The next energy frontier: floating wind farms

The global energy transition is underway. The uptake of renewables is accelerating, as the technology undercuts fossil fuel based energy generation and governments seek to achieve international climate targets. Renewable energy is now also accepted as an opportunity to drive green economic growth and job creation to help support the recovery from the impacts of Covid-19.

Olivia Burke

Offshore wind has a key role to play in this energy transition, having grown nearly 30% per year between 2010 and 2018. The IEA predicts global offshore wind capacity to increase fifteen-fold by 2040, becoming a US$1 trillion industry. After successfully lowering the price of bottom-fixed projects, the next frontier for industry is floating offshore wind.

Floating wind unlocks new markets

A key factor driving the development and scaling of floating wind is the technology's ability to unlock new markets for offshore wind development. An estimated 80% of global offshore wind resource is located in deep water areas (depths of more than 60m), where winds are typically stronger and more consistent, with the potential to yield superior capacity factors. The first larger capacity floating wind turbine (2.3MW) was installed and tested over a decade ago in Norway. Since then interest has increased as the viability and the scale of the technology has grown, with Hywind Scotland demonstrating a 30MW turbine - the largest floating turbine to-date.

The development of floating wind projects is currently focused across six countries in Europe and Asia. However, this will not always be the case. For some newer markets, such as the United States (US), where there is no installed floating capacity, over 50% of potential wind resource area is not suitable for bottom-fixed structures. Floating wind is therefore critical for geographies that do not have the appropriate sea bed conditions for bottom-fixed turbines to capitalise on the expanding offshore wind market, and to decarbonise their energy systems. Floating wind also creates opportunities to attract supply chain investment to new areas that may have lost out to established offshore wind regions.

The opportunities for business are significant and we are already starting to see companies keen to become first movers - making significant investments in research and development (R&D). By the end of 2020, global floating wind capacity will reach 130 MW and our latest analysis suggests the sector will grow to reach 70 GW by 2040.

Innovation and incentives are required to accelerate technology uptake

Multiple demonstration projects have progressed the technology, however, floating wind remains an emerging sector. Stable policies and government support are required to achieve a pipeline of projects to accelerate commercialisation and unlock savings at scale. This will also help create certainty to encourage supply chain innovation and investment.

Alongside policy support, innovation is also needed to address technical bottlenecks such as mooring design, heavy lift alternatives and new monitoring and inspection. Common to multiple floating wind designs, these challenges are suitable for industry-led collaborative research and development efforts.

In response to these needs the Carbon Trust created the Floating Wind Joint Industry Programme (Floating Wind JIP), a collaborative R&D programme, with 15

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leading offshore wind developers and support from the Scottish Government. Since its formation in 2016, over 20 projects have been kicked off investigating the technical challenges that still need to be overcome to achieve large scale deployment.

While our Floating Wind JIP focuses on technology and is geographically agnostic, experience has also taught us that targeted market collaboration can be an efficient way of channelling funding to technology developments. For example, the Offshore Wind Accelerator (OWA) programme started in 2008, has delivered a 15 per cent reduction in the Levelised Cost of Energy; an impressive return on investment for the industry and government funders based on an investment of over £100 million. This equates to a European-wide cost saving of £34 billion based on European government’s build targets out to 2030.

Market-specific approaches to R&D: US case study

The United States is a potential major market for floating offshore wind, particularly on the Pacific Coast and in Hawaii. Multiple commercial projects are already being explored along the West Coast including an up to 1GW project in Morro Bay (California), an up to 150MW project off the Humboldt Coast (California), and three 400MW projects in Hawaii. While the Northeast is typically associated with shallower waters, there are also suitable sites for floating wind.

The abundance of potential wind resource in deep waters makes floating attractive to states looking to decarbonise energy generation and create jobs. Cost reduction is critical to realising the potential for floating wind and collaborative approaches to R&D projects in new geographies allow established companies to invest and provide learnings to market entrants, accelerating information sharing and innovation.

Public-private partnerships are also emerging as an effective way to finance floating wind. An example is the University of Maine’s pioneering Aqua Ventus project, which has just taken the next step to becoming the first industrial-scale floating wind project in the US. It is a collaboration between an experienced developer, RWE Renewables, and Mitsubishi-owned Diamond Offshore Wind.

In 2018, based on our experience running the OWA, we helped to establish the US National Offshore Wind R&D Consortium (NOWRDC), which includes the US Department of Energy, and the New York State Energy Research and Development Authority, and is dedicated to managing industry-focused R&D for offshore wind to maximise economic benefits for the US. The NOWRDC has identified a target for the Levelised Cost of Energy of at or below US$60 per megawatt-hour by 2030.

Floating wind is on the cusp of achieving scale and cost reductions, and the deployment of commercial windfarms will lead to greater opportunities, for not only developers, but the wider supply chain. We estimate that at 70GW in 2040 the floating wind industry will have a project value of £195bn, demonstrating the opportunity for the supply chain globally to support and invest in floating wind. The race is on.

The Carbon Trust is a not-for-profit consultancy established in 2001, with a mission to accelerate the move to a low carbon economy. With over a decade of experience working at the forefront of offshore wind development globally, the Carbon Trust has played a central role in accelerating cost reduction across the industry and stimulating supply chains. Find out more at www.carbontrust.com