Offshore wind: energy security and challenges

Words: Dennis Jul Pedersen, Port Director, Esbjerg

As Europe faces growing energy demands and the need for greater security, offshore wind emerges as a vital solution. Yet the industry is hindered by slow development, logistical challenges and insufficient infrastructure. A concerted effort to foster collaboration among European ports is now essential, coupled with strategic investments and comprehensive policy reforms. Such initiatives could unlock the full potential of offshore wind, firmly establishing it as a pivotal element of Europe's sustainable energy landscape.

At the beginning of the year, WindEurope reported that only 2 gigawatts of offshore wind capacity were installed in 2024: a figure that falls far short of the targets set in various declarations and plans by European leaders. While energy independence remains a key driver of the green transition, the biggest challenge lies with offshore wind turbine manufacturers, who are facing significant difficulties.

The need for public funding is now more pressing than ever. However, projects must be financially viable, regardless of the security concerns linked to energy independence. The key question remains: how can offshore wind take its rightful place in Europe's energy mix, especially given its reputation as the lowest cost energy source?

Conversely, access to low-cost hydrocarbons has supported the competitiveness of the industrial complexes in Europe during previous decades. Looking ahead, it is clear that offshore wind is one of the technologies needed in Europe's energy spectrum. Energy has therefore become a measurement of both competitiveness and independence, which is closely linked to security.

The priorities will change with events in the macro environment, but long-term planning and delivery of offshore wind targets may alleviate concerns about security and competitiveness.

Electrification is essential for decarbonizing our societies, and hard-to-abate industries must find alternatives to natural gas to reduce greenhouse gas emissions. This requires a vast supply of green electricity, a challenge further intensified by the growing energy demands of artificial intelligence.

The European Union recently released the Draghi Report, highlighting the need for low energy prices to enhance competitiveness. The report references two common contract models for offshore wind farms: Power Purchase Agreements (PPAs) and Contracts for Difference (CfDs). From a broad perspective, PPAs can be an effective solution for electrifying large consumers when needed, while CfDs, with their built-in subsidies, are more suitable for projects that serve the greater public good.

Ultimately, these contract models are most effective when the regions requiring energy also possess optimal offshore conditions for wind farm installations.

The scenario in which renewable energy generation can be tailored exclusively to meet the needs of nearby industries or communities exists only in limited parts of Europe. To restore momentum in the offshore wind industry and achieve the necessary installation rates, improving trading mechanisms should be a priority.

Currently, the industry is hindered by a slow and complex development process, characterized by lengthy approval procedures, supply chain struggles, inadequate grid capacity, and a lack of interconnectors. This state of stagnation reinforces the notion of 'muddling through,' highlighting the urgent need for structural reforms to accelerate progress.

The cycles of boom and bust in the energy sector are well documented throughout history; from whaling and coal to oil and gas, these industries have always played a crucial role in shaping the cost of living.

The wind industry has the potential to break this pattern by providing a stable and sustainable source of energy. However, to realize this promise, offshore wind turbines must be deployed at a much faster pace. The key challenge remains: how can a true step change be achieved, leaving behind the current slow progress?

At the center of this discussion is the North Sea, a shallow, wind-rich area ideal for bottom-fixed offshore wind turbines. Part of this prime location falls within Danish waters. Yet with a population of just six million, Denmark cannot fully capitalize on this vast potential, nor does it have the industrial capacity to support large-scale offshore wind developments on its own. This raises the question of how to unlock the region's full potential for the benefit of Europe as a whole.

In this context, there is a strong argument for European countries to collaborate more effectively on renewable energy generation, an issue that is increasingly tied to Europe's security. While the idea of one country leasing the seabed from another may seem like a piecemeal approach, Europe must embrace a new era in which competitiveness is closely linked to its ability to expand renewable energy production.

A sustainable energy mix could be one of Europe's greatest strategic advantages in the decades ahead. Realizing this potential, however, depends on accelerating the deployment of offshore wind farms and the necessary grid infrastructure. By acting decisively, Europe can secure both its economic future and energy independence.

From the perspective of Port Esbjerg, situated directly on the North Sea, there is an urgent need for more ports to support offshore wind expansion. Currently, the lack of port capacity threatens to delay offshore wind projects by several years, with little chance of sufficient infrastructure being developed in time.

Addressing this challenge, The Alliance of Major Offshore Wind Ports of Europe exemplifies how competitors can collaborate for the greater good. The alliance includes Associated British Ports, Eemshaven, Cuxhaven, Szczecin and Świnoujście, Saint-Nazaire, Esbjerg, and Ostend, ports that not only possess deep operational expertise in offshore wind logistics but also serve as key hubs for wind turbine manufacturing.

By working together, these ports play a crucial role in accelerating offshore wind deployment and strengthening Europe's renewable energy ambitions.

Optimizing logistics in the offshore wind industry can significantly increase installation frequency, paving the way for future industry growth. The Port Alliance exemplifies both confidence in and commitment to the sector, demonstrating the importance of a coordinated effort to support offshore wind expansion.

To keep pace with the rapid development of offshore wind turbines, continuous investment and upgrades in port infrastructure are essential. This calls for a new approach to port operations, prioritizing efficiency and adaptability. Knowledge sharing is crucial and decision-makers across Europe must recognize the urgent need for further research into offshore wind ports.

Ports are just as critical to the offshore wind industry as grids and turbines, yet no unified strategy has been adopted to address the challenges they face. A common European approach is needed to ensure that port infrastructure can meet the demands of an expanding offshore wind sector.

The Port Alliance has taken the initiative to develop 'Guidance in Planning and Operation of Offshore Wind Ports', with the primary goal of sharing knowledge and best practices. Offshore wind port activities differ significantly from conventional port operations, making this guidance essential for industry adaptation.

At the same time, this document serves as a starting point for broader discussions and deeper collaboration, both of which are necessary to refine port operations in response to the industry's evolving needs. Ideally, a joint industry project would have taken the lead on this subject, as such an initiative could drive logistics optimization and enhance efficiency across the sector.

Logistics have historically accounted for 12% to 14% of the total capital expenditure of an offshore wind farm. With the increasing size of major components, these costs are unlikely to decrease. Clear evidence suggests that manufacturing within ports near major offshore wind developments offers a significant competitive advantage.

In this context, some ports are naturally well positioned to support the offshore wind industry, while others will never be relevant. This uneven distribution of suitable locations adds another layer of complexity to the already challenging task of creating the right incentives to drive a surge in offshore wind development. Addressing this issue will be critical to ensuring the industry's growth and long-term viability.

The case for accelerating offshore wind development should be grounded in fact-based, non-political research that identifies the specific requirements for grid infrastructure, production, supply chains, port capacity, and logistics. This research would provide a clear roadmap for scaling the offshore wind industry to the levels Europe urgently needs for green energy generation.

A similar methodology has been successfully applied in defining the Trans-European Transport Network (TEN-T), which designates core and comprehensive ports alongside critical logistical interconnectors such as roads and railways across Europe. The effectiveness of this EU-led approach is well documented, though further efforts are required to reduce bureaucratic hurdles and optimize infrastructure. Applying this strategy to offshore wind could provide the clarity and coordination needed to drive sustainable energy expansion.

Today, Europe urgently needs low cost energy, and offshore wind stands out as one of the key solutions. It is time to move past the protectionism of individual states and collaborate on harnessing the waters most suitable for offshore wind farms.

This collaboration should not only focus on optimizing the sites but also on nurturing and supporting the industry that will be a cornerstone of Europe's energy future. By doing so, we can enhance Europe's competitiveness and work toward a secure, greener future for all.

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