GETTING AHEAD OF THE REGULATIONS

With the recent innovations into floating offshore wind to support the growth of green energy, turbines can now be installed in deeper and more complex seabed locations. (Courtesy: NatureMetrics)

New technologies are accelerating biodiversity reporting for floating offshore wind projects.

By RACHEL MADOR-HOUSE

Since the construction of the first wind turbine in 1991, many technological advancements have made the utilization of offshore wind energy a reality. According to 2023's Global Offshore Wind Report, 2022 was the second-highest year in history for offshore installations, which brought 8.8 GW of new offshore wind into the grid, bringing the total offshore wind power capacity to 64.3 GW. That represents 7.1 percent of global wind installation. It has been projected that by 2050, offshore wind will contribute about 34 percent of total wind production.

With the recent innovations into floating offshore wind to support the growth of green energy, turbines can now be installed in deeper and more complex seabed locations. This has been made possible by floating platforms anchored to heavy weights on the seabed through flexible steel cables and chains. The four different types of offshore floating platforms that have currently been developed allow for adaptability of this technology depending on the specific conditions of each site.

These floating platforms are designed to give turbines buoyancy in diverging seabed conditions and wind types and can extend manufacturing capability while reducing the cost of floating wind farms. As a result, floating offshore wind is expected to achieve a total capacity of 380 GW by 2030, according to the Global Offshore Wind Alliance (GOWA).

Global interest in floating offshore wind has been growing exponentially, as countries aim to reach renewable energy targets by 2030 and beyond, to reach net zero. In March of last year, White House National Climate Adviser Ali Zaidi announced the release of the U.S.' very own Offshore Wind Energy Strategy. Through this, the country is aiming to leverage all potential resources to harness offshore wind energy as a reliable energy source and create thousands of well-paying union jobs that will simultaneously help to revitalize coastal communities and position the U.S. as a leader in offshore wind energy. With this as a backdrop, the Biden administration set a goal to generate 30 GW of floating offshore wind energy by 2030, which would power more than 10 million homes.

Although investment into engineering technologies allowed for European renewable energy to be price-competitive with conventional power sources in 2017, the U.S. has gone a step further and set the Floating Offshore Wind Shot goal of reducing the cost of offshore wind by more than 70 percent, which would further aid in the positioning as the global sector leader. In becoming a global leader, the U.S. geography lends itself to the use of various offshore technologies. Where the East Coast is opting for traditional piled-soiled platforms, the deeper waters of the West Coast make floating wind the only viable option if offshore wind is to be introduced.

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ENVIRONMENTAL IMPACT AND REGULATION

Despite the floating offshore wind technology being nascent with most projects currently piloted or at the pre-commercial stage, the total pipeline of projects is growing, and floating wind is expected to reach 15 percent of total energy produced by offshore wind by 2050. However, little is yet known about the impact this emerging technology might have on marine ecosystems. The technical developments of floating offshore winds will allow for the placement of these floating turbines in deep-sea areas that have very rich habitats, so it will be critical to understand how the technology will affect these important environments.

Targets to guide each country's marine regulatory efforts have already been suggested within the Kumming-Montreal Global Biodiversity Framework, which set the goal to recover and restore 30 percent of global marine ecosystems, halting human-induced extinction of threatened species through the implementation of conservation measures and the sustainable use of seascapes and the ocean. To adhere to these targets, there must be a just and sustainable deployment of floating offshore wind to go hand-in-hand with the advancements in design and manufacturing that will allow for this renewable energy to achieve its full potential.

Traditional methods such as trawling have historically been used to track the impact of offshore wind farms. However, these methods require specialized vessels and ecologists, are dependent on the weather conditions at sea, and netting techniques are unable to be used within wind-turbine arrays leading to a lack of biodiversity data at the closest

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affected site. New technologies developed in recent years have allowed for the development of sampling methods that provide a more accurate picture of the biodiversity in the environment while tackling many of the issues that traditional methods present.

NATURE INTELLIGENCE TECHNOLOGIES: AN ESSENTIAL TOOL

Innovative approaches such as environmental DNA (eDNA) analysis and earth observation are enabling offshore wind companies to accurately measure and track the environmental impact of business operations to boost productivity that are inherently tied to the environment in which they operate; eDNA technology, which can detect traces of DNA that species leave behind in their environment, allows for the identification of up to 70 percent more species from a water or sediment sample. Earth observation methods such as satellites and drone remote sensing technologies allow for the visual monitoring of habitat types, distribution of species, and even the creation of digital twins replicating an entire ecosystem to assess biodiversity. The use of these nature intelligence technologies will allow offshore wind companies to build a complete map of the ecosystems in which they operate and future-proof marine construction projects against regulatory frameworks.

Some companies are already successfully using these technologies, which have proven to uncover a greater diversity of species than previously thought given the information that had been collected through traditional methods. With funding from the U.K.'s Offshore Wind Growth Partnership's

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Innovation Grant, EDF Renewables' Blyth Offshore Demonstrator, a local coastal wind farm half a mile off the coast of Blyth, Northumberland, England, set out to investigate whether eDNA sampling was an effective and replicable methodology to the standardized trawling method — which is invasive to the analyzed ecosystem. The sampling involved the collection of water samples one meter above the seabed, reducing the safety risks that trawling entails, and personnel costs as this sampling can be conducted as part of regular site works.

The eDNA method was not only able to detect more species compared to the traditional trawl method, but it was also able to detect mammals, invertebrates, and birds. In addition, because the eDNA testing is done with a simple water sample, this enabled surveying to be done within the turbine array, where trawling cannot be conducted. This led to data insights within the array that showed greater relative abundance of reef-dwelling and commercially important fish species, which supports a hypothesis that the structures provide an artificial reef and nursery environment. The specificity of insights these technologies bring to the table will be increasingly valuable and standardized due to the rise in frameworks informing marine conservation.

As communities continue to need more energy and green energy becomes a preferred choice, we will only see more innovation within the energy transition era. But making sure we're protecting ecosystems we're trying to save by using green energy is imperative. Companies will need to be equally innovative in how they measure nature to navigate inefficiencies and costs, while also capturing robust data on the ecosystems they affect, as they continue to deploy early-stage technologies in the field; eDNA is helping to provide an answer to these challenges, ultimately supporting the green transition while also ensuring a sustainable foundation for energy businesses and a brighter future for our planet.

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