

50 **OFFSHORE WIND COMPANIES** TO WATCH IN 2024

INTRODUCTION

These are difficult times for the offshore windpower industry. Challenged by rising costs and interest rates, supply chain bottlenecks, and increasing price competition, the industry has suffered major project cancellations and faces weakening investor confidence. To survive and thrive in this environment, wind project developers and companies at every level of the supply chain must innovate for agility and efficiency.

Fortunately, there are positive long-term market signals. In U.S. coastal states, political support for decarbonizing electricity grids with wind power remains strong. New Jersey voters, for example, favored windpower proponents in November 2023 legislative elections, while most candidates who had campaigned against offshore wind were defeated. On the business side, Avangrid and Copenhagen Infrastructure Partners' 800 MW Vineyard Wind is under construction and expected to achieve commercial operation in 2024. Dominion Energy and Ørsted have achieved permitting and financing milestones for offshore wind projects in the U.S. Northeast of about 3.3 GW. In Europe, the EU Commission is rolling out new supportive policies. "The new actions on finance, auctions and permitting will speed up the development of wind farms [and] help Europe's wind energy supply chain deliver the equipment," said WindEurope CEO Giles Dickson in October 2023. And in Asia, Vietnam, South Korea, and other countries are ramping up their offshore wind ambitions, while project developers in China—the global leader—are "maintain[ing] stable growth in the new era" of policies that eliminated premium pricing in most of the nation, according to the Global Wind Energy Council.

In this report, Reuters Events spotlights 50 companies to watch in 2024. We have divided the list into ten categories, with five organizations per category. Please note: the Top 50 list is designed to spotlight a selection of significant players across the offshore wind supply chain—it is not a formal, quantitative ranking based on objective criteria.





PORTS

Ports are essential players in the offshore wind industry, serving as hubs for assembly, deployment, and O&M and providing platforms for project developers to streamline operations and logistics. To meet the offshore wind industry's specialized needs, many ports have installed heavy-lift cranes, dedicated large storage areas, and upgraded logistical infrastructure. As offshore wind development pivots toward floating wind turbines which can be deployed at greater depths than bottom-fixed turbines, existing harbors will have to be upgraded extensively to accommodate longer blades and foundations. To accommodate the growth of fixed and floating offshore wind, ports are increasingly working together—a trend exemplified by the recently announced exploration of opportunities for collaboration by six leading windpower ports in the UK and EU.

ESBJERG, DENMAR

The leading European offshore wind port, the Port of Esbjerg has played a vital role in the growth of offshore wind in Denmark, the UK, the Netherlands, Belgium, and Germany. The port has spe-cialised and flexible facilities for transporting, pre-assembly, shipping, and servicing. It is also a symbol of the EU's growing commitment to offshore wind as embodied in the 2022 Esbjerg Declaration that saw Belgium, Denmark, Germany, and the Netherlands commit to ambitious joint tar-gets and to co-developing energy hubs in the North Sea with electrical interconnections and green hydrogen infrastructure.

CHAOZHOU PORT, GUANGDONG, CHINA

Among China's many offshore wind ports, Chaozhou stands out as the future staging ground for a wind power project that is enormous even for China: Chaozhou City's 43.3 GW wind farm, which is expected to begin construction in 2024. Utilizing sites between 75 and 185 km off the city's coast, the wind farm is projected to achieve capacity factors of 43% to 49%.

Salem Offshore Wind Terminal, Massachusetts, USA

In keeping with the trend toward collaboration among ports, the Salem Wind Services Terminal will become the operational base for the enormous Sea Installer jack-up vessel that will install the GE Haliade-X wind turbines for Avangrid and Copenhagen Infrastructure Partners' Vineyard Wind project. The Sea Installer is too large to pass through the hurricane barrier at Vineyard Wind's main port, New Bedford. But the Port of Salem, which once hosted a coal-fired power plant, is expected to support other offshore wind projects to meet Massachusetts' clean energy goals.

NEW BEDFORD OCEAN CLUSTER

Leveraging its fully developed and modern fishing and shipping sectors, the New Bedford Ocean Cluster aims to become the key staging area for offshore windpower development on the New England Coast. The port is home base for Vineyard Wind, which in September 2023 utilized two specialized 400-foot U.S. flagged barges to transport the first of its GTE Haliade-X Wind Turbine Generators to its location more than 30 miles off Cape Cod.

TAICHUNG, TAIWAN

As part of Taiwan's ambitious drive to power its semiconductor industry with clean energy, the country is rapidly building out offshore wind in the Taiwan Strait off its west coast, using the Port of Taichung as its primary base. Denmark's Orsted has signed long-term lease and O&M contracts with the port and maritime operations companies headquartered there to support its development pipeline of as much as 6 GW. Energy from the firm's 920 MW Greater Changhua 2b and 4 has been contracted by Taiwan Semiconductor Manufacturing Company (TSMC), the world's largest semiconductor manufacturer.

PROJECT DEVELOPERS

Without the dealmaking skills, financial acumen, and operational expertise of project developers, the offshore wind power industry would be limited to government-funded R&D projects. Developers select and bid on offshore sites, obtain purchase agreements with utilities or other customers, structure equity and debt financing, conduct environmental impact assessments, secure permits, enter EPCI contracts, and manage or contract for long-term O&M. With rising costs, supply chain constraints, and declining electricity price supports, wind power developers have faced financial challenges in the last year, including the necessity of canceling projects and writing down the value of once-promising projects. Under increasing pressure to excel at all phases of their work, these top five project developers are recognized by Reuters Events.

EQUINOR

Formerly the Norwegian State Oil Company, or Statoil, Equinor still invests in an expanding port-folio of oil and gas resources, while it increasingly emphasizes carbon capture and storage, off-shore wind, and hydrogen. The company plans to achieve cumulative offshore wind capacity of at least 12 GW by 2030, with an increasing proportion from floating offshore projects like its pioneering Hywind. "Floating offshore wind is the next wave in renewable energy and [we] are excit-ed about the possibilities," write Equinor on its website.

BP

In its strategic partnership with Equinor, BP Wind recently received approval from the U.S. De-partment of Interior for the approximately 2GW Empire Wind project south of Long Island and east of New Jersey. It's expected that New York State's newly announced offshore wind energy solicitation will help the companies justify the investment in the face of rising costs.

AVANGRID

Connecticut-based Avangrid, a subsidiary of Iberdrola, owns and operates eight electric and gas utilities and an expanding portfolio of renewable generation assets. In a 50-50 Joint Venture with Copenhagen Infrastructure Partners, the company is constructing 800 MW Vineyard Wind 15 miles south of Martha's Vineyard and Nantucket. Like other developers, the company is looking to new policies—such as Massachusetts, Connecticut, and Rhode Island's recent announcement of joint regional wind energy procurement—to overcome challenges presented by inflation, high in-terest rates, and supply chain snarls.

ØRSTED

Since building the world's first offshore wind farm in 1991, Denmark's Ørsted has developed off-shore wind in Germany, the Netherlands, Poland, Taiwan, the UK, U.S. and in its home country. It is ranked as the top developer worldwide and aspires to reach 28 GW of offshore wind capacity by 2030. While facing the same difficult economics as other developers, Ørsted boasts technological innovation that has brought offshore wind costs toward parity with a newly constructed fossil gen-eration facility in northwest Europe, according to its website.

RWE

125-year-old RWE is the number two offshore windpower developer with 3.3 GW of capacity in operation (by ownership share) and a goal of commissioning an additional 4.7 GW by 2030. In its U.S. project pipeline are Community Offshore Wind off the coast of New York, for which RWE and Copenhagen Infrastructure Partnersowned Vineyard Mid-Atlantic bid \$1.1 billion and a wholly owned \$158 million lease off the coast of northwest California where ocean depths will require floating wind turbines.



ENGINEERING AND CONSTRUCTION

Offshore wind engineering, procurement, construction, installation, and commissioning (EPCIC) companies bring together multidisciplinary teams of engineers, designers, procurement, logistics, and construction experts to build offshore wind farms and associated infrastructure. Their roles span the entire project lifecycle, from initial feasibility studies and front end engineering and design (FEED) to construction and O&M—and their tasks range from wind turbine generator (WTG) in-stallation and commissioning to building high-voltage direct current (HVDC) offshore platforms and onshore converter stations. The companies in this list leverage cutting-edge technology and innovative engineering solutions to navigate the complexities of deep-sea foundations, intricate ca-ble laying, and offshore infrastructure.

MCDERMOTT

Leveraging its extensive expertise in offshore oil and gas industries, McDermott has scaled up its capabilities to perform conceptual engineering, FEED, detailed design, fabrication and installation services for offshore wind power. The firm provides a broad range of field services for modular and conventional construction, project management, construction inspection and management, scheduling, welding and quality assurance and commissioning. A recent notable project: providing EPCIC for the transmission system operator TenneT's HVDC system connecting 980MW Bor-win6 offshore wind project to the regional grid at Schleswig-Holstein, Germany. The company's investment in offshore wind services includes fabrication yards in Indonesia and Dubai.

HEREEMA MARINE CONTRACTORS

With engineering and fabrication divisions, Hereema provides offshore wind developers by in-stalling foundations and offshore substations and wind turbine generators. The firm has developed a novel "floating to floating" installation method for floating wind farms which it says can eliminate the need for wet-tows and mashalling yards. By submerging floaters by weight, Hereema enables developers to forego the use of hightech ballasting and tensioning systems; and bottom foundation work is optimized by Heerema's semisubmersible crane vessels, according to the company.

MHI-VESTA

Known primarily as wind turbine manufacturers, Vestas and Mitsubishi Heavy Industries com-bined forces in 2020 to form MHI-Vestas. Among the consortium's clients is the 950 MW Moray East offshore wind farm for which it is providing WTG installation and commissioning and turbine O&M and repair.

OFFSHORE CONSTRUCTION ASSOCIATES

Offshore Construction Associates has helped deliver over 100 major offshore wind projects across the globe as both owner's engineer and as part of EPCIC contractor teams. The firm's expertise includes site investigation, design and procurement through, fabrication, transportation and installa-tion. Recently, OCA worked with Anchor QEA to assess the upgrades that would be required on ports in Humboldt Bay and Morro Bay, California, to support large offshore wind projects.

GEOSEA NV

GeoSea focuses on the installation of wind turbine foundations and erection of turbines using large jack-up platforms and drilling and piling rigs. One notable project the firm is engaged in is Space@Sea, a consortium of 17 European organizations aiming to provide sustainable and afford-able workspace at sea by developing a standardised, cost-efficient modular island. GeoSea is ad-dressing the practical requirements of building, installing, monitoring and maintaining floating is-lands for these purposes.



TRANSMISSION INFRASTRUCTURE

Transmission infrastructure is needed to transmit electricity from offshore wind projects to onshore grids. A range of specialist firms design, engineering, and construct high-voltage direct current (HVDC) transmission systems, subsea cable arrays, and onshore converter stations. The five firms listed here work with offshore wind developers, utilities, regulatory bodies, stakeholder groups and others to design and build offshore transmission systems while mitigating environmental impacts.

GE GRID SOLUTIONS

A global division of GE with more than 13,000 employees, GE Grid Solutions provides offshore wind power plants with substations, gas-insulated switchgear, transformers, SCADA systems, and other equipment, with the expertise to design and integrate this equipment efficiently and safely. Among its recent offshore wind projects: Neart na Gaoithe off the Fife Coast of Scotland and France's St Brieuc and Fécamp.

PRYSMIAN GROUP

Italy-based Prysmian Group is a global leader in submarine cable systems with nearly 30 offshore wind projects completed or ongoing. Under its \$232 million contract with Vineyard Wind, Prysmian Group is designing, building, installing and commissioning an HVAC cable system in-cluding 83 miles of power cables laid by its vessels Cable Enterprise and Ulisse. Prysmian will also provide PRY-CAM permanent monitoring of the system.

HSM OFFSHORE ENERGY

With more than 60 years serving the offshore oil and gas industry, HSM was an early player in offshore wind power transmission and has to date been involved in the interconnection of 3.5 GW of offshore wind capacity in the UK, Germany, Belgium, and The Netherlands. A

highlighted pro-ject is RWE's 1 GW Thor project off the coast of Denmark, for which HSM will supply EPCIC of an offshore high voltage substation and its jacket foundation.

BOND CIVIL & UTILITY

This firm landed its first electric utility client—Boston Edison—more than 110 years ago. Now named Eversource, the Boston-area utility is still a client for which Bond and Burns & McDonnell recently built a 22mile 345kV underground electrical transmission system, one of the longest in the country. For offshore wind, the firm was recently awarded, with GE Grid Solutions, the con-tract for on- and offshore high voltage equipment for the 816 MW Empire Wind 1 off Long Island.

METOX TECHNOLOGIES

This Houston-based firm is developing and manufacturing high-temperature superconducting Xeus wires to deliver large amounts of power at low voltage with little to no line losses. In addition to applications in medical imaging technology and commercial fusion, MetOx anticipates its super-conductors will enable faster and more efficient growth of offshore wind power. It recently won a \$3 million ARPA-E award to fine-tune its manufacturing processes and conductor performance.



VESSELS

The offshore wind industry has enough wind turbine installation vehicles (WTIVs) for the next few years, but after the middle of this decade, Europe, the U.S., and Asian countries (excluding China) may well face a shortage, according to GWEC's 2023 offshore wind report. This scenario points to the importance of companies like these five and the vessel manufacturers from whom they source vessels.

HAVFRAM

Havfram is a pure-play offshore wind company focused on providing transport and installation services to the offshore wind sector. The firm has installed more than 600 offshore wind turbines with cumulative capcity of 6.1 GW. It has a dedicated team for the emerging floating wind segment and recently ordered a second WITV featuring low-carbon hybrid drivetrain technology from CIMC Raffles.

WÄRTSILÄ

Marine and energy technology firm Wärtsilä provides specialized propulsion systems for WITVs. A recent order came from the China Three Gorges Corp which will use the firm's steerable and tunnel thrusters in two new 2,000-ton WITVs being built by CSSC Huangpu Wenchong. Ship-building and China Merchants Heavy Industry. The thrusters will ensure the vessels can achieve optimal positioning in challenging sea and weather conditions.

DEME

Marine engineering and construction firm DEME may deserve a spot on Reuters Events' top five EPCIC firms—but it also stands out in vessel technology with its multipurpose Living Stone. Commissioned in 2017, the 161-meter ship features 10,000-tonne cable capacity and an innovative dual-lane cable installation system that can install one cable while preparing a second one on deck. Other technologies designed to maintain cable integrity during lay minimize risk of damaging cable while improving production rates and reducing costs.

FRED. OLSEN WINDCARRIER

As its name suggests, Fred. Olsen Windcarrier serves the offshore wind industry with installations and O&M. The firm has two jackup vessels in operation in Europe and will soon commission a third—Blue Wind—for the Asia Pacific region. The firm has provided transport and installation for more than 15 offshore wind farms and it services and repairs dozens of operating wind farms in the North Sea and Irish Sea.

FUGRO

In addition to WITVs, the offshore wind power industry needs vessels for environmental and ge-otechnical surveys, buoy deployment and other functions. Fugro stands out as a provider of ge-otechnical and other services with specialized vessels. The firm recently added the Fugro Quest to its fleet. The vessel began operations last year assessing soil conditions to establish optimal loca-tions for offshore wind farms.

PROJECT FINANCIERS

COPENHAGEN INFRASTRUCTURE PARTNERS

Founded in 2012, Copenhagen Infrastructure Partners (CIP) is the world's largest dedicated fund manager for greenfield renewable energy investments and a global leader in offshore wind. CIP manages 11 funds and has to date raised approximately €26 billion from more than 150 international institutional investors. In October, CIP and its partner Avangrid announced a \$1.2 billion tax equity deal with J.P. Morgan Chase, Bank of America, and Wells Fargo to finance Vineyard Wind 1. Advisers included CCA Group, Santander Corporate & Investment Banking, and Kirkland & Ellis LLP.

ONTARIO TEACHERS' PENSION PLAN

The Ontario Teachers' Pension Plan has entered a long-term partnership with Corio Generation—part of Macquarie Group—to invest up to US\$1 billion in the West of Orkney offshore wind farm which is expected to produce 2 GW of electricity and green hydrogen.

OCTOPUS ENERGY

A global energy and technology group with almost 6 million retail customers, Octopus Energy has invested in a £6 billion portfolio of renewable energy projects that includes stakes in Hornsea One and other offshore wind projects. With Tokyo Gas, Octopus recently launched a £3 billion offshore wind fund that will invest in projects in the development, construction, and operational phases and consider both fixed and floating turbine technologies.

PKA

The Danish pension fund has invested in offshore wind projects since 2011. In spring 2022, on the heels of the Esbjerg declaration (see Ports above), the fund announced it aimed to increase its green energy investments by 40% within three years.

RABOBANK

One of many project finance lenders that have funded offshore wind power, Rabobank devotes significant resources to thought leadership and policy advocacy, including recent reports on the financial and technical challenges facing floating offshore wind and the need to overhaul wind tender designs to meet climate goals.





FLOATING WIND

Floating offshore wind power capacity is expected to rapidly scale up from less than 300 MW to-day to nearly 40 GW by 2035, according to analyses cited by Rabobank. To accomplish that growth, the floating wind sector will have to tackle high costs—estimated by DNV in 2022 at four times that of fixed offshore wind—and the logistical and infrastructure challenges brought on by the larger size of floating foundations, blades, nacelles and other components.

ATKINSREALIS

This consulting engineering firm with an extensive background in offshore wind recently received \$2.36 million in U.S. ARPA-E funding to generate experiments designed to assess the behavior of unconventional 15 MW floating offshore wind turbines. Using control co-design strategies, the research project aims to yield lessons for designing economically competitive floating turbines.

COBRA WIND

The windpower subsidiary of Cobra Group, Cobra Wind handled the EPCIC for the 15 MW Kin-cardine Offshore Windfarm, which features five Vestas 9.5 MW turbines and one Vestas 2 MW turbine—all installed on WindFloat semi-submersible platforms designed by Principle Power.

PRINCIPLE POWER

After more than a decade of development, Emeryville, Calif.-based Principle Power has 75 MW of floating wind turbine capacity deployed and 30 MW under construction. The firm has expanded its WindFloat product portfolio with a fourth-generation WindFloat T using its standard tubular de-sign and a pontoon-based solution known as WindFloat F, which is designed for depths as shal-low as 9 meters.

RAMBOLL

Design and engineering firm Ramboll has wide experience in offshore wind, and the firm was re-cently appointed by Fred. Olsen 1848 to refine the design, mooring system, logistics, transporta-tion, and O&M for the company's semi-submersible BRUNEL floating steel foundation for wind turbines.

DNV

With its expertise in assurance and risk management long history in offshore energy, DNV is ena-bling the commercialization of floating offshore wind turbines with digital tools and guidance for safety, reliability, and cost efficiency.





ENVIRONMENTAL

Evaluating environmental impacts and performing environmental impact assessments (EIAs) and related studies are essential functions for the offshore wind industry. While requirements vary from country to country, globally relevant firms must meet internationally accepted standards to avoid and mitigate impacts to marine environments, birds, aquatic species and other resources. Environmental consultants often perform other services such as feasibility studies.

TRC COMPANIES

This U.S.-based firm offers offshore wind clients fully integrated project management and tech-nical teams for effective delivery of projects. The firm's capabilities include power system studies, market analysis, constraints mapping, early engineering, permitting, detailed design, testing and commissioning.

ANCHOR QEA

Environmental science and engineering firm Anchor QEA offers innovative technical solutions to address challenges and implement sustainable solutions. The firm works with clients in offshore wind from initial planning, site investigation, and feasibility evaluation, through design, plans and specifications, construction management, permit compliance, and environmental monitoring.

RPS GROUP

The firm provides expert support and advice to offshore wind developers, governments, and con-tractors across Europe, the U.S., Australia and Asia. The firm's services

range from assessing en-vironmental and permitting risks through MetOcean forecasting with specialized software.

STANTEC

Stantec provides full-service environmental and engineering consulting to the offshore energy gen-eration and power delivery industry. With decades of experience in the offshore environment and onshore transmission in the United States, the firm offers technical knowledge and a strong under-standing of federal, state, and local regulations. Its staff routinely work on highly visible and fast-paced offshore projects.

DETECT

As anyone who follows wind power knows, the industry is increasingly challenged to mitigate im-pacts to migratory birds. DeTect provides bird and bat monitoring and mitigation systems for wind energy project developers, owners, operators and environmental consultants. The company has de-ployed over 500 systems worldwide.



DIGITAL SOLUTIONS

Like every industry, offshore wind power is benefiting from software and other technology that utilizes machine learning, data science, and artificial intelligence. These are five solutions to watch in 2024.

TERRADEPTH

The firm deploys autonomous underwater vehicles to streamline high-resolution geophysical sur-veys and data collection. Its services for offshore wind include: foundation, anchor, and route sur-veys; hazard identification; benthic habitat characterization; cultural inspection; and seafloor dynamics.

ARUP

Global professional services firm Arup has developed the SCALE digital tool to help governments and offshore wind farm developers balance performance, lifecycle costs, and impacts on the envi-ronment and other marine economic activities as they identify the most favorable sites. UK seabed leasing authorities have used SCALE, according to Arup. Arup has also created the LEAP Life Extension and Management Platform, a monitoring system to enable in-service foundation life to be assessed by clients.

ALICE TECHNOLOGIES

Delays, cost increases and other unexpected contingencies are routine in offshore wind power de-

velopment. ALICE offers what it calls a "construction optioneering platform" for offshore wind and other industries to learn the cost and time impacts of a range of disruptions and delays and to automatically generate corrective schedules.

GERMAN REMOTE SENSING DATA CENTER

For more than two decades, offshore wind power has grown so rapidly that there's a need to map and detect turbines and related infrastructure, according to the researchers at the German Remote Sensing Data Center, or DFD. DFD has developed algorithms that utilize AI to analyze satellite images to automatically detect offshore wind turbines.

IBERDROLA

Among Iberdrola's digital solutions for offshore wind energy and other types of renewable is Me-teoFlow. According to the firm, the platrom estimates energy production across its renewable ener-gy facilities in the coming hours and days. The privileged information optimizes decision-making in energy markets and identifies the most cost-effective time windows for O&M.





SOLUTIONS ACROSS THE SUPPLY CHAIN

Vendors, consultants, and technology providers are innovating to provide cutting-edge solutions within the offshore wind industry. Whether it's improving the efficiency of wind turbines, durabil-ity against harsh marine conditions, or enhancing the overall deployment of projects, the companies listed here help make offshore wind energy more cost-effective, reliable, and sustainable. Don't miss their progress in 2024!

OCAS

A small change to welding methods used on offshore wind foundations could significantly reduce fabrication and manufacturing times and costs. That's why the Belgian Research Centre for Appli-cation of Steel (OCAS) has been funded by The Carbon Trust and a consortium of wind power companies to investigate the viability of single-sided welds for tubular joints in offshore structures. The research is expected to wrap up in 2025.

THAYERMAHAN

ThayerMahan is the first U.S.-based company to provide bubble curtain technology from Germa-ny-based Hydrotechnik-Leubeck to the offshore wind energy industry. Comprised of large, perfo-rated hoses and specialized air compressors, bubble curtains absorb and dampen sound during the installation of offshore wind turbine foundations. Vineyard Wind is one of the company's U.S. clients.

CLS WIND

CLS Wind is developing designer lifting systems to lift any size wind turbine or nacelle to any height with smaller capacity cranes and vessels than currently deployed and to perform O&M and repairs more quickly and less expensively. The firm aims to help the offshore wind industry grow without constraints from a lack of high-capacity cranes and vessels.

BENCHMARK LABS

This firm's AI-based turbine-specific wind forecasts can significantly reduce grid operating costs by optimizing generation and improving maintenance windows, according to its website.

NY OFFSHORE WIND TRAINING INSTITUTE

Like many growing industries, the offshore wind segment in the U.S. and globally needs more workers with a variety of skills. To encourage and train this workforce, NYSERDA and State University of New York lanuched the OWTI in 2020. The state, building trades unions, and voca-tional schools have contributed additional funding in the last year.



OUTLOOK AND CONCLUSIONS

2024 will be a pivotal time for the offshore wind industry to overcome the challenges of the last year. From visionary project developers to engineering and construction firms and technology innovators, each company listed plays a vital role in shaping the future of offshore wind.

To meet the innovators, risk takers, and visionaries in this industry, plan to attend Reuters Events' Offshore Wind

USA 2024, returning to Boston June 17-18. Featuring 500+ senior project developers, suppliers, and policy leaders, the interactive event program is designed to overcome the cost crisis and get projects back on track.

You can find out more here: <u>https://events.reutersevents.</u> <u>com/renewable-energy/offshore-wind-usa</u>

