



moffatt & nichol

Powering the Energy Transition

Offshore Wind Ports



Sector Overview

Setting Offshore Wind in Motion

To achieve net zero emissions by 2050, a significant expansion of wind power is needed. While offshore wind is a key driver of the renewable energy expansion, further acceleration is needed to meet global commitments, including the COP28 goal of tripling renewable capacity by 2030.

But with constraints from space to investor confidence, port expansion or reconfiguration to support offshore wind is a complex feat of integrating master planning, detailed design, engineering and operations and applies whether the client is a port authority or operator, a developer or an energy company.

Moffatt & Nichol works with ports and the energy sector globally to help them adapt, reinforce and design infrastructure to handle turbine components, specialist vessels, heavy lift quays and storage facilities. We use our FlexTerm digital twin software to ensure ports are wind sector ready, while optimising operations and minimising environmental impact.

We are the trusted partner to ensure ports are ready to propel the energy transition.



Our Impact

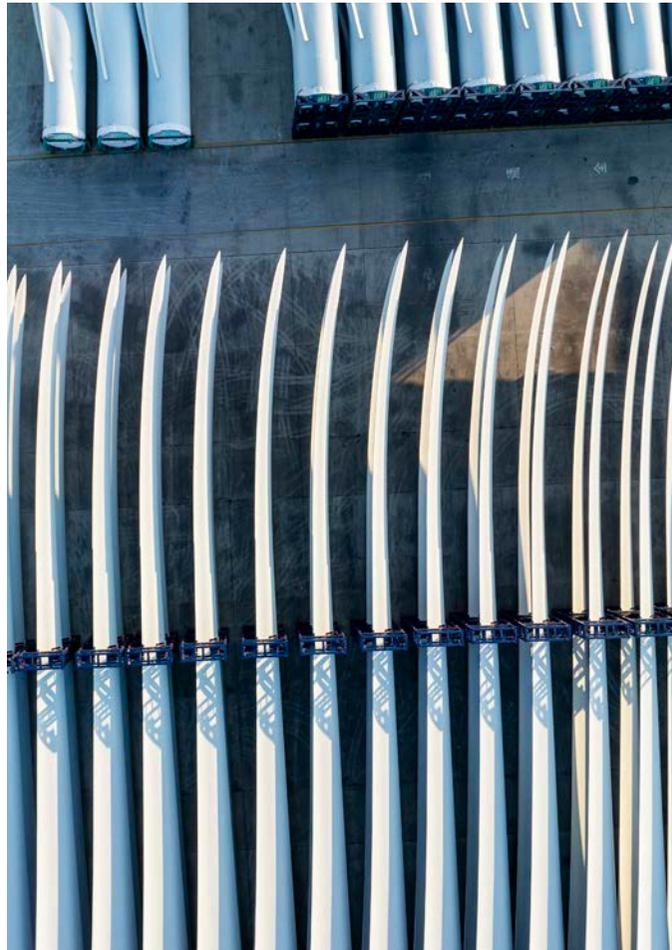
Delivering Effective Solutions

Enabling the energy transition

With the need to deliver the energy transition at scale and pace globally, ports play a vital role in supporting the rapid expansion of offshore wind. As countries and companies strive to meet net zero targets, ports are essential for facilitating the development and deployment of clean energy infrastructure.

Sustainable and resilient solutions

Building clean energy infrastructure shouldn't be at the expense of coastal ecosystems. Nature and new infrastructure can co-exist when sensitively designed, with marine habitats either protected or restored. Resilience must be embedded into all designs, whether that's protecting a shoreline or ensuring that infrastructure can withstand environmental changes such as rising sea levels or sediment movement.



Managing operational changes

As ports adapt to meet the needs of offshore wind developers, the vital role they play in global trade and supply chains needs to be maintained. Ports need viable solutions to continue enabling movement of people and goods globally.

Unlocking viability

Offshore wind development has a complex stakeholder map of investors, OEMs, regulators, planners and community groups among others. Mitigating risk through practical, constructable solutions is key to instilling project confidence and securing the funding to progress.

About Us

Creative People, Practical Solutions



As a team of just two when starting out in 1945, Frank Nichol and John Moffatt fostered a philosophy which has grown into a set of values to which we remain committed:

- Attract the best practitioners.
- Work as a team.
- Earn a fair return.
- Respect employees and clients.
- Operate always with honesty, integrity, and decency.



Today, Moffatt & Nichol has more than 50 offices and 1,200 employees worldwide, with our head office in Long Beach, California. Our network across the United States now reaches into Europe, Asia, Australia, South America and the Middle East. Our industry experts bring deep technical skill and they have completed more than 14,000 projects globally, sustaining an 80% repeat client rate.



From our core practice areas of ports, water, transportation and commercial, we innovate and progress industry best practice in areas such as resilience and artificial intelligence through research and innovation. We don't aspire to be all things to all clients, instead we leverage our niche expertise to help clients bring their vision to life.

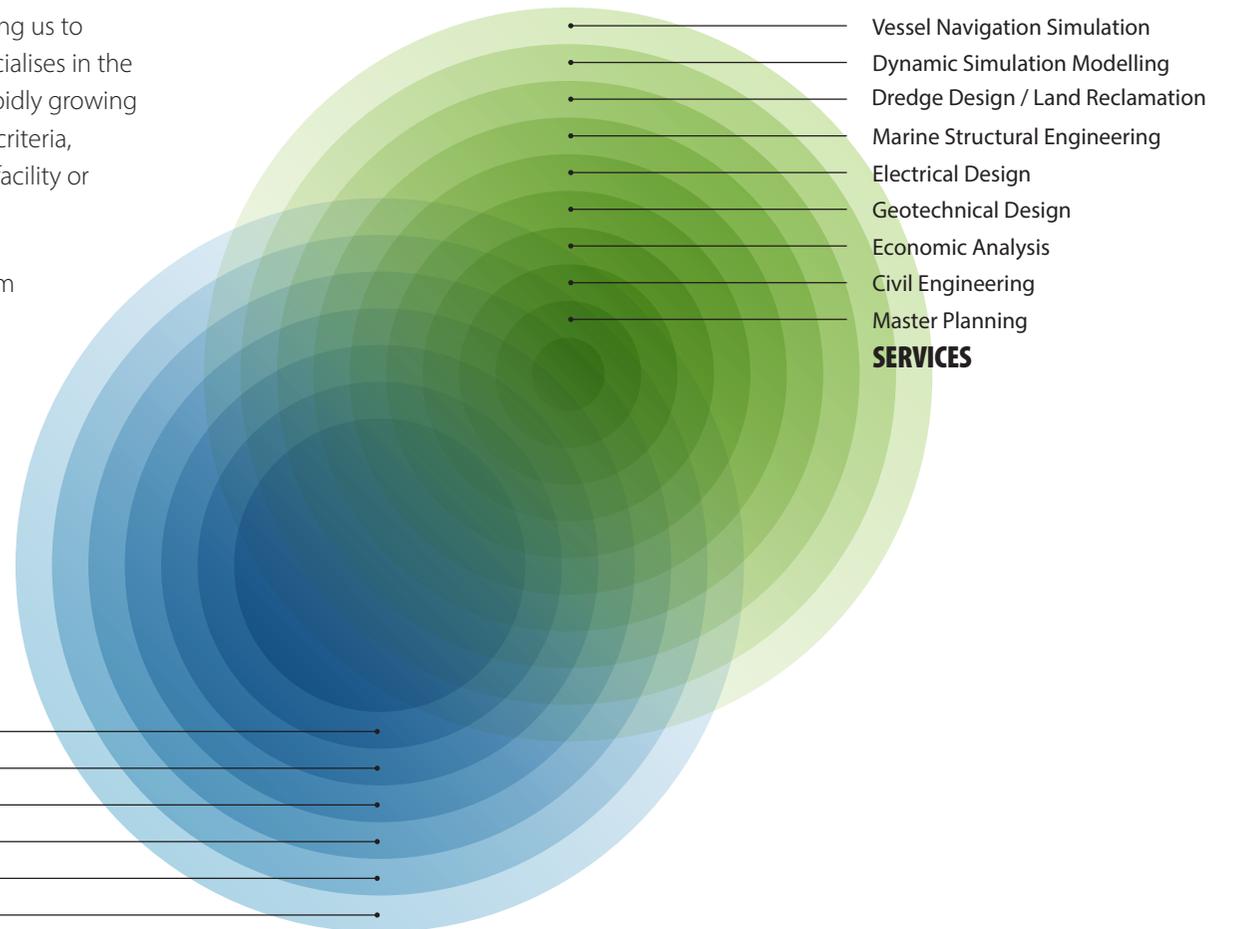
Services

Offshore Wind Ports

Moffatt & Nichol has been a forerunner in the offshore wind sector, enabling us to bring our port clients in-depth experience and knowledge. Our team specialises in the planning, modelling, and design of offshore wind ports to support this rapidly growing industry. We guide clients through the challenges of assimilating loading criteria, logistics, layout geometries and vessel berthing requirements into a new facility or expansion.

Working with our proprietary technology FlexTerm, our clients benefit from our unique vantage point of combining dynamic simulation capabilities to run design and operational scenarios with our extensive technical expertise. It means solutions have been evaluated from all angles including feasibility, practical delivery and day-to-day operational impact.

We deliver projects including marshalling ports, staging and integration ports (floating offshore wind), operations and maintenance ports and waterfront manufacturing facilities (wind turbine generator components and foundations).





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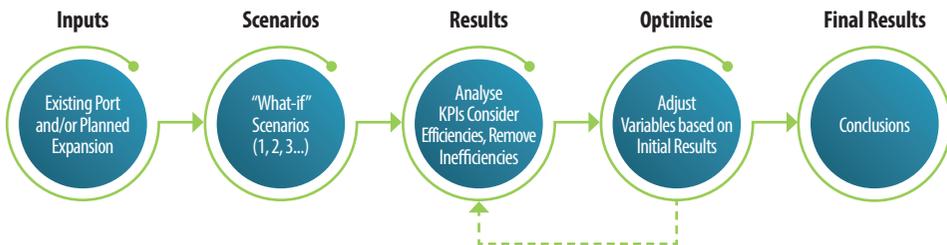
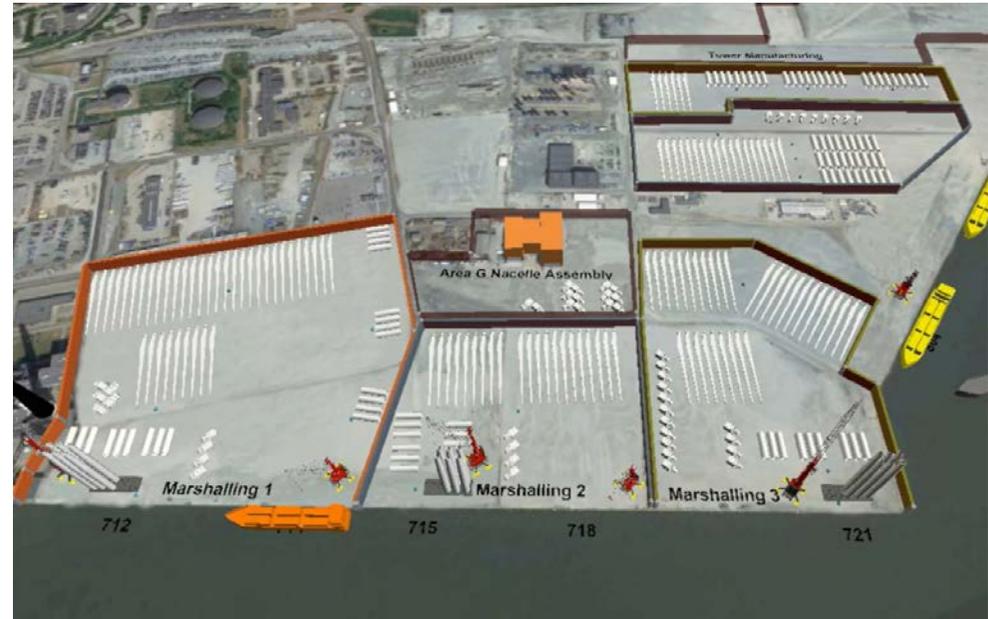
Modelling

Dynamic Simulations

Moffatt & Nichol began dynamic simulation modelling of offshore wind ports to supplement its extensive, ongoing port planning and detailed design work, and has completed successful dynamic simulation modelling for the largest offshore wind port facilities in Europe and North America (Port of Esbjerg and New Jersey Wind Port). The modelling is performed using Moffatt & Nichol’s proprietary modelling software, FlexTerm.

Key Benefits

- Provides platform for “what-if” scenarios to test marine terminal logistics plans
- Identifies and eliminates potential system bottlenecks and pinch points to improve efficiency and profit
- Establishes required spatial parameters for proposed projects and throughput
- Tests multiple layouts and logistics plans in low-risk environment
- Virtual optimisation of the system prior to Capex spending
- Project revenue estimation (lease terms and quay activities).



FlexTerm

FlexTerm is a powerful 3D simulation software that provides the ability to visualise how changes may affect port facilities’ capacity, operations, efficiency, and profitability.

By changing the model input and variables, FlexTerm can simulate proposed operations at the port facility and compare performances of various scenarios.

The software offers both a visual (digital twin) and a report-based analysis of the terminal to identify pinch points and congestion areas during operations.

Port Of Esbjerg

Esbjerg was the first wind port in the world to commission a digital twin that can calculate efficient methods for deploying offshore wind installations. FlexTerm's outputs demonstrated that the port could triple its annual shipping capacity for offshore wind installation from 1.5GW to 4.5GW within three years.

FlexTerm was used to run what-if scenarios, so that operational efficiency and throughput could be maximised. It also established the best locations for storing wind turbine components and calculated where a deeper basin is needed.

The team created a dynamic simulation model of the port to test different scenarios, for example when moving turbine blades, to ensure the processes were as efficient as possible.

FlexTerm was able to map out the entire supply chain delivering the giant components. As the majority of components are being transported by water, the need to co-ordinate optimal timings for cranes, ships and so on is critical.

The simulation also allowed for RoRo and onshore wind, container and bulk projects that take place at the port at the same time. This helped ensure that other existing port operations were able to continue usual operation.

Experience

Key Projects



New Jersey Wind Port Detailed Design and Simulation Modelling **Lower Alloways Creek, New Jersey, USA**

Moffatt & Nichol applies marine planning and structural expertise to lead design for the first U.S. purpose-built offshore wind port.

The New Jersey Wind Port, currently a greenfield site, will import, stage, preassemble, and load out turbine, tower, and blade components for large commercial scale offshore wind installations—with allowable live load capacities up to 6,200 pounds per square foot at the wharf. The new port will offer purpose-built marshalling and manufacturing space, heavy-lift wharfs, and connectivity to an existing federal navigation channel. Terminal improvements will include a combination of deep draft vessel berth for importing of wind turbine components and a deeper berth designed to accommodate use of a jack-up vessel to assist with component assembly. Work includes dredge design of a 4,500-foot-long by 500-foot-wide deepwater access channel. Moffatt & Nichol provided services that included navigation safety and vessel accessibility analysis, stakeholder outreach, dredging assessment, final engineering design, construction cost estimating.

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Experience

Key Projects



Searsport Floating Offshore Wind Port

Searsport, Maine, USA

Well positioned to become a leader in the offshore wind industry, the State of Maine explored opportunity at the Port of Searsport.

The Maine Department of Transportation contracted Moffatt & Nichol to evaluate the feasibility of using the existing Mack Point Terminal at Searsport to service the offshore wind industry. The evaluation considered multiple terminal sites for either wind turbine generator marshalling or fabrication, for both fixed and floating foundation offshore wind turbines. The study goal was to identify the best use for this port in servicing the wind generation industry and to come up with estimated cost of repurposing the marine terminal to service largescale offshore wind farms. Moffatt & Nichol then prepared infrastructure assessments that included conceptual layouts, preliminary concept designs, construction schedules, and opinions of probable cost. In addition, an economic analysis was conducted for selected sites using a model that incorporated potential revenue streams, terminal activity (staging or fabrication), and the required capital expenditure to generate a return on investment. Moffatt & Nichol executed this model for each site included in the study. Following the evaluation, Sears Island was chosen as the preferred site.

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Experience

Key Projects



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Long Beach Pier Wind Floating Offshore Wind Terminal

Long Beach, California, USA

Currently, Moffatt & Nichol is providing 15 percent engineering design and other as-needed support services to the Port of Long Beach for the development of Pier Wind. This innovative offshore wind port terminal will create new land southwest of the Long Beach International Gateway Bridge in the harbour district's outer harbour. The terminal is planned to meet offshore wind industry requirements for staging and integration and floating foundation assembly. As conceived, the 400-acre facility would be the largest at any U.S. seaport specifically designed to accommodate the assembly of floating offshore wind turbines. When ready for deployment, turbines would then be towed out from the Port of Long Beach to offshore wind farms off the coast of Central and Northern California.

In addition to engineering and design development, services for the proposed offshore wind terminal include sediment management, seismic design, tsunami risk evaluation, and coastal wave and navigation studies.

The new facility will help contribute to California's planning goals for deploying 25 gigawatts of offshore wind energy by 2045 and the federal goal of 15 GW of floating offshore wind capacity by 2035.

Experience

Key Projects



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Fixed Foundations Dynamic Simulation Model

UK

A confidential client was looking to build out one of its port assets to enable it to act as a marshalling port to support the offshore wind (OSW) industry. Moffatt & Nichol was appointed to create a dynamic simulation model of the OSW marshalling port, focusing on monopile foundation marshalling operations. The objective of the project was to assess the suitability of the port's configuration, operations, and logistics for the future OSW marshalling operations and evaluate these versus key performance indicators.

At the time, the available berths at the port were on the inside of a lock system. The maximum allowable vessel beam that could transit the lock was 33 metres. This width allowed the passage of bulk carrier vessels delivering wind turbine generation components to the terminal but was not sufficient to allow the passage of installation vessels or Heavy Lift Vessel carriers transporting foundations. The client's buildout plans included a new berth outside of the lock that would enable vessels with a wider beam to visit the port.

Moffatt & Nichol performed the dynamic simulation using FlexTerm, developing a model to assess the port's ability to marshal a foundation project using the new outer berth and the laydown area of 24 hectares, including storage area for secondary components. It included the import of XL monopiles to the delivery berth, the movement of these components to the storage area, and the loadout of these monopiles onto the export vessel at the loadout berth.

Project duration, storage utilisation, and berth utilisation were assessed for each scenario with specific findings compared against the project key performance indicators.

Experience

Key Projects



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Ports Identification and Comparison to Support Floating Offshore Wind **UK**

Moffatt & Nichol was engaged by an OSW developer to identify potential UK ports capable of supporting OSW component construction, marshalling, installation, and operations and maintenance.

In collaboration with the client, Moffatt & Nichol established a basis of analysis document to assess OSW port requirements and site screening criteria against the existing port infrastructure. The study team developed a long list of potential ports, which was narrowed to less than a dozen after holding a site screening workshop with the client. Moffatt & Nichol undertook further analysis, site visits, and meetings with port management at the ports that made the short list.

Moffatt & Nichol developed conceptual layout plans and project development schedules for the top three sites from the multi-criteria analysis.

Experience

Key Projects



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Offshore Wind Dynamic Simulation Model

Ardersier, Scotland, UK

Hventus commissioned Moffatt & Nichol to provide planning services for an OSW port at Ardersier Port, a 180-hectare facility near Inverness. The planning effort involved creating a dynamic simulation model, using FlexTerm modelling software.

As part of the project, Moffatt & Nichol carried out project we carried out an analysis of the port's proposed vessel characteristics and associated planned berth length to ensure the arrangement was adequate for the planned OSW operations.

The outcome of the berth analysis and port planning exercise was used to create a dynamic simulation model of a commercial scale OSW project installed at Ardersier Port, focusing on the foundation and wind turbine generator marshalling operations. The objective was to assess the suitability of the port's configuration, operations, and logistics for future OSW marshalling operations and to evaluate these against established key performance indicators.



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