Uncrewed Surface Vessels; Low Impact Ocean Data Collection for Offshore Wind Farms

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XOCEAN
Ocean data, delivered.

BACKGROUND

With the United States expected to surpass 30GW of offshore wind capacity by 2030, the demand for data to support Offshore Wind Farms (OWFs) will continue to grow. This includes the collection of seabed and sub-surface information for geophysical surveys for site development, surveys during construction, routine inspections through operations and maintenance, and data to support decommissioning.

Ocean data has traditionally been acquired using large, crewed vessels, which emit substantial amounts of carbon from the consumption of thousands, or even tens of thousands, of litres of fuel per day. With typical speeds of 5 knots or more during operations, and much higher transit speeds, these vessels also pose a threat to marine mammals through collision.

OBJECTIVES

A sustainable approach to collecting data that:

- Reduces carbon emissions, risk to marine life and other environmental influences during operations.
- Minimizes risk to personnel during project execution.
- Meets stringent data collection specifications.
- Allows vessel fleet capacity to be increased in less time and with a lower carbon footprint.

METHODS

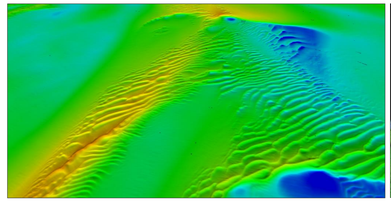
The above objectives are achieved using Uncrewed Surface Vessels (USVs) with:

- A renewable and fully automated hybrid power system consisting of solar harvesting, lithium-ion battery, intelligent control system and auxiliary micro diesel generator.
- Compact hull design (4.5m / 15’ long) and low survey speeds (~3 knots).
- Visible light and thermal cameras that provide 360° views for situational awareness for safe navigation, and to minimize risk and maintain recommended distances from protected species.
- Full uncrewed ‘over the horizon’ operation using satellite communications, or cellular or Wi-Fi when available, with no personnel offshore.
- Power (3.2kW) and payload capacity (250 kg) for commercial grade sensors.

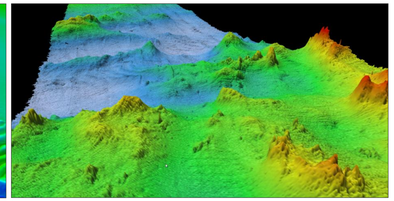
OFFSHORE WIND ACTIVITY: JAN - JUNE 2022

12,000 Operational Hours	11,300 tons CO_2 Offset	36 Survey Missions	14.6 GW Supported	7 Jurisdictions

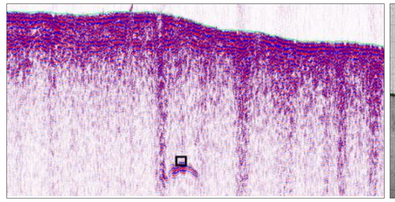
DATA EXAMPLES



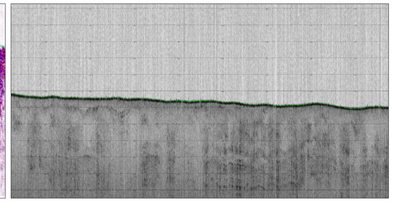
Bathymetry data delivered as part of 20,000km of geophysical survey.



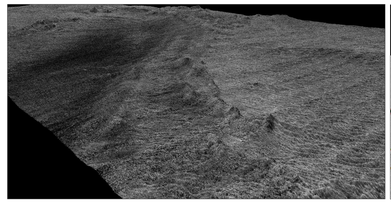
Export Cable Route bathymetry from 1,750km of geophysical survey.



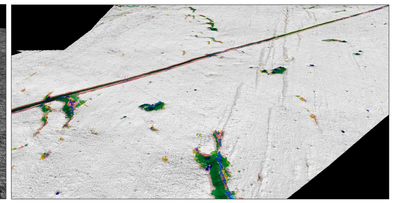
Inter Array Cable with 12cm diameter in 25m water detected with Innomar standard Sub Bottom Profiler (SBP).



12m seabed penetration up to bedrock during geophysical survey using Innomar medium-USV SBP.



Multibeam backscatter example collected during route survey.

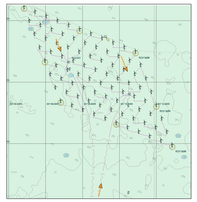


Automated seabed feature detection for route survey using backscatter mosaic and bathymetry Digital Elevation Model (DEM).

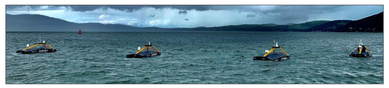
OPERATIONAL EXAMPLES

Marine mammals observed with USV visible light cameras during operations.

Ocean data delivered to support the development and operation of OWFs worldwide.



3 x USVs (orange arrows) shown operating simultaneously during asset inspection survey.



Part of XOCEAN’s fleet of 23 x USVs. USVs enable carbon neutral ocean data collection to support the rapid expansion of the offshore wind industry in USA and other regions.

CONCLUSIONS

- Ocean data plays a key role in the development of OWFs, assessing changes to the marine environment (installation and removal of assets) and ensuring the oceans remain healthy [1].
- A USV hybrid power system consumes very small volumes of fuel and the resultant carbon emissions are ~0.1% of a conventional vessel, which are offset for carbon neutral operations.
- Radiated underwater ocean noise is reduced to limit disturbance to marine life by using electric thrusters and operating at lower speeds of ~3 knots [2].
- USVs have sufficient power and payload capacity to concurrently run high-resolution Multibeam Echosounders (MBES) and high-powered SBP to support OWF site and route development through to decommissioning.
- Continuous operation and monitoring of the USVs by qualified mariners with remote access to the visible light and thermal cameras allow measures to be taken to, ‘Minimize Vessel Interactions with Protected Species’ as per Bureau of Ocean Energy Management (BOEM) Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection [3].

REFERENCES

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2. Amendments to the North Atlantic Right Whale Vessel Strike Reduction Rule, National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce, accessed August 2022, <federalregister.gov/d/2022-16211>
3. Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection, U. S. Department of The Interior, BOEM, Office of Renewable Energy Programs, Atlantic OCS Region, accessed May 2022, <www.boem.gov/pdcs-and-bmps-atlantic-data-collection-11222021>
4. XOCEAN – Survey Data Throughout the Offshore Wind Lifecycle, Hydro International, accessed August 2022, <www.hydro-international.com/case-study/xocean-survey-data-throughout-the-offshore-wind-lifecycle>

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