creating technology-specific renewable energy credits for offshore wind. These Offshore Wind Renewable Energy Credits ("ORECs") are generally the environmental attributes of one MWh generated by the offshore wind facility and may include other product characteristics. Under these state procurement procedures, developers bid an OREC price as part of their application, and this price is awarded to the winning bidder. The selection process, however, is not limited to price, and requires consideration of a number of other criteria, such as environmental impacts and local economic development, to determine the winning bid.

Other states, such as Massachusetts, Rhode Island, and Connecticut have developed a procurement process that results in a long-term power purchase agreement ("PPA") between the project and the local load-serving utilities. Under these PPAs, the generator contracts with the electric distribution utilities within the relevant state to sell bundled energy and renewable energy credits generated from the project at a competitively offered rate. The electric distribution utilities sell the delivered energy and can either sell the renewable energy credits or use them to meet their own renewable energy obligations. The generator keeps any revenues it receives for capacity and ancillary services from the wholesale markets.

States that use an OREC procurement approach:

- **Maryland** - In Maryland, the state regulatory commission administers the procurement and selects the project based on price and other criteria. The state commission's OREC Order sets the terms for the project's sale of ORECs. Load-serving entities purchase ORECs in order to meet that supplier's RPS requirements. The commission recently completed a "round two" procurement securing more than 1,600MW of capacity.

- **New Jersey** - In New Jersey, the ORECs are sold to the state electric utilities as the agents of all energy suppliers through a participation agreement entered into with a third-party OREC administrator.

- **New York** - Under New York's procurement program administered by the New York State Energy Research & Development Authority ("NYSERDA"), developers are allowed to bid either a fixed OREC price or a variable index strike price that is calculated monthly as part of their bid application. The winning bidder may enter into a long-term contract to sell the ORECs to NYSERDA, which then resells the ORECs to load-serving entities to meet their RPS compliance obligations.

States that use a bundled energy plus renewable energy credits procurement approach:

- **Connecticut** - In Connecticut, the request for proposals is issued by a state agency. Projects selected by the agency have the opportunity to enter into PPA negotiations with the electric distribution utilities. The PPAs are then submitted to the state regulatory commission.

- **Massachusetts** - The Massachusetts program centralizes the request for proposals process into a joint offering by electric distribution companies, in coordination with the state agency.

- **Rhode Island -** Rhode Island has passed legislation allowing for participation in the offshore wind procurement processes of other New England states, and Rhode Island participated in the 2017 Massachusetts RFP to select a procurement of 400MW.

The goal of these approaches, whether through an OREC Order issued by the state utility regulatory commission or a PPA with the distribution utility, is to reduce project risk by providing a long-term stable revenue stream for the project.

Key States in Offshore Wind

The approaches and progress of these states and several others follows. We have addressed states alphabetically without regard to the approach taken.

California

Compared to the Eastern Seaboard states, California offers new opportunities and challenges to developers and operators of offshore wind projects. In general, the waters off California tend to be deep and rocky, such that developers typically plan to use floating or tethered wind turbine technology to harness the significant wind resources in the central and northern parts of the State. California has also historically invested heavily in coastal transmission and substation infrastructure, at least in the southern and central parts of the State. Due to the retirement of several nuclear and once-through-cooling power plants, these assets are carrying less capacity and may facilitate cheap onshore transmission of wind power that is generated offshore. Northern parts of the State, however, where the wind resource tends to be best, remain very transmission constrained.

In April 2019, BOEM released a memo summarizing the indications of interest received for commercial leases off California and included 14 companies that were deemed legally, technically, and financially qualified to participate. BOEM announced that the next step is to identify the specific areas that will undergo NEPA review (i.e., portions of the Humboldt, Morro Bay, and Diablo Canyon areas), and after that, the actual leasing process. In July 2021, BOEM advanced these efforts, identifying two additional areas within a 399-square-mile area located off Morro Bay, called the Morro Bay Call Area East and West Extensions. BOEM also formally designated the Humboldt Wind Energy Area ("WEA") offshore northern California and began the NEPA process to conduct environmental review. On January 11, 2022, BOEM released the Draft Environmental Assessment that analyzes the potentially significant environmental effects of issuing a lease and site assessment activities. On January 25-26, 2022, BOEM held a public meeting to inform the public on the development of a Draft Environmental Assessment for the Humboldt WEA. On February 11, 2022, BOEM made a Finding of No Historic Properties Affected.

With some carve-outs for military and environmentally sensitive areas, California retains jurisdiction over the first three miles of water off its coastline. While few wind turbines will be sited that close to shore, any transmission or substation infrastructure within three miles of the coast requires a lease from the California State Lands Commission. Onshore or near-shore development related to the offshore project would trigger review by the California Coastal Commission, which evaluates whether BOEM's proposed leasing is consistent with the California Coastal Act. All state leasing and permitting decisions must comply with the California Environmental Quality Act ("CEQA"), which requires the lead government agency to identify any significant environmental impacts arising from the project. The project must incorporate feasible mitigation measures to mitigate those impacts to a level that is "less than significant." Based on our experience with onshore solar and wind development, we anticipate that CEQA's citizen-suit provisions will offer project opponents a powerful tool to block or modify projects they don't like (unless exemptions are granted by the California legislature).

California has an aggressive Renewable Portfolio Standard ("RPS") and may need a significant amount of new renewable generation to meet its goal of 60% RPS by 2030 and 100% RPS by 2045. California is also adding electric vehicles ("EVs") to its highways at a clip of 20,000 per month, and aims to have five million EVs on the road by 2030. To facilitate offshore wind development (estimated to be at least 20GW, at 46-55% capacity factors), California and BOEM have established the Intergovernmental Renewable Energy Task Force ("Task Force"), which is a partnership of state, local, and tribal governments and federal agencies, to plan and consider competitive leasing issues for future offshore renewable energy development opportunities. The Task Force provides tools and mapping programs to assist offshore wind developers in site selection. In its July 13, 2021, the members of the Task Force discussed next steps for offshore wind off California's Central and North Coasts in order to seek public input on Task Force initiatives.

The California Energy Commission ("CEC") has also opened docket 17-MISC-01 to accept comments and presentations from developers, trade groups, environmentalists, and others looking to shape California's offshore wind policy. In 2019, the CEC began hosting workshops for industry stakeholders to evaluate the progress of the state's offshore wind efforts and exploring ways to incorporate offshore wind energy production into the state's Integrated Energy Policy Report ("IEPR"). Stakeholders stressed offshore wind's ability to complement utility-scale and rooftop solar production, mitigating the evening ramp as California's solar production begins to fall drastically around 4 p.m. Labor interests have urged the state to implement a comprehensive industrial policy for offshore wind, making the case that greater state investment can create clusters of economic activity, drive industry, and have positive co-benefits with other sectors. It is envisioned that the Port of Humboldt Bay and Humboldt State University, in particular, would stand to benefit as regional "centers of excellence" and promote a robust domestic supply chain for parts and labor. Based on these workshops and collaboration with stakeholders, the IEPR contains a synthesized evaluation of major energy trends in the state and provides policy recommendations to ensure reliable energy supplies that fuel the state's economy. A new IEPR is to be prepared every two years with an update every other year. Currently, the CEC is requesting public comments on the Draft Scoping Order for the 2022 IEPR Update.

The state level efforts received a significant boost in September 2021 when Governor Gavin Newsom signed AB 525, An Act to Add and Repeal Chapter 14 of Division 15 of the Public Resources Code Relating to Energy, which directed California's energy and environmental agencies to develop a strategic plan for offshore wind resources in California. In particular, the CEC must create a strategic plan to develop offshore wind projects and set certain GW-based targets for offshore wind production for 2030 and 2045. The CEC must also evaluate the extent to which infrastructure improvements are needed to accommodate the offshore wind facilities. California's 2021-2022 state budget includes US$20 million earmarked to spur "environmentally responsible" offshore wind development. On March 3, 2022, the CEC held a workshop to explore the requirements of AB 525 and how to achieve these objectives.

Connecticut

In early 2018, and pursuant to Section 8 of Public Act 13-303, An Act Concerning Connecticut's Clean Energy Goals, the Department of Energy and Environmental Protection ("DEEP") conducted a competitive solicitation for renewable energy projects. The solicitation sought to procure up to 899,250MWh/year of renewable energy and associated RECs from offshore wind, fuel cell, and anaerobic digestion renewable energy resources, pursuant to long-term contracts of up to 20 years. DEEP ultimately selected a 200MW tranche of Ørsted's Revolution Wind project for eligibility to negotiate a PPA with the State's electric utilities. The PPA was filed with and subsequently approved by the Public Utilities Regulatory Authority in December 2018. In July 2018, pursuant to Section 1 of June Special Session Public Act 17-3, An Act Concerning Zero Carbon Solicitation and Procurement, DEEP issued a solicitation for up to 12,000,000MWh/year of zero carbon electricity generating resources. Among other awards, DEEP selected a 100MW tranche of the now Ørsted-Eversource joint venture project Revolution Wind to negotiate and enter into long-term contracts with the electric distribution companies. In June 2019, in response to Public Act 19-71, An Act Concerning the Procurement of Energy Derived from Offshore Wind, DEEP issued a solicitation for up to 2,000MW of offshore wind. A bid from Vineyard Wind was selected to provide the equivalent of 14% of the state's electricity supply, representing the largest purchase of renewable energy in Connecticut's history. The project, known as New England Wind (formerly Vineyard Wind South), is slated to more than double the amount of new zero-carbon renewable energy procured by DEEP to date.

- New England Wind: New England Wind project, reported above, will serve both Connecticut and Massachusetts.

- Revolution Wind: The Revolution Wind project, reported above, will serve both Connecticut and Rhode Island.

Following its acquisition of Deepwater Wind, Ørsted also committed to a suite of investment projects in Connecticut. On February 26, 2021, Ørsted and Eversource, through a joint venture, signed a Host Community Agreement ("HCA") with the City of New London to revitalize the state pier. The HCA is in furtherance of the US$157 million public-private Harbor Development Agreement ("HAD") between the State and the Ørsted-Eversource joint venture to transform the state pier into a modernized, heavy-lift facility.

On December 14, 2021, Governor Ned Lamont awarded US$500,000 to a coalition led by Southeastern Connecticut Enterprise Region ("seCTer") and supported by the Connecticut Department of Economic and Community Development. The funds, distributed pursuant to the American Rescue Plan Act's Build Back Better Regional Challenge through the U.S. Department of Commerce's Economic Development Administration, will be used to strengthen local capacity to support Connecticut's offshore wind industry. The coalition proposed six projects to support offshore wind, including plans to diversify and expand the supply chain, provide waterfront industrial sites for development, build a green business park, leverage a replicable workforce development model, support blue tech research, and bring innovative new products to production.

Maine

Maine has seen progress in fits and starts. In 2010, Maine enacted a law directing the Maine Public Utilities Commission ("MPUC") to conduct a competitive solicitation for proposals for long-term renewable energy contracts from one or more deep-water offshore wind energy pilot projects or tidal energy demonstration projects. In July 2013, the MPUC issued a supplemental request for proposals for long-term contracts for deep-water offshore wind energy pilot projects. In February 2014, the MPUC selected New England Aqua Ventus (formerly, Maine Aqua Ventus) for a long-term contract with Central Maine Power Company.

The New England Aqua Ventus project, a joint venture between Diamond Offshore Wind and RWE Renewables, is an approximately 11MW floating offshore wind pilot project under development on a site south of Monhegan Island, Maine. As part of the project, the University of Maine designed a floating concrete semi-submersible hull. The project has received US$10.7 million from the DOE, and is eligible for additional federal funding (up to US$39.9 million) subject to reaching certain development milestones.

The Central Maine Power Company-New England Aqua Ventus PPA was filed with the MPUC in December 2017, but in June 2018 the MPUC voted not to address the contract. In response, in June 2019, Maine enacted a law that directed the MPUC to approve the PPA under the terms agreed to between New England Aqua Ventus and Central Maine Power. On November 6, 2019, in compliance with the new law, the MPUC voted unanimously to approve the PPA and, on December 9, 2019, Central Maine Power Company and New England Aqua Ventus signed a 20-year PPA for the project. According to the most recent status report (from June 2021), New England Aqua Ventus is still targeting a commercial operation date in Q4 2023.

During its 2021 session, the Maine legislature passed two offshore wind bills, L.D. 1619, An Act to Establish a Moratorium on Offshore Wind Power Projects in Maine's Territorial Waters, and L.D. 336, An Act to Encourage Research to Support the Maine Offshore Wind Industry. With the L.D. 1619 prohibition on new offshore wind project in state waters (which extend three miles from shore), Maine sought to preserve state waters for recreation and fishing (as approximately 75% of Maine's commercial lobster harvesting occurs in state waters), and to prioritize the location of offshore wind projects in federal waters in the Gulf of Maine. With L.D. 336, Maine sought to create the first U.S. research area for floating offshore wind by directing the MPUC (upon petition) to negotiate a contract for the purchase of energy from a proposed floating offshore wind research array on the OCS in the Gulf of Maine. On October 1, 2021, the Governor's Energy Office submitted an application to BOEM to lease a 15.2-square-mile area in the Gulf of Maine for a floating offshore wind research site. Maine has again partnered with New England Aqua Ventus to develop this floating offshore wind research array.

Governor Janet Mills also launched the Maine Offshore Wind Initiative in June 2019 to explore the development of floating offshore wind energy in the Gulf of Maine. Since then, Maine has engaged in several offshore wind partnerships, including signing a memorandum of understanding with the United Kingdom to collaborate and share offshore wind research, becoming a member of the National Offshore Wind Research and Development Consortium and joining the Business Network for Offshore Wind. Maine also joined Massachusetts and New Hampshire in a BOEM-sponsored Gulf of Maine Intergovernmental Renewable Energy Task Force to facilitate commercial renewable energy leasing on the OCS in the Gulf of Maine.

Maryland

An early mover in offshore wind nearly 10 years ago, Maryland passed the Offshore Wind Energy Act of 2013 ("OWEA") to encourage offshore wind development. The statute created Offshore Renewable Wind Energy Credits ("ORECs") and authorized the Maryland Public Service Commission ("PSC") to administer a competitive solicitation process for offshore wind projects, with winners selected by the Commission as eligible to make long-term sales of ORECs to meet the State's new offshore wind RPS. Six years later, in April 2019, Maryland passed the Clean Energy Jobs Act ("CEJA") amending OWEA. CEJA revises the State's RPS to provide that at least 50% of the state's electricity supply come from renewable energy by 2030, and establishes a second round of procurements over a three-year period to award OREC eligibility to at least 1,200MW of new offshore wind capacity. As with OWEA, the CEJA procurements must take into account rate impacts to Maryland retail customers, and create opportunity for local, small, minority, women-owned, and veteran-owned businesses by requiring developers to enter into community-benefit agreements. Winning projects must provide local training opportunities for the offshore wind labor force, including pre-apprentice education programs.

The PSC conducted its "Round 1" procurement in 2017, and became the first state to approve OREC eligibility for two commercial-scale projects: U.S. Wind's MarWin project and Skipjack Offshore Energy's (formerly Deepwater Wind) Skipjack Wind Phase 1 project. Both projects have been delayed by the federal permitting process.

The PSC's "Round 2" procurement under CEJA opened in December 2020 requesting proposals for Year 1. On December 17, 2021, the Maryland PSC approved OREC eligibility to two additional commercial-scale projects—Momentum Wind and Skipjack Wind Phase 2. Both are expansions of the two Round 1 projects and will be located within the same lease areas as the Round 1 projects. Each of the developers had offered multiple size configurations for these projects, which were submitted as mutually exclusive bid proposals, and the Maryland PSC selected the 808.5MW option for Momentum Wind and the 846MW option for Skipjack Wind Phase 2. As part of their commitments for their Round 1 projects, U.S. Wind and Skipjack would make investments in port infrastructure and Operations and Maintenance ("O&M") bases. Additional commitments made as part of the Round 2 projects include additional port infrastructure and O&M base investments, and also investments in Maryland-based component manufacturing facilities including: a cable array and tower manufacturing facilities by Skipjack, and a monopile manufacturing facility by U.S. Wind.

- MarWin and Momentum Wind: U.S. Wind executed two commercial leases for wind projects with BOEM in December 2014, and subsequently merged those into a single agreement. The lease is part of BOEM's Maryland OCS leasing activities. In Round 1, the PSC selected U.S. Wind's MarWin proposal for a 250MW project approximately 17 miles offshore Ocean City expected to generate approximately 913,845 ORECs per year for 20 years. BOEM has since approved U.S. Wind's site assessment plan in May 2021, and allowed U.S. Wind to install a meteorological buoy. In Round 2, Year 1, the PSC selected U.S Wind's Momentum Wind proposal for an 808.5MW project consisting of 55 turbines that will be located between 15 and 22 miles offshore. Momentum Wind is expected to generate approximately 2,513,752 ORECs per year for 20 years.

- Skipjack Wind: Skipjack has a lease with BOEM after receiving an assignment of a portion of the GSOE I, LLC lease. This lease is part of BOEM's offshore Delaware OCS leasing activities. In Round 1, PSC selected Skipjack's proposal for a 120MW project to generate up to 455,482 ORECs per year for 20 years. Skipjack Wind Phase 1 will be located approximately 19.5 miles offshore Maryland and 26 miles from the Ocean City Pier. In Round 2, the Maryland PSC selected a Skipjack Wind Phase 2 proposal to construct an additional 846 MW of nameplate capacity that will be located approximately 20 miles off the coast. Skipjack Wind Phase 2 is expected to generate approximately 3,279,207 ORECs per year for 20 years.

As noted above, both of the Round 1 projects have experienced delays. In November 2019, the PSC issued an order restating the regulatory requirement of projects to provide public notice of changes or delays to the expected commercial operation date. Currently the MarWin project is expected to reach commercial operation in 2023. Skipjack Wind Phase 1 and both of the Round 2 projects are expected to begin commercial operation in 2026.

Massachusetts

Massachusetts has been an early mover in the offshore wind space, but its progress had been mixed until recent years. The 468MW Cape Wind project offshore Martha's Vineyard received its BOEM lease in 2010, the first federal offshore wind commercial lease in the United States. But the project encountered substantial opposition from local stakeholders. National Grid and NStar ultimately terminated their power purchase agreements ("PPAs") with the project in 2015. The project is dead as it has surrendered its BOEM lease. Since that time, Massachusetts has redoubled its focus on offshore wind in this region by providing long term contracts for offshore wind energy.

Massachusetts and the U.S. government have increased their focus on offshore wind in this region in recent years. In 2016 Massachusetts restarted the push for offshore wind in 2016 pursuant to An Act Relative to Energy Diversity that encouraged utilities to procure up to 1,600MW of offshore wind by 2027. This initiative was later expanded in 2018 through An Act to Advance Clean Energy to 3,200MW by 2035, and then again in 2021 under An Act Creating a Next Generation Roadmap for Massachusetts Climate Policy to 5,600MW by 2035. Separately, in December 2018, BOEM conducted a lease sale for 390,000 acres offshore Massachusetts. Eleven companies participated in the auction. The winning bids totaled a record-breaking (at the time) US$405 million from Equinor Wind U.S., Mayflower Wind Energy, and Vineyard Wind.

To date, Massachusetts Department of Energy Resources ("DOER") and the local electric utilities have selected, through three competitive solicitation processes, four offshore wind projects totaling about 3.2GW of capacity. Procurements commenced in 2017 when the Massachusetts utilities in coordination with DOER issued their first solicitation for long-term contracts for up to 800MW of offshore wind proposals. In May 2018, the electric utilities and DOER selected Vineyard Wind, an 800MW project jointly developed by Avangrid and Copenhagen Infrastructure Partners. The selection was subject to approval by the Massachusetts Department of Public Utilities ("DPU"), with approval secured in April 2019. Vineyard Wind's goal was to begin commercial operations in 2021, but the project's commercial operation date is delayed to 2023. As part of the DPU's approval, Vineyard Wind committed to investing US$15 million in a fund that will promote the use of battery storage in low-income communities and further the development of energy storage across the commonwealth.

On May 23, 2019, Massachusetts and the electric utilities issued a second solicitation for offshore wind. Bay State Wind, Vineyard Wind, and Mayflower Wind submitted bids to this solicitation. In October 2019, the DOER and the utilities selected Mayflower Wind as the winning bidder with 804MW of offshore wind capacity with a planned commercial operation date by January 1, 2027. The DPU approved the PPAs on November 5, 2020.

In May 2021, the DOER and the electric utilities issued a third solicitation for offshore wind. Under this solicitation, all proposed projects must have a commercial operation date by January 1, 2030. Bids were due in September 2021. Both Mayflower Wind (a 400MW project) and Vineyard Wind (a 1,200MW project) were selected. PPAs for these winning bidders are expected to be submitted to the DPU in April 2022.

- **New England Wind:** New England Wind (formerly referred to as Vineyard Wind South) is within lease area OCS-A-0534 covering 101,590 acres, adjacent to the Vineyard Wind 1 project in Vineyard Wind's lease area OCS-A-0501, located offshore Massachusetts. The New England Wind Project is being developed in two phases. Phase 1, also known as the 804MW Park City Wind Project, will be developed immediately southwest of Vineyard Wind 1. Phase 2, called Commonwealth Wind, would deliver 1,200 to 1,500MWs of power. The project is planned for construction southwest of Phase 1 and would occupy the remainder of the Southern Wind Development Area. On June 30, 2021, BOEM published a notice of intent to prepare an EIS looking at environmental impacts associated with the New England Wind lease. A phased development Construction and Operations Plan ("COP") was submitted to BOEM on July 2, 2020, proposing the construction of up to 130 wind turbine positions, two to five offshore substations, inter-array cables, up to three onshore substations, and up to five transmission cables for both phases of the project. An updated COP was submitted in November 2021, to incorporate additional cable routing variants for the Phase 2 offshore export cables. In total, the project is expected to add up to 2.3GW of offshore wind capacity.

- **Vineyard Wind / Vineyard Wind 1:** Originally auctioned off in 2015, through a partial assignment in June 2021, Vineyard Wind 1 became the holder of lease OSC-A 0501 now covering 65,296 acres. Vineyard Wind 1 will generate 800MW of electricity. On December 19, 2017, Vineyard Wind 1 submitted its COP for Lease OSC-A 0501 to BOEM, and on May 10, 2021, BOEM issued a Record of Decision for the Vineyard Wind 1 COP. This was following a lengthy delay of the final EIS for the Vineyard Wind 1 in order to conduct a "cumulative impacts analysis" due to the agency determining that the draft EIS did not fully address the scale of offshore wind buildout that DOI now considers reasonably foreseeable. On July 15, 2021, BOEM approved Vineyard Wind 1's COP.

  Separately, in 2018, Vineyard Wind was a winner an auction round for lease OCS-A 0522 covering 132,370 acres.

- **Mayflower Wind Energy:** Mayflower is the holder of lease OCS-A 0521 covering 127,388 acres that was auctioned off in 2018. On May 26, 2020, BOEM approved the SAP for Mayflower Wind energy, and Mayflower Wind Energy submitted a COP in October 2021. On November 1, 2021, BOEM issued a notice of intent to prepare an EIS looking at environmental impacts associated with the Mayflower project's COP. BOEM expects to request public comments on a draft EIS for Mayflower Wind in January 2023 with a final EIS published for public review by September 2023.

In October 2021, the DOE issued a US$3.3 million grant to Coonamesset Farm Foundation and Partners in East Falmouth, Massachusetts, for it to survey changes in commercial fish and marine invertebrate populations and seafloor habitats at an offshore wind development site on the East Coast.

New Jersey

After a long hiatus, New Jersey has taken substantial steps forward to develop significant offshore wind capacity. By executive order in January 2018, Governor Phil Murphy directed state agencies, including the New Jersey Bureau of Public Utilities ("BPU"), to move towards deploying 3,500MW of offshore wind energy projects by 2030. Then, in May 2018, the New Jersey legislature passed the Clean Energy Act codifying the governor's 3,500MW target. In 2019, that target increased to 7,500MW by 2035 by virtue of another executive order signed by Governor Murphy. Also in 2019, the New Jersey Legislature passed legislation that included a definition for "open access offshore wind transmission facilities" and authorized the BPU to conduct competitive solicitations for these transmission and related interconnection facilities. In September 2020, the BPU finalized a strategic plan for achieving the 7,500MW of offshore wind by 2035, which included a recommendation for collaboration with PJM Interconnection, L.L.C. ("PJM") to study and develop adequate transmission infrastructure to accommodate these projects.

The BPU has thus far administered two rounds of competitive solicitations for offshore wind generation projects, awarding OREC eligibility to 1,100MW of offshore wind capacity at the conclusion of the first solicitation in 2019, and another 2,658MW of capacity at the conclusion of the second solicitation in 2021. The BPU anticipates it will release its third solicitation by January 2023 for at least another 1,200MWs. In order to support the offshore wind industry, the State's Economic Development Authority has created the New Jersey Offshore Wind Supply Chain Registry, which has attracted 400 registrants to-date and will match investors and project developers with New Jersey-based vendors and equipment suppliers. The State has committed to the first purpose-built New Jersey Wind Port, with target completion expected in late 2023. The facility has the potential to expand to include co-located manufacturing. Offshore wind developers have committed to invest in or order foundations from a monopile manufacturing facility planned for Paulsboro, New Jersey; and will also support nacelle assembly facilities at the New Jersey Wind Port and use the port for marshalling activities.

- **Ocean Wind:** The BPU selected the 1,100MW Ocean Wind 1 project as eligible to generate ORECs in the first competitive solicitation. The project is co-owned and supported by Public Service Enterprise Group, Inc. through its 25% equity interest in the project. BOEM has approved the SAP for Ocean Wind 1, authorized the placement of buoys on the proposed OCS wind farm site, and has initiated the environmental impact review process for Ocean Wind's COP. Commercial operations were initially expected by the end of 2024, but delays in the federal permitting process may require scheduling adjustments. As part of the second round competitive solicitation, in 2021 Ørsted was awarded eligibility to generate ORECs for its 1,148MW Ocean Wind 2 project, which will be located adjacent to the Ocean Wind 1 project.

- **Atlantic Shores Offshore Wind:** Atlantic Shores Offshore Wind is a joint venture between EDF Renewables North America and Shell New Energies U.S. formed to co-develop a lease area acquired from U.S. Wind of approximately 183,000 acres eight miles offshore of Atlantic City. At the conclusion of the second competitive solicitation round, BPU selected the 1,510MW project as eligible to generate ORECs. BOEM has approved the SAP, authorized the placement of buoys, and initiated the environmental impact review process for Atlantic Shores' COP. Atlantic Shores is the provisional winner of one of the newly leased areas located off of New Jersey's coast as part of the recent New York Bight auction.

To address the issue of how to most efficiently provide transmission to offshore wind projects, in November 2020, the BPU requested that PJM consider the State's intent to integrate 7,500MW of offshore wind by 2035 in its regional transmission expansion planning process. This request triggered PJM's State Agreement Approach, which is a supplemental process responsive to state requests to develop transmission investment to support public policy initiatives. New Jersey's request that PJM utilize the State Agreement Approach ("SAA") is the first time the mechanism has been deployed, and will allow the State to evaluate various project options that will fulfill the State's public policy goals to develop offshore wind off the coast of New Jersey.

On December 18, 2020, PJM filed a study agreement between PJM and BPU with the FERC that establishes a process for PJM to study how best to accommodate the anticipated 7,500MW of New Jersey offshore wind projects by 2035. The study agreement further specified that PJM would open a competitive proposal window to solicit project proposals from transmission developers, and after closing the solicitation window, PJM would make recommendations to BPU regarding efficient and cost-effective solutions. FERC accepted the agreement by order in Docket No. ER21-689-000, and on April 15, 2021, PJM opened a 120-day competitive proposal window, which closed on September 17, 2021. On January 27, 2022, PJM filed with FERC an agreement between PJM and BPU that formalizes the terms and conditions that will govern the remaining steps under the SAA process should BPU select one or more projects, as well as terms relating to the assignment of transmission rights and capacity and the interconnection process that will apply to offshore wind generators that are part of the BPU OREC solicitation process. That agreement is pending FERC review.

PJM and the BPU are currently in the process of reviewing the project proposals submitted during PJM's competitive proposal window, and after further discussions regarding the available options, the BPU anticipates that it will conduct a separate competitive bidding process, and will then have the option to select one or more SAA projects. Should the BPU select one or more projects under the SAA, the BPU will have the right to assign transmission capacity provided by the SAA project(s) to offshore wind projects that have been selected through the BPU's OREC solicitation process.

In February 2022, the Bureau of Ocean Energy Management (BOEM) held an auction for six new lease areas in the New York Bight, an area of the Atlantic Ocean Outer Continental Shelf off the coasts of New York and New Jersey. The winning bids for these lease areas amounted to a total of US$4.37 billion. On a per-acre basis, this amount is many multiples higher than BOEM's previous lease auction in 2018 for three lease areas off the coast of Massachusetts.

New York

With five offshore wind projects totaling more than 4,300MW in its pipeline, New York has more offshore wind capacity contracted and under active development than any other state in the country.

In January 2019, New York raised its offshore wind goals dramatically by announcing that the state is targeting the installation of 9,000MW of offshore wind generation by 2035, quadrupling the state's previous target. In July 2020, New York codified this 9,000MW goal in the Climate Leadership and Community Protection Act ("CLCPA"). The CLCPA also directs the state's electricity system to be 100% carbon-free by 2040 and to reduce greenhouse gas emissions 85% below 1990 levels by 2050.

The New York Public Service Commission ("PSC") issued an order on July 12, 2018, establishing a framework for procuring offshore wind energy. The framework follows on the New York State Energy Research and Development Authority's ("NYSERDA") Offshore Wind Master Plan of January 2018. Under this arrangement, NYSERDA serves as the procurement agent for the offshore wind projects and then sells ORECs that load-serving entities ("LSEs") must purchase in order to comply with the renewable portfolio mandate. The PSC determined to add offshore wind generation to the overall Clean Energy Standard and adopted the ultimate goal of 2,400MW by 2030, with 800MW for the initial procurement in 2018 and 2019. On January 20, 2022, the PSC issued its Order on Power Grid Study Recommendations, which modifies future wind energy procurements, seeks detailed plans from Consolidated Edison Company of New York Inc. for a "wind energy interconnection hub", and develops strategies for advanced transmission technology deployment.

NYSERDA issued its initial solicitation for ORECs from one or more offshore wind projects totaling 800MW of generation in November 2018. The solicitation requested base proposals of 400MW of offshore wind generating capacity with a 25-year term and including a transmission proposal for interconnection with NYISO Zone J or Zone K. But bidders were permitted to submit alternative offshore wind proposals. Four bidders responded to the solicitation, and in July 2020, New York announced that it had selected two projects proposals: an 880MW generation capacity from Sunrise Wind and 816MW from Empire Wind (Empire Wind 1).

- Sunrise Wind, which is expected to enter commercial operation in 2025, is located more than 30 miles off the east coast of Long Island. The project will connect to New York's electricity grid at the Holbrook Substation in central Long Island and will fabricate key components for foundations in the Capital Region. The project is will be among the first offshore wind projects in the U.S. to utilize High Voltage Direct Current ("HVDC") transmission technology, which compared to AC technology will reduce the number of cables needed, improve transmission efficiency, and eliminate the need for additional electrical equipment between offshore and onshore converter terminals.

- Empire Wind 1, which is expected to enter commercial operation in 2026, is located approximately 14 miles from Jones Beach State Park in the New York Bight region. It is the first of two phases of the Empire Wind project (see below regarding Empire Wind 2), and will use "quiet" gravity-based foundation technologies to minimize environmental impacts by reducing pile-driving noise. The project will connect to New York's electricity grid at the Gowanus Substation in Brooklyn.

NYSERDA issued its second solicitation for ORECs in July 2020, seeking a generation capacity totaling 2,500MW. Bay State Wind, Equinor Wind, and Vineyard Wind responded to this solicitation. In January 2021, NYSERDA selected Equinor and provisionally awarded its two project proposals: a 1,260MW facility (Empire Wind 2) and a 1,230MW facility (Beacon Wind). NYSERDA estimates that both projects will generate enough energy to power 1.3 million homes and support more than 5,200 direct jobs.

- Empire Wind 2, which is planned to enter commercial operation in 2027, is the second of the two Empire Wind phases. This project will be adjacent to the Empire Wind 1 project and will connect to New York's electricity grid at the Barrett Substation in Oceanside, Nassau County.

- Beacon Wind is located over 60 miles east of Montauk Point and, through an assignment, is the holder of Lease OCS-A 0520 that was auctioned off in 2018. On September 24, 2021, BOEM approved the SAP for Beacon Wind lease; Beacon Wind has not yet submitted a COP. Beacon Wind will be among the first offshore wind projects in the U.S. to utilize HVDC transmission technology. The project is scheduled to enter commercial operation in 2028.

The Ørsted-Eversource joint venture's 132MW South Fork project is under construction offshore Rhode Island and Massachusetts for delivery into the local electricity grid of the Long Island Power Authority ("LIPA") with the cable landing onshore in East Hampton, New York. In January 2017, the LIPA Board of Trustees approved a PPA to buy energy from South Fork project and is expected to begin operation in the second half of 2023. The project will include 12 wind turbines that will be located out of sight from the East Hampton beaches. The project has attracted some public opposition and concern, including from community organizations and trade groups.

In January 2021, BOEM issued a draft environmental impact statement ("EIS") for the South Fork project. During the comment period, the agency hosted three virtual meetings regarding the project. BOEM issued the final EIS ("FEIS") in August 2021. The FEIS noted that the cumulative adverse impacts of the project on commercial fisheries would be "major," while yielding only "minor to moderate" economic benefits to the area. BOEM announced its final approval of South Fork's Construction and Operation Plan in January 2022, clearing the way for construction to begin.

Also in January 2022, Secretary of the Interior Deb Haaland announced that BOEM would hold a wind energy auction of six lease areas in the New York Bight area. BOEM pared down a 1.7 million acre call area by 72% to 488,000 acres to avoid conflicts with ocean users (including commercial fishers) and minimize environmental impacts. On February 23, 2022, the auction closed after sixty-four rounds, drawing competitive winning bids from six companies totaling approximately US$4.37 billion. The leases include new stipulations that aimed to promote developing U.S. supply chains for offshore wind construction, and demand wind developers engage with the commercial fishing industry, other ocean users, underserved communities, and tribes.

Governor Kathy Hochul also announced in January 2022 a third OSW procurement that is expected to result in at least 2,000MW of new capacity. NYSERDA will couple this procurement with US$500 million of investments in the ports, manufacturing, and supply chain infrastructure to support New York's offshore wind industry. Governor Hochul also announced a New York State Cable Corridor Study that will identify potential cable corridors and interconnection points that minimize the onshore and ocean floor impacts of transmission.

New York City itself is also looking to become a player in the OSW industry. In January 2021, then-Governor Andrew Cuomo announced that the South Brooklyn Marine Terminal would become a new wind turbine assembly plant partially funded by the state. The turbines built there would be shipped to the Beacon Wind, Sunrise Wind, and South Fork Wind projects. In December 2021, the project received a US$25 million grant through the Maritime Administration's Port Infrastructure Development Program.

And in September 2021, Mayor Bill de Blasio and the New York City Economic Development Corporation ("NYCEDC") announced a 15-year, US$191 million Offshore Wind Vision plan. The plan envisions the construction and operation of 12GW of OSW by 2035, leading to 8,000 to 13,000 jobs. NYCEDC hopes to make OSW a priority public-private investment area through its Public-Private Impact Initiative Request for Expressions of Interest.

New York has also made environmental and energy equity a central part of its OSW development strategies. For instance, New York City's plan calls for 40% of the job and investments from its OSW development to be directed toward women, minority, and environmental justice communities.

North Carolina

There have been no legislative initiatives in North Carolina designed to facilitate the development of the state's offshore wind resources. Despite this, Avangrid Renewables entered into a lease with BOEM in 2017 for offshore wind development in the Kitty Hawk wind resource area and is evaluating options for up to 1,500MW of offshore wind. On July 26, 2021, Avangrid Renewables, through its subsidiary Kitty Hawk Wind, LLC submitted a Construction and Operation Plan for the Project. On July 30, 2021, BOEM issued a notice of intent to prepare and EIS for the Project.

On September 26, 2019, the North Carolina Department for Environmental Quality ("DEQ") issued its Clean Energy Plan. The plan identifies offshore wind as a resource for achieving its renewable energy goals and calls for the DEQ to evaluate potential legislative options to support and foster offshore wind development in the state. More recently, on June 9, 2021, Governor Roy Cooper issued Executive Order No. 218 "Advancing North Carolina's Economic and

Clean Energy Future with Offshore Wind." Among other things, the Executive Order established Offshore Wind Procurement Targets of 2.8GW of offshore wind energy resources by 2030 and 8GW by 2040.

On October 28, 2021, BOEM announced a proposed lease sale for 127,865 acres in the Carolina Long Bay area offshore of North and South Carolina. According to BOEM, this area has the potential to provide over 1.5GW of offshore wind energy. Public comments on the proposed notice of sale were due on January 3, 2022. Interested bidders were also required to submit materials demonstrating their qualifications on that same date. Once BOEM has considered the public comments, it will issue a final notice of sale that establishes the final auction format, the list of qualified bidders, and the date of the auction, which is likely to occur later this year.

Importantly, the leases for this area must be entered into prior to July 1, 2022 when a 10-year moratorium on offshore energy leasing instituted by the Trump administration takes effect. In an April 8, 2021 letter to BOEM, a bi-partisan group of the North Carolina Congressional Delegation requested that take all available measures to remove the impending moratorium. Soon thereafter, on April 16, 2021, Representatives Ross (NC-02) and Tonko (NY-20) introduced the Restoring Offshore Wind Opportunities Act which would reverse the Trump administration moratorium and allow BOEM to issue leases for offshore wind development in the previously affected areas. This bill remains in committee.

Oregon

Oregon has also been identified as an ideal location to realize the Biden administration's offshore wind goals. The winds blowing off the Oregon coast are some of the strongest in the nation and hold significant energy production potential. Like California, the steep drop-offs along the continental shelf off the Oregon coast will likely require floating foundations for developing offshore wind. Offshore wind nicely complements Oregon's existing energy mix; strong late summer and fall winds can augment hydropower when water is least available and compensate for reduced solar generation during cloudy Pacific Northwest winters when heating demands significant energy loads.

Oregon's current energy infrastructure is well-positioned for offshore wind development. A study by the Pacific Northwest National Laboratory found that 2-3GW of energy from winds off the Oregon coast could be carried by existing transmission lines and could power approximately 1 million of the 1.8 million homes in Oregon—a significant amount of clean energy for the state.

Oregon House Bill 3375, effective September 2021, initiated planning for development of up to 3GW of offshore wind energy projects within federal waters off the Oregon Coast by 2030. The bill requires the Oregon Department of Energy ("ODOE") to develop a legislative report by September 15, 2022 identifying the benefits and challenges of developing and integrating up to 3GW of floating offshore wind. The bill calls for broad stakeholder engagement during the development of the report, and public meetings are expected over the course of this year.

On October 14, 2021, Oregon senators Jeff Merkley and Ron Wyden announced a US$2 million grant to Oregon State University to study potential impacts of offshore wind development on seabirds and marine mammals in order to develop density maps of species existing in prospective wind energy development areas off the West Coast for the purpose of better evaluating potential impacts of offshore wind developments on such species. This preliminary work is expected to assist the federal Department of Energy with siting offshore wind facilities to minimize environmental impacts.

BOEM coordinates planning for offshore leasing and development activities in Oregon through the BOEM Oregon Intergovernmental Renewable Energy Task Force, a partnership between state, local, and tribal government members and federal agencies that provides a forum for stakeholder input, information exchange, and collaboration. The Task Force held its annual meeting on October 21, 2021, and updated the timeline for announcing lease areas in Oregon's Outer Continental Shelf to the third quarter of 2023, and discussed the ongoing process to identify those lease areas. The Task Force held its next meeting on February 25, 2022 to discuss proposed lease areas. In partnership with BOEM, the Oregon Department of Land Conservation and Development, developed the Oregon Offshore Wind Mapping Tool to provide public access to the best available data for offshore wind planning.

Rhode Island

Rhode Island has led offshore wind energy development with the first operational offshore wind project at Block Island. In 2009, Rhode Island passed the Long-Term Contracting Standard for Renewable Energy that remade the State's RPS program and directed that the state's electric utility enter into long-term contracts with a 10MW offshore wind demonstration project at Block Island and, if the demonstration project was successful, a second 150MW utility scale offshore wind project.

- **Block Island:** Deepwater Wind developed and deployed the first offshore wind farm in the United States, a 30MW project with five turbines. Block Island, which entered commercial operation in December 2016, is now owned by Ørsted. Unlike other offshore wind projects, Block Island is located in state waters, although the transmission line from the turbines to the shore crosses BOEM OCS lands and required a federally approved right-of-way ("ROW").

- **Revolution Wind:** Revolution Wind is a 50/50 joint venture between Ørsted and New England utility Eversource. 400MW of the project is committed to Rhode Island and 304MW is committed to Connecticut. The project will be located in federal waters at lease area OCSA-0486 offshore Rhode Island and Massachusetts, about 17 nautical miles south of Rhode Island. In April 2021, BOEM published a Notice of Intent to Prepare an EIS. Revolution Wind has submitted its COP in March 2020, which is under reviewed by BOEM. The project is well into federal and state siting processes and expects to receive final siting approvals in the second half of 2023. If approved, Revolution Wind would be allowed to construct and operate a 704MW wind energy facility, with commercial operation expected in 2025.

Since 2019, Ørsted and Eversource have been taking steps towards transforming Rhode Island's Providence Port into a regional U.S. offshore wind construction hub by setting up a foundation component factory. The new factory will be used for fabrication and assembly of foundation platforms for Ørsted and Eversource's joint venture offshore wind projects serving Rhode Island, Connecticut, and New York. In total, Ørsted and Eversource are investing a combined US$40 million at Providence Port and Quonset Point in North Kingston, Rhode Island, to support offshore wind development.


Rampiom Offshore Wind Farm - Courtesy of Kent

Texas

Offshore wind may be coming soon to the Lone Star State. The Gulf of Mexico provides unique advantages for developing offshore wind projects, including existing offshore infrastructure, technical energy expertise, high wind capacity, and shallow waters. According to a 2016 National Renewable Energy Laboratory report, the Gulf of Mexico accounts for 25% of technical offshore wind energy potential in the United States. According to some reports, Texas has enough potential offshore wind capacity to meet—and exceed—the state's current electricity demand.

As part of the Biden administration's goal of deploying 30GW of offshore wind energy by 2030, the DOI has studied numerous new sites for offshore wind projects, including in the Gulf of Mexico. Previously, BOEM has identified Port Isabel and Port Arthur in Texas as potential sites for offshore wind projects in the Gulf of Mexico. In June 2021, BOEM published a RFI in the Federal Register to assess commercial interest in offshore wind projects in the Gulf of Mexico Outer Continental Shelf. After the interest demonstrated in response to the RFI, in November 2021, BOEM published a Call for Information and Nominations ("Call") in the Federal Register to further assess commercial interest in wind energy leasing in the Gulf of Mexico. Several prominent energy companies responded to the Call, including Ørsted, RWE Renewables, Avangrid Renewables, Mainstream Renewable Power, and Shell New Energies.

After the Call, several additional steps are necessary before leases can be issued in the Gulf of Mexico. BOEM must conduct an environmental review as per the NEPA and consult with tribes and federal and state agencies regarding the potential environmental consequences of offshore wind projects. In January 2022, BOEM hosted four Gulf of Mexico fisheries workshops. BOEM will evaluate the existing uses of the area, as well as feedback from the public and the Gulf of Mexico Intergovernmental Renewable Energy Task Force (a partnership of state, local and tribal governments and federal agencies tasked with coordinating renewable energy planning activities on the Outer Continental Shelf in the Gulf of Mexico). The BOEM must then decide whether to designate WEA and to publish a PSN, which will describe the area for lease along with proposed lease terms.

Virginia

In 2010, Virginia established the Virginia Offshore Wind Development Authority. The agency is tasked with coordinating and supporting the development of the offshore wind energy industry and supporting project developers and equipment vendors.

Dominion's Coastal Virginia Offshore Wind agreed with Ørsted to develop a small research wind project offshore Virginia Beach (two turbines for 12MW in total). Construction began on July 1, 2019, and the two-turbine research project was completed in September 2020. Legislative changes in Virginia provided that investments such as this were in the public interest and, in November 2018, Virginia's State Corporate Commission approved the project's US$300 million construction cost despite noting that it would not have passed muster under a prudence review.

Dominion also secured an OCS lease from BOEM in 2013. BOEM approved Dominion's SAP in October 2017, including a floating resource assessment wind buoy.

BOEM has executed a series of cooperative agreements with Virginia and BOEM has approved the first wind energy research lease for Virginia.

On September 17, 2019, Governor Northam issued Executive Order No. 43, titled "Expanding Access to Clean Energy and Growing the Clean Energy Jobs of the Future." This Executive Order establishes a goal of 30 percent renewable energy by 2030 and 100% by 2050. The order further identifies Virginia's offshore wind resource as a vehicle for achieving these goals and calls on up to 2,500MW of offshore wind to be developed by 2026. Days after Governor Northam issued the Executive Order, Dominion Energy announced plans for a 2,600MW offshore wind facility off the coast of Virginia Beach. In July 2021, BOEM initiated environmental review of the project.

The Port of Virginia reached an agreement in August 2021, to lease a portion of the Portsmouth Marine Terminal to Dominion Energy to use as a staging and pre-assembly area for the foundation and turbines of the project. Two months later, Governor Northam announced the establishment of the first offshore wind turbine blade facility in the United States. Siemens Gamesa Renewable Energy will lease space at the Portsmouth Marine Terminal to produce turbine blades for offshore wind projects, to include the Coastal Virginia Offshore Wind Commercial Project.


Block Island Offshore Wind Farm - Courtesy of Deepwater Wind

3.0 U.S. Offshore Wind Legal and Financing Framework

3.1 Equipment Supply and EPC

By: Jeff M. Cohen, K&L Gates

Construction of offshore wind projects can be fraught with risk. Offshore wind projects require the mobilization of highly expensive equipment filled with state-of-the-art technology, into some of the most inhospitable areas of the sea. Foundations and cables must be constructed across vast areas of largely unknown seabed subsurface conditions, often while coping with high winds and heavy seas. Massive turbine components must be transported and erected, often in abbreviated seasonal installation windows with favorable conditions. This requires specialized equipment and highly skilled construction professionals. When things go wrong, as things tend to do, solutions are difficult and expensive in terms of both cost and project delay. A careful and thorough identification and allocation of these risks and consequences is vital in the project planning and execution phase. The main vehicle for this risk allocation process is the drafting and negotiation of the suite of project agreements among the various parties for engineering, design, procurement, and construction of the project.

Project documentation for U.S. offshore wind projects will be influenced by both the norms of contracting in the geographic markets where offshore wind has developed (mainly Northern Europe) and the contracting structures that have been well developed in the U.S. onshore wind market. Early projects have offered an interesting mix of forms and processes, which will create some learning opportunities around competing legal, commercial, and financing issues.

European Offshore Contracting Model - FIDIC Forms

Many offshore wind projects in the European market have utilized model forms developed by the International Federation of Consulting Engineers ("FIDIC"). Based in Geneva, Switzerland, FIDIC is a Non-Governmental Organization consisting of 104 national associations of consulting engineers. FIDIC-based contracts are not typically seen in the U.S. construction market, but are widely used outside of the U.S. as the standard starting point for a construction agreement with a fairly balanced risk allocation between the project owner and the contractor. FIDIC has developed and offers for sale, many types of contract forms, including the new "rainbow" suite of Yellow, Red, and Silver books released in December 2017. The latest editions are each approximately 50% longer than previous versions. The most often used version for offshore wind, the Yellow Book, is actually aimed at onshore projects and requires a good bit of revising to accommodate the realities of expensive rig stand-by charges in the event of delay, and the subsea cabling issues regarding unknown conditions, rely upon information, and cable burial performance criteria, to name just a few critical terms.

FIDIC has its own vocabulary and structure, which is not entirely intuitive on first pass, particularly to those experienced with typical U.S.-based engineering, procurement and construction ("EPC") contracts. For example, the milestone that is called "Substantial Completion" is roughly similar to the FIDIC term "Taking Over" but with some material differences. Other terms are less subtle, including that the engineer carries the power and authority to make determinations as a neutral party, and that in many cases claims are time-barred and deemed accepted or rejected on the passage of time without objection.

U.S. Onshore Contracting Model - Bespoke and Vendor Forms

In the United States, due to the fact that wind turbines are the major cost element and are often procured directly by the developer/owner, the dominant contracting structure for onshore wind projects has been for bifurcated contracts. This means that the project owner will contract directly with a turbine vendor for the supply of wind turbines under a Turbine Supply Agreement ("TSA") and then separately contract with a contractor for all site and electrical improvements, including the erection of the turbines under an agreement called either an "EPC Contract" or more correctly a "Balance of Plant ("BOP") Contract." While this bifurcated structure was met with initial skepticism by some owners and lenders, with proper coordination in drafting of the risk interfaces, this structure affords solid risk coverage and is now well accepted by the project finance community. Turbine Supply Agreement ("TSA") forms are typically, but not universally, vendor-generated forms, while BOP Contracts do not follow any standard form, but seem to appear in strikingly similar first drafts from project to project. Unlike what is commonly seen in some international power project contract structures, it is not typical to see a coordination agreement used to tie the TSA and the BOP Contract together.

Turbine Supply Agreements

A typical TSA is heavily driven by the realities of large equipment design, manufacturing, delivery and performance assurance. Vendors often insist on considerable deposit payments and buyer credit commitment upfront and well before delivery to the site. Project cancellation charges are often quite steep, reflecting the difficulty a turbine vendor would have in realizing value for specially manufactured turbines in this fast-moving market. Design certification, typically done by an international organization like DNV, plays a big role in providing guidance to buyers and lenders, and their respective technical advisors on the technical specifications and expected performance. It is not unusual for the buyer and its advisors to conduct factory inspections for a continuing check on the manufacturing quality control and schedule. Delivery terms and transportation arrangements depend on the point of manufacture and the intended project execution plan. With many major components manufactured overseas to the U.S., there are significant issues regarding transit risk of loss, marine cargo insurance, shipping logistics, and risk management in general. Given the continuing uncertainty around U.S. customs and tariffs, negotiations will certainly address this point and clearly define which party controls arrangements and bears this risk. Some agreements sweep this issue into the general force majeure provisions, but better practice is to deal with tariff as a component of pricing for the known situation, and a change in law in the event the requirements change from the time of contracting to the time that equipment arrives at the customs port. Delivery of offshore wind components may or may not involve use of shore side laydown areas; vessels may be used that can both deliver and erect major turbine components.

Typical TSA terms include:

- Delivery Delay Liquidated Damages and Commissioning Delay Liquidated Damages, with subcaps of 10% to 15% of the contract price.
- Overall liability cap of 100% of the contract price, excluding fraud, intentional acts, third-party indemnity and infringement of intellectual property claims.
- Consequential damages are waived (except liquidated damages, intellectual property, and confidentiality).
- Mutual indemnity for third-party claims.
- Steep buyer cancellation schedule.
- Advance payments - as much as 90% paid prior to delivery.
- Credit support for 100% of buyer's payment obligations (via a parent guarantee or letters of credit) and solid credit for turbine vendor.
- Often paired with service offerings and performance warranties.

Balance of Plant Contracts

When paired with a well-drafted TSA, a typical BOP contract for construction and installation of a U.S. onshore wind project is rather more straightforward. It typically, but not always, has a fixed price, contractor provided design, and significant liquidated damages for delay. Many sophisticated onshore wind project developers manage equipment procurement and often design services themselves, which reduces scope and adds owner contract administration duties in pursuit of cost savings. Weather conditions affecting crane operations are dealt with as force majeure above specific operating limits, often with set standby crew rates and an assumed "bank" of pre-compensated wind delay days.

Typical BOP Contract terms include:

- Delay Liquidated Damages with a subcap of around 20% of the contract amount.
- May have interim milestone Liquidated Damages.
- Contractor takes risk of loss of turbine equipment at delivery to substantial completion.
- Overall liability cap of 100% of the contract price, excluding fraud, intentional acts, third-party indemnity and intellectual property claims.
- Consequential damages waived (except for liquidated damages, intellectual property infringement and confidentiality).
- Mutual indemnity for third-party claims.
- Owner has a cover remedy for default termination.
- Credit support for 100% of contractor's obligations.

(parent guarantee, letters of credit and in some cases performance bonds) and for Owner's payment obligations.
- May have construction management elements separated.

Particular Issues for U.S. Offshore Construction Contracts.

Against this backdrop, we expect major U.S. offshore projects to blend the best practices of FIDIC-based European experiences with standard U.S. onshore practices. Aside from differences in terminology between FIDIC and typical U.S. contracts (which will require some acclimatization), there are a number of specialized offshore issues that will require special consideration:

Subsea Cable Systems

The design, manufacturing, and installation of cable systems is a technical and specialized activity that must be treated with care in project contracting. Because the cable routes can be many miles through widely variable and sensitive coastal, nearshore, and offshore seabeds, it is not practical for the cable providers and installers to each expend the resources and time to perform route studies of existing conditions. Rather, such a study is typically done by the project owner/developer, the results of which, combined with other geotechnical and locational information and called "Rely Upon Information," becomes the basis for the cable system providers' contractual expectations. As conditions vary from this expectation in a way that requires a change in methods or that slows production, the cable system provider is entitled to relief in the form of additional time and money. This is preferable to having the cable providers bid much higher prices against the risk of unforeseen and unknown conditions that might not materialize.

Managing cable installation risk can require cooperative efforts during installation. It is not unusual for a representative of the owner, and often an independent engineer, to be onboard the cable installation vessel observing the efforts being expended and the results being achieved. In certain conditions, it can be more economical and just as effective to ease the burial depth requirement in favor of installing cable protection. This is a call best made in the field at the time of installation. This requires a different contractual structure than the often cumbersome and time-consuming change order process.

Use of Marine Warranty Surveyor ("MWS")

Due to the high burn rate for manpower and equipment, the daily costs of project delay and disruption on offshore projects are far higher than for onshore wind projects. As a result, contracting structures need to favor swift notice of problems and expedited problem solving. One way that this can be accomplished is through the use of a marine warranty surveyor. A MWS provides independent technical review during the design and construction process and is often a requirement of construction all-risk insurance. The goal of the MWS process is to review the intended design from a technical and constructability perspective, review processes and systems for compliance with standards and compliance in execution, and to approve the contractor's operations. In some cases, the contractor cannot proceed with the work without the approval of the MWS, and the ongoing operations of the contractor are governed by and must be in compliance with the conditions of such approval.

Indemnity - Knock-for-Knock versus Comparative Negligence

In the international market, particularly with respect to oil and gas construction projects, it is common to see an indemnity scheme called "knock-for-knock." This means that each company is responsible for damages and injuries to its people and equipment, no matter the cause of the injury, damage, or loss. Under knock-for-knock, a contractor will not be liable for damage or injury to the owner's personnel or property, even if caused by the contractor's negligence, violation of law, or breach of contract. These clauses were originally developed to solve the problem that contractors could not accept the staggeringly high risk of loss on offshore oil rig projects with multiple contractors. As a practical matter, the responsible party for a loss or damages is determined not by who is at fault, but by the identity of the claimant or the owner of the property. As a happy by-product, these clauses also streamline the claims process by avoiding messy disputes over which entity was at fault.

In the U.S., knock-for-knock indemnity is not common outside of the oil and gas industry. Further, many U.S. states, at the urging of the construction industry, have enacted statutes that severely restrict the enforceability of indemnity clauses. Typically these "anti-indemnification" statutes state that any clause in a construction contract that purports to require a party to indemnify another party for claims and damages caused by the other party's sole negligence are void and unenforceable. In some states, this applies to comparative negligence claims as well, and a party cannot require the other party to indemnify it to the extent such claim or damage is caused by the first party's negligence. Of course, knock-for-knock indemnity clauses violate this rule, because responsibility is not based on fault, but simply on who was injured or who owns the property damaged. As a result, there is a very real risk that a U.S. knock-for-knock indemnity clause in a construction contract could be ruled void and unenforceable.

U.S. federal maritime law offers a potential solution pathway. Maritime law does not have any anti-indemnification statute or analogous concepts and therefore is receptive to knock-for-knock indemnity. As a result, a contract's indemnity may be enforceable under maritime law, but unenforceable under state law and so disputes are often decided on the otherwise technical procedural question of applicable law. This issue is not settled in all jurisdictions where offshore wind projects are proposed or may be built.

3.2 Interconnection

By: Kimberly Frank, Jennifer Mersing, and David Wang, K&L Gates

Offshore wind projects will have transmission-level interconnections. In the continental United States (outside of the Electric Reliability Council of Texas region), transmission interconnections are generally subject to the jurisdiction of FERC. FERC has adopted standard interconnection procedures, although a public utility may adopt different interconnection procedures in its open access transmission tariff with FERC's approval.

Much of the coastal transmission grid is under the control of FERC-jurisdictional Regional Transmission Organizations and Independent System Operators ("RTOs/ISOs"). ISO New England ("ISO-NE") operates most of the transmission facilities in New England; New York Independent System Operator ("NYISO") operates most of the transmission facilities in New York (including Long Island); PJM Interconnection ("PJM") operates most of the transmission facilities in the mid-Atlantic states (including New Jersey); and California Independent System Operator ("CAISO") operates most of the transmission facilities in California. The transmission-owning utilities in RTOs/ISOs have turned over the operational control of their respective transmission systems to the independently operated RTOs/ISOs (with the transmission owners still owning the transmission facilities). The process for interconnection to the systems of FERC-regulated RTOs/ISOs and transmission-owning utilities is set out in their open access transmission tariff.

As part of the interconnection process, RTOs/ISOs and transmission-owning utilities located outside of RTOs/ISOs will identify the necessary upgrades required to accommodate the interconnection of new generation to their transmission system (as well as affected system upgrades that may be required as a result of interconnections on neighboring transmission systems). RTOs/ISOs and transmission-owning utilities located outside of RTOs/ISOs also have the responsibility for planning the expansion and enhancement of their transmission systems.

Overview of the Interconnection Process

Nearly two decades ago, FERC issued a landmark rulemaking, Order No. 2003, to standardize the process for interconnecting generation to the transmission grid. Those processes continue to be used today. Order No. 2003 broadly addressed interconnection issues and adopted pro forma Large Generator Interconnection Procedures ("LGIP") and a Large Generator Interconnection Agreement ("LGIA") to establish the standard terms and conditions by which utilities must provide interconnection service to large generating facilities (defined as facilities with generating capacity greater than 20MW). As a result of Order No. 2003, each transmission provider, including the RTOs/ISOs, were required to adopt the pro forma LGIP and LGIA and to incorporate these documents into their tariff. Next, in Order No. 2006, FERC established pro forma interconnection procedures and a standard interconnection agreement for facilities with a generating capacity of 20MW or less.

Since the issuance of Order Nos. 2003 and 2006, FERC has made several additional reforms to the pro forma interconnection procedures and agreements. While each transmission provider is required to adopt the current pro forma interconnection procedures and agreements, FERC also allows each transmission provider to demonstrate the need for variations from the pro forma to account for regional differences in the operation of their respective transmission systems if the transmission provider demonstrates that the proposed variation is consistent with or superior to Order Nos. 2003 and 2006. FERC has provided RTOs/ISOs with extra flexibility in developing their own interconnection procedures and agreements. Even with these differences, the interconnection process generally follows the same main steps, including:

- **Application/Interconnection Request:** Prospective interconnection customers must submit an application or interconnection request to the applicable transmission provider. Some transmission providers have implemented a cluster queue process in which the transmission provider will only accept interconnection requests during certain periods of time each year. The application must include standard information about the project, along with an interconnection study deposit, which will be applied to costs incurred by the transmission provider to administer the necessary interconnection studies. In addition, some transmission providers have required that site control and other readiness milestones (or, in the alternative, increased deposits) be demonstrated at the time the interconnection request is submitted. The applicant will be assigned a queue position based on the timing of the request — with earlier queued projects generally having priority over later queued projects (and, for transmission providers that utilize a cluster queue process, projects in the same cluster having equal priority).

- **Scoping Meeting:** After the transmission provider notifies the customer that its application is complete, valid and ready for study, the transmission provider will schedule a scoping meeting with the interconnection customer and the transmission owner of the interconnecting system (if in an RTO/ISO). The purpose of the scoping meeting is to discuss general preliminary information such as commercial operation dates, alternative interconnection options, and transmission data that would reasonably be expected to impact such interconnection options. information such as commercial operation dates, alternative interconnection options, and transmission data that would reasonably be expected to impact such interconnection options.

- **Feasibility Study:** Next, the transmission provider will conduct a series of studies, beginning with a feasibility study that will identify the transmission upgrades, cost estimates, and construction schedule for the project. For projects in a cluster queue process, a combined feasibility study is generally conducted for all or part of the projects in the clusters. Each study is designed to provide increasing levels of accuracy on the estimated costs and timing required to interconnect the generation project to the grid. The goal is to provide the customer with increasing levels of information regarding the cost of the facilities from which the customer can evaluate the economics of moving forward in the process. The feasibility study provides a preliminary snapshot of these estimates. The interconnection procedures contain timing estimates for the transmission provider to complete those interconnection studies, but those estimates are not binding and the timeframe for completing the studies is frequently delayed. Restudies may also be required if a higher queued project drops out of the interconnection queue.

- **System Impact Study:** The system impact study further assesses the capability of the transmission system to support the requested interconnection. As with the feasibility study, for projects in a cluster queue process, a combined system impact study is generally conducted for all or part of the projects in the clusters. The study provides further refinement of the cost and length of time that would be necessary to implement the interconnection. To move onto the system impact study phase, an interconnection customer may have to demonstrate site control or other readiness milestones for the proposed generation facility and/or provide additional financial deposits.

- **Facilities Study**: Finally, the transmission provider will conduct a facilities study, which determines the estimated cost and timing of the equipment, engineering, procurement, and construction work (including overhead) needed to connect the project to the grid. It also determines the upgrades or modifications needed at the point of interconnection and provides a more precise level of cost and timing for the interconnection. Even for projects participating in a cluster queue process, the facilities study will generally be individual to the project. To move onto the facilities study phase, an interconnection customer may have to demonstrate certain readiness milestones for the proposed generation facility and/or provide additional financial deposits.

- **Draft Agreements:** Once the necessary studies are completed, the transmission provider will prepare either a draft interconnection agreement and/or construction service agreement that outlines the necessary provisions such as the scope of work, construction schedule, payment schedule, and capacity connection rights. The interconnection agreement (which is based on the pro forma interconnection agreement in the transmission provider's tariff) includes project specific information such as cost estimates, timeline for interconnection, and operation and maintenance of the interconnected facilities. The interconnection agreement also has financial security requirements to account for the transmission owner's costs to construct required upgrades and interconnection facilities, which are often due within a short period after execution of the contract. After completing construction, the RTOs/ISOs or transmission owner will test the new facilities to ensure conformance with the relevant terms and conditions set forth in the relevant tariff. The interconnection customer is generally responsible for the costs of the upgrades necessary to accommodate the interconnection of its generation facility (although the interconnection customer may be entitled to reimbursement, in the form of cash, transmission credits, or financial transmission rights, for certain of the upgrade costs).

Interconnection Considerations for Project Developers

Interconnection Study Process Delays

Due to the locations of offshore wind projects, significant interconnection facilities and transmission system upgrades (both on the interconnecting utility's system and potentially on neighboring systems) may be required to interconnect such projects to the transmission system, particularly in areas with limited capacity on existing transmission infrastructure. While there may be opportunities for the developer to recoup some of the costs of transmission network upgrades, project-specific interconnection facilities will be borne solely by the developer. Developers will need to take into account the potentially significant costs necessary to interconnect a project and the timeframe for construction of such upgrades when determining the viability of a project.

In addition, the timing and cost of interconnection also may be affected by changes to the scope of a project or in the event that earlier-queued projects drop out of the interconnection queue. Models used in the study process to develop cost estimates for a particular project are based on the assumption that all earlier-queued projects will be placed into service and pay for their respective system upgrades. Because transmission is "lumpy," later queued projects will likely benefit from these upgrades. However, to the extent that earlier projects drop out of the interconnection process, a developer may be required to fund more upgrades than first expected. Any change to the scope of the project, including increasing the capacity of the project or changing the project's point of interconnection, may reset that project's position in the interconnection queue. Moving to the back of the interconnection queue also could lead to delays or additional costs. Some transmission providers also impose financial penalties on interconnection customers for withdrawing from the interconnection queue.

Developers should also take into account the time required to complete the interconnection study process. As outlined above, the interconnection process involves a number of comprehensive studies that must be completed prior to executing an interconnection agreement. The level of costs and studies required for the interconnection service are impacted by the type of services provided. The RTOs/ISOs and many transmission providers offer different levels of interconnection service for those customers that seek to provide capacity service versus those customers who want to provide energy-only service. These higher levels of interconnection often require more in-depth analysis of the interconnection request that results in more upgrades and higher costs.

Developers should expect delays in the interconnection study process. FERC has undertaken reforms to the interconnection process to attempt to make it more streamlined and more transparent, but it can still take years for a project to move through the process. RTO/ISO queues are experiencing significant backlogs and some have announced delays or freezes to their interconnection queues. In late 2021, FERC approved CAISO's request for study delays for new entrants to the CAISO queue due to the massive influx of interconnection requests in Cluster 14 totaling about 150GW of potential new capacity. FERC also approved CAISO's request to delay the Cluster 15 application request window from April 15, 2022 to April 15, 2023. PJM is considering interconnection study reforms that would follow a first-ready approach, a proposed interim period with a two-year delay for projects already in the interconnection queue, and deferral on new interconnection requests until the end of 2025.

Transmission Planning for Public Policy

FERC's landmark Order No. 1000, issued in July 2011, adopted transmission planning and cost allocation reforms for RTOs/ISOs and other public utility transmission providers. Order No. 1000 requires public utility transmission providers to incorporate procedures into local and regional transmission planning processes that will identify and evaluate transmission needs driven by public policy requirements established at either the state or federal level, as well as solutions to meet those needs. FERC specifically highlighted the need to identify transmission solutions that would cost-effectively integrate location-constrained renewable resources to meet renewable portfolio standards adopted by states, and, more broadly, encouraged states to take an active role in identifying public policy transmission needs and potential solutions.

Separate from Order No. 1000's transmission planning processes, FERC has recently clarified that states and others may enter into alternative voluntary agreements for the development of new transmission projects to support public policy goals, such as interconnecting offshore wind projects. On June 25, 2021, FERC issued a policy statement in Docket No. PL21-2-000 addressing state efforts to develop transmission facilities through voluntary agreements. The policy statement explains that voluntary agreements can facilitate the development of transmission facilities by providing states with an alternative to the Order No. 1000 transmission planning process for public policy projects. FERC issued the policy statement to dispel concerns that voluntary agreements may run into conflict with the Federal Power Act and the commission's open access transmission regulations, and to confirm that Order No. 1000 accommodates the voluntary negotiation of alternative cost sharing arrangements. For example, PJM and ISO-NE each have cost sharing arrangements that permit states to voluntarily plan and pay for transmission facilities that will enable the states to achieve their public policy goals. PJM's mechanism is called the State Agreement Approach ("SAA"), and ISO-NE's mechanism is the Voluntary Agreement approach.

In 2020, New Jersey became the first state to use PJM's SAA procedure, and it requested that PJM begin a request for proposals process to evaluate transmission solutions in order to interconnect planned offshore wind projects that will be located off the coast of New Jersey. The solicitations window closed in September 2021, and PJM and the New Jersey Board of Public Utilities ("NJ BPU") are now reviewing those proposals. The NJ BPU is expected to make a decision whether to move forward with one or more proposals later in 2022.

Interconnection Reforms Under Consideration

As mentioned above, there are sizable delays in interconnection queues across the country. While various RTOs/ISOs and transmission providers have sought (and will continue to seek) to implement interconnection queue reform on a market-specific basis, FERC is also reviewing its current pro forma interconnection regulations in an effort to improve the process. Acknowledging the interconnection queue backlog, FERC, in July 2021, issued an Advanced Notice of Proposed Rulemaking ("ANOPR") to evaluate potential reforms to improve the electric regional transmission planning and cost allocation and generator interconnection processes. The ANOPR, titled Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection, is docketed as RM21-17-000. Many entities submitted comments in response to the ANOPR with proposals for interconnection reform, which are currently under review by FERC. But, due to the length of the FERC rulemaking process and the subsequent rounds of compliance filings, comprehensive interconnection reform is likely still many years away.

Considerations for Interconnecting Offshore Wind Projects - FERC Approvals for "Waivers" of Tariff Requirements

The FERC-approved tariff procedures setting out the interconnection process include strict project development timelines and performance milestones for the developer. The inability of an offshore wind project to meet those tariff requirements can result in the loss of a valued queue position, i.e., removal from the interconnection queue. It is important to understand that the RTO/ISO or transmitting utility does not have unilateral authority to change deadlines, so unless its tariff provides that authority, FERC approval is required. In these circumstances, an offshore wind project may consider petitioning FERC to request a waiver of tariff requirements. Such waiver requests should be made on a prospective basis. FERC will only grant the request if it finds that the request meets each factor of its four-factor good cause test.

For example, FERC recently granted the waiver request of offshore wind developer Empire Wind to extend the commercial operation date in its interconnection agreement. Empire Wind is developing a 816MW offshore wind project off the coast of New York and anticipates that the facility will achieve commercial operation in December 2026. The terms of the NYISO tariff, however, require that Empire Wind adopt a commercial operation date of no later than June 14, 2025.

In October 2021, Empire Wind submitted a waiver request to FERC for a limited, prospective waiver of the NYISO tariff requirements so that its interconnection agreement would accurately reflect the estimated commercial operation date of the project. Empire Wind requested that: (1) June 14, 2025, be listed as the milestone date by which Empire Wind's interconnection facilities are expected to be energized and placed in service, (2) December 24, 2026, be listed as the commercial operation date milestone for the project, and (3) Empire Wind could extend those milestone dates subsequent to the execution of the interconnection agreement by demonstrating to NYISO that it has made reasonable progress on the milestones (as provided for in the NYISO Tariff). Empire Wind noted that it satisfied all four factors historically considered by FERC when evaluating tariff waiver requests.

NYISO submitted comments indicating that did not oppose Empire Wind's waiver request, but noted that its acceptance of a waiver in this case should not be construed as having any impact on the applicability of tariff requirements to other projects. FERC granted Empire Wind's request. FERC agreed with Empire Wind was acting in good faith and that the waiver addressed a concrete problem (i.e., avoiding delays of the project). It also noted that, given NYISO's limited acceptance of the request, a waiver would be limited in scope and therefore would not have any undesirable consequences. FERC therefore found no issue with granting Empire Wind's request.

3.3 Power Purchase Agreements

By: Bill Holmes, K&L Gates

A power purchase agreement ("PPA") is a long-term contract between the developer of an offshore wind project and a buyer, sometimes called an "offtaker". The PPA (or PPAs, in some cases) is essential for project financing because it gives investors and lenders a high degree of confidence that they will earn their negotiated return. Although the term of PPAs varies significantly, we expect offshore wind PPAs to have lengthy terms because of the cost to construct and operate the facilities. To date, we are aware only of PPAs for offshore wind where a state or state entity is the power purchaser. Nonetheless, we expect utilities and private parties to become more active in the offshore wind PPA market as the industry matures in the United States. This discussion addresses several of the most material matters in a PPA, but is not exhaustive.

The Power Purchaser, or Offtaker

The power purchaser is either (a) a public utility that is buying the output and/or renewable energy credits from the project to serve its customers, or (b) a non-utility purchaser that is buying the output and/or renewable energy credits generated by the project to meet its voluntary sustainability goals.

In the United States, public utilities come in a number of forms, including investor-owned utilities, municipal utilities, cooperatives and public utility districts. If the utility is also buying the project's output to meet a state RPS, it will require that all renewable energy credits associated with the project's output be "bundled" and sold along with the energy. If the utility is interested only in buying an energy supply at a favorable price, it may allow the seller to "unbundle" the RECs from the energy and retain them for sale to a third party under a separate RECs agreement. The buyer may also bargain for capacity rights and ancillary services produced by the project, although the seller sometimes wishes to retain these services and market them separately.

Over the last several years, a new and growing class of non-utility power purchasers have emerged for wind projects. These buyers are sometimes referred to as commercial, industrial, and institutional ("CI&I") customers and include corporations, universities, hospitals, and other non-utility buyers that want to purchase wind energy to meet zero-emission, renewable portfolio or other corporate sustainability goals. Historically, such buyers have been unable to purchase renewable energy because the utility that supplies their power has an exclusive service territory that legally entitles it to be the sole supplier of the customer's energy. More recently, however, some U.S. states have adopted "direct access" programs that, subject to various limitations, allow CI&I customers to purchase their energy supply from a supplier other than their incumbent utility. Other states have created "green tariff" programs that enable customers to purchase renewable energy from a seller by buying renewable energy from an incumbent utility, which in turn buys the renewable energy from a project developer. However, most CI&I customers procure renewable energy through a "virtual power purchase agreement" ("VPPA"), which is described in more detail below.

Conditions Precedent

The PPA will usually bind both parties as soon as it is signed, but the obligation to perform the PPA for the full term is often qualified by conditions precedent. For example, a utility buyer's obligations are often conditioned on the utility's receipt of an order from its public utility commission that allows it to recover its power purchase costs in the rates that it charges to its customers. For its part, the seller may bargain for a conditions precedent that allows it to terminate the PPA without liability if, for example, it has not obtained by a specified date a final, non-appealable permit, or an interconnection agreement, or a material element of site control. Particularly with respect to offshore wind PPAs, the buyer may require that site control be spelled out as a representation and warranty as of the effective date due to the increased complexity in securing site control off land. In contrast, the CI&I market is very concerned about meeting publicly announced renewable energy procurement or carbon emissions reduction goals, which cause corporate customers to prefer projects that are likely to be completed successfully no later than a specified date. As a result, seller conditions precedent in CI&I PPAs tend to be few in number.

The buyer will be interested in keeping track of project development. Accordingly, the PPA may require the seller to submit monthly or quarterly reports documenting its progress toward commercial operation. The PPA will probably set out "milestone dates" by which certain key events must occur, such as the signing of the project's interconnection agreement; receipt of all permits in final, non-appealable form; financing commitments; notice to proceed deadline and the target commercial operation date. Buyers will often press for more milestone dates to provide greater insight into the project's progress, while sellers (particularly those with an excellent record of completing projects) prefer fewer.

The consequences of a failure to achieve a milestone vary across PPAs. Some agreements treat a missed milestone as a default, but this outcome is disfavored by sellers. The PPA will usually require the seller to post additional security or pay daily liquidated damages if the consequences caused by a missed milestone. The PPA will usually extend milestone dates to the extent that a delay is caused by force majeure, transmission provider delay or buyer default.

Commercial Operation

The PPA will require seller to achieve commercial operation by a specified "target commercial operation date." If it fails to do so, seller is required to pay the buyer liquidated damages, often stated on a dollar per MW basis, for each day that commercial operation is delayed. If commercial operation is not achieved by a "guaranteed commercial operation date," which usually occurs 180 to 365 days after the target commercial operation date, the buyer will have the right to terminate the PPA. In offshore wind PPAs in the United States to date, the project timeline has been substantially longer than onshore wind PPAs because of the developing offshore regulations and longer permitting and development time required.

A PPA will usually provide a mechanism for extending the target commercial operation date and the guaranteed commercial operation date for delays caused by force majeure, buyer default, or the transmission provider's failure to complete interconnection facilities or network upgrades by a specified date. However, the PPA may specify an "outside date" or a "long stop date" beyond which the agreement may not be extended. Due to the relative infancy of offshore wind development in the United States and the substantially larger size and complexity in constructing offshore wind projects as compared to onshore projects, offshore wind PPAs will also allow a longer period of excused delays due to force majeure or by payment of delay damages.

The energy generated by the project after it has been interconnected to the grid but before it has achieved commercial operation is usually referred to as "test energy." If the PPA does not require the buyer to purchase test energy, the seller will sell the test energy for the available market price. If the PPA requires buyer to purchase test energy, the price will usually be discounted relative to the contract rate that comes into effect on the commercial operation date. In CI&I PPAs, buyers usually do not take test energy due to accounting concerns and instead take deliveries of project output and/or renewable energy credits upon the commercial operation date. The contract rate may be fixed for the term of the PPA, or it may escalate over the term.

The seller is motivated to achieve commercial operation as soon as possible in order to avoid paying delay damages, to prevent the buyer from terminating the PPA and (in the case of utility PPAs) to convert the test energy rate into the full contract rate. The PPA will define "commercial operation" by reference to a list of criteria. In general, the project must have obtained all of its permits and must be interconnected to the grid and capable of delivering energy reliably. The commercial operation clause may call for independent engineer certification of specified matters, as well as officer's certificates concerning the status of the project. From the seller's perspective, the criteria for commercial operation should be objective and not left to the discretion of the buyer. The PPA should also provide that an independent engineer will resolve any disagreements between the parties about whether commercial operation has been achieved.

Some PPAs allow the seller to declare commercial operation for the whole wind project if at least 85% to 95% of the project's installed capacity has been interconnected and is capable of reliably delivering energy. The seller will be required to complete the project after declaring commercial operation, and it will be liable for liquidated damages on a per MW basis to the extent that it fails to build the project to its full expected nameplate capacity.

Caps on Pre-COD Damages

The power purchaser wants to incent the seller to build the offshore wind project. One tool for doing that is to recover damages from seller if (i) the project does not achieve commercial operation by a specified date, and (ii) the failure is not excused by force majeure or by the buyer's default. For financing and commercial reasons, the seller should cap its liability to buyer if it is unable to build the project or the project does not achieve commercial operation by a specified date. The PPA's delay liquidated damages clause, the development security clause, and the default clause are usually tied together in a way that makes it clear that seller's liability for a pre-commercial operation date ("COD") default cannot exceed the development security that seller is required to post.

The buyer will be concerned that if seller's liability is capped, seller may have an incentive to "arbitrage" the PPA in order to re-market the project to take advantage of rising power prices. The buyer's concern is usually addressed by including a right of first offer clause, which states that if the PPA is terminated because the project does not achieve commercial operation, whether for seller default or force majeure, the buyer will have the right, for one to three years after the termination occurs, to purchase the output of the project on the terms and conditions agreed upon in the PPA. This "right of first offer" or "ROFO" provision assures buyer that seller will not take advantage of a force majeure event or pre-COD liability cap to remarket the project.

Credit Support

Credit support in U.S. wind PPAs typically takes the form of an irrevocable letter of credit, a guaranty from a creditworthy entity, or cash deposited into escrow. In the United States, utility buyers rarely post credit to support a PPA. PPAs will occasionally provide that if a utility buyer experiences a defined downgrade event, it will have an obligation to post credit support. The credit rating of the utility buyer is thus a very important consideration for the seller and the parties providing financing for the wind project.

CI&I PPAs, in contrast, typically require corporate buyers to post credit support if the buyer does not have, or is unable to maintain, a specified minimum grade credit rating (usually investment grade). Even in cases where buyer credit support is not required upon execution of the PPA, the agreement will usually require the buyer to post credit support if it experiences a downgrade event. Sellers in CI&I PPAs are usually not allowed the option to post cash as collateral because the corporate buyers are not set up to hold the cash or do not want to deal with a cash escrow account. In a CI&I PPA, adequate buyer credit support is very important to project financing.

The developer of a U.S. wind project will usually create a special purpose entity, typically a limited liability company, for each of its wind projects to enter into the PPA as the "seller." Since the seller's credit will not be sufficient to support its obligations to the buyer, the seller will be required to post credit support. The posting may occur in tranches, with one-half being posted upon execution of the PPA or within a certain number of days thereafter, and the other half being posted when buyer has received approval of the PPA from its public utility commission. Seller's pre-COD credit support typically ranges from around US$100,000 to US$200,000 per MW of expected nameplate capacity, and is typically based on the costs buyer will have to incur to find and negotiate another PPA in place of the failed wind project (typically a rough estimate is two years' revenue for the PPA).

In some PPAs, utility buyers ask for a second lien on the project's assets, either in lieu of or in addition to other forms of credit support. Although developers occasionally view a second lien on assets as a low-cost alternative to posting more liquid credit support, second liens are unusual in U.S. wind PPAs. At a minimum, the second lien will result in higher transaction costs and will involve the buyer in the negotiation of an intercreditor agreement with the project's lenders. If at all possible, sellers should just say "no" to a utility buyer's request for a second lien.

PPAs usually distinguish between pre-COD security and post-COD security. Since the project risk is much higher in the development period, the pre-COD security is higher than the post-COD security. Post-COD security levels are typically tied to 12 to 18 months of expected project revenue and may in some cases be subject to adjustment over the term of the PPA, depending upon energy market conditions. PPAs will sometimes, though not often, include a post-COD cap on seller's damages up default and termination of the PPA. Such caps usually distinguish between technical defaults that cause the buyer to terminate (e.g., failure of a guarantor to maintain a required credit rating, or failure to achieve availability or output guarantees), which are subject to the cap, and willful defaults (e.g., a breach involving a sale of project output to a third party), which are never capped. In rare cases, the buyer may ask for a cap on its liability, but such PPAs are challenging to finance, and the seller should avoid agreeing to a buyer liability cap.

Deliveries of Energy and RECs

A PPA for the physical delivery of energy ("physical PPA") will specify the point at which seller will deliver the energy from the project. In a "busbar" sale, the energy will be delivered to the buyer at the project's point of interconnection with the grid. Other PPAs require the seller to deliver energy to a specified point on a transmission system, in which case the seller will be responsible for securing the transmission required to deliver the energy to that point. In organized markets operated by ISOs or RTOs, seller may be required to deliver to a market hub. The seller will in any case bear the costs of building the project's interconnection facilities and network upgrades for which the seller is responsible under the project's interconnection agreement.

Typically, CI&I PPAs are "virtual" or "financially" settled, where the seller does not deliver physical title of the energy to the buyer, but instead delivers the energy into the ISOs or RTOs at the interconnection point (or less commonly at a mutually agreed to point if outside of an ISO or RTO). The parties financially settle for the energy and RECs based on the market price at the nearest trading hub to the project. In these settled VPPAs, the seller will often take basis risk (the price differential between what the seller receives from the ISOs/RTOs at the interconnection point and the price the parties settle for at the hub). Increasingly, parties to VPPAs negotiate basic risk sharing mechanisms to incentivize the seller to keep generating in order to ensure the buyer receives its renewable energy credits, while still allowing seller to manage the financial basis risk.

The PPA will likely require RECs from the project to be delivered to buyer through one of the nine independent renewable energy tracking systems, such as the Western Renewable Generation Information System in CAISO, ERCOT Tracking System in ERCOT, PJM GATs in PJM, Midwest Renewable Energy Tracking System in MISO, or New England Power Pool Generation Information System in ISO-NE. These systems are intended to account for the generation and retirement of RECs and to avoid double counting. Some CI&I offtakers additionally require that RECs be certified or be able to be certified by Green-e, but this trend is decreasing. Green-e RECs may be sourced from projects that are tracked by one of the tracking systems or that, with less frequency, are delivered to buyers by attestations.

Curtailments

The seller usually has the right to curtail the project's output in the case of an emergency, and the seller must curtail the project if so instructed by the transmission provider or another authority having the right to regulate the facility's output. If the curtailment results from a transmission system emergency, transmission system maintenance, or similar circumstances, the seller is usually not compensated for the curtailed energy (although curtailed energy should always be counted toward the fulfillment of any output guarantee). If the curtailment is instructed by the buyer, either directly or through buyer's bidding strategies in an organized market, the seller is usually compensated for the curtailed energy at the contract rate plus a gross up for lost production tax credits, calculated on an after-tax basis. Buyers will sometimes bargain for uncompensated curtailment, and the circumstances that trigger a compensated versus an uncompensated curtailment are often heavily negotiated. Negotiations of basis risk in CI&I PPAs often include provisions around when seller is allowed to curtail (during negative pricing at the project node or settlement hub), and at what cost to seller. These curtailments can also be counted against seller in its availability or output guarantees.

Performance Guarantees

Wind PPAs with utility buyers will usually include an output guarantee under which the seller will be required to pay liquidated damages to the buyer if seller fails to achieve a minimum level of output during a specified period. The liquidated damages are based on the shortfall of actual project output relative to the output guarantee with the price per MWh for liquidated damages often being set by reference to the weighted average of a market price index over the period in question. Output guarantees will sometimes allow the seller to make up the shortfall by delivering make up energy and RECs during the year following the shortfall event.

Output guarantees are often structured to exclude the first year of operation and to be measured over a one-year period or rolling two-year period. The PPA should be drafted so that seller receives credit for energy that could have been generated but was curtailed by the buyer or the transmission provider or that could have been generated but for a force majeure. The seller may also be credited for energy that could have been generated but was not because of a serial defect in the project's equipment (though crediting for serial defects is usually allowed only during the first one to three years of project operation).

Wind PPAs usually include a mechanical availability guarantee, either in lieu of or in addition to an output guarantee. The seller promises that the project's mechanical availability will meet a certain minimum (usually 95% to 97.5%). If it fails to do so, the shortfall in mechanical availability will be converted into a MWh shortfall, which will result in a payment of liquidated damages calculated in a manner similar to that used for an output guarantee. For accounting reasons, CI&I PPAs often include only a mechanical availability guarantee and no output guarantee. Sellers are generally happy to offer only a mechanical availability guarantee since such a guarantee does not expose seller to the risk that the winds at the project are lower than expected.

Force Majeure

A force majeure event will excuse the affected party's duty to perform under the PPA. In the seller's case, a force majeure may function to extend deadlines or to excuse seller's obligation to generate and deliver energy, particularly in connection with a performance guarantee.

A well-drafted force majeure clause will describe events that are definitely considered to be force majeure events, as well as those that are definitely not considered force majeure events. For offshore wind projects, sellers should make it clear that a force majeure event includes not just a storm, but also the time during which the facility must be shut down in anticipation of the storm, as well as the time required to return it to operation. Because of the complexity in repairing and constructing an offshore wind project, offshore PPAs should allow the seller to have substantially more time than onshore projects to be excused from performance obligations under the PPA before the buyer can terminate (without liability).

CI&I Transactions

Offsite CI&I wind PPAs are structured as either "physical" or "virtual" transactions. A CI&I buyer may choose a physical wind PPA when (1) the buyer has a discrete load, such as a data center, that it wants to serve with renewable energy; and (2) it can use retail direct access to deliver the energy to the load. In this case, the buyer or a designated market participant will take title to the energy that the project generates. The energy would then be transmitted to a delivery point on the system of buyer's local utility and delivered to buyer's load by the utility. Physical PPAs are physical, forward contracts that are usually not subject to Dodd-Frank Act reporting requirements.

Although a number of CI&Is continue to enter into physical PPAs, VPPAs, which are also known as synthetic PPAs, are being deployed more frequently. A CI&I buyer may use a VPPA when: (1) it has a distributed load, such as scattered retail outlets; (2) open access is not available to the retail load(s), which means that the load(s) can receive energy only from an incumbent utility; or (3) when projects that could be contracted with a physical PPA are not cost-effective sources of renewable energy compared to those reachable by a VPPA. Even with a VPPA, however, some buyers may require that the project be located in the same market as the load so that the virtual energy is generated and used in the same region.

A VPPA is a "contract for differences," the terms of which may be embedded in the VPPA, set out in a separate long-form swap agreement, or documented as a transaction under an ISDA Master Agreement. The VPPA is also a swap transaction that is subject to Dodd-Frank Act reporting requirements. In such a hedge arrangement, the buyer will purchase the project's output at a "fixed price" and keep all of the associated RECs. The remaining "brown power" will be sold into the market, and a "floating price" will be paid by the seller or an energy manager. The floating price will be subtracted from the fixed price to produce a settlement amount, which is reconciled monthly — if the floating price exceeds the fixed price, seller will pay buyer; if market prices are less than the fixed price, buyer will pay seller. The buyer continues to take and pay for energy from its local utility. At the end of the day, the buyer ends up with a long-term contract that will supply it with RECs from an additional renewable energy project which, ideally, will be located in the same area as the load to be served.

A VPPA depends on the availability of a floating price, so it is typically used only to purchase output from a project located in an organized market, such as an ISO or an RTO. Because such markets sometimes send negative price signals, the buyer does not want to be obligated to settle when the floating price is negative — for example, the VPPA might allow the owner of a wind project to deliver energy into a negative price to capture the production tax credit, but the buyer would not be obligated to bear the cost of the negative price. Similarly, the buyer will want the floating price to be determined at a market hub rather than at a local marginal price ("LMP") node so that the floating price is not set in a more limited, less liquid market that is subject to congestion risk. Sellers will, of course, be concerned about the basis risk between the LMP node and the hub.

CI&I PPAs will typically include protections for the buyer's reputation, which include a representation and warranty as of the execution date of the PPA that no reputational concerns exist at the project, including whether there are any environmental concerns. For example, the buyer will ask for disclosure of any endangered species, avian issues, historically or culturally sensitive areas, and the existence of military facilities. During the term, the seller must also disclose if anything changes with respect to the original status of this reputational representation. The aim of this disclosure is not to dictate how seller owns or operates its wind project, but to ensure that the long- term partnership between the parties has healthy communication such that both parties can anticipate and get in front of any possible reputational media events which may arise with respect to the project.

Accounting issues also play a prominent role in corporate procurement transactions. For example, attorneys familiar with renewable energy PPAs may assume that a buyer will want an output guarantee to incent the seller's performance. However, in the corporate procurement context, an output guarantee will represent a "notional value" that will trigger derivative accounting, an outcome that corporate buyers prefer to avoid. The commonly used alternative is a mechanical availability guarantee that calculates liquidated damages on a percentage of shortfall basis rather than on a per MWh basis, since the latter could be deemed to assign a notional value that requires derivative accounting.

3.4 Financing Offshore Wind Facilities

By: Elizabeth Crouse, Elias Hinckley, Molly Barker, Anthony R.G. Nolan, Buck Endemann, Ken Gish, K&L Gates

Financing any renewable energy project in the United States typically involves a variety of resources from construction and term debt to strategic equity, tax equity, and virtual power purchase agreements. Due to offshore wind's fairly nascent development in the United States, there is even more stress on the financial model than in onshore wind and solar. This is due in part to the very long timeline for development, which increases the need for strategic or risk-tolerant private equity funding, the early stage of the industry, and the additional legal complications of infrastructure development offshore. The cost and complicated nature of offshore wind development also puts pressure on the financial model.

At the same time that interest in offshore wind has surged, we have also observed a surge of public and private interest in financing sustainable technologies and infrastructure. Thus, whereas public bonds and private debt have always been available to a greater or lesser degree, we are now also seeing a trend in sustainability-linked or "green" bonds. We have also observed a surge in corporate energy sourcing, which we expect to continue in the offshore wind sector.

This section begins with a high-level overview of some of the most material financial techniques that are currently used in U.S. renewable energy transactions and may be used in offshore wind as well. (More information about sustainability-focused financial instruments and the rules applicable to them can be found in the K&L Gates LLP ESG Handbook).[1] That discussion is followed by an overview of the most material current U.S. federal and state tax-related incentives. However, as many readers know, the United States Congress has been working toward additional tax-related incentives for offshore wind and other renewable energy technologies. If the U.S. federal and state incentive landscape changes in the near future, we will provide an update to this section!

Material Options for Offshore Wind Financing

A **Virtual Power Purchase Agreement ("VPPA")** is a cash-settled, fixed-to-floating price swap (or a contract for differences) that permits the generator of renewable electricity to hedge volatility in wholesale markets. In a VPPA, the buyer and the renewable energy producer agree to a fixed amount per kWh (the "strike price") that the seller will receive for its delivery of energy into the wholesale market. If the market price per kilowatt of the renewable energy is less than the strike price the buyer must pay the shortfall to the renewable energy producer, while the producer must pay the buyer the difference if the market price is greater than the strike price. The buyer does not receive the physical energy produced by the renewable project, but it does receive the environmental attributes associated with its share of the production. The revenue from a VPPA supports returns to investors in the facility itself and is a key component of the cash flows for many generation facilities. VPPAs are popular with large corporations, particularly in the United States and Europe, because they provide the buyer with environmental attributes that help it satisfy its renewable energy goals while providing upside exposure to renewable energy prices. A VPPA is regulated as a swap under U.S. law, although the RECs and other environmental attributes conveyed by a VPPA are excluded from the definition of swap.

Renewable Energy Certificates ("RECs") are physically settled instruments that represent environmental, social or other non-economic attributes of electricity production using renewable energy resources such as the sun or wind. RECs do not represent any right in the associated power, including any right to share in the proceeds of its sale. A person may purchase RECs from an electricity generator or on various spot or futures markets. Power utilities in some jurisdictions need RECs in order to meet regulatory requirements. RECs are traded under ISDA documentation under a supplement to the ISDA North American Power Annex. As physically settled instruments RECs between commercial market participants are generally not regulated as swaps under U.S. law even if cash settled through book-out transactions that comply with the CFTC's Brent Interpretation.

RECs can be purchased from a variety of sources. Often, RECs are bought and sold under the same PPA (i.e., contracts for the physical delivery of electricity) as the underlying electricity commodity. RECs can also be bought and sold on a bilateral basis, from brokers, utilities, and power generators who "unbundle" the RECs from the underlying power. In the U.S. and around the world, RECs are created, tracked from one entity to another, and retired via REC tracking systems, similar to online bank accounts; this avoids double-counting of the same REC. When an owner "retires" a REC, no one else is able to claim the environmental attributes associated with that MWh of renewable electricity. Use of the REC may include, but is not limited to, (1) use of the REC by an end-use customer, marketer, generator, or utility to comply with a statutory or regulatory requirement, (2) a public claim associated with a purchase of RECs by an end-use customer, or (3) the sale of any component attributes of a REC for any purpose.

Thirty states and the District of Columbia require electric utilities in their regions to deliver a certain amount of electricity from renewable or other clean energy sources. Of these, 20 states and the District of Columbia have adopted an RPS. Utilities in states that have RPS generally purchase RECs through PPAs to comply with the utility's RPS. The standards range and qualifying energy sources vary. The ability to buy and sell RECs in this context makes RECs somewhat similar to a cap and trade system, but the two concepts are not identical. Some states also include "carve-outs" (requirements that a certain percentage of the portfolio be generated from a specific energy source, such as solar power) or other incentives to encourage the development of particular resources. In addition, eight states have voluntary electricity goals, which are generally not legally binding. In contrast, some other states have multiple legally enforceable standards. For instance, Massachusetts has an RPS, a clean energy standard, and an alternative portfolio standard.

[1] *https://www.klgates.com/esgHandbook*

Corporations and other entities not subject to an RPS are called "voluntary" REC purchasers. Many multi-national corporations are currently increasing voluntary REC purchases under both PPAs and VPPAs.

Hedges, swaps, futures, and forwards. To the extent that sustainability transitions require long-term funding, it may be necessary to use hedges to permit market participants to manage price, rate and currency risk, as well as to facilitate transparency, price discovery and market efficiency in the context of the particular markets involved[2].

- In the renewable electricity context, traditional hedges are a key component of cash flow for generation facilities in electricity markets that do not permit sales of power directly to a utility. In addition, a variety of instruments are available to mitigate performance risks, including proxy revenue swaps and balance of hedge contracts, and wind index futures (available in some markets). Renewable energy buyers may also enter into similar types of contracts to mitigate intermittent generation risks.

- Many other industries, notably agriculture and forestry, utilize these types of financial instruments in order to mitigate exposure to market fluctuations and performance risk. In addition, futures in respect of alternative fuels are becoming more popular in futures markets.

Counterparties to private contracts in these and other industries vary somewhat, but banks and strategic industry participants are very common. Nonetheless, hedges may also be affected by the growth of debt products that are described below.

Debt Instruments. There are several categories of debt instruments that are intended to facilitate the development of projects or activities featuring certain sustainability components. These bond instruments typically comply with voluntary process guidelines created by the International Capital Market Association ("ICMA"), the Loan Markets Association ("LMA") or other organizations. While these instruments are fundamentally debt, they are issued by businesses in respect to projects that must meet certain certification requirements and auditing of claims made to support classification under the ICMA standards. Thus, the monikers attached to these instruments may be viewed as a representation that additional steps, including external verification, have been taken to ensure that claims about certain sustainability factors (typically environmental or social) have substance. In many cases, these types of attribute-based instruments feature below-market returns.

These types of debt instruments may be in the form of bonds or loans. Economically, both are similar, but they differ in how funding is raised and how the evidences of indebtedness can be traded. Bond investors tend to be institutional investors and funds rather than banks, while lenders on a loan tend to be banks. The issuance and funding process for a sustainability-focused debt product is essentially the same as that for a corresponding conventional bond or loan, as the case may be. The differences relate more to covenants, reporting, and use of proceeds.

There are several different types of bonds available under the sustainable finance banner, with the character depending on the use of proceeds. Of the options currently available, green bonds may be the most compatible with offshore wind development activities. Green bonds are issued to finance or refinance certain activities or projects that fit into one of five broad eligibility categories described in the Green Bond Principles ("GBP") published by ICMA. These categories are: climate change mitigation, climate change adaptation, natural resource conservation, biodiversity conservation, and pollution prevention and control. Projects that may fall within these categories include renewable energy, clean transportation, water management, eco-efficient packaging, sustainable mitigation, climate change adaptation, natural resource conservation, biodiversity conservation, and pollution prevention and control. Projects that may fall within these categories include renewable energy, clean transportation, water management, eco-efficient packaging, sustainable agriculture, afforestation and reforestation, and terrestrial and aquatic biodiversity conservation and habitat creation. The GBP includes high-level guidelines concerning processes for project evaluation and selection, management of proceeds, and recordkeeping and reporting about how the proceeds are used. Green Bonds are subject to the ICMA GBP and Green Loans are subject to the Green Loan Principles developed by the LMA. Bonds and loans that are committed to marine or water projects, such as promoting sustainable fish stocks, are sometimes described as "blue" rather than "green."

Other types of debt instruments could be used to support offshore wind development activities, but they would typically not be used to finance a generation facility.

[2] *For an authoritative discussion of the role of derivatives in environmental social governance markets, which is related to environmental sustainability see the Overview of ESG-related Derivatives Products and Transactions published by ISDA. https://www.isda.org/2020/10/02/the-role-of-derivatives-in-esg/*

- **Sustainability Bonds** intentionally comply with both the GBP and the Sustainability Bond Principles ("SBP"). For example, publicly available materials in connection with a sustainability bond issued by Adidas AG in 2020 indicate that it will use the proceeds of the financing to, among other things, procure fabric made from recycled ocean plastics for use in its products as well as expenditures to help improve opportunities for female workers at its suppliers.

- **Sustainability-Linked Bonds (SLBs)** are not used to finance particular types of projects or activities. Rather, the Sustainability-Linked Bond Principles ("SLBP"), as created by ICMA, state that an SLB may be any type of bond instrument the features of which vary based on whether the issuer achieves predefined sustainability objectives. For example, the coupon or term could vary based on compliance with stated goals. Thus, SLBs are essentially a way for any type of issuer to substantively demonstrate that it is financially committed to achieving certain sustainability goals.

The SLBP incorporates five components, which are rather different than those in the GBP and SBP. These components address selection of key performance indicators ("KPIs"), calibration of sustainability performance targets ("SPTs"), bond characteristics, reporting of compliance, and verification of compliance. Additional guidance in the SLBP describes how issuers should approach these tasks. For example, KPIs should be "relevant, core and material to the issuer's overall business" as well as "externally verifiable" and "able to be benchmarked." The SPTs "should be ambitious" and "represent a material improvement in the respective KPIs." Moreover, issuers of SLBs are urged to publicly explain all of these components, particularly the selection of KPIs and SPTs.

The KPIs for sustainable bonds can be adopted to the specific requirements of the borrower and the sector. To date, common categories of KPIs include KPIs designed to reduce behavior that negatively impact the environment, KPIs that are designed to encourage behavior that is beneficial for the environment, linking performance to governance standards. This is a fast-developing area, and it is likely that KPIs will be linked to new areas that have become newsworthy, such as supply chain integrity, seafarers human rights, etc..

- **Collateralized Treasury Products Based on the Above.** With the increase in issuance of green bonds and other sustainability-focused bonds, it is likely that standardized treasury and cash-management products such as securities lending, repo, and credit default products will evolve to accommodate those types of obligations as collateral or reference obligations in a sustainability context. For example, while sustainability-focused instruments still occupy a relatively small niche in the repo market, in November 2020, Eurex launched the Green Bond GC Basket, a standardized general collateral basket for repurchase transactions that is comprised exclusively of green bonds. There have been signs of tentative take-up of the new product as measured by quoting activity and regular bid and ask prices.

It should be noted that when the sustainability component of a sustainable loan or bond is distinct from the financial obligation under that instrument, the sustainability component (even if unhedged) may have to be bifurcated from the financial obligation and separately accounted for as a derivative if it meets all three requirements on Topic 815 under US GAAP. These criteria are met if (i) the economic characteristics and risks of the embedded derivative are not clearly and closely related to the economic characteristics and risk of the host contract, (ii) the hybrid instrument is not remeasured at fair value and (iii) a separate instrument with the same terms as the embedded derivative would be considered a derivative instrument subject to derivatives accounting. Parties to sustainable loans and bonds should consult with their accounting advisors to determine whether the contract is subject to bifurcation and whether it may be subject to potential scope exceptions under applicable accounting rules. This may require fine judgments as to the relationship of the sustainability features and the economics of the financial obligation, particularly as relates to the obligor's creditworthiness, whether the sustainability feature is commonly seen in free-standing derivatives, and perhaps the extent to which the sustainability adjustments are specific to entire party to the contract.

U.S. Tax Incentives for Offshore Wind

In the United States, tax-related incentives have played a very important role in developing renewable energy resources. Without the incentives currently available, it is difficult to finance facilities utilizing emerging technologies because the cost of power generated from them is otherwise not competitive with power produced through established technologies. Federal incentives are well developed, known, and sought after. However, state credits have been essential for the development of wind and solar industries in many parts of the country.

Material U.S. Federal Income Tax Incentives

Tax Credits. Historically, our tax credits have been based on two models. Production tax credits ("PTCs") are available in respect of kWh of electricity produced by certain renewable energy generation facilities and sold to a third party during the 10 years after the facility was "placed in service." The PTC rate is adjusted annually. In addition, we have experienced several rounds of "sunsetting," that is, gradual reductions in the rate with the goal of terminating the PTC. Most recently, 2021 was the last year when a project could "begin construction" to qualify for the PTC at all.

Although the PTC is sunsetting for onshore wind, there is a specific Investment Tax Credit ("ITC") available for offshore wind facilities. Rather than accruing on a per kWh sold basis, the ITC is taken as a percentage against qualifying portions of the cost of the facility. Only tangible personal property and costs that may be allocated to it under generally applicable U.S. federal income tax law will qualify for the ITC. The ITC for offshore wind is 30% of the cost of qualifying property the construction of which begins no later than December 31, 2026. Pursuant to Internal Revenue Service guidance, facilities that meet this beginning of construction test have a 10-year safe harbor period to place the facility in service. Currently, there is no sunset period for the offshore wind ITC.

To establish that a project has begun construction, one of two tests must be met:

- The "5% safe harbor" requires that the facility owner pay or incur at least 5% of the total qualifying cost of a facility in the relevant year by purchasing assets that will be qualifying property when incorporated into the offshore wind facility. If title or physical delivery of the asset cannot occur in the year in which construction must begin, it is possible to take title or physical delivery within 3.5 months after the date of payment. The 5% safe harbor is not popular for offshore wind because of the large capital investment fairly early in the project life cycle, as well as the potentially long storage period for any property acquired.

- Under the "physical work" test, construction of a significant nature may begin at the site of a facility or offsite. Work onsite may be on a material component of an item of equipment that will be integrated into the facility or certain types of site preparation, e.g., concrete foundations or substation construction. Work offsite must be on a material component of an item of equipment that will be integrated into the facility. There are many judgment calls that must be made when evaluating whether a facility has begun construction under this test and different tax equity investors have different risk tolerances. In addition, not all the equipment that will be eventually integrated into an offshore wind facility will qualify for the physical work test. However, this test remains very attractive because there is no minimum amount that must be spent.

Both of the beginning of construction tests have many nuances and gray areas. We strongly suggest consulting with an experienced practitioner before designing a beginning of construction program and throughout its implementation period.

Depreciation Deductions. For U.S. federal income tax purposes, the basis of tangible property is recovered over a specified useful life using one of several methods. The favored method is the modified accelerated cost recovery system ("MACRS"), which generally provides for accelerated depreciation deductions in the earlier years of a property's useful life. Wind energy property that is located and used within the United States (as further described below) may be depreciated using the MACRS method over five years.

MACRS depreciation is not available to certain types of direct or indirect owners, e.g., government organizations, tax-exempt organizations, and non-U.S. persons. When one of these types of people owns wind property through a partnership (including a limited liability company treated as a partnership for U.S. federal income tax purposes), the amount of MACRS depreciation available to any other partners in the partnership may be at risk. You should consult with experienced tax counsel before structuring investment into an offshore wind facility by any of the types of people described in the first sentence of this paragraph.

In addition, renewable energy property with a recovery period of 20 years or less that is placed in service after September 27, 2017 and before 2023 generally will qualify for 100% immediate expensing, sometimes referred to as "bonus" depreciation. Bonus depreciation will continue to be available at reduced rates for property placed in service in calendar years 2023 through 2026.

Note on Location of Offshore Wind Facilities. There is some inconsistency (and confusion) about where an offshore wind facility must be located to qualify for the PTC, ITC, or accelerated depreciation:

- To qualify for the PTC, the generation activity or facility generally must be in the United States. The geographical definition of "United States" for this purpose includes the states, the District of Columbia, U.S. possessions, and submarine areas that are adjacent to the territorial waters of the United States or its possessions and over which the United States or its possessions have exclusive rights under international law.

- To qualify for the ITC for qualified offshore wind facilities, the generation facility must be located in the "inland navigable waters" of the United States or in the "coastal waters" of the United States. Unfortunately, there is no definition of "coastal waters" in U.S. federal income tax law. However, 33 C.F.R. § 175.105(b) (which governs the Coast Guard) defines the term as including: the U.S. waters of the Great Lakes; the "territorial seas" of the United States; and, certain waters directly connected to the Great Lakes and territorial seas. The territorial seas are those waters that are 12 nautical miles, or approximately 13.8 miles, from the shore of the United States. It is not clear whether the Department of the Treasury would apply this or another definition.

- To qualify for the favorable MACRS five-year depreciation regime, the facility must not be used "predominantly outside of the United States." Here, United States is defined as the states and the District of Columbia. Although not expressly referenced in applicable law, states that border the Atlantic or Pacific Oceans generally have jurisdiction over submerged lands out to three nautical miles, or approximately 3.45 miles, offshore.

Given the surge of activity in the offshore wind industry, clarity around these distances would be helpful, particularly as technologies advance and permit development farther out to sea.

Future Congressional Action. In 2021, there were high hopes for a strengthened renewable energy tax credit regime, including for offshore wind. At the time of publication, these hopes appear to have been dashed. Nonetheless, there were provisions in that potential legislation that would have been helpful for the offshore wind industry and could yet be revived in whole or in part. A few of the more material provisions include:

- A "direct pay" feature whereby owners of wind facilities could elect to receive payment from the federal government to the extent of any unused tax credits. Particularly important for offshore wind was a feature whereby federally recognized Indian tribes, state and local governments, and tax-exempt organizations could invest in wind facilities and claim these payments.

- A provision that would allow a wind generation facility to qualify for the PTC even when the same owner uses the power produced to manufacture hydrogen for sale to third parties.

- Appropriations for planning a national transmission grid that would include planning specifically oriented toward offshore wind interconnection, as well as an ITC for transmission equipment.

- Provision for an interminable offshore wind ITC.

- Tax credits for facilities manufacturing components of offshore wind facilities, including fixed and floating foundations, as well as facilities recycling components of offshore wind equipment.

State Tax Incentives

More than half of the states have significant potential for offshore wind, either for purposes of generation or shore support. Nonetheless, for many years, state tax incentives, such as payments in lieu of tax agreements, have generally required skillful negotiation with local agencies and legislatures. However, we may begin to see that change. Recently, New Jersey created the Offshore Wind Credit, which operates similarly to the ITC, but includes a net positive economic benefit requirement. Thus, applicants for an award of the credit must demonstrate that the investment in and job creation from their project will generate tax revenue to the state of at least 110% of the total tax credit amount awarded over a five-year period. It is not yet clear whether other states with offshore or inland waters with good wind potential will create similar types of legislation, but in light of the prior trend for state tax credits for onshore wind generation, we may see something similar in offshore in the near future.

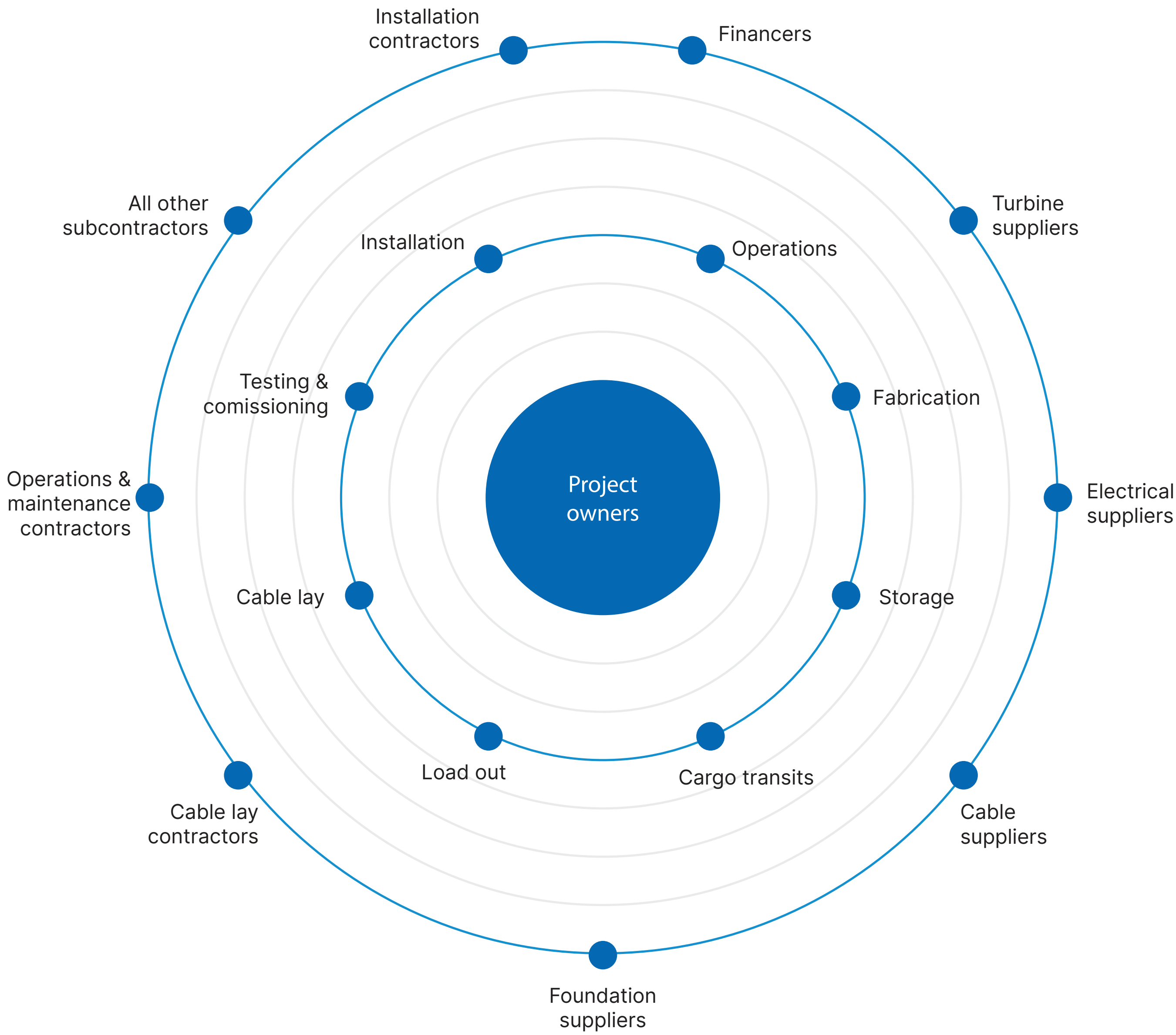
Úna Brosnan, Mainstream Renewable Power; Jeffrey Meagher, K&L Gates

Building and operating an offshore wind farm is fraught with risk. Design and construction is always challenging and complex and generally requires significant CAPEX and integration prior to generating electricity. Construction can involve fabrication, transportation, and installation of substructures, towers, blades, and wind turbines, all of which require specialist transportation due to their size. Moreover, wind turbines are increasing in size, blades are getting longer (which makes them extremely fragile), and vessels are quickly becoming neither big enough nor sufficiently adapted to have them aboard. Operating an offshore wind farm can be equally challenging, with many unique risks that can vary in complexity by region. Moreover, when something goes wrong in either the construction or operation phase, there can be several potential root causes for a failure and identifying which one caused the loss can be difficult.

To align with the offshore wind industry's growth and complexity, while also avoiding unexpected financial losses, developers must be fully aware of the risks involved and have adequate insurance in place to cover them. Key areas of concern include the following:

- Physical damage to facility assets
- Revenue lost due to a resultant delay and/or loss of key installation equipment
- Design defect
- Transportation activities (during installation and operations)
- When the policy covers all parties agreed under the contract
- Third-party property damage

Power-cable failures offshore are often the main risk affecting the development and operation of offshore wind farms and result in approximately 80% of insurance claims in offshore wind.



Claims statistics available to date from offshore wind renewables insurers show foundations, cables and natural catastrophe risks are key areas of concern. When evaluating the risk underlying a potential policy, insurers often take into account the following:

- Location of the facility and exposure to natural catastrophe risks (e.g., earthquakes, hurricanes, typhoons, tsunamis, etc.)
- Historical performance and experience of the turbine, installation contractors
- Design parameters for the turbine, cables, foundations, and their suitability for the location and exposure
- Mitigation measures in place where an imminent threat has been identified
- Experience of cable supplier and contractor and proposed installation methodology
- Identity of the Marine Warranty Surveyor, as well as their scope and overall role in the project
- If the facility equipment is of a new model, the changes from previous models and results of testing and certification processes
- Construction schedule

Below is an overview of the key insurance requirements to support a bankable offshore wind development:

Phase	Insurance Cover	Responsible Parties	Insurance Coverage For
Construction	Construction All Risk ("CAR") including Marine Transit & Terrorism	Principal, all contractors, technical advisors, lenders	Principal, all contractors, technical advisors, lenders
	Third Party Liability (including Marine Liability)	Principal /Contractors	Principal, all contractors, technical advisors, lenders
	Delay in start-up ("DSU") including Marine DSU and Terrorism	Principal /Contractors	Principal & lenders
Operator	Operating All Risk, including Machinery Breakdown	Principal	Principal, O&M contractor, Lenders
	Business Interruption ("BI")	Principal	Principal & Lenders
	Third-Party Liabilities	Principal	Principal, O&M contractor, Lenders
General	Professional indemnity	Designers	Phase for their own interests
	Charterer's liability	Chartering Party	Liabilities related to the chartering party
	Protection & indemnity	Vessel Owner	Vessel Owner's property
	Hull & Machinery	Vessel Owner	Vessel Owner's property
	Employers Liability/ Workers Compensation	All Parties	All parties' interests
	Plant & Equipment	Contractors	All Owners
	Motor Liability	All Parties	All Owners

3.6 Contract Lessons Learned from the United Kingdom

By: Charles Lockwood, Clare Kempkens, K&L Gates

There have been offshore wind farms in the waters of the United Kingdom, for a couple of decades, and therefore, there has been longer for disputes to arise and to play out. Not surprisingly, it is clear that the scope for disputes in offshore wind is every bit as great as in any major infrastructure project. New materials, new technologies, new contracts, and a challenging offshore environment mean some disputes are inevitable. Many of these disputes have not reached the courts, and clearly, with the transition becoming ever more urgent, we all want these projects to work. However, risk still needs to be allocated between commercial parties, and the importance of drafting that allocation clearly is as important in offshore wind as it is everywhere else. Two widely reported cases in the English courts offer valuable lessons for offshore wind development, both for operators and contractors.

"Fitness for Purpose" and being "Stuck in the Middle"

Greater Gabbard is a 500MW offshore wind farm off the east coast of England. By 2012, all of its 140 turbines had begun producing power. By November of that year, an arbitration tribunal had ruled in the first of the proceedings concerning its construction causing its principal contractor, Fluor, to book a US$400 million pre-tax charge.

The position between Fluor and the developer was later reported settled on undisclosed terms, but the legal proceedings did not end there. Fluor brought a subsequent claim against ZPMC whom it had contracted to supply monopiles ("MPs") and transition pieces ("TPs"). Those proceedings resulted in five reported judgments, the last of which was issued in March 2018. The judgments are all publically available and well worth a more detailed read, but two points stand out[1].

The first is that a promise by a contractor of "fitness for purpose" (as a matter of English law at least) is not simply a question of the physical state of works.

The underlying issue with the MPs and TPs had been the discovery of cracking in welds. As a result, an extensive (and expensive) program of retesting and repair was commenced and huge standby costs for vessels were incurred. However, by the time of the proceedings it was no longer argued by any party that this cracking meant the MPs and TPs would not survive their 25-year design life. The judge noted "it seems that they had been sufficiently overdesigned so that they were well able to withstand the likely imposed loads".

One might think that by definition the MPs and TPs were therefore "fit for purpose". Not so. The court held that, where goods have a single use, the meaning of "fit for purpose" required that the components be in a condition that a buyer having full knowledge of the condition, including any defects, would buy them without (i) abatement of the price for such components in reasonable condition, or (ii) any special terms attached to the purchase[2].

The court went on to say that in a situation where a buyer knows the true condition of the product but is unable to discover without lengthy investigation whether that condition affects its use, the only reasonable option for the buyer is to investigate the extent to which use is affected. In Fluor's case, due to the welding defects, the MPs and TPs were not in a condition where a reasonable purchaser could, without any further investigation, install them in the seabed and so were not fit for purpose.

From a buyer's perspective, it is a comfort that where there are legitimate concerns about fitness for purpose, the buyer may be justified in refusing to accept delivery until fitness for purpose is established. From a seller's perspective, as the costs involved in establishing fitness for purpose will generally be for the seller's account, the case provides a reminder of the importance of being able to demonstrate the applicable contractual standards are met and for such equipment to be thoroughly inspected to identify any defects before hand over. It is also a cautionary reminder that "fitness for purpose" warranties are not to be given lightly.

The second point these proceedings drove home is one familiar to most EPC contractors, namely, that the middle of a contract chain is a very uncomfortable place to be.

Ensuring contracts are completely back-to-back in all respects will often not be feasible. However, standards, testing and inspection provisions should be aligned wherever possible. In this instance, minor differences in the weld scanning requirements (the implications of which were not appreciated at the time) between the EPC contract and the Fluor/ZPMC contract meant the test that would have identified the cracks earlier was not carried out.

Once disputes have arisen, the middle spot becomes still more difficult. Fluor did ultimately make a significant recovery from ZPMC but as the dispute unfolded, it had reached an agreement with ZPMC to waive claims arising out of non-conformance reports issued by the developer in return for an assignment of ZPMC's claims. The court held that the terms of the agreement "imposed significant limitations" on the damages that Fluor could recover down the chain.

Mounting costs and operational issues when a dispute arises can make for high-pressure situations. Difficult compromises can be called for. While it is unlikely there will be a magic solution, the earlier these can be recognized and appreciated, the easier they are likely to be manage.

[1] Fluor Limited v. Shanghai Zhenhua Heavy Industries Limited ("ZPMC") [2016] EWHC 2062 (TCC) available at www.bailii.org
[2] Adopting a test of merchantability from previous cases

Design Standards

The other most well known of the English law cases on offshore wind is MT Højgaard A/S v. E.ON Climate & Renewables UK Robin Rigg East Limited[3]. The Robin Rigg wind farm was the first in Scotland, the contract for its construction was signed in 2006, and the wind farm was commissioned in April 2010. Its subsequent journey through the English courts has been epic (featuring six reported judgments along the way) and the question of which party carried responsibility for a design error took significantly longer to resolve than the wind farm did to build.

The error in question was not directly made by either party. As in Fluor, one cannot help but feel sympathy for the contractor in the case. As required by the contract, MTH produced a foundation design based on strength calculations set out in international standard DNV-OS-J101 ("J101"). DNV was appointed as certifying authority and approved MTH's design, allowing installation to take place.

Subsequently, grouted connections between the MPs and the TPs began to fail. It was discovered that DNV's strength calculations in J101 were incorrect and the strength of the grouted connections had been overestimated. The question was who should bear that cost of the required remedial works?

As is so often the case, the contractual arrangements were "long and diffuse". There was much debate about the location of the various relevant terms and arguments as to their consistency. Ultimately, however the contract contained not only a requirement for the design to comply with J101 (amongst other provisions) but also to ensure that the foundations had a design life of 20 years. The court held that MTH was obliged to meet the highest standard imposed by the contract and was therefore required to apply more stringent standards than J101 where that was necessary to achieve the required design life. Poor drafting of the contract, including the fact that an onerous obligation featured in a technical document appended to the contract, did not persuade the court otherwise.

EPC contracts are complex documents, often with obligations dispersed across multiple sections and clauses. Different departments often review different sections, and the legal team may have less input into the technical requirements. These proceedings highlight the need for an overall review. It is well worth trying to structure the contract well, group provisions dealing with similar subject matter together, and use clauses that dictate a hierarchy of priority for conflicting provisions in different sections of a contract. When drafting individual provisions, consider whether the provision is a fixed or maximum requirement or, as J101 was found to be, a minimum standard.

The lessons we share from the UK offshore wind disputes will not be new to most EPC lawyers. However, these two cases (and others that are unreported) really drive home the challenges of new technologies and the offshore environment.

On a positive note, it is not only the technological capabilities that have grown over recent years, the quality of the contracts has improved with experience too. Standard, industry accepted allocations of (ideally insurable) risk will continue to develop and are likely to be as valuable in offshore wind as they have been in the oil and gas industry.

Therefore, our "lesson" from the UK is a simple one: If margins on offshore wind projects (for both contractors and developers) are to be preserved, careful contracting is key.

[3] [2017] UKSC 59

Beatrice Offshore Wind Farm - Courtesy of Smulders

4.0 Project Phasing

By: Úna Brosnan, Mainstream Renewable Power

Project development timelines vary from region to region and depend on a number of factors (consent timeline, weather, availability of vessels, etc.). Below are some typical project timelines for key development phases.

Development Period

The development period from the timeframe of identification of a project site has typically taken four to five years in Europe and includes elements such as securing project approvals, site investigations, tender process, finance, and major contract awards.

Having clear energy policy and consenting regime and establishing funding mechanisms to give developers and investors a clear roadmap of the development timeline are all imperative to support the industry.

Consenting regimes and approval timelines vary from country to country, but having a clear timeline is key for planning of other aspects of the project and to provide confidence to investors.

From a developer's perspective, once the lease is awarded, the developer needs to perform the following activities in the development period:

- **Data Collection:** There are several data collection activities that need to be performed in this period. Data needs vary from geotechnical data, to the wind resource and marine data that are required for various permit filings.

- **Permit Applications:** State and federal permit applications need to be identified and the permit applications will be filed during this time period. The schedule for the permits is discussed in the permitting section separately.

Manufacturing

The project design is typically finalized during the permit approval process and includes optimizing the engineering of the wind farm through FEED (Front End Engineering Design) and Detailed Design processes. Major contracts are tendered and are readied for placement in parallel with the permitting cycle. Once the permits are issued then the larger contracts such as manufacturing can be released so elements such as foundation and substation manufacturing can start.

In offshore wind farm developments, one of the key cost reduction areas has been attributed to driving standardized designs and serial fabrication methods. Engagement of fabrication and installation contractors from early stages to ensure structures can be manufactured, transported, and installed with ease is important. This not only provides fabrication and installation efficiencies and best practices to be identified from an early stages of design but also allows for manufacturing variations to be considered should multiple fabricators awarded. An example where early engagement was key in Europe was on the Beatrice project, where there were three fabrication yards for the 84 jacket foundations. All three fabrication yards had slightly different fabrication methods that had to be considered.

Depending on the project size, the overall manufacturing can take up to three years for the project. The project risk level (which may be due to pressure on lead in schedule or subsidy deadlines) can also dictate if the manufacturing is started after the permits are finalized or during the last phases of the permitting period.

Offshore Installation

Installation of the project components in the field can take up to three years depending on the size of development, construction season, program, and vessel capability and availability. This phase includes elements such as site preparation, installation of foundations, turbines, transformer stations and final testing and commissioning. This phase can in some delivery programs, overlap the manufacturing schedule by up to a year. In addition to the structure installation, the inter array cables, export cable, and onshore substation construction can also take place at the same time.

In the U.S., projects have an additional offshore installation consideration with respect to the Jones Act as referenced earlier. At present in the U.S. there are no Jones Act compliant heavy lift installation vessels so alternative Jones Act compliant installation sequencing is currently being considered for the near-term projects. This is likely to feature Jones Act compliant feeder vessels supporting international installation vessels.

Operations and Maintenance ("O&M") and Life Extension

Projects are typically designed for an operational life of up to 25-years without major life extension upgrades, however, ensuring that a robust O&M strategy is in place for the lifetime of the project is essential to allow owners and operators to react where required and minimize project downtime.

Ongoing O&M of an offshore wind farm is typically managed from a local base close to the wind farm which helps to assist with reaction times. O&M involves regular turbine and structure maintenance based on the preventive maintenance ("PM") schedule or condition-based maintenance ("CBM") approach as identified by the asset owner. These approaches drive the levels of inspections and maintenance required. Most wind farms will have target availability of 97% or above, so O&M strategy is a key factor.

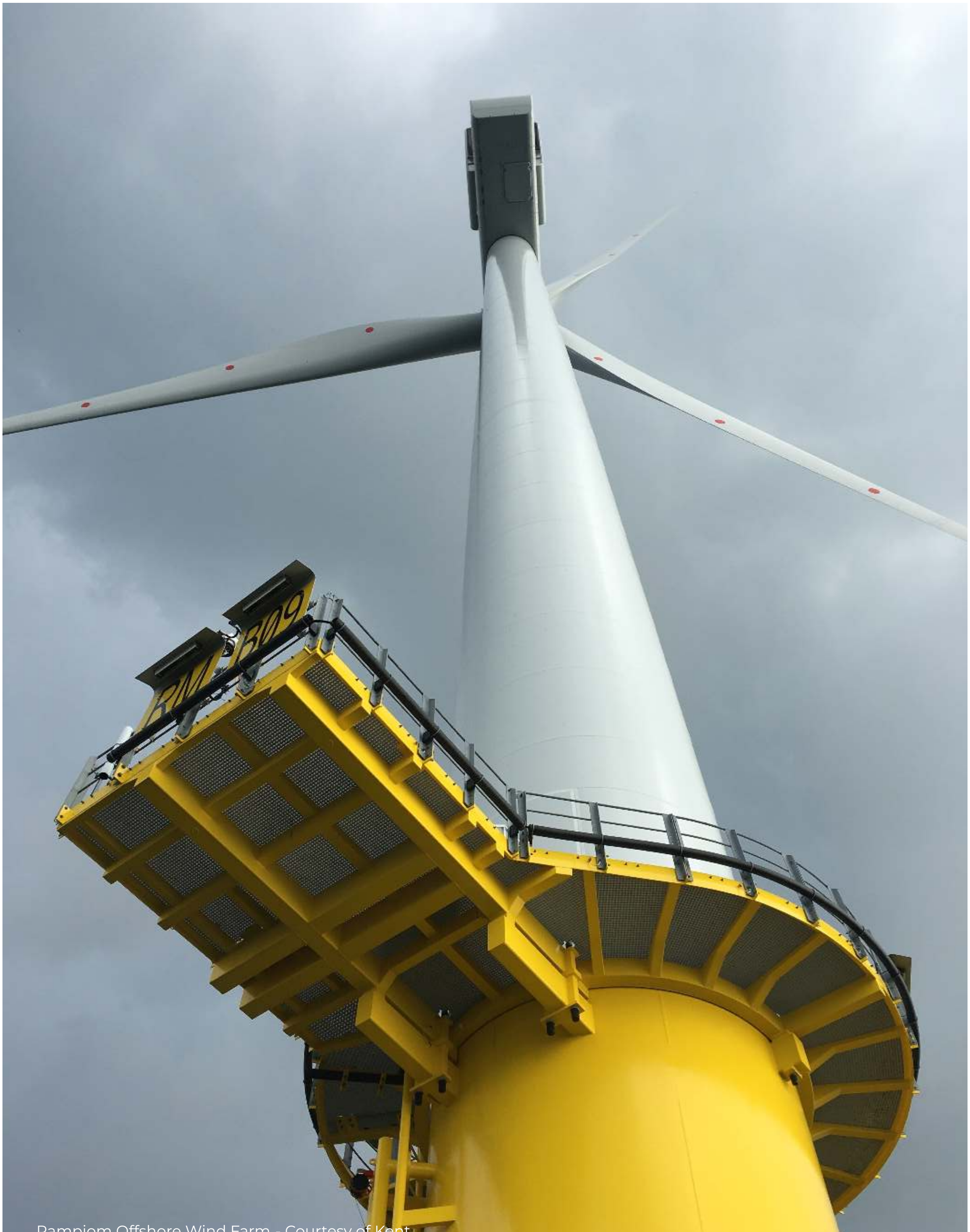
Monitoring regimes and instrumentation are also a key consideration, not only to assist the O&M phase but also to assist in later phases such as life extension and decommissioning as it can give an opportunity to have actual live data for the condition of the structures that can subsequently allow accurate analysis.

Decommissioning

Typically, at the end of the project life, unless life extension is an option, the project decommissioning will need to take place in accordance with the permit conditions for the project.

Innovation Installation Vessel—Courtesy of Deme

Yttre Stengrund Wind Farm — Courtesy of Vattenfall



Rampiom Offshore Wind Farm - Courtesy of Kent

Dounreay Tri Floating Wind Farm - Courtesy of Hexicon

5.0 Offshore Wind Farm Infrastructure

By: Andy Malpas, Ed Unwin, Kent

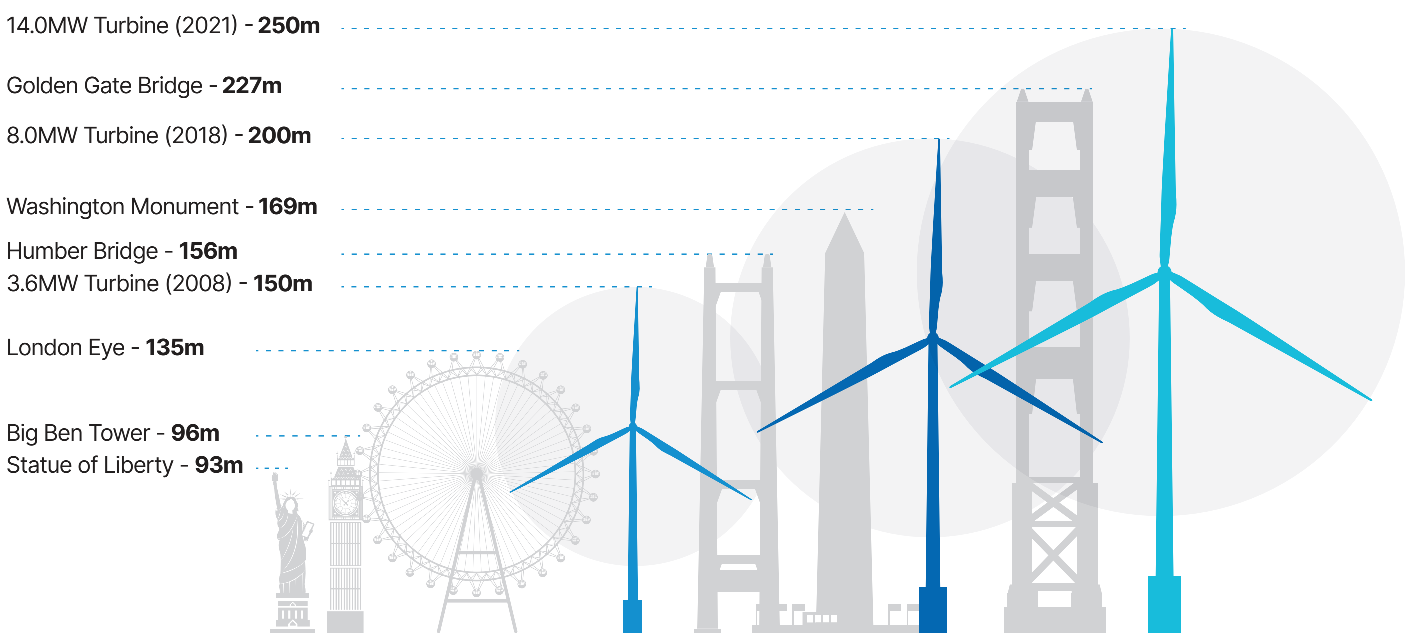
5.1 Wind Turbine Generators

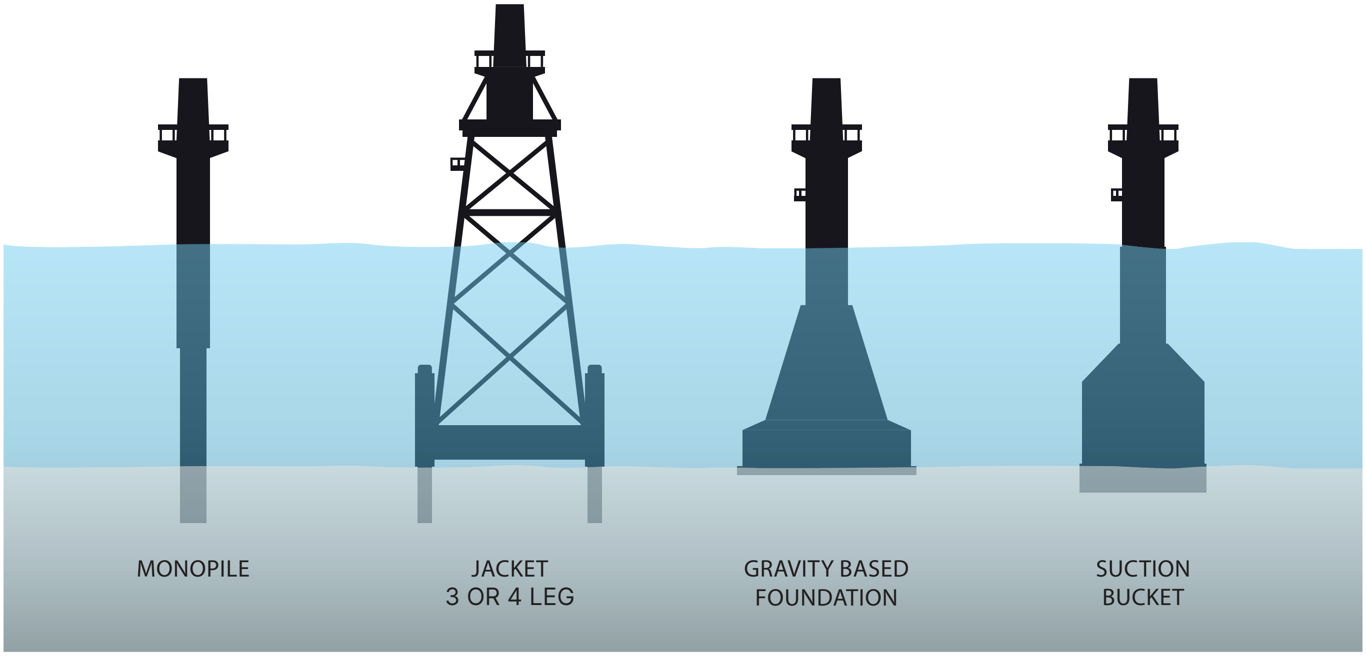
Offshore Wind Turbine Generators ("WTG") are considerably larger than their onshore relatives. The early turbines were converted from their onshore siblings and suffered from being exposed to the harsh environmental conditions found offshore. Turbine manufacturers recognized the issue and moved to designing turbines specifically for the offshore market through enhancing the designs to not only address the more aggressive environment but also to reduce operations and maintenance ("O&M") due to the higher costs associated with transporting maintenance crews and replacement components to and from offshore wind farms.

The largest installed turbines today are rated to 9.5MW, however these will soon be overtaken by projects such as Vineyard Wind 1 (U.S.) and Dogger Bank (UK), which are planning to use 13MW and 14MW turbines.

The pace and scale of turbine technology development has been unprecedented with offshore turbines growing from 2MW to the recently announced 14MW and will continue to grow further in the coming years. This growth and technology innovation is one of the key contributing factors to the industry cost reduction drive. The main advantage being that larger power outputs means less turbines are needed for each wind farm. Less turbines leads to fewer foundation structures, less cable, and smaller sites, which reduces installation and maintenance costs. In addition to the size of offshore turbines, improved reliability has also greatly helped to streamline maintenance and improve turbine availability.

There are a number of offshore turbine providers in the market that have products that have been developed off the back of years of experience and through extensive R&D programs. The competitive nature of the sector is greatly helping to drive innovation as developers continuously look for solutions to help reduce their Levelized Cost of Energy ("LCOE").





5.2 Foundation Structure

Fixed Bottom Structures

Early developments were relatively near to shore and located in shallow water, this combination best suited fixed bottom solutions such as monopiles ("MPs"). As the turbines got bigger, further offshore, and developments moved into more transitional waters (typically 30m to 60m water depths) then jackets have been more widely deployed given they are a familiar and trusted concept from the hydrocarbon sector. Alternative substructures have also been successfully deployed, although in smaller numbers which include gravity base, tripod, suction bucket (rather than traditional pin piles) and hybrid solutions.

To date the market has been dominated by MPs with jackets starting to become more commonplace as developments get deeper and turbines get bigger. That said, the industry is starting to push the envelope for MPs and we now have more advanced technology that can support the fabrication, transportation and installation of larger diameter structures. This has resulted in MPs moving into traditional jacket space supporting large turbines in 40m+ water depths.

The industry has been highly successful in driving down cost within the foundations and substructures from a CAPEX and OPEX perspective. Application of the following have made considerable contribution to the industry cost reduction:

- Larger turbines
- Larger project size i.e., generating volume hence economies of scale
- Standardization
- Serial fabrication
- Optimization of design and fabrication processes
- Pushing the boundaries in design codes
- Improved understanding of ground conditions (e.g., PISA study)

Beatrice Jacket - Courtesy of SHL

Blyth Demonstrator - Courtesy of EDF

Floating Structures

A floating wind turbine is an offshore wind turbine mounted on a floating structure that allows the turbine to generate electricity in water depths where fixed bottom foundation turbines are not feasible.

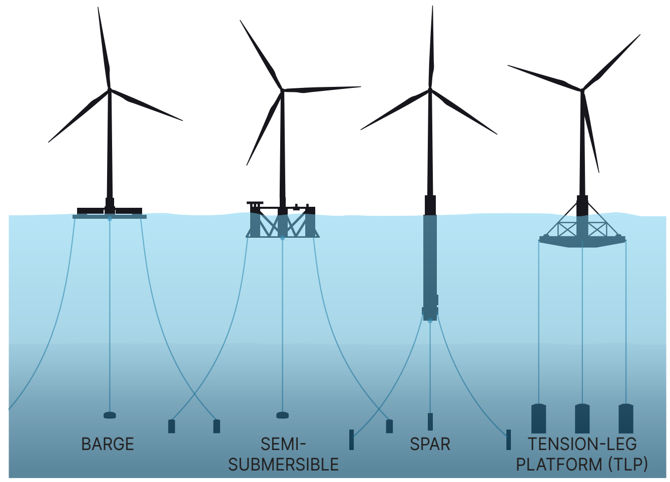
Floating substructures are typically categorized as follows:

- Barge
- Semi-submersible
- Spar
- Tension leg-platform

The market is also seeing projects in the advanced planning stage, which utilize multi-turbine, hybrid wind-wave, or wind-to-hydrogen technology.

Floating wind has been behind the curve in comparison with fixed foundations simply because near-shore shallow sites were developed first. There are over 6,000 fixed structures whereas floating structures can be measured in double digits, so it is difficult to make cost comparisons based on actual data as economies of scale in floating wind have not yet been realized.

Floating offshore wind is on the pathway to becoming commercially competitive as the technology strives to catch up. There have been several demonstrators and pilot projects installed globally, and the next step for the industry is to realize commercial scale projects where they then will be a in a position to demonstrate its ability to drive down cost similar to that in fixed bottom solutions (i.e., serial fabrication, scale etc.). The world's first commercial floating offshore wind farm (Hywind) was installed in Scotland in 2017 with six 6MW turbines on a spar substructure and this has proved an operationally very efficient commercial scale wind farm. Kincardine Floating Wind Farm was completed in 2021 and is now the largest operating foating wind farm. Equinor has announced that they are targeting the cost of floating offshore wind to be US$50-$74 per MWh by 2030. Leasing rounds such as Scotwind, the Celtic Sea in the UK and early developments in South Korean and California will be key to realizing commercial scale floating wind.



BENEFITS OF FLOATING WIND

Challenge	Benefit
Increased wind exploitation	• Higher, more consistent wind and larger turbines
Shoreside assembly	• Eliminates heavy lifts, reduces risk, less weather dependency
Larger resource base	• Not restricted to shallower water depths (typically >50m)
Significantly reduced ground risk	• When compared against fixed structures
Conduct major repairs/upgrades	• Ability to tow structures to shore
Deployment further offshore	• Less planning risk and visual impact
Anchored moorings	• Pre-installed gravity anchors and mooring lines, which can eliminate piling activities and associated negative environmental impacts
Safety	• WTG installation alongside, less activities offshore, no need for jack-ups

Floating offshore wind creates new opportunities within the sector through the associated supply chain, employment, and export opportunities from which first movers and those with experience in related fields such as offshore oil and gas or maritime will benefit most.

For the U.S., the benefit for floating offshore wind predominately lies on the West Coast where waters are a lot deeper nearshore than the East Coast (typically 500–1000m). However, there is good potential for floating wind on the East Coast and in the Gulf of Mexico.

5.3 Offshore Electrical Systems

Overview

The cost and efficiency of an offshore wind farm is influenced by a number of key elements when identifying an optimum electrical network for an offshore wind farm:

- The type of electrical system (AC or DC)
- Transmission length/distance from shore
- Transmission voltage
- Inter-turbine collector system (e.g., 33kV or 66kV)
- Rated power
- Farm topology
- WTG being proposed
- Wind farm wind speed

With these many variables to consider, comprehensive computational optimization is necessary to determine an optimal solution for the wind farm. This analysis should take into consideration whole life cycle cost and be influenced by aspects such as loss/downtime and reliability.

Offshore Substation

Finding the balance between resilience and cost of an Offshore Substation ("OSS") is one of the key optimization challenges for offshore wind farm developers today. The design decision drivers for an offshore wind farm can be different from those of utility systems, and each client can have different drivers for substation development from both a technical and commercial perspective, which can also vary from one country to another. Designers therefore need to establish from an early stage a definite method which will allow them to assess options against the requirement of an individual wind farm and provide results that then will be taken forward to underpin economic decisions around a development. Below is an example of the variance between some of the European approaches in the UK, Germany (DE) and The Netherlands (NL).

An OSS facilitates the systems to collect and export the power generated by an offshore wind farm through specialized submarine cables and are an essential component of offshore wind farms, especially at large, multi-megawatt sites. They are critical to stabilizing and optimizing the voltage generated offshore, reduce potential electrical losses, and transmit the electricity to shore in an economical manner to maximize the return on investment for the project. One of the key challenges during a design is identifying the life-cycle cost implication of transmission losses and availability losses (i.e., during downtime).

Transmission System	Onshore Substation	Export Cable	Offshore Substation	Array Cables	Wind Turbines
UK	OWF Developer's Scope/divested to OFTO				OWF Developer's Scope
DE TENNET	Offshore TSO scope			OWF Developer's Scope	
DK ENDK NL TENNET	TSO scope			OWF Developer's Scope	

The governing purpose of an OSS is to reduce electrical losses on the system by increasing the voltage and then exporting the power to shore. Early developments, small or pre-commercial (less than 100MW) near-shore projects (less than ~15km), or projects with grid connection at collector voltage (i.e., under 36kV) don't require an OSS, however, as capacity increases, we move to deeper waters and further offshore the requirement increases which often results in the need for one or multiple OSSs. Part of the decision-making process also has to include discipline specific questions such as High Voltage AC ("HVAC") or High Voltage DC ("HVDC") and reactive compensation system studies are the starting point here to assess the concept and connection options in the transmission and distribution network.

Offshore substations typically serve to step up the voltage from the site distribution voltage (30kV to 36 kV) to a higher voltage (100kV to 220 kV), which typically will be the connection voltage. This step-up dramatically reduces the number of export circuits (subsea cables) between the OSS and the shore. Typically, each export circuit may be rated in the range 150kV to 200MW. On designing an offshore electrical network, the following elements need to be taken into consideration during the early development of the transmission network for a wind farm:

- Capacity of wind farm
- Distance from shore
- HVAC/HVDC
- Reactive compensation requirements
- No. of export cables to shore
- No. of transformers on the OSS (i.e., capacity dependent)
- Redundancy
- Equipment failure rates
- Traditional OSS or Offshore Transformer Module ("OTM")
- Power supply for ancillary/LV systems
- 33kV v 66kV inter-array cables
- OSS maintenance strategy
- Interlinking of multiple offshore OSSs/adjacent offshore wind farms
- Availability target/requirements
- Installation strategy

As the offshore wind sector has matured, project capacities have increased and developments have moved further offshore. To date, the majority of offshore wind projects have been built with AC transmission (with the exception of small number of collector hubs in Germany), however, the industry has been successful to date in delaying the requirement for expensive DC transmission through the introduction of mid-point compensation platforms. Such a system requires an AC/DC converter station both offshore and onshore; however, both stations are large installations.

In the current wave of UK projects, the industry is seeing HVDC technology take its first steps on projects such as Dogger Bank.

Traditional Offshore Substation vs. a Module Approach

Transmission infrastructure for an offshore wind farm typically accounts for 10-20% of the capital cost of the project. A large proportion of this cost can be directly related to the development, fabrication, and installation of OSSs which are needed to convert the array voltage (33kV or 66kV) to a higher level (110kV to 220kV) to allow for efficient transmission. Should offshore converter platforms be required for HVDC transmission, then projects costs will be higher, therefore, driving cost reduction through reduction in platform size and weight offers a massive potential. If the total weight of topsides and substructures can be kept below 1,000t each, it allows for smaller and less costly installation vessels to be utilized during installation, which can have a significant impact over cost. The introduction of a single deck, modular concept approach has made inroads on project, such as Beatrice offshore wind farm where two Offshore Transformer Modules ("OTM") were installed in 2018, the first of their kind in the offshore wind sector. This approach has now been successfully used on a number of projects in Europe.

Integrated Offshore Substations

Another approach being explored in industry is integrating two HVAC substations along with one HVDC converter platform on a single support substructure. The aim of this approach is toward weight reduction of the structure when compared to utilizing current HVDC technology. This approach offers significant opportunity for reduction in CAPEX and OPEX due to the leaner cost and service requirements associated with having one platform instead of multiple individual platforms. This approach, however, is dependent on regional transmission development approaches (i.e., in Germany, the HVDC platform would be built by the transmission operator and the developer would build the AC platform).

“Interlink” of Offshore Platforms

With the capacity of offshore wind projects increasing developers are assessing their risk and availability profiles to understand how best they can mitigate against downtime. A number of developers are planning to install transmission cables (interlinks) linking multiple local wind farm OSSs. If failure of the export cable occurs, then the project affected still has capacity to export some (or all) of its power to shore through the interlink (depending on the capacity available on the cable and interlink). This interlink essentially provides a security mechanism on projects in the event of a cable failure and provides a more cost-effective alternative to utilizing multiple cables connecting to a single common substation from each of the adjacent offshore projects. The costs for the interlink cable would be shared between project owners based on a formula reflecting availability and capacity. In some markets, regulatory approaches would need to change, such as the UK where currently the transmission charging methodology for offshore transmission considers only radial cables to shore and therefore does not take account of any interlinks that may be built.

Cost Reduction

The industry is evolving. Electrical innovations helping to bring down costs include:

- Increasing the Inter Array Cable Voltage to 66kV

  A 66kV systems increases the power density through the cables resulting in a more cost-effective cable system. There are ongoing studies exploring how to refine the 66kV system further. Adopting a 66kV system does have an increased unit cost associated with higher voltage cables, terminations and switchgear however these costs are outweighed with benefits such as:

  > Array cable length reduction (circa 20-30%, depending on site layout), which has a reduction in CAPEX for radial and ring inter array design.

  > Reduction in the number of OSSs required for a higher voltage system.

  > Additional design options can be considered, including the option to connect all the power to a single platform and introduces the possibility of using cheaper aluminum cables.

Galloper Offshore Transformer Platform (UK) - Courtesy of Kent

Siemens Offshore Transformer Module - Courtesy of Siemens

- Adoption of the mid-point reactive compensation platforms
  - > The introduction of mid-point reactive compensation platforms has been a key driver in pushing out the requirement/adoption of HVDC technology in the UK today. HVDC technology brings significant cost but also reduces risk. On projects such as Hornsea 1, the developer, Ørsted, had three collector platforms and reactive compensation platform located between the shore and the wind farm. This approach facilitates electrical reactors, which limit the electrical losses over the course of the HVAC transmission through the provision of reactive compensation.

- Adoption of larger turbines
  - > The introduction of larger turbines has increased overall substation design power resulting from the larger voltages experienced on the system. This in turn impacts on higher cable requirements and thus results in increased costs in the electrical system. These higher costs however are balanced by increased electrical output of the bigger turbines.

- Standardization of offshore substation structures
  - > One of the biggest and most cost prohibitive issues associated with OSSs is that they are typically designed and fabricated in a bespoke fashion, with each substation a custom fit for a specific development. This has resulted in a higher cost per substation, thus standardization will improve efficiencies and drive innovation, which will help with cost reduction.

- Adoption of GIS over AIS
  - > The adoption of GIS (Gas Insulated Switchgear) as an alternative to AIS (Air Insulated Switchgear) has led to significant cost reductions when assessed over the lifetime of the asset. The classic reason to use GIS over AIS is when there is a limited installation footprint available. GIS systems may be marginally more expensive in terms CAPEX, however, when considering the total cost (i.e. including OPEX too) of a substation over its lifespan, GIS can work out significantly cheaper due to not only this reduced footprint requirement offshore but also through lower maintenance requirements and through improved system reliability.

Technology Advancements

Below are a number of technology advancements at various stages of development, which will have the potential to change the dynamic of offshore wind if introduced in the years ahead.

- **Dynamic Cables** – a different type of cable is needed to handle the dynamic loading that comes with floating wind installations. Dynamic cables need to use different types of water barrier, which allow the cable to flex without affecting the cable integrity. Optical fibers may also be integrated into the cable to provide an early warning of stress and temperature spikes. A lot of research is being done in this area.

- **Floating Substations** – will greatly assist in areas with environmental challenges (e.g., Typhoon's and seismic activity), areas sensitive to piling solutions, and deep water developments. They could also have cost advantages around installation and O&M and may assist in areas such as the U.S. where there are installation restrictions around the Jones Act. Floating substations are now advanced in the development stage.

- **Low Frequency AC** — a concept that could result in the ability to transmit power at a frequency lower than the standard grid frequency, enabling an increased transmission distance capability through the subsea cables. This has the potential to remove the requirement for HVDC transmission systems.

- **Offshore Hub Development** — use of an offshore artificial island instead of a platform, which then can be utilized as a central hub for installation and operation and maintenance activities.

- **Utilizing Existing Offshore Infrastructure** — existing offshore interconnector runs or connecting into an offshore load (e.g., an offshore oil and gas platform).

- **Direct HVDC** – offshore wind turbines exporting HVDC direct from the individual turbines.

- **Submerged/Subsea Substations** — planned to be used for upcoming floating wind developments in Scotland. Can provide improved reliability due to natural cooling and reduced maintenance costs. Concept has been proved recently by Microsoft for subsea data centers.

Block Island Offshore Wind Farm - Courtesy of Deepwater Wind

6.0 Development – Challenges and Project Risk

By: Úna Brosnan, Mainstream Renewable Power

The risk of developing offshore wind projects in each country is inherently different. Variances predominately lie in elements such as environment, grid connection and transmission arrangements, consenting/permitting requirements and processes and types of studies the developer needs to undertake, along with the in-country ambition, subsidy, or financial support mechanisms.

By way of example, in the UK and France, developers need to develop and construct the transmission elements of the asset (i.e., offshore substation, export cable, and onshore substation), however, in countries such as the Netherlands, Germany, and Denmark the transmission assets are provided by the state.

On the consenting side, developers in the UK are responsible for undertaking all site assessments (including the geotechnical and metocean studies), however, in Denmark and the Netherlands, the government takes ownership of running most of the site assessment activities, including metocean measurement campaign.

Below is a high-level summary of some of the key risks and challenges that need to be taken into consideration during the development of a U.S. offshore wind opportunity.

Risks	Details
Policy Risks	Changes in the political environment can have an impact on the project. Political and policy stability is crucial in securing developer and investor confidence. A key element to mitigate policy risk in an emerging market is to have clear visibility on the pipeline and route to market, which will not only instill confidence in the market but will enable investment to support infrastructure and grow the supply chain. Policy for the development of offshore wind in the U.S. has predominately been driven at state level with targets for the generation of power from offshore wind being set and passed in several states. These state targets have been significantly reinforced recently with the Administration's commitment to "double" offshore wind lease capacity in the U.S. by 2030, which was subsequently followed by the introduction of a new investment tax credit to support the realization of this target by Congress.
Regulatory Risk	Multiple permits are required for a development in the U.S., by multiple agencies, in contrast to one permit in the UK. Further to this, there can be significant difficulty and delay in obtaining permits.
Financing and Cost	The most pressing challenge the industry faces is the cost of offshore wind, and the related lack of available power purchase agreements and/or state and federal policies to support those costs. However, due to the maturity and competitiveness seen in the UK and European markets, the price of offshore wind energy is reducing year on year. In their 2021 Offshore Wind Market Report, the U.S. Department of Energy recognized that the levelized cost of energy has declined by 28-51% between 2014 and 2020 and is estimated to further reduce over the next decades. In their latest Cost of Wind Energy analysis, NREL based their fixed bottom offshore reference project on a cost of energy of US$77/MWh, down from US$215/MWh in 2013.

The Jones Act	There are restrictions around the use of vessels for transportation of passengers and merchandise between points in the U.S. and the Outer Continental Shelf ("OCS"). The Jones Act is an important piece of legislation that will have a profound effect on the offshore wind industry and will dictate which vessels can be used for the transportation and installation of offshore wind farms in the U.S. As explained in detail in the Laws and Regulations chapter, in order to qualify as Jones Act compliant, the vessel must: (1) be built in the United States (and have never been rebuilt abroad); (2) be owned and controlled by citizens of the U.S.; (3) have primarily a U.S. citizen crew and (4) have a Certificate of Documentation with a coastwise endorsement issued by the U.S. Coast Guard. The first U.S. offshore wind projects will need to rely on a mixture of Jones Act compliant 'feeder' vessels and existing installation vessels, until Jones Act compliant installation vessels are available.
Supply Chain	There is limited offshore design, fabrication, and installation infrastructure and experience in the Northeast of the U.S. To date, most of the offshore marine experience lies in the Gulf of Mexico due to the presence of the offshore hydrocarbon sector. With at least 30 offshore projects forecasted to be developed in this decade, and a surge in development worldwide, having a suitable skilled workforce, a robust supply chain, and the necessary experience is going to be a challenge. In recent years, however, there have been a number of investment announcements in the supply chain, with investment announced for monopile and tower fabrication yards, the commissioning of a Jones Act compliant installation vessel, and, more recently, investment in blade factories to support the growing offshore pipeline.
Vessel Availability	Installation vessels (cables, foundations, etc.) are specialist, so they need careful planning to ensure they are suitable and available. The transportation and installation plan must also meet Jones Act requirements.
Grid Connection	Transmission interconnection and upgrade requirements can significantly impact projects. If grid connection dates cannot be met, there is a risk of delay to the operational start of the offshore wind farm.
Ramp up of Serial Fabrication	This is a risk based on the limited resources available to deliver the project works. To date in the U.S., the fabrication of offshore structures has been predominantly for one-off hydrocarbon assets. Fabrication processes and yards need investment to prepare for serial production. A number of fabricators in Europe, the Middle East, and China have seen substantial losses on projects due to issues around serial fabrication and quality control.
Local Content Requirements	The local content requirements can have an impact on the project and may vary considerably from state to state and project to project. States may mandate substantial subcontracting of the supply chain and/or the use of unionized labor, which can have a cost impact but can also bring wider integration risk to projects.

Weather Risk	Good quality environmental data and understanding of weather windows is essential for robust offshore working strategies. This affects both installation and ongoing operations and maintenance work. Weather downtime of vessels can place a considerable cost and risk to a project and clients are generally liable for these costs. This can be considerable if using some of the larger vessels which can have day rates in the order of US$185k–US$375k per day.
Contracting	A robust contracting strategy that can balance risk and interface management is essential. At present, the U.S. has little local offshore marine experience in offshore wind, and as such, there is a significant risk for contracting.
Financial Risk	It is important to have adequate access to funding and be prepared for any key criteria to meet investor requirements around investment/lending.
Visual Impact	The risk of objection to offshore wind farms due to visual impact has hampered the U.S. industry in the past. The Cape Wind offshore wind farm experienced considerable objection from local residents, and it ultimately led to the project being canceled. At present, wind farms are being sited a minimum of 10 miles from shore where possible to minimize visual impact.
Technical Risk	There is considerable experience and confidence in most foundation structures, such as monopiles and jackets, due to their extensive use in European projects. However, technical risk should not be underestimated, as turbines get larger and new technology develops to meet the challenges of constantly pushing the boundaries of size, location, and complexity.
Natural Catastrophe Risk	Extreme environmental events, such as seismic and hurricane risks, also need to be considered over the lifecycle of projects, both for the operational phases and the high exposure risk during installation. Consideration needs to be given to the financial impact of delays and business interruption caused by natural catastrophes or adverse weather, and appropriate insurance policies and warranties need to be put in place to protect developers and investors.
Environmental Risk	Understanding how the development could impact the local environment, such as fishing location, and bird and mammal migrations, is very important, as this will drive the technical solutions and will have a large impact on the consent and permitting process.

7.0 Construction and Offshore Installation

By: Norman Johnston, Kent

7.1 Planning for the Marine Environment

Due to the challenging nature of the offshore environment and cost of construction offshore, the majority of fabrication and pre-commission tasks for equipment for the Wind Turbine Generator ("WTG") foundations, towers, nacelle, and blades are undertaken onshore. The WTG foundations, towers, nacelle, and blades are then transported from the fabrication yards, through marshalling facilities, to the project site for installation offshore.

An offshore workability assessment will be undertaken early in the project to consider the offshore environment, weather, metocean data, water depth, currents and tides, the vessel dynamics and operational limits, the foundation design, and the WTG design. This will then be used to determine the project risks, timescales, and costs, and agree on the transportation and installation plan for the project. Experience indicates that bad weather is one of the main causes for delays in the transportation and installation of offshore wind farms and can impact the 24/7 operations if bad weather is prolonged.

It is important to determine the optimal operational weather window for vessels and installation tasks offshore to minimize risks during transportation and installation. Based on this, an installation schedule will be developed, including estimated weather downtimes ("WDT") for specific vessels that relate to the transit and installation tasks.

In addition to the scheduling requirements governed by weather, sea-states, and vessel operational limits, there are also marine seasonal noise restrictions that limit piling and geophysical operations throughout the year along the Eastern Seaboard in the U.S. These are to protect the endangered North Atlantic Right Whale migration along the East Coast. These restrictions reduce the operational construction window offshore. For example on Vineyard Wind, from January 1 to April 30 there are no pile-driving activities allowed (Red Period), from November 1 to December 31 and May 1 to 14 enhanced mitigation protocols are required (Yellow Period), and between May 15 to October 31 comprehensive monitoring and clearance zone protocols are required. There are similar restrictions imposed on geophysical surveys that limit the Root Mean Square ("RMS") sound pressure levels to below 180dB re 1µPa at 1m for equipment that operates between 7Hz and 35kHz. This is restricted between January 1 to May 14 (Red Period) and allowed between May 15 and December 31, with comprehensive monitoring and clearance zone protocols in place.

7.2 Manufacturing

The manufacturing process has been a key factor in contributing to the cost reduction of offshore wind through a strong emphasis not only on quality but also on driving standardization, serial fabrication, and optimization of the manufacturing process itself. Due to the size and complexity of turbine blades, each blade must be crafted to the highest quality standards in order to ensure reliability. Turbine blades must be able to maintain their strength and aerodynamic structure during virtually non-stop operations over its typical 25-year design life.

As the demand for offshore wind components increases, coupled to the fact we are seeing an unprecedent drive in wind turbines technology and "scale-up" to even larger sizes, manufacturers are being continuously challenged to optimize their processes further to lower the cost of wind energy. Some of the challenges manufacturers experience are due to the sheer size and scale of the structures, e.g., bigger "roll" diameters for monopiles ("MPs"), load-out frequency, and lift capacity.

Manufacturing structures for the offshore wind industry differs greatly from the oil and gas sector. Offshore wind demands a high volume of structures to be produced and, in many cases, have the requirement for constant load-out to meet a continuous offshore installation schedule. Driving standardization across foundation design coupled with streamlining serial fabrication processes has been pivotal for the supply chain to meet its delivery and cost challenge. The power of early collaboration in the supply chain across design, manufacturing, and installation phases should not be underestimated and should be encouraged as early as possible.

In support of the developing U.S. offshore wind market, there has been major investment in new manufacturing facilities, assembly yards, marshalling facilities, and storage areas in the last couple of years along the Eastern Seaboard, with new supply chain announcements being made regularly. A select few examples are given below.

In New Jersey, a new MP manufacturing facility will be created by EEW on a 70-acre site at the Paulsboro Marine Terminal, Gloucester County. This will support the Ocean Wind project for the 1,100MW being delivered off the coast of New Jersey by Ørsted and PSEG.

Source: https://nj.gov/windport/docs/20210224-economic-PaulsboroMarine.pdf

In the Port of Providence, a new assembly facility will be built. This will support the fabrication and assembly of foundation platforms and foundation components for the Ørsted and Eversource projects, which include the 704MW Revolution Wind (Rhode Island and Connecticut), 132MW South Fork (Long Island), and 924MW Sunrise Wind project (New York).

Source: https://pbn.com/orsted-eversource-plan-wind-farm-manufacturing-facility-at-provport/

In Port Albany, New York, a joint partnership of Marmen and Welcon have forged an alliance with Smulders to build a new facility to manufacture Transition Pieces ("TP"). Equinor will use this facility to support the Empire Wind and Beacon Wind projects.

Source: https://www.welcon.dk/news/marmen-and-welcon-will-build-a-new-plant-for-the-fabrication-of-offshore-wind-towers-in-new-york-state/

At Sparrows Point in Maryland, a 90-acre waterfront site is being transformed into a new wind development hub, which will bring steel production back to the area. Tradepoint Atlantic will support U.S. Wind's 1,200MW Momentum Wind project. Ørsted has also formed a partnership with Tradepoint Atlantic to develop a 50-acre part of the site to be used as a staging, assembly, and deployment base for their 120MW Skipjack project.

Source: https://www.tradepointatlantic.com/wp-content/uploads/2018/04/Factsheet_Tradepoint_Offshore_Wind.pdf

A number of other manufacturing, marshalling, staging, assembly, and transportation hubs are being planned across the Northeast, including the New Bedford Marine Commerce Terminal (which will be used for the Vineyard Wind and Mayflower projects), the Salem Harbour Station Port (for Commonwealth Wind), the New Jersey Wind Port, and the Arthur Kill Terminal in Staten Island. It is expected other staging ports will be announced along the coast to support the various developments in progress.

Heavy T&I Vessels

Lift Vessels

The offshore wind renewables market utilizes many of the worlds largest Heavy Lift Vessels ("HLV") and Jack-Up Vessels ("JUVs") to install MP foundations, jacket foundations, gravity base foundations, offshore substation ("OSS") foundations, and WTGs, including the tower, nacelle, and blades.

Lift vessels are split into two main categories, single-hulled vessels that use dynamic positioning ("DP") or anchoring systems to maintain position during installation and JUVs that utilize movable (jack-up) legs to raise the vessel above the water to install the foundations and WTGs. There are other types of vessels that can also be used such as Semi-Submersible Construction Vessels ("SSCV"). Examples include Saipem's S7000 and Heerema's Sleipnir. These are very effective vessels that use a mixture of DP and a semi-submersible hull to provide additional stability.

Seaway 7 Strashnov (HLV - monohull DP)

Sapiem S7000 (SSCV)

Van Oord Aeolus (JUV)

Heerema Sleipnir (SSCV)

https://www.seaway7.com/wp-content/uploads/2020/08/Seaway-Strashnov.pdfhttps://www.mpi-offshore.com/equipment/aeolus

Sources: https://www.offshorewind.biz/2021/10/11/first-jacket-in-at-deepest-fixed-bottom-offshore-wind-farm https://www.heerema.com/heerema-marine-contractors/fleet/sleipnir

It is worth noting that these vessels have high operational day rate costs, and it is important to optimize the operational time for vessels and minimize any weather downtime and delays caused by non-essential work.

Heavy Transport Vessels, Cargo Barges & Tugs

It is important to optimize the transportation of the foundations to field for installation by the HLV to avoid unnecessary port trips and vessel downtime. The foundations (jackets or MPs) will initially be transported from the fabrication facility using a Heavy Transport Vessel ("HTV") to a nearby port or harbour, stored until required, then transported on cargo barges using tugs to field for installation.

Cargo barges are then typically used for transporting foundations to field for installation, below are typical barge configurations being used for transporting, first jackets, and then MPs with TPs.

Beatrice OFW Jackets at Smulders Fabrication Yard before transportation to Nigg

Source: https://www.smulders.com/en/offshore-wind

Xiang Yun Kou (XYK) delivering the first five Seagreen jackets from the fabrication yard in Jutal, China to Nigg, Cromarty Firth, Global Energy Group

Source: https://www.ross-shirejournal.co.uk/news/seagreen-wind-farm-jacket-foundations-arrive-at-port-of-nigg-247439

Transport of Beatrice OFW Jackets to Field on Cargo Barge with two Tugs

Source: https://www.energyvoice.com/renewables-energy-transition/173750/final-beatrice-jackets-head-towards-wind-farm

Transport of MPs and TPs to Field on Cargo Barge with single Tug

Source: Source – Royal Wagenborg

Jack Up Vessels ("JUV") for Tower, Nacelle, Blades and Foundation Installation

The installation of the towers, nacelles, and blades is typically undertaken using JUVs and sometimes for foundations also. These vessels will use their back decks for load out of the turbine components afloat at quayside in sheltered waters. Then, after transit to field, jack themselves clear of the sea and subsequent motions for installing the foundations, towers, and turbines. It is also possible to use cargo barges and tugs to feed the JUVs with components if required.

For the installation of foundations, the JUVs are less sensitive to wave conditions due the vessel's ability to jack-up out of the splash zone, however with the increase in the size of the foundations, there may be limits to the crane capacity and ability to achieve either the lifting capacity or required hook height.

OHT Vind 1 (New build JUV)

Source: https://www.oedigital.com/news/482177-oht-orders-its-first-wind-turbine-generator-installation-unit

The latest JUVs also provide what's termed as a Smart Back-Deck that has been designed to provide ease of optimizing the deck layout for a variety of operations and lifts. This improves vessel utilization and reduces the time and cost to reconfigure the back-deck while in port for different operations offshore.

Offshore Installation Planning and Engineering

The offshore installation schedule for the project is dictated by the operational weather windows, the sea-state limits, vessel motions and accelerations, and associated crane and boom tip motions for lifts.

Each vessel operation and installation task has a limiting sea-state and weather window for the task; this includes transit from the fabrication yard to the marshalling yard, the transit of the cargo barge and tug from the marshalling yard to the field for installation, the lifting of the foundation from the cargo barge using the HLV (vessel-to-vessel motions, cargo barge, and HLV), the installation of the foundation through the splash zone, and set down on the seabed using the HLV.

It is worth noting that the foundation requires to be designed for the fatigue and ultimate loads ("FLS" and "ULS" loads) generated during these tasks:

- Foundation load out
- Offshore transport (transferred through the sea-fastening and grillage to the vessels) for the
  - Transit from the fabrication yard
  - Transit from marshalling yard
- Offshore installation stages including
  - Lowering the foundation through the splash zone
  - Land out on the seabed
  - Piling driving and grouting operations
  - On-bottom stability during self-weight penetration and installation to depth for suction caissons

Choosing a HLV or JUV

The governing factors to consider when choosing a vessel include:

- Vessel availability
- Cost/day rate of vessel
- Mobilization/demobilization costs and timeline
- Installation rate/timeline
- Operational limits of vessel
  - crane lift capacity
  - hook heights
  - sea-state operational limits
  - size of back deck
  - vessel draft
- Installation strategy, water depth, current and tidal restrictions
- Marshalling strategy and/or use of vessel back-deck

For the U.S. market, the Jones Act presents an added complication and cost to offshore installation works for wind farm developments. As there is currently no Jones Act compliant HLVs or JUVs suitable for offshore installation works, overseas vessels will need to be utilized along with U.S. Jones Act compliant feeder vessels. The feeder vessels (e.g., cargo barge and tug) will be used to transport the foundations, towers, blades, and nacelles from the marshalling ports to the field whilst the HLV/JUV will remain offshore. Already, a number of companies have signaled that they will be building Jones Act complaint installation vessels, however, the lead time will mean these are not expected to be in service until 2023/24 at the earliest.

Surveys and Survey Vessels

At the early stages of the design for an offshore wind farm, there is a need to gather hydrographic and geophysical information to create a geological model of the site. It is critical to have an accurate and reliable hydrographic and geophysical survey to locate and design the WTG foundations and seabed cable routes (including export to shore).

The gathering of the hydrographic, seabed bathymetry, and geotechnical bore hole data for soil sampling and undertaking the cone penetration tests ("CPTs") for soil strength and layering are carried out using survey vessels equipped with CPT and bore hole equipment on board.

The results of these surveys are used to determine cable routes for the export cables to shore, taking into account the need to trench, backfill, and rock dump the cables. For example, route selection will need to consider shallow rockhead, gravel, and surface boulders (if not easily movable) and shallow areas such as sandbanks, which may cause vessel draft issues during cable installation. The optimum export cable route will need to consider landfall locations, beach crossings, and proposed grid tie-in locations onshore.

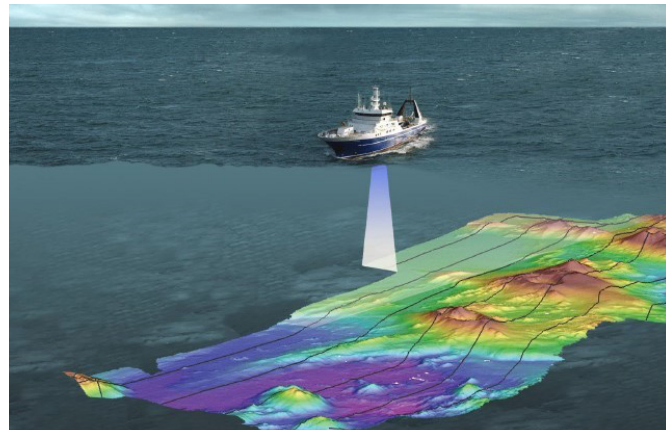
Modern survey vessels, such as the Fugro Equator, have been built to create an acoustically quiet platform, using the latest digital seismic seabed mapping systems. This, combined with the advanced surface positioning equipment, provides the necessary platform to gather accurate survey information to build the geological model.

Survey Vessel - Fugro Equator

Source: https://www.fugro.com/docs/default-source/about-fugro-doc/vessels/fugro-equator.pdf

Seabed mapping systems consist of a multi-beam echo sounder that emits a fan of sound waves to the seafloor to scan a wide swath of the seabed in great detail.

Survey Vessel - Multi-Beam Echo Sounder



Source: https://marinedata.niwa.co.nz/multibeam-data

The results of the site characterization will be used extensively in the design of the foundation and the export and inter array cables.

A further pre-lay survey will also be undertaken by the installation contractor before the foundation and cable lay operations are carried out to check and remove any surface boulders or Unexploded Ordnance ("UXO") on the cable route or within the target foundation locations.

Cable Installation Vessel

The export and inter array cables are installed using Cable Lay Vessels ("CLVs") that are designed to load in, store, and lay the cables to the foundations, the OSS and then onshore to the beach. The transition from the CLV, to shallow water barge for the final pull of the export cables to the beach crossing is dictated by the CLV draft and water depth.

Seaway 7 Aimery - (CLV)

Source: https://www.seaway7.com/wp-content/uploads/2020/08/Seaway-Aimery.pdf

These vessels typically have inbuilt carousels and turntables for cable storage, cable tensioning, and cable over-boarding systems and work-class Remotely Operated Vehicles ("ROVs") with launch and recover systems to assist in the cable pull-ins and subsea inspections pre-and-post-works.

Cable Trenching

Cable trenching requires the use of a plough or jet trencher to create the trench for cables to be laid into either during or prior to the cable lay task. The type and size of the plough is dictated by the seabed conditions, and for the smaller jet trencher, this operation can be caried out using the equipment on the CLV. For the larger ploughs in a stiffer seabed condition, these requires the use of Trenching Support Vessel ("TSV"), using a Light Construction Vessel ("LCV") or Platform Supply Vessel ("PSV").

The three main trenching methods utilized by such machinery are Jetting, Ploughing and Cutting, which are considered below.

Trench Jetting

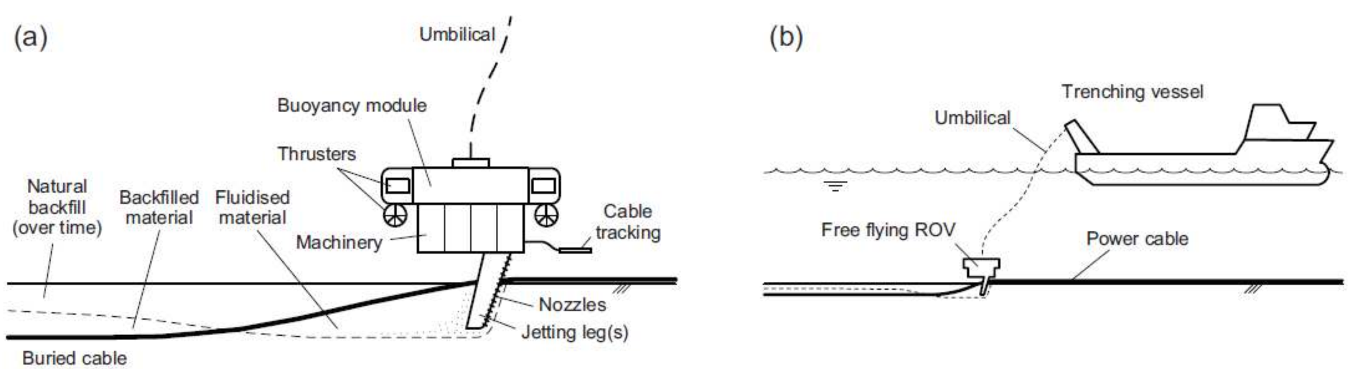
Jetting trenching operates by pumping high-pressure water to fluidize or displace the soil. This forms a slot of fluidized soil into which the cable is lowered. This operation takes place within the footprint of the trenching machine itself.

Jetting trenching machines are generally tracked self-propelled crawlers connected via control umbilical to the support vessel and operated remotely. Jetting is particularly effective in sandy soils, but less so in cohesive materials such as firm or stiff clays. Larger soil particles also require more jetting power, so the method may be less successful in gravelly sands; indeed, in such conditions, there may be a tendency for the gravel particles to sink during the fluidization process, displacing the sand upwards. This aspect of the potential backfill material needs to be understood on a case-by-case basis.

Source: https://globalmarine.co.uk/vessels-trenching-assets/xt600-trenching-system

The figure below shows a typical ROV jet trencher and the principle of its operation.

ROV Jet Trencher



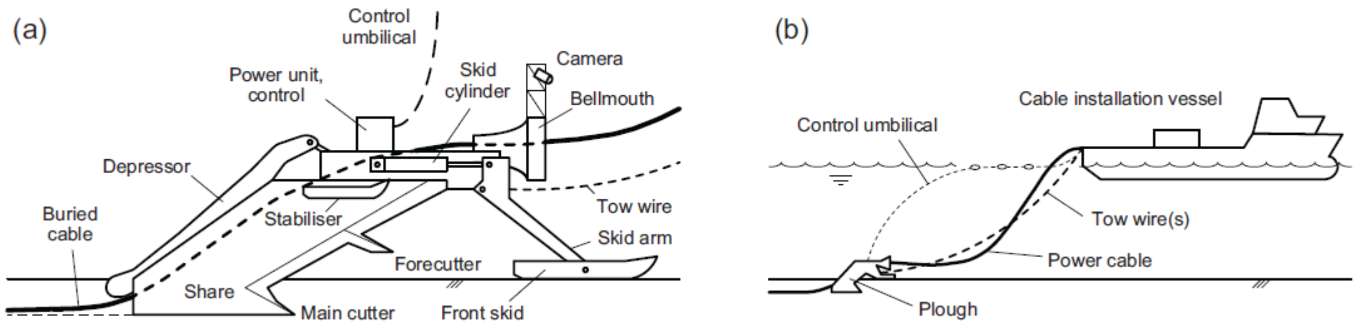
Source: DNV-RP-J301

Trench Ploughing

Trench ploughs are passive machines that are towed behind a support vessel, the towing distance being a function of water depth. This makes them less maneuverable than self-propelled machines, particularly in confined areas such as wind farms, where cable routes have to be arranged to avoid conflict between the towing vessels and WTGs.

This method is generally effective in most soil types (granular and cohesive), although variable conditions such as stiff clays with embedded cobbles can be problematic. For electrical cables, the plough may be equipped with a cable depressor, so that the removed soil can be backfilled within the plough's footprint. The figure below shows a typical ploughing machine and the principle of its operation.

Trench Cable Plough



Source: DNV-RP-J301

Specialist plough types also include "rock-ripping" and "vibrating" variants. Both feature a narrowed plough share intended to penetrate the rock more efficiently. Deployment of rock-ripping ploughs tends to be more practical for the ripping of rocks and boulders cemented with soil (i.e., conglomerates and brecchias) rather than directly upon solid rock. The vibrating plough is potentially more effective if it incorporates a strong impacting action on the rock; an example is shown in the figure below.

Subsea Vibrating Plough

Source: https://www.ldtravocean.com/subsea-systems/ploughs

Trench Cutting

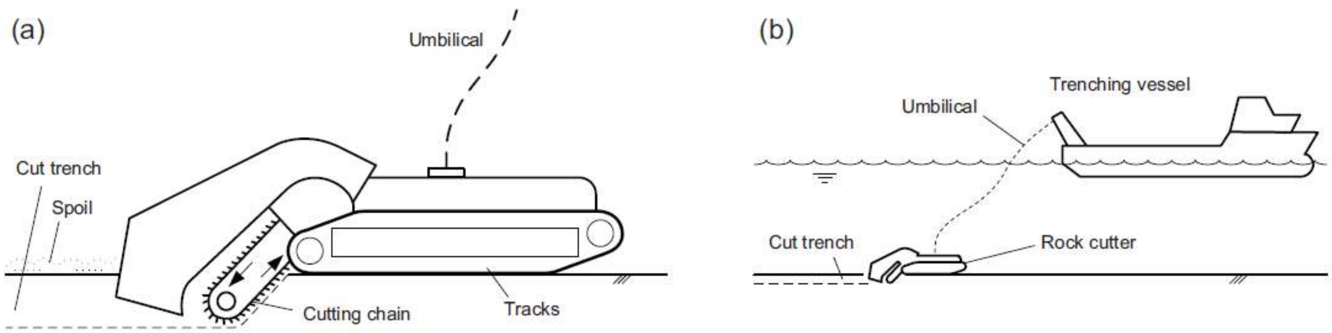
Trench cutting is performed using a similar self-propelled vehicle to that used for jetting, except that it is equipped with a cutter chain that creates a vertical slot into which the cable is lowered.

The technique is particularly suited to firm or stiff clays where jetting would be ineffective and where the soil can maintain a vertical-sided profile.

The figure below shows a typical chain cutter and the principle of its operation. Alternatively, a cutting wheel may be adopted. Both types of equipment are illustrated in the figure below.

Cutting into rock is feasible with such a system but requires frequent replacement of the cutter's teeth and can be a slow process.

Chain Cutter : Rock cutting Operation



Source: DNV-RP-J301

Subsea Trench Cutting Machinery

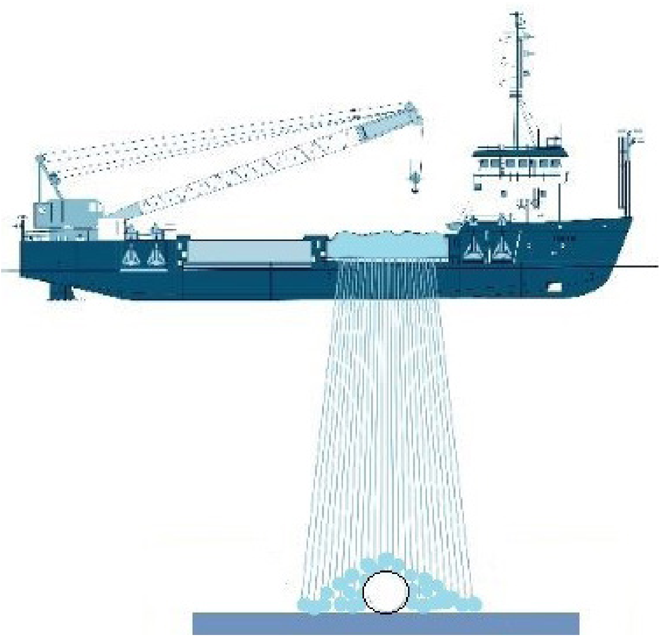
Source: https://www.ldtravocean.com/subsea-systems/ploughs

Rock Dumping

Rock Dumping Vessels ("RDVs") are used to place rock on exposed cables in open trenches that are not backfilled and on cable sections that run on the seabed from the trenched section to the cable protection system before entering into the J-tube on the base of the foundation. Rock protection may also required around the base of the foundation to prevent against local scour, where the seabed may be eroded by the effects of current or tide.

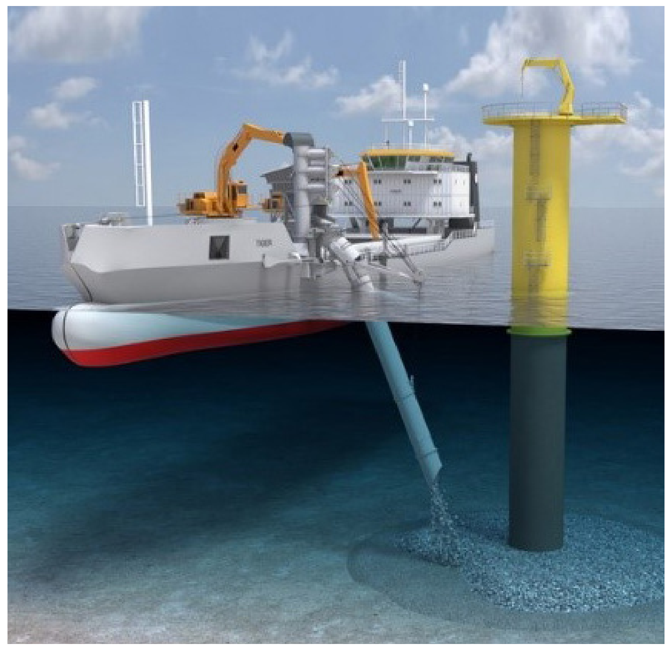
RDVs use a flexible fall pipe or side shoot system to dump rocks on the seabed. Side-discharging by means of crane is usually done in shallow waters; fall pipes are more commonly used in deep-water rock-dumping operations.

Rock Dump Vessel - Side Stone Dumping Systems

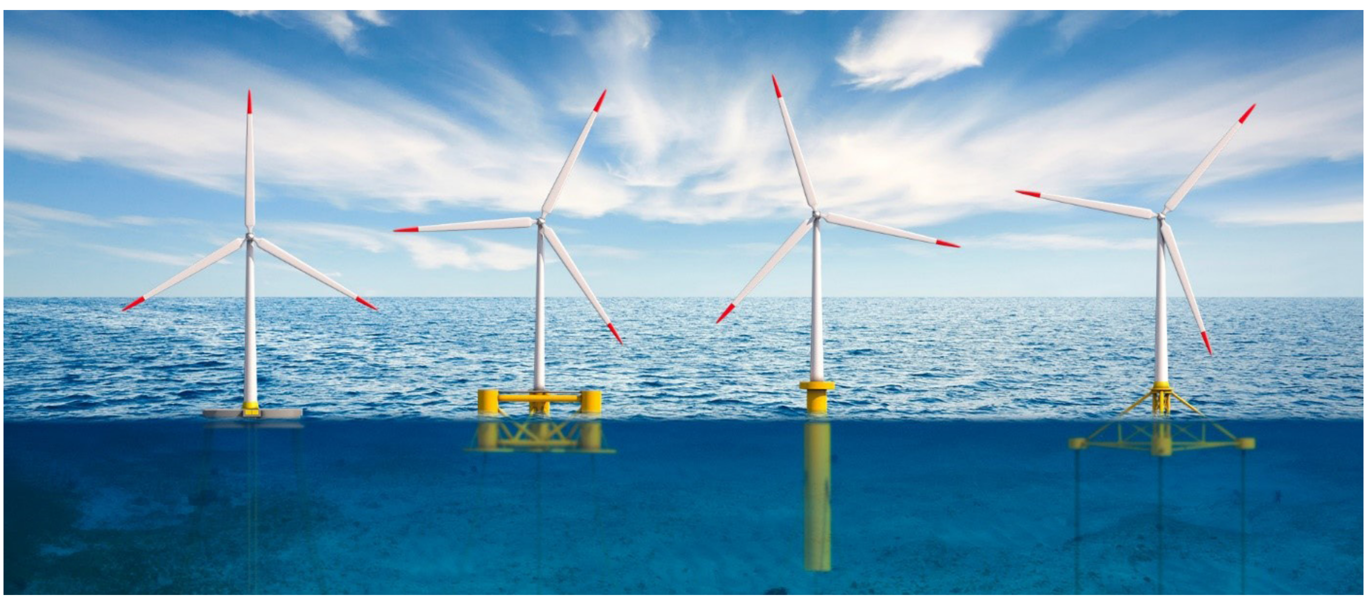


Source: IADC & Seahorse

Flexible Fall Pipe System



Source: IADC & Seahorse



All commissioning activities need to be coordinated to ensure safe and correct completion. It is essential that the contractor develops a coordination program between the installation teams and the commissioning teams for all elements associated with the WTGs, array cables and OSSs.

As part of developing a detailed installation and commissioning program, the contractor will need to develop an interface schedule that will identify a number of key hold points. These hold points will identify handover points between the different installation and commissioning teams for the OSS, export and array cables, and WTGs. This will help to ensure safe handover of the assets and limit access to plant when undergoing commissioning.

The interface schedule will facilitate any overlapping activities, such as installing the turbine tower and the commissioning of the array cable on the same string. This can reduce the anticipated timescales associated with the commissioning of an array, however, coordination of these activities is key to minimize risk and manage safe working of the operations.

Health and safety, particularly in the offshore environment, is paramount; therefore, adequate provision must be made to ensure that personnel do not have access to any plant or equipment that is made "live" unless they are authorized to do so as part of the commissioning process. For example, the developing of control or permitting documentation associated with "hot" commissioning activities takes time to complete. For hot commissioning, the system must be commissioned as a whole. Each WTG can be hot commissioned separately, as long as its associated array cable has been energized and hot commissioned.

Once the WTG is hot commissioned, it will then enter the availability and reliability phase. In line with the manufacturer's recommendations, the WTG must remain available and operate for a minimum of 360hrs before it passes its availability and reliability test. Once this test is complete, the WTG is available for generating.

Another key factor in the commissioning phase is the hook up to the OSS. Final commissioning of the OSS can be dependent on the ultimate delivery date of export cable; once the OSS foundation has been installed, there will be an interface with cable-pulling operations that needs to be coordinated with either the CLV or HLV so that overall delivery schedule is not compromised.

Installation Support Vessels ("ISVs") are used to help with the commissioning activities for the WTG foundations. These vessels have quick and safe "walk to work" access systems using active motion-compensated ("AMC") gangways and 3D motion compensated offshore cranes. The Seaway 7 Moxie is a typical ISV and can provide safe access to WTG platforms in up to significant wave heights of 3.5m.

Seaway 7 Moxie

Source: https://www.subsea7.com/content/dam/subsea7-corporate2018/Datasheets/Vessel/Renewables/Seaway Moxie.pdf

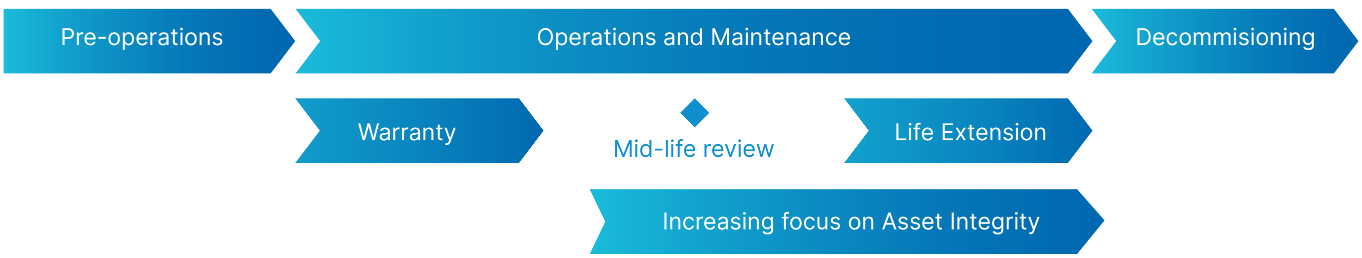
Thanet Offshore Wind Farm - Courtesy of Vattenfall

8.0 Asset Management and Decommissioning

By: Abid Sayeed & Andy Malpas, Kent

Owners seek to maximize the value they extract from their wind farms while ensuring that they remain safe and compliant. To effectively achieve this, owners need to adopt a holistic and strategic whole-life approach with activities tailored to the needs of each component or plant area and within a wider management system.

A strategic asset management approach gives the owner assurance that it is deploying its resources in the most effective way, it has a good understanding of its risk profile, that all risks are acceptable and there is a clear plan for each asset.



8.1 Pre-Operations

Prior to a wind farm entering the operational phase, owners have the opportunity to prepare it for its integration into a wider portfolio of assets, develop and implement its Operations and Maintenance ("O&M") strategy, implement the systems, processes, and infrastructure required to effectively deliver the O&M requirements, and recruit and train the operations team. The owner also needs to manage the handover from the construction to operations phase to ensure that any residual commercial and technical risks are identified and managed.

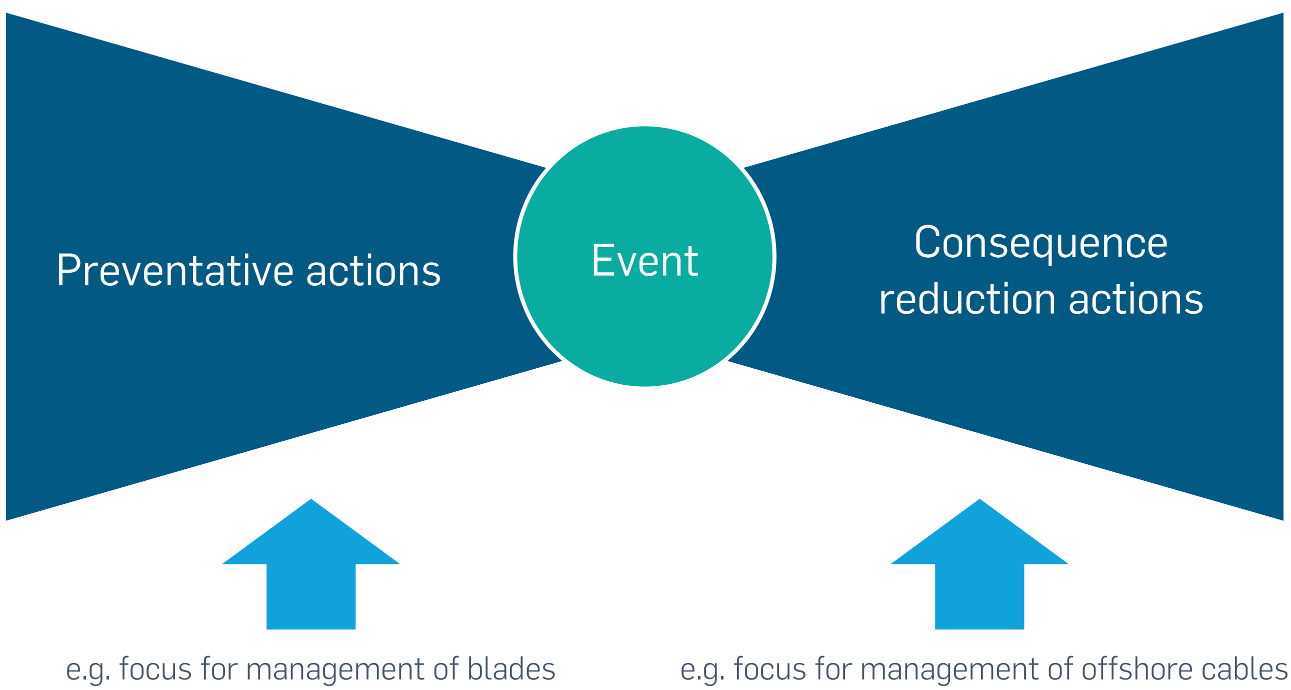

Rampion Offshore Wind Farm - Courtesy of Kent

8.2 Operation and Maintenance

O&M costs contribute significantly to the total OPEX of a project. O&M is made up of number of elements, including routine scheduled maintenance, major correctives, fault-finding, logistics, warehousing, staffing, and spare parts management. When developing an O&M strategy, the owner needs to ensure appropriate planning and prioritization while considering the optimum balance of proactive and reactive maintenance, necessary repair contingencies, spare parts management, the contracting strategy, and revenue. Alongside the O&M strategy, owners also can select different options for the delivery of the O&M, such as procuring the service from the original OEM or independent service providers, or creating in-house service teams. Regardless of the strategy adopted, the wind farm owner has ultimate responsibility for overall asset management, safety management, management of any warranties and availability guarantees, power forecasting, and local stakeholder management.

As owners seek to achieve an optimizing balance of power generation volumes/revenues, O&M costs, and risk profile they will need to adjust the O&M strategy at different times in the assets' life to account for its age, condition and any changes in the external commercial landscape.

An offshore wind farm, similar to any other form of power plant, is generally subject to 24-hour supervision to monitor performance and manage alarms. This is normally carried out remotely in central control rooms. Onshore operations teams plan and manage the O&M activities, and teams of offshore technicians execute the work. Effective planning and delivery of maintenance is essential to effectively use the opportunities to access the wind farm. A wind farm consists of many individual assets, so a cost-effective O&M strategy is built on Reliability Centred Maintenance, Risk-Based Inspections/Maintenance philosophies and the application of Condition Monitoring and Structural Health Monitoring. The owner will need to assess each plant area and determine its optimum asset care package. This will be based on the types of issues and damage mechanisms that can be detected, the impact of failure (cost and safety), and the ability to complete rectification or recovery works. Some components are well suited to a preventative maintenance strategy, while others provide little opportunity for this approach so the focus is on developing plans to reduce the impact of any failure.



O&M activities also include regular routine servicing, major corrective work (for example, the replacement of main components), any inspections required by the relevant authorities, inspections of safety equipment, performance monitoring, logistics, and repairs. Specialist Remotely Operated Vehicles ("ROVs") can be utilized to survey and monitor the subsea components, such as the foundation, scour protection, and cable route. This technology provides an opportunity to minimize the requirement for diver works.

During the operational phase, the owner may be required to undertake various environmental surveys of the marine fauna and flora and birdlife. These are typically a condition imposed by the relevant authorities.

Depending on the strategy adopted, the initial period of operation is usually characterized by a period of warranty from the WTG supplier during which it is responsible for managing the turbine servicing and delivering the contractual performance guarantees. During this period the owner monitors performance and manages the contracts, warranty claims, and construction defects.

The midlife of an asset provides the owner with a milestone to assess the performance of the asset compared to the original investment assumptions and plan for the remaining life, including any activities needed to assess and confirm the viability of life extension.

Owners may have the opportunity to upgrade or enhance the asset during the operational phase. This could be to improve the availability of the asset through improving the reliability of components, optimizing the control system strategies, or increasing the output. The owner needs to ensure that it implements appropriate technical assurance activities to effectively develop and execute any modifications to the asset.

Throughout the O&M phase, the owner has access to data from several sources. Intelligent use of this provides the owner with information regarding the performance of the asset and the condition of the different plant areas. This helps to effectively schedule maintenance activities and can be integrated into operational business planning processes and budget allocation. A strategic approach maximizes the value of this data and can be used to optimize the decision it makes.

8.3 Life Extension

The investment case for offshore wind farms is usually based on an operational period of 20 to 25 years. This requirement is then aligned with technical design requirements and commercial factors (operational costs, grid connection charges, power prices and Power Purchase Agreements, and support regimes), along with legal arrangements, including leases, licenses, and consents. The wind farm design is carried out to achieve this with some conservatism, which means that the actual life can sometimes be longer than the originally planned lifetime. Generating electricity over a longer asset lifetime using all or elements of the existing asset presents an opportunity to deliver a lower Levelized Cost of Energy ("LCOE"). Life extension also provides the owner with an option to defer the decommissioning costs.

In order to extend the operational life of an offshore wind farm, the owner needs to ensure leases, consents, and wayleaves can remain in place beyond the initial design life and assess the business case, taking into account any possible reduction in reliability, increase in costs due to the management of obsolesce, the necessary asset integrity activities, and any increase in risks.
In the offshore hydrocarbon sector, extending the operational life of offshore structures is routine, and although the offshore wind industry is comparatively young, there are a number of early offshore wind farms coming to their end of life where similar life extension practices are being considered.

The technical options available to operators include the use of measured data to reevaluate the foundation structure design, update the asset integrity analyses, and optimize the risk-based inspection strategy. Regardless of the approach adopted, the owner will need to ensure sufficient assurance that acceptable reliability and integrity levels can be achieved. These activities need to be planned well in advance of the end of the original design life and ideally as part of a mid-life review of the asset.

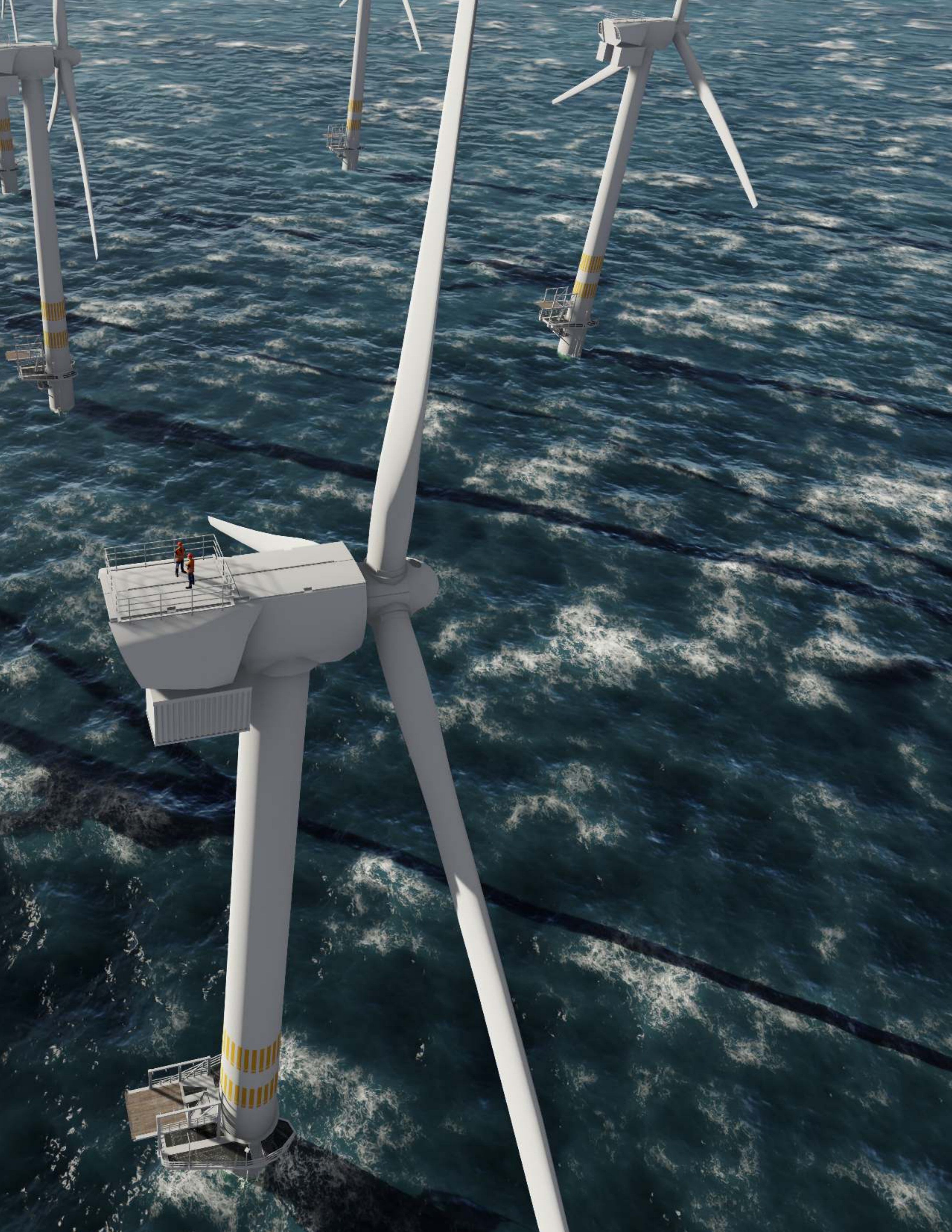
In addition to life extension, repowering (partial or full) might also be considered to allow the wind farm site to continue operating and generating past the original design life. Repowering involves upgrading major parts of the old assets, such as upgrading the turbines or even replacing the foundation structures and cables. However, permitting or location constraints can make repowering unviable.

8.4 Decommissioning

When an offshore asset has reached the end of its useful life, the owner needs to manage the decommissioning safely and with minimal costs. It is important that decommissioning is considered at the design stage and as part of the whole-life costing exercises.

The decommissioning process is generally the installation process in reverse with the application of oil and gas experience for specific activities such as removal of the substructure. The overall decommissioning project will involve offshore dismantling of the major elements and onshore disassembly of sub-components. A major part of the decommissioning activity is the environmentally neutral removal of offshore substructures and foundations.

Only a very limited number of offshore wind farms have undergone decommissioning activities, however, some of the early-stage wind farms in Europe are now nearing the end of their original design life.



9.0 Industry Lessons Learned

By: Úna Brosnan, Mainstream Renewable Power; Trevor Hodgson, Kent

The success and growth of the offshore wind industry over the last 25 years has not come without its challenges. Like many other fast paced and innovative emerging industries with highly complex and novel challenges to address, the industry has at times raced to find solutions during the development of a number of the European offshore wind projects. It is imperative that the U.S. offshore wind industry uses these lessons learned to have a better understanding of project risk for their developments. The challenges and lessons learned span technical disciplines and project stages, from gaining a better understanding of how structures behave, materials, corrosion, fabrication issues, and installation challenges through to contracting and risk management. Most of these challenges have been dealt with inside project development, however, a small number of disputes have required resolution in the courts. Below is an overview of a sample of key examples of industry lessons learned across offshore development disciplines.

Cumulative Effects on Marine Species

Assessing the impacts of offshore wind developments on marine mammals and seabirds should not be underestimated, and it is imperative that projects ensure a good quality baseline is established via surveys prior to construction. In January 2015, a Scottish wildlife charity (RSPB) lodged a legal challenge against the consent granted to four major offshore wind farm projects in the Firth of Forth and Firth of Tay, off the east coast of Scotland. The RSPB raised concerns about the impact on migratory wild bird species and their protected habitat population, including Atlantic puffins, northern gannets and black-legged kittiwakes, as well as guillemots and razorbills. This challenge was initially awarded in favour of the RSPB, but was later overturned in the courts on appeal and consents were reinstated. Some key lessons learned brought to the fore during the process involved the following:

- The importance of key baseline data for birds and mammals on projects which can be used to determine the link between the development and key populations.
- The requirement to assess cumulative effects of wind farm development in the area.
- Ensuring adequate monitoring mechanisms are in place during wind farm construction and operation to determine disturbance effects and avoidance responses, but also to support future offshore wind farm developments.
- Applying learning from other industries to inform risk assessments and the effectiveness of mitigation measures.

With the growth of offshore wind farms, in both number and scale, there is a growing need to consider the population level consequences and cumulative impacts of offshore wind developments on marine species. Ensuring early planning for strategically targeted data collection and modelling will be important to support both the consenting process and challenge by regulators and planners, and also to support the decision making process and finding the balance between environmental legislation and a country's climate change target.

Environmental and Geotechnical Data

Good quality environmental data is key for the design of offshore wind farms and is particularly important to underpin design assumptions and the optimization of foundation design, siting of structures and cables, and the design of inter-array and export cables, including cable protection systems ("CPS"). Understanding seabed movement is essential in offshore wind farm design. There have been a number of industry cases that have resulted in detrimental impacts on existing offshore wind farms, including a number of incidents where inadequate assumptions on sand wave amplitude resulted in structures and cables being subject to damage due to excessive scour.

There have also been several cases documented across the UK and continental Europe where issues have arisen with the CPS moving across the scour protection (the rock protection placed on the seabed around the foundations to avoid seabed erosion), resulting in abrasion of the CPS and in the worst cases, cables failure. For one developer, it was reported that the remedial works for impact to its portfolio was of the order of US$500 million.

Blockage and Wake Effects

In 2019, one of the offshore wind developers declared to the market that it had likely been overestimating the energy produced by its wind farms. After running advanced analysis of its models, it found that production forecasts underestimated the adverse effect of blockage and wake effects. This was specifically highlighted to the market as this method had been widely used by the industry, and the expectation was that the ramifications would be industry wide. This issue resulted in a downgrade of its long-term target for unlevered lifecycle internal rate of returns ("IRRs") for a number of offshore developments. The blockage effect arises from the wind slowing down as it approaches the offshore turbines. An individual blockage effect is encountered for each turbine and there is a further blockage effect for the whole wind farm, which is greater than the sum of the individual turbine effects. Wake effects are seen for each turbine, affecting nearby turbines, and the issued is further compounded by neighboring wind farm effects. With the global build-out of offshore wind farms, these will be key factors that need to be considered by developers going forward, especially where wind farms are close to each other as we're seeing in some of the U.S. leasing areas.

Design Codes

One of the most prominent cases involving a design error that went through the courts was on the Robin Rigg Offshore Wind Farm in the UK. MT Højgaard had a design and build contract for the design, fabrication, and installation of the foundations for 60 wind turbines structures. In this case, the wind turbine was supported by a monopile ("MP") which was driven into the seabed. The bottom of the turbine tower is connected to the MP by a steel cylinder known as a transition piece ("TP"), which is fitted over the top of the MP. The gap between the TP and the MP is filled with grout. The grouted connection works by friction between the grout and the two steel surfaces between which it sits. A passage in the contract required the contractor to prepare a detailed design of the foundations in accordance with an international standard published by Det Norske Veritas, DNV-OS-J101 ("J101").

The contractor designed and fabricated the foundations in compliance with J101. However, shortly after completion of the works, the grouted connections started to fail, and the transition pieces began to slip down the MPs. It then transpired that J101 contained a serious error. As a consequence, the axial capacity of the grouted connection had been overestimated, and the foundations did not have a design life of 20 years. The subsequent court proceedings focused on the interpretation of the different elements of the contract, and the court held that MTH was obliged to meet the highest standard imposed by the contract and was therefore required to apply more stringent standards than J101 where that was necessary to achieve the required design life.

Robust Design Interfaces

Interface management is a key element to be considered during the design, fabrication, and installation phases, and one where if adequate attention is not adhered to can result in costly remediation. One industry example concerned the location of the fabrication yard where the foundation structures were being fabricated, and the method of transportation used. Consideration must be adequately given for Transportation and Installation ("T&I") methods proposed by the contractor in the design and analysis of the structure – this is essential to ensure that the design life of the structure, particularly the fatigue life, is not impacted. In the example of jacket structures, these are secured to a barge/ship deck and generally transported in the vertical. If transported over long distance, and if the jackets are particularly tall, consideration need to be given for Vortex Induced Vibration ("VIV") during transportation where the structure may need to have additional reinforcement to mitigate the VIV effects (loss of fatigue life on some of the joints). The interface here between the design team, the installation contractor and the procurement team was key. Particular care should also be given to cases where there may be multiple yards used for construction and for varying sea states during the T&I phase.
A key area where a robust integration process is imperative is safety. In design phases, it is key that all phases of design, construction, operation, and decommissioning are considered. This is particularly important when assessing safety. There have been a number of challenges experienced in industry where during the construction phase, the safety of installation teams has been challenged due to a lack of consideration for the installation and commissioning of the assets. This has resulted in retrofits being required to facilitate safe working during the installation and commissioning phases, which had knock on effects in the program and cost. These can in turn can have significant impacts on the project program if a site is already challenged with

limited operational weather windows.

Fabrication Issues

One of the most prominent lessons learned has come from the challenges experienced by a number of contractors due to serial fabrication of the foundation structures. In the hydrocarbon market, structures are generally "one-offs", however, offshore wind requires anywhere up to 150 structures to be built. Serial fabrication has brought many challenges in how fabricators approach the manufacturing and quality control processes required. In a number of cases, the complexity and challenge this brought to fabricators was hugely underestimated, resulting in heavy revenue losses on contracts and in some cases failure of businesses. As offshore wind builds-out globally, it will be imperative that new entrants to the supply chain recognize these challenges in their diversification strategies and recognize the key learnings from an early stage.
Some prominent industry examples include the Greater Gabbard Wind Farm in the UK. The farm consists of 140 MP foundation structures which were installed in 2010. Extensive fabrication defects in the MP and TP welds were uncovered shortly before installation, but these were not fully repaired as this would have delayed the installation schedule, and the contractor argued that the defects did not impede on the design life. This resulted in extensive offshore inspection, material sampling, and offshore monitoring, as well as a lengthy arbitration between the owner and the contractor. This is not an isolated incident and another UK wind farm recently experienced similar fabrication defects, which were only detected at a late stage in the fabrication and installation phase. The key lesson here revolves around ensuring that during contracting and fabrication there are robust specifications and processes in place to ensure a high level of quality control and oversight at various phases of construction, with detailed inspection procedures agreed, in place and verified from the beginning. Further to this, is ensuring that adequate monitoring and inspection strategies are in place for the wind farm life to ensure that structures can be assessed during the O&M phase to detect issues and provide a strong basis for life extension studies.

Policy and Regulatory Issues

A key learning from early offshore wind markets, from a policy and regulatory perspective, has been for governments to adequately understand the market and follow through on their objectives and targets. When governments change or slow down on their commitments, this raises uncertainly in a market which can result in projects stalling or in some cases failing. The key challenge has been confidence with investors and the supply chain. If they don't have a commitment and clear visibility on pipeline and timeline, they will struggle to make investment in areas such as supply chain and infrastructure.

One example of a change in regulatory framework in a market was in Germany where there were significant cost overruns and delays on the build-out of the grid. A combination of technical issues and the incentives not being fully aligned resulted, not only in project delays, but a cost burden being placed on consumers. This has since been restructured whereby the Transmission System Operator ("TSO") carries the risk. Where a central development model is being considered, it is imperative that prior to adoption, government have demonstrated a strong track record and hold strong capabilities within its teams to ensure that they do not become a bottleneck in development processes.

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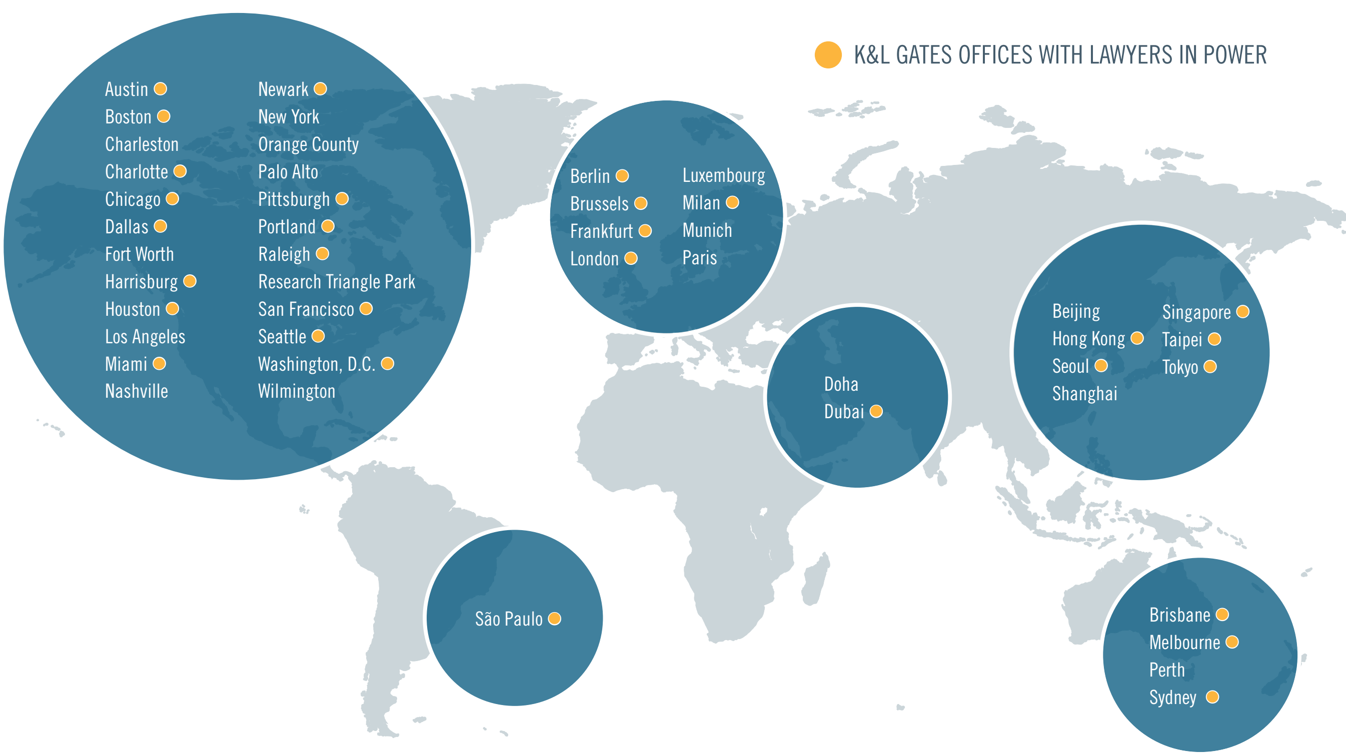
K&L GATES

With a Power practice group of more than 100 lawyers in the United States, and more than 150 lawyers in the practice group globally, we serve clients in virtually all renewable energy and utility sectors across the globe. Our clients operate in onshore and offshore wind, solar, biomass, hydrogen, hydropower, geothermal, and complementary sectors, including energy storage, smart grid, and transmission. Our Power group operates within our seamless, full-service, global platform of more than 1,800 lawyers in offices across five continents.

WE KNOW THE ENERGY BUSINESS

We have represented clients in wind projects across the United States and around the world. Our firm combines extensive experience in thermal and renewable energy project development with a thorough understanding of the issues involved in permitting, financing, constructing, operating, and maintaining wind power and other infrastructure projects in a marine environment. Our clients include investor-owned and publicly owned utilities, independent power producers, project developers, EPC contractors, turbine manufacturers, investors, and emerging businesses in the energy sector.



MAINSTREAM RENEWABLE POWER

Mainstream Renewable Power is a leading global renewable energy company that develops, builds and operates renewable energy plants. We have an unrivalled track record in project delivery having brought 6 GW of wind and solar assets to financial close and has won over 4.5 GW in competitive auctions around the world. Mainstream is one of the largest renewable energy companies in Chile and the largest in South Africa.

A GLOBAL LEADER IN OFFSHORE WIND

Mainstream is the most successful independent developer of offshore wind at scale globally. It has developed and consented Hornsea One and developed Hornsea Two totalling 2.6 GW in England and consented the Neart na Gaoithe offshore wind project in Scotland, 450 MW. These projects represent approximately 20% of the UK's offshore wind capacity either in operation or under construction.

In APAC, Mainstream and its local partners, the Phu Cuong Group, are developing the 1.4 GW Phu Cuong Soc Trang offshore wind farm in Vietnam. When fully built, it will be one of the largest offshore wind farms in SE Asia. In addition to its Phu Cuong Soc Trang flagship project in Vietnam, it is developing the 500 MW Ben Tre offshore wind project with local company, AIT. In Japan, Mainstream is preferred bidder to acquire a 50% stake in an 800 MW floating offshore wind project.

In the US, Mainstream is focused on supporting the country in its mission to implement 30 GW of new offshore wind capacity by 2030 and has received full qualification to apply for a lease in the upcoming New York Bight lease auction.

Mainstream also continues to extend its global footprint and is actively pursuing further offshore wind opportunities in Ireland, the Philippines and South Korea.

OUR OFFSHORE PROJECT DEVELOPMENT PORTFOLIO

Mainstream's predecessor company 'Airtricity' developed the following offshore wind farms:

- **Arklow Bank (Ireland) 25 MW** – Operational: 2004
- **Greater Gabbard (England) 504 MW** – Operational: 2012
- **Butendiek (Germany) 288 MW** – Operational: 2015

England

- **Hornsea Zone – approx. 6 GW**
  - Mainstream and the Siemens consortium, 'SMart Wind', awarded the Hornsea zone in The Crown Estate's competitive Round 3 leasing programme.
  - Consented Hornsea One (1.2 GW) and developed Hornsea Two (1.4 GW) before selling these projects and the entire Zone to Dong Energy (now Ørsted) in 2015.

Scotland

- **Neart na Gaoithe – 450 MW**
  - Awarded 450 MW Neart na Gaoithe (NnG) offshore wind farm in the Scottish Territorial Waters competitive programme.
  - Fully consented NnG and won 15 year Contract for Difference (CfD).
  - Sold NnG to EDF Group in 2018.

Vietnam

- **Phu Cuong Soc Trang – 1.4 GW**
  - Phase 1 – 400 MW. The first 200 MW of Phase 1 is in the Vietnam Government's Power Development Plan 7 and has received its Investment Registration Certificate enabling it to reach financial close and enter construction in 2022.
  - Phase 2 – 1,000 MW under development.
- **Ben Tre – 500 MW**
  - Under development

Japan

- Mainstream and Aker Offshore Wind awarded preferred bid status for 800 MW floating offshore wind project.

www.mainstreamrp.com

kent

Courageously tackling the greatest challenge of our time, to bring our world the energy it needs in the most responsible way ever imagined.

At Kent, we design, build and maintain the assets that power the world for today and make it future-ready for tomorrow. With 100 years of know-how, our people are the smartest at what we do.

12,000 employees

100 year history

24 global offices

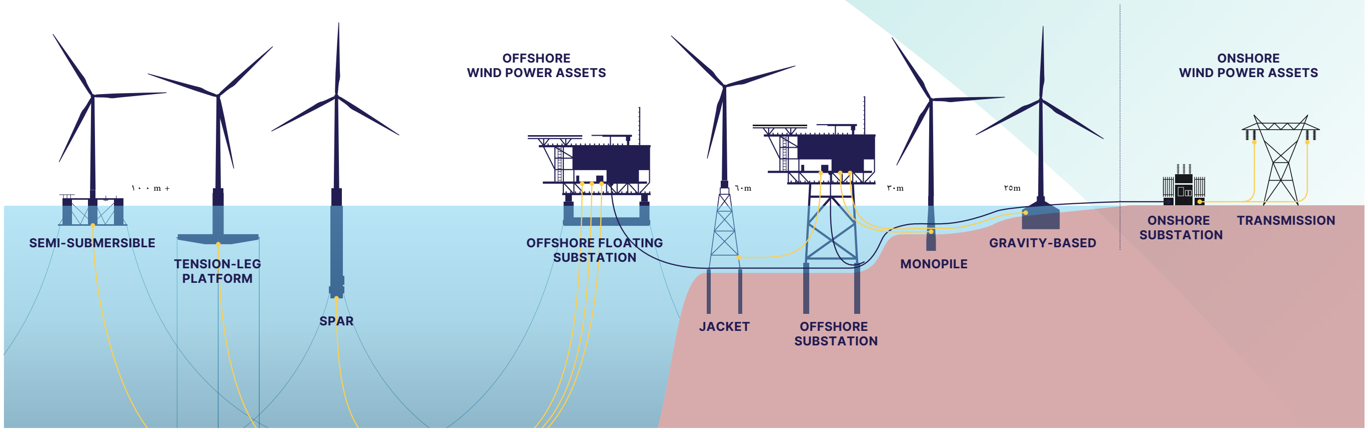
Kent has been at the heart of the offshore wind revolution, delivering technical solutions to master the industry's toughest problems and drive down the levelized cost of electricity.

- When it came to figuring out the first floating platform, we were there.
- We've also been there to deliver %70 of the UK's offshore wind farms and have assisted governments with crafting their long-term offshore wind strategies.
- We delivered the first certified project using the PISA geotechnical design which produced much lighter monopiles than industry standard and have delivered some of the deepest fixed bottom foundation structures in some of the toughest ground conditions.

In the U.S. we're supporting developers with wind farm planning, leasing strategies, concept studies, and design scopes for substations and WTG foundations, and we're working hand in hand with the Department of Energy to develop floating wind solutions that will leverage and maximise the U.S. supply chain.

45+	**Years experience** in offshore engineering & 20 years in offshore wind
20+	**Offshore Substations** fully designed, fabricated & installed
400+	**Offshore engineers**
11+	**Floating wind projects** that we're involve with
450+	**Wind turbine generator (WTG)** foundations designed covering monopile & jacket structures
1000+	**Offshore wind foundations** supported by our asset integrity management services
11GW	**of offshore wind power** delivered globally

*Kent was born in August 2021 bringing together the expertise of Kentech, SNC-Lavalin Oil & Gas (including the offshore wind and low carbon markets) and their previous acquisitions of the former Atkins Oil & Gas, Kentz and Houston Offshore Engineering



At Kent, we are courageously tackling the greatest challenge of our time, to bring our world the energy it needs in the most responsible way ever imagined. We design, build, and maintain the assets that power the world for today and make it future-ready for tomorrow. With 100 years of know-how, our 12,000 people are the smartest at what we do. From consulting to design, build, and commissioning, through to maintenance, operations, and decommissioning. With over 20 years' experience in offshore wind, our collective ingenuity allows us to lead the market with sustainability and innovation. For more information about Kent, visit kentplc.com.

K&L Gates is a fully integrated law firm with lawyers located across five continents. The firm represents leading multinational corporations, growth and middle-market companies, capital markets participants, and entrepreneurs in every major industry group, as well as public sector entities, educational institutions, philanthropic organizations, and individuals. For more information about K&L Gates or its locations, practices, and registrations, visit klgates.com.

Mainstream Renewable Power is firmly on track to becoming one of the world's first pure-play renewable energy majors with a global development portfolio of 14.97GW of utility scale wind and solar assets, with plans to bring 5.5GW to financial close by 2023. Mainstream has successfully developed 3.5GW of offshore wind projects in the UK from initial concept, through consenting to the ready-to-build stage, which includes the world's largest offshore wind farm, Hornsea 1 and Hornsea 2, along with Scotland's NNG project. In partnership with Phu Cuong Group in Vietnam, it is currently developing the 1.4GW Phu Cuong Soc Trang offshore wind farm, which when fully built will be one of the largest offshore wind farms in SE Asia. For more information about Mainstream Renewable Power, visit mainstreamrp.com.