

Enhancing offshore wind construction timelines

XOCEAN's cutting-edge uncrewed survey vessels helped Ocean Winds keep Moray West Offshore Wind Farm on schedule, delivering fast, precise seabed data to accelerate construction. By combining innovation with efficiency, the project showcases how smart maritime technology drives safer, greener and more cost-effective deep water wind development.

Developed by Ocean Winds, a joint venture between EDPR and ENGIE, the Moray West Offshore wind farm is located on the Smith Bank in the western area of the Moray Firth, roughly 22 km from the Caithness coastline. From March to August 2024, XOCEAN worked closely with Ocean Winds to deliver critical seabed data between construction phases at the wind farm.

The 60 offshore wind turbines and two offshore substation platforms cover an area of 225 km² in water depths ranging from 35 to 52 m. The wind farm, once complete, will have a total electric generation capacity of 882 MW, enough to meet the average electricity needs of over 1.33 million homes. The development will result in the removal of 1.1 million tonnes of CO₂ emissions per year.

Purpose and objectives

To help facilitate the offshore construction programme, XOCEAN was contracted to conduct debris clearance surveys following the installation of the transition pieces and before the installation of the WTGs.

The surveys aimed to accurately determine water depth in the vicinity of the monopile structures and to identify all objects or obstructions on the seabed that might hinder the jack-up barge deployment or other aspects of the construction process. Ocean Winds required the surveys to be conducted in four phases, synchronizing with their construction schedule, and had strict data delivery milestones for each phase of the work to facilitate planning and operational timelines.

MBES and backscatter data were collected within 300 x 300 m boxes centred on the monopile locations. The data specification from Ocean Winds required a 0.5 m object detection threshold with 100% coverage. The resulting data, including Digital Terrain Models and object identification lists, were delivered within 30 days of data acquisition in order to inform the ongoing construction planning.

Solution and implementation

XOCEAN mobilised one USV for each of the four phases and used Buckie Harbour on the south coast of the Moray Firth as a base for the operations.

The USVs operated as fully uncrewed 'Over-The-Horizon' vessels, communicating via satellite. Real-time images and situational awareness data from each USV were transmitted back to XOCEAN's Control Room, where a dedicated team of USV Pilots and Surveyors monitored the data and controlled the vessels 24/7.

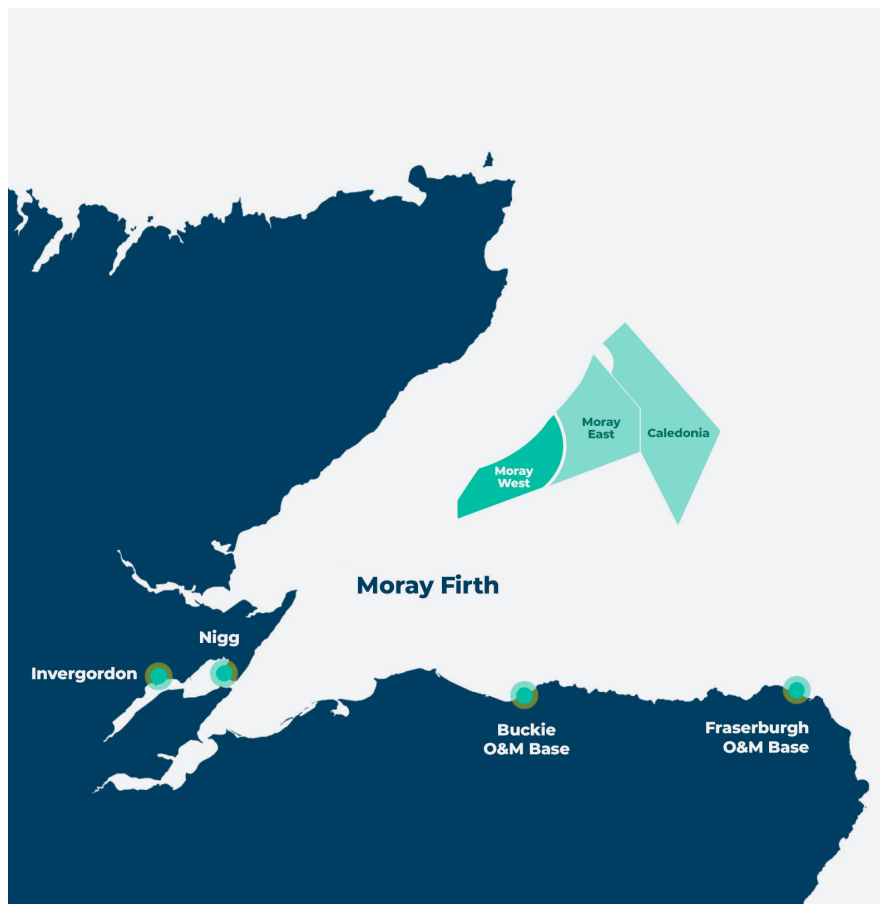


Figure 1. Location of the Moray West Offshore Wind Farm. Also shows the location of Buckie Harbour, which was used as a base for all of the operations



Figure 2: USV operating over the horizon and controlled by a USV pilot remotely via satellite

The entire system adhered to Autonomy Level 2 standards as per the UK Maritime MASS Code and complied with the requirements of existing International Maritime Organization (IMO) instruments.

The primary survey sensor on board the USVs was the NORBIT Winghead MBES. Renowned for its state-of-the-art analogue and digital platform, NORBIT Winghead sonars boast powerful signal processing capabilities, delivering accurate roll-stabilized bathymetry and backscatter outputs.

The USVs were fitted with a winch capable of deploying a Valeport Swift SVP while underway. This system provided accurate data compensations for environmental variables like temperature, salinity, and pressure, essential for accurate multibeam data processing.

The sonars and the survey team ensured quality survey data acquisition, even in challenging operational environments, such as the rough sea conditions that can be encountered in the Moray Firth.

As this was the first time Ocean Winds had USVs on their site, introductory sessions were held with the project team to introduce them to the USVs and the XOCEAN project team. The cyberdeck used by the USV pilots and surveyors was demonstrated and the XOCEAN field operatives outlined their launch and recovery processes. Ocean Winds reported that integration of uncrewed operations into the existing project's marine policies and procedures was smooth and well managed. Ocean Winds particularly noted that with multiple construction and CTV vessels on site, the USV's simultaneous operations were seamless and safely executed.

Results

XOCEAN coordinated multiple mobilisations with flexible dates, ensuring that subsequent contractors had access to the most up-to-date survey data. This proactive approach helped prevent delays to future activities and ensured survey data was available between key project phases.

Its operational agility and efficient mobilisation and demobilisation ensured an economic solution that integrated with their critical schedule.

Throughout all four phases, 461 targets were identified within the survey extents. Jack-up footprints were commonly found at each of the monopile locations. Boulders, debris, and depressions were also found throughout the site.

Each of the phases was successfully mobilised within the allotted timeframes.

All of the acquisition phases were completed on time and the priority data and deliverables were delivered to the project within the preset milestones, ensuring uninterrupted construction phasing.

XOCEAN was also able to accommodate several additional survey requirements within the existing mobilisations. A secondary output from the phased data collection approach was the ability to provide insights into sediment dynamics at monopile locations.

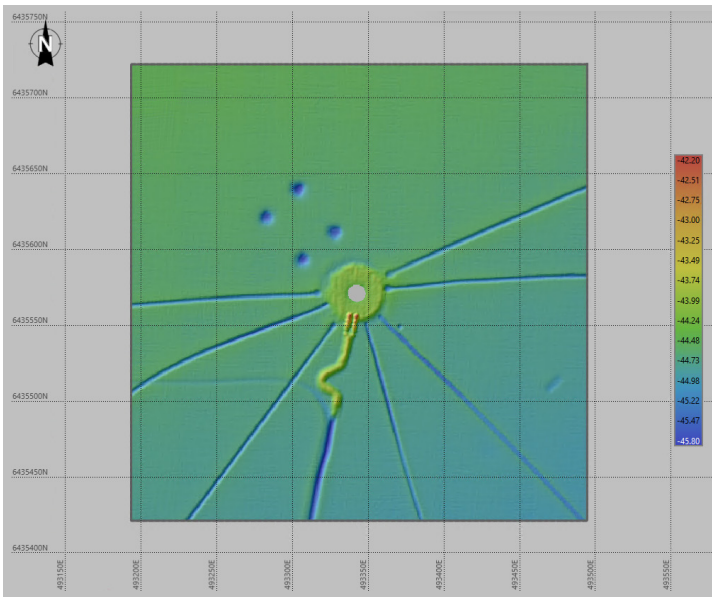


Figure 3. An example Digital Terrain model derived from the MBES data surrounding one of the monopiles at Moray West, showing inter-array cables and Jack-up footprints

This enabled the project team to make early, informed decisions on proactive mitigation while they still had construction vessels on site.

Conclusion

This collaboration on the Moray West Offshore wind farm construction project showcases the effectiveness of utilizing USV technology for seabed mapping and debris clearance surveys in advance of and during construction phases of an offshore wind farm.

By deploying four USVs equipped with MBES and employing a flexible, phased survey approach, XOCEAN successfully met the stringent requirements set by Ocean Winds, delivering precise and timely data crucial for the overall project's construction timeline.

The seamless integration of USVs into the existing marine operations and policies, coupled with the ability to conduct simultaneous operations with other vessels, further underscores the company's operational

success. The survey data not only facilitated the efficient progression of construction activities but also provided insights into sediment dynamics, aiding in proactive decision making. The project highlights the pivotal role of innovative maritime technology in safely advancing large-scale renewable energy projects, contributing to significant environmental benefits by supporting the reduction of CO₂ emissions.

xocean.com

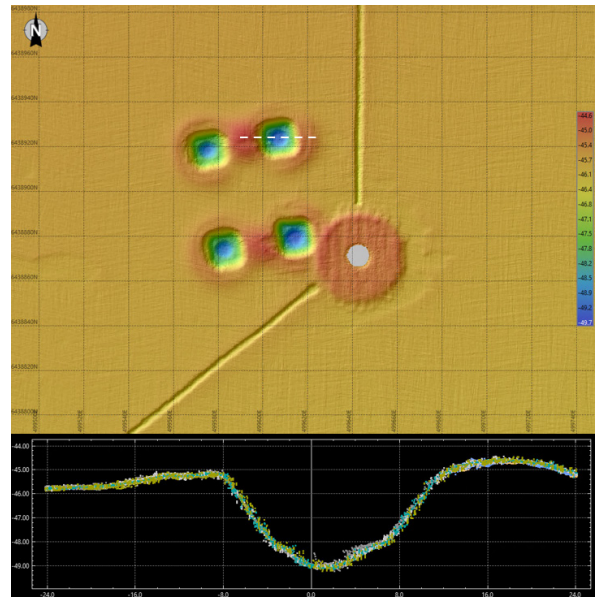


Figure 4: Detailed MBES DTM and profile across a Jack-up footprint at one of the Moray West monopiles

