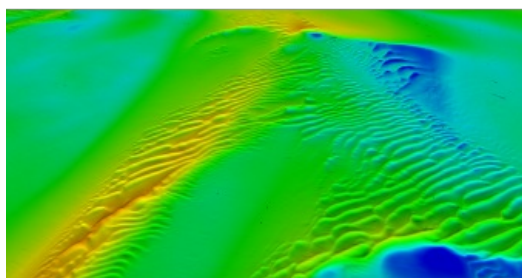


# XOCEAN PROVIDES SUSTAINABLE DATA FOR THE DEVELOPMENT, CONSTRUCTION, OPERATION AND MAINTENANCE OF OFFSHORE WIND FARMS.

## XOCEAN “Survey Data Throughout the Offshore Wind Lifecycle

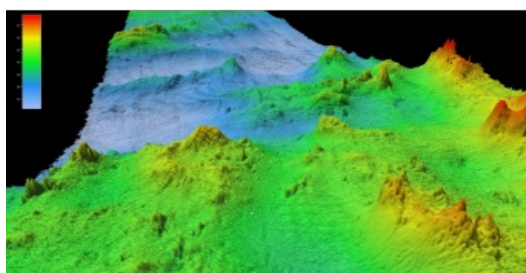


As the rapid expansion of the offshore wind industry continues worldwide, one of the challenges facing developers at each phase of an offshore wind farm's 40-year lifespan is the ongoing survey and data requirements.

Since its commercial launch in 2019, XOCEAN has completed over 65,000 operational hours of survey for world-leading energy companies and has worked on over 150 projects in 18 jurisdictions globally. In the first half of 2022 alone, XOCEAN delivered 12,000 hours of carbon-neutral uncrewed survey operations to offshore wind farms. This was done in 36 missions using multiple USVs across seven jurisdictions, supporting the development of 14.6GW of new offshore wind while increasing the number of vessels in the



fleet to 23 to meet this growing demand.



### Offshore Wind Farm Site Investigation Survey | Development Phase

XOCEAN recently completed a series of site surveys for bp's Morgan and Mona offshore wind farms, located approximately 30km off the coast in the Irish Sea. These two wind farms, which are being developed by bp and EnBW, have a combined area of approximately 800km<sup>2</sup>. Once operational, they will have a generating capacity of 3GW by 2029.

XOCEAN were contracted by bp to acquire high-resolution seabed surveys in water depths ranging from 0–35m, as part of the overall geophysical site surveys required for the preconstruction phases. The high-quality data collected will give the wind farm's engineering and project teams insights to create robust designs for the sites.

With work commencing in 2021, the Morgan and Mona project took place over four phases in a two-year period covering 20,000 survey line kilometres. The XOCEAN team was able to quickly mobilize USVs to site in the Irish Sea, completing over 300 survey days. To

maximize efficiency in data collection, multiple USVs were deployed to the site with up to four operating at a time.

XOCEAN delivered 70,000GB of high-quality bathymetry data, as well as recording backscatter and water column data. Drone footage of the cable landing site was captured as part of the overall scope of the project, to identify the connection points from the wind farm to the coast. XOCEAN's USVs emit just 0.1% of the CO<sub>2</sub> of a conventional vessel, saving 35,000kg of carbon during the project.

By utilizing XOCEAN's USV technology, the data collected will enable bp to build the most efficient offshore wind farms possible, identifying viable options for the export cable corridors with a much-reduced carbon footprint.



XOCEAN XO-450 operating on the Greater Gabbard Offshore Wind Farm for SSE Renewables.

## Offshore Wind Farm Inspection Survey | Construction

XOCEAN have been engaged in ongoing seabed monitoring and construction surveys at Ørsted's Greater Changhua 1 & 2a Offshore Wind Farms, located 35–60km off the coast of Changhua County, Taiwan. At the 108.7km<sup>2</sup> site, where continued construction is taking place, XOCEAN has so far completed 160 seabed surveys within the wind farm in various stages of the construction, including surveys around the wind turbine generators and offshore sub-station positions in water depths ranging from 30–45m.

During the construction phase of these large offshore wind farms, an accurate and consistent view of the seabed is required, as well as insight into the integrity of the turbines and cables being installed, to allow the project and engineering teams to make informed decisions as they move through installation and development at the site.

To maximize efficiency and flexibility, mobilization on site was aided by deploying the USV from a service operations vessel (SOV) using our custom Launch and Recovery System (LARS).

Safety during construction is a principal factor in the risk evaluation and management of an offshore wind farm. With the small size of XOCEAN's XO-450 USV, this has allowed for minimal interference as construction takes place. USV Pilots monitor and have full command and control through XOCEAN's highly secure cloud-based environment, Cyberdeck.

With 26 successful missions completed over the past year, productivity has been maximized at the Greater Changhua 1 & 2a sites by utilizing XOCEAN's USV technology, whereby data collection takes place quickly and is fed back 24 hours a day, seven days a week. XOCEAN can safely deliver high-quality bathymetry data in these challenging locations.



Four XOCEAN XO-450 USVs were used to deliver 20,000km of geophysical survey for the Morgan and Mona Offshore Wind Farms.



XOCEAN's XO-LARS (Launch & Recovery System) used in Taiwan.

## Offshore Wind Farm Inspection Survey | Operations & Maintenance

XOCEAN recently completed a routine operations & maintenance inspection of Equinor's Sheringham Shoal offshore wind farm on behalf of Reach Subsea, located 17–23km off Norfolk's coastline. XOCEAN was tasked with surveying 88 wind turbine foundations and two of the wind farm's 22km export route cables.

To maximize efficiency, the XOCEAN team quickly mobilized to site within 48 hours and completed the project in just nine days. Using multiple USVs allowed for swift data collection of the cable routes, whereby two USVs were deployed to inspect the foundations and inter-array cables while a third USV inspected the export cables.

While the strong tides and shallow waters of the Sheringham Shoal site may have presented challenges to a traditional vessel, the small size and weight of the USVs meant that XOCEAN could quickly mobilize to and navigate the site to acquire the data for the client.

XOCEAN efficiently and safely delivered high-quality bathymetry and backscatter data for Reach Subsea, sharing the results with Equinor in HTML format, which allowed the project teams to identify any potential changes to the seabed that would compromise the integrity of the wind farm.



Three XO-450s [orange arrows] simultaneously operating on the Sheringham Shoal Offshore Wind Farm.

## Offshore Wind Farm Lifecycle

XOCEAN is proud of its continued partnership with SSE, having completed surveys on 16 projects with their teams over the past three years, returning to many of their offshore wind farm sites in this time. Two such projects include Dogger Bank C and Greater Gabbard, where surveys were completed at different stages of the offshore wind farms lifecycle.

## Offshore Wind Farm Cable Route Survey | Dogger Bank C

In 2021 XOCEAN performed a geophysical scouting survey of the third phase of Dogger Bank Wind Farm's export cable route. Travelling up to 236 km offshore off the north-east coast of Yorkshire, Dogger Bank C windfarm is part of the soon to be largest offshore windfarm in the world, that will provide the UK with 3.6 GW of power by 2026.

Dogger Bank Wind Farm is a joint venture between SSE Renewables, Equinor and Eni Plenitude. It's being built in three phases known as

Dogger Bank A, B and C. Fugro was contracted to undertake a variety of surveys on the array and cable route areas and engaged XOCEAN to support with the acquisition of geophysical data on the cable route. Combining the data obtained from the different sensors is important to accurately determine the subsurface, and that's where XOCEAN and Fugro complement each other, working together on this project to understand the routing options for an engineering corridor for installation of the export cable route.

Efficiency was ensured by deploying two USVs to the site for swift data collection. In site conditions of up to 2.5m wave heights and water depths ranging from 18m up to 36m, XOCEAN's USVs acquired high-resolution seabed data for the project team.

Using a Multibeam Echosounder and Sub-bottom Profiler to deliver over 1,750-line kms of high-quality bathymetric and backscatter data allowed SSE to determine water depths, topography, gradients, rugosity, and micro-elevation. The high-resolution sub-bottom data was used to determine the shallow sub-surface soil conditions that may influence foundation and cable installation.



Two XOCEAN XO-450 USVs were used to deliver 1,750km of geophysical survey for the third phase of Dogger Bank Wind Farm.

## Offshore Wind Farm Inspection Survey | Greater Gabbard

XOCEAN has regularly returned to SSE's 140-turbine Greater Gabbard site located in the North Sea, around 20km off the coast of Suffolk. Over the past two years, SSE has engaged XOCEAN to provide routine operations & maintenance surveys of the 147km<sup>2</sup> wind farm.

In one such mission during this period, XOCEAN was contracted by SSE to perform inter-array cable inspection surveys to assess the depth of burial along seven cables and at two turbine locations in preparation for the arrival of a jack-up vessel. Conducting 24-hour operations in the area, XOCEAN was tasked with acquiring high-quality multibeam echosounder, sidescan sonar and sub-bottom profiler data.

XOCEAN transited to site within 12 hours, completing the survey work in just over two days. Six cable surveys and one jack-up survey were completed in the first stage of the mission along the northern area of the wind farm. A following cable survey and jack-up survey were also completed in the southern area.

XOCEAN provided SSE with over 370 survey line kms of high-quality bathymetry data in this high current environment in water depths ranging from 2 to 30 m. The data collected allowed the project team to identify the state of burial or exposure of the wind farm cables, and as a result deploy sufficient protection systems to ensure the integrity and optimal operation of the cables and turbines.

## Conclusion

Continued growth of the global ocean economy is driving the need for high-quality ocean data to enable informed decisions and support the development of offshore wind farm projects. The requirement to survey areas to modern standards is also ongoing for the creation and updating of navigational products, which support global shipping, trade and numerous other activities related to our oceans. By using USVs, we can increase the rate at which ocean data is collected, support the growth of the blue economy and conduct carbon-neutral operations to help utilize our oceans in a sustainable way.

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<https://www.hydro-international.com/case-study/xocean-survey-data-throughout-the-offshore-wind-lifecycle>

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