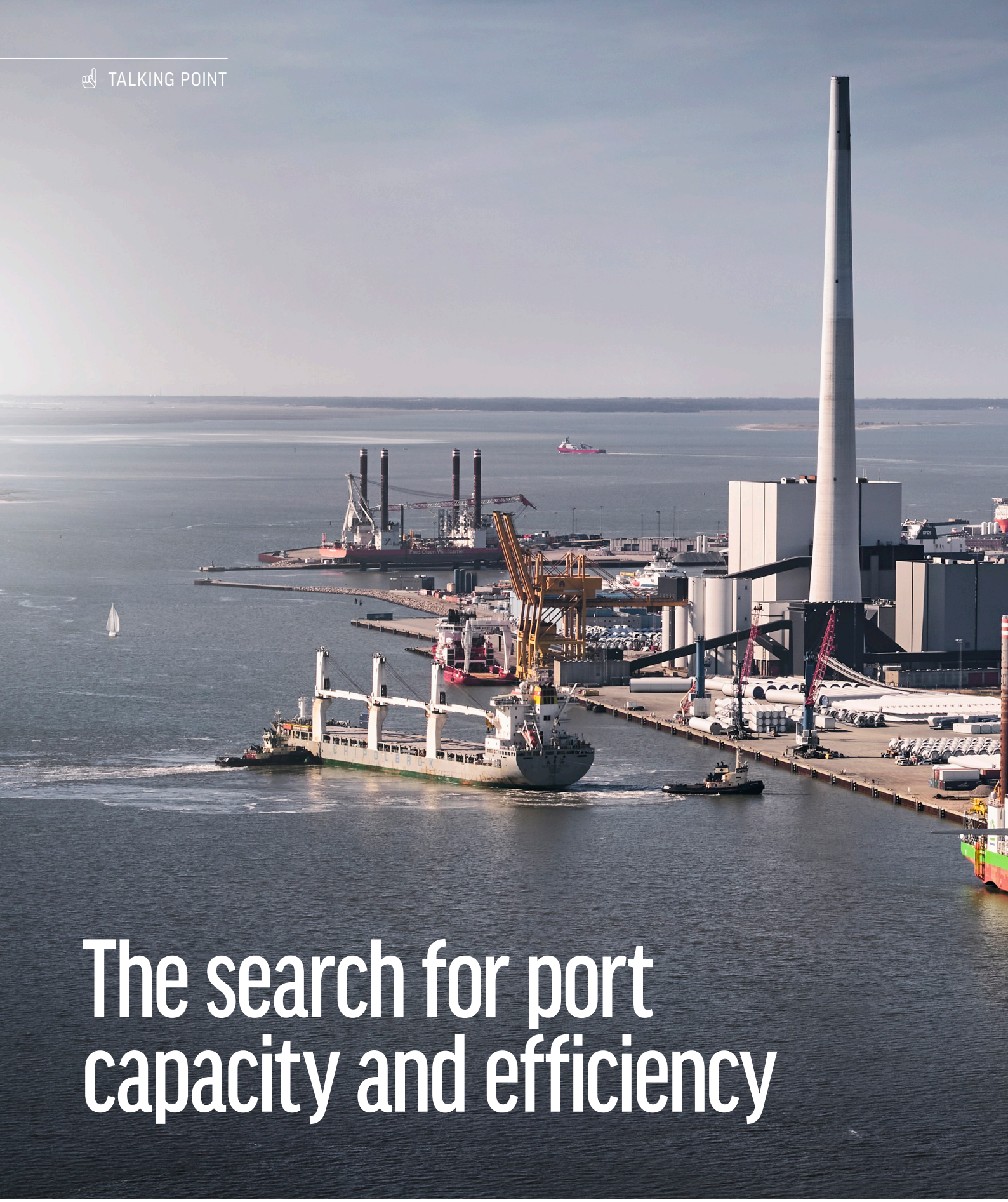
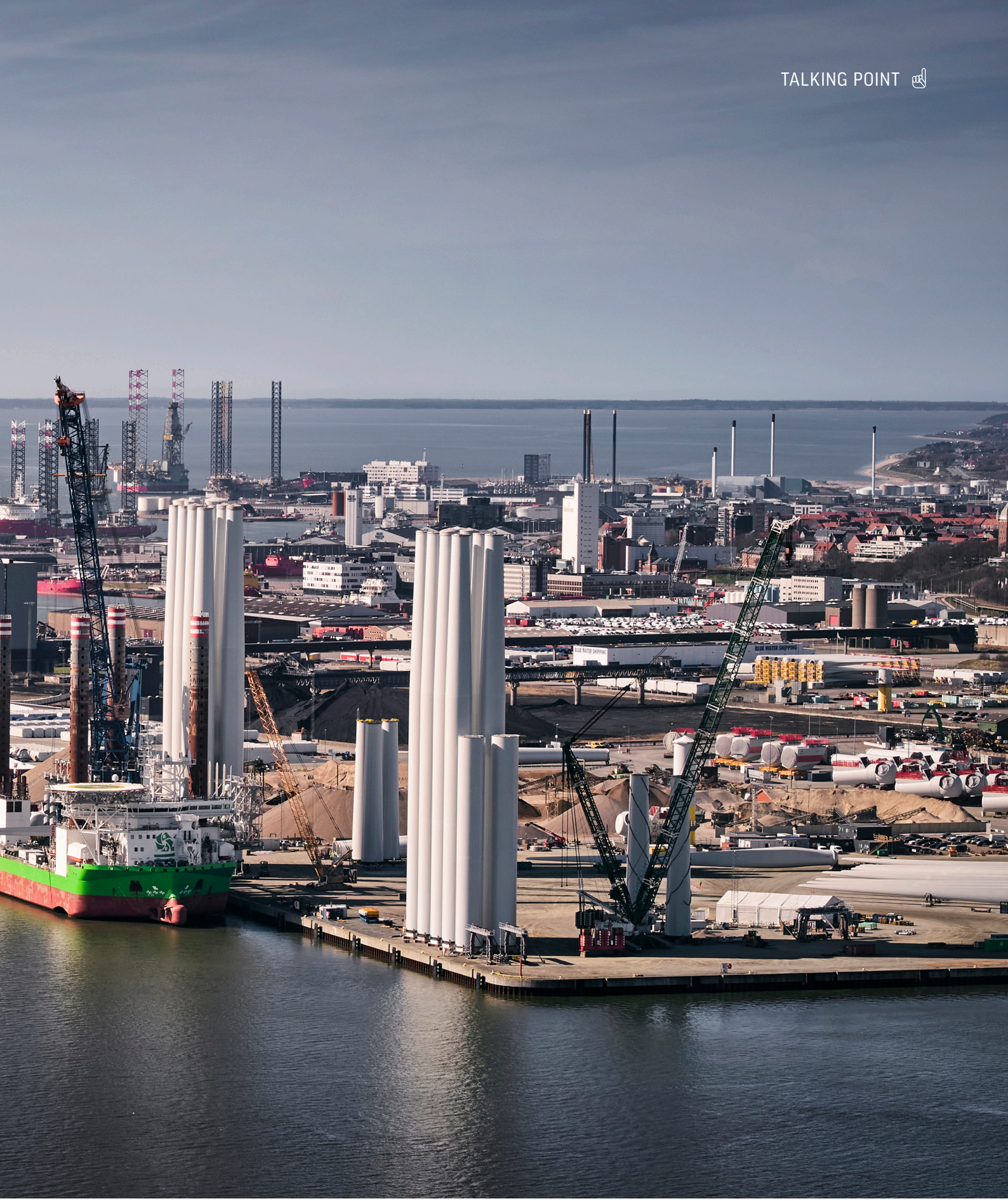


The search for port capacity and efficiency

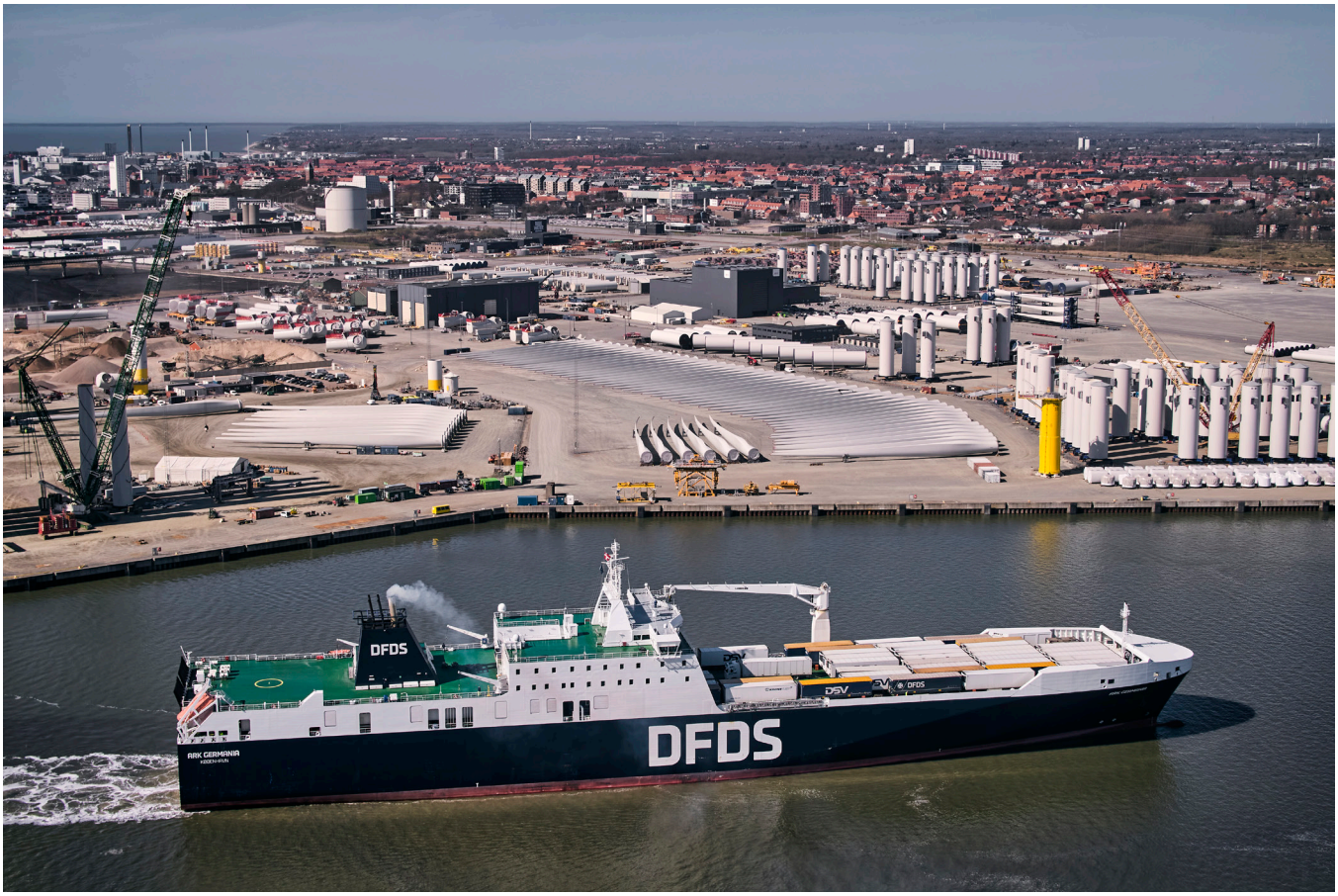
The current geopolitical situation, as well as an impending need to curb carbon emissions, requires European countries to rethink their energy policies. The offshore wind industry can provide one of the solutions to the equation, but to do so mature port capacity in Europe must be increased.



Consider the current plans for offshore wind in Europe, where the size of many offshore wind farms will exceed 1 GW, while components for the wind turbines continue to increase in size. Such projects will require storage areas of up to 50 hectares, and given the efficiency of the installation, the project campaign will be shorter than previously seen in offshore wind projects.

This provides a dilemma for ports, where income stems from ship dues, cargo tariffs and the lease of land. In port terminology, a good activity involves large ships with frequent port calls and a vast amount of goods moving through a small area. This simplistic view counteracts the requirements of offshore wind ports and therefore, the business models need to be revisited.

Traditionally, the developers and the manufacturers of offshore wind turbines have made significant investments when



establishing the sites in ports which have the capacity for the installation of offshore wind farms. This has allowed numerous ports in Europe to participate in the various segments of the installation phases. This evolution has divided the expertise of the ports according to their capacity. Today, some ports are used for foundations and others for offshore wind turbines, while a few ports are involved in all phases of the construction of offshore wind farms.

The predicted surge in the offshore wind market will require even more from ports, and the infrastructure will have to be specific to the part of the offshore wind farms. In 2021, Wind Europe declared that ports need to invest €6.5 billion in infrastructure to cope with the demand from offshore wind. The question remains if such demand can be justified, and what does it entail, if ports have to invest this heavily towards such project activities?

The business model of ports

The business model of ports pivots around cargo tariffs, ship dues and land leases. In this context, the most optimal operations depict large vessels and a high flow of goods over a relatively small area, as this will generate a high earning to repay for the investment in the port infrastructure.

Therefore, container and trailer cargoes are sought-after activities for any port, as they provide large cargo volumes, big ships and limited requirements for areas.

Contrary to this, the installation of offshore wind farms requires large areas for short-term lease, and the activities require only one or two turbine installation vessels with infrequent port calls.

Consequently, ports may advocate that offshore wind is less lucrative compared to conventional port activities. This provides a dilemma for Europe's plan for more offshore wind and even more activities. The attractiveness of a market is not only the growth rate but also the likelihood of profitability when investing in this market. Overarching is the climate need for green transition and perhaps also the countries' energy independence.

This situation portrays a paradigm shift in offshore wind over the next three to five years, where ports need to revise their business models to regain profitability, while increasing investment, enhancing efficiency and cutting costs.

Port flexibility is the norm for offshore wind

For Port Esbjerg, the epitome of this new business model is flexibility and collaboration with the supply chain. The business model is to have storage areas and pre-assembly sites for the wind turbine manufacturers and wind farm developers available on a project basis. Therefore, it does not require any capital expenditure for the customers to conduct their specialized operations.

These plans have already materialized, and the sites are already in use in Esbjerg. Here, for example, TS Tech has assisted Port Esbjerg in establishing a highly efficient pre-assembly site available for lease on a project-by-project basis.

The pre-assembly site is just one of the parameters of a highly efficient offshore wind port. Studying the in and outflow of major components has been crucial in the layout of buffer zones that cater for temporary storage and the picking and placing of major components for the pre-assembly site. The buffer zones must have direct access to the quaysides, where both roll-on/roll-off and cranage activities can be conducted.

The layout of port infrastructure for efficiency has long been studied regarding conventional port activities. For container ports this has resulted in the container ports performance index (CPPI), where container ports are benchmarked on container movement times and port call turnaround time, among other parameters.

Ports that service offshore wind are different, and the parameter on efficiency varies from container ports, but the methodology of placing the areas to achieve

the optimum for storage, buffering and pre-assembly remains important. The time to enter the port and the time to position the installation vessel and conduct the load-out are parameters bound by the layout of the port and the access being unrestricted by tide and traffic.

Equally important are both the layout of the areas where major components are received, stored, and picked for the pre-assembly activities and the layout of the pre-assembly site. Port Esbjerg has been involved in 55 offshore wind projects, and by studying these, the port is now seeking to create the best layout to cater for the surging offshore wind market.

In this context, it may be argued that today the efficiency of offshore wind ports is more important than ever before. The installation of more offshore wind in Europe is now important both from a climate perspective and to the desired shift in energy dependence.

Therefore, offshore wind ports must be able to support the increased installation activity, and this requires learning how to create the most efficient port for the future. To simulate the efficiency of the layout in the port of Esbjerg, Moffatt and Nichol developed a digital twin. This allows for every sequence of the port operation to be simulated, scrutinized and changed to allow for the most efficient offshore wind port, today and in the future.

A versatile workforce is needed

There is, however, one parameter, where offshore wind ports differ greatly from conventional ports. This parameter is the need for continued training of manpower to handle and pre-assemble the even increasing offshore wind turbines. This implies that companies must ensure that their employees are trained in handling the major components and conducting the operations safely and efficiently. This constant need for training

adds to the cost of manpower and port operations. Since the operation cannot be automated, the cost-out methodology must be different compared to a container port.

Versatility is the keyword for this to be achieved. The possibility to hire manpower as and when needed is the cost-out needed in offshore wind operations. Fortunately, this is the epitome of how ports traditionally have worked, before being specialized in certain cargo types. The loading and discharging of various cargoes from ships of different sizes, arriving at odd hours, and with different requirements for urgency, require multiskilled stevedores and dockers working on call-out terms.

In Europe, large ports have organized dockers, who provide the certainty of a competent workforce capable of conducting the loading and discharging of ships, but equally important is that remuneration is linked to the activity.

These arrangements can be justified, as stevedore companies and dockers today are multiskilled. At the port of Esbjerg, the same stevedore companies and dockers operate cranes, drive truck masters and reach stackers to load and discharge various kinds of ships, work in warehouses and recently also got hired for blade repair activities. They are always contracted for the job and therefore provide the versatile workforce sought after in offshore wind operations, while at the same time being trained to work safely and efficiently. In the future offshore wind ports, also pre-assembly crews should be available on an activity-related basis as and when needed.

The efficient offshore wind port

The epitome of offshore wind is flexibility on the lease of the infrastructure, coupled with a versatile and competent workforce. This provides the efficiency and cost reduction needed to support the offshore wind industry. In context to ports, this methodology varies notably from the economies of scale sought after in conventional port operations.

The difference is between the optimization of handling one type of cargo to the complexity that offshore wind displays, where operations vary with the types of turbines and further are weather dependent. The operations change on a project-by-project basis, and therefore efficiency must be measured in the port and workforce capability to constantly change in conformity to these ever-expanding requirements from the offshore wind industry.

In summary, ports servicing the installation of offshore wind farms are obliged to keep developing the infrastructure and the workforce, but also to serve the noble purpose of fighting climate change.

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