The Right Questions to Ask Before Installing a Floating Wind Farm

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New complexities to manage

Moving from shore to deeper and deeper waters means a range of new complexities for installation and logistics for offshore wind that have to be managed. On the surface it all looks the same, but below the surface it is a completely different story.

Floating wind is set for rapid expansion within the next 10 years. In Europe, projects like Portugal's Windfloat Atlantic and Scotland's Hywind bringing a combined 50+ MW of floating wind power onto the grid in recent years have solidified confidence in the new industry.

Up to 30 floating turbines will be installed by 2021, and depending on the development of the industry over the coming years, up to 1300 are estimated to be installed by 2030. The discussion in floating wind now needs to move from 'Is it possible?' to 'How do we make installation and logistics commercially viable?'

Source: Floating Wind Energy, 4C Offshore - Floating Wind: Changing Gear

"The discussion in floating wind now needs to move from 'Is it possible?' to 'How do we make the installation and logistics commercially viable?'"

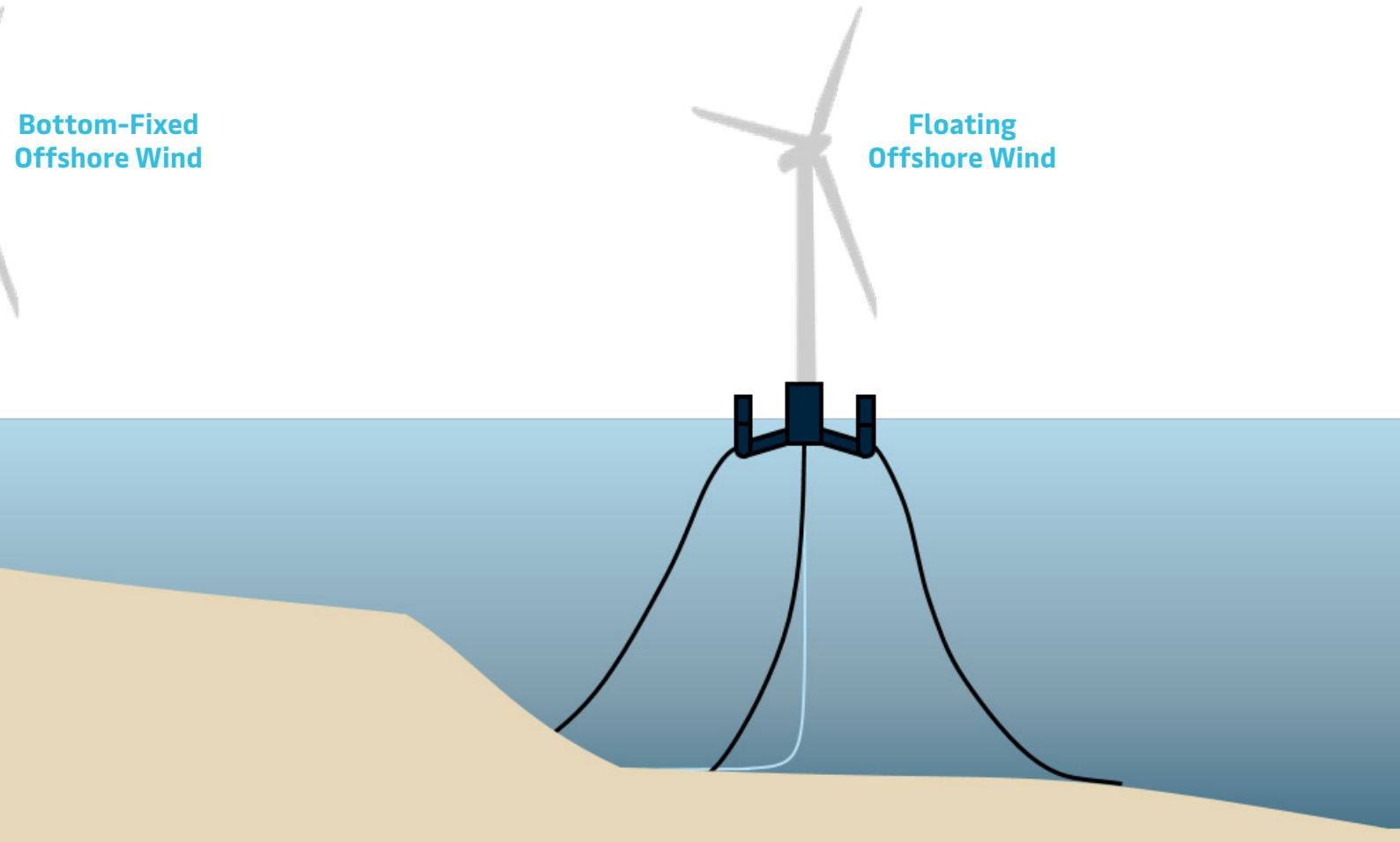
Gry Rostrup, Floating Wind Business Development Manager

25-30

Floating turbines to be installed by 2021 (250 MW)

1100-1300

Floating turbines to be installed by 2030 (13 GW)



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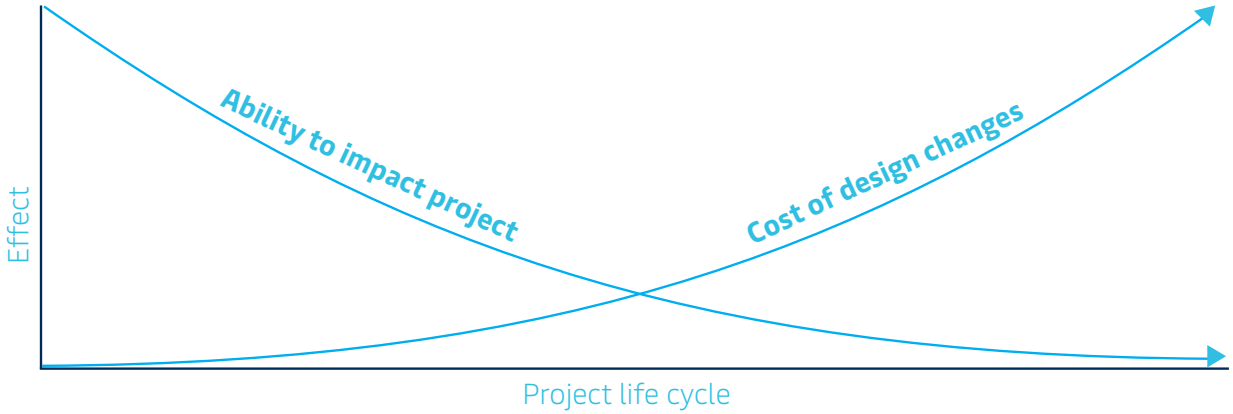
Incorporating a marine perspective

Having provided installation services for the offshore energy sector since 1967, Maersk Supply Service has carried out more than 475 towing and mooring related scopes in the last 10 years. To succeed in lowering the levelised cost of floating wind energy, the industry will inevitably need to leverage experience from the existing offshore energy sector. Installation of a floating wind turbine can be broken into five main phases: planning, pre-lay, tow out, hook up and cable installation, followed by operation and maintenance.

1 Planning: Early engagement is the key to success

This is the most critical phase for the success of the project and where you will have the best chance of realising any cost saving opportunities. This is where your ability to impact the project is highest. As time passes throughout the project life cycle, the cost of changes to the solution design goes up significantly.



To get the most out of this phase, it is necessary to engage your value chain as early as possible. This is the only way to ensure your solution is optimised from the operational perspective. No matter how much planning you do, at the end of the day it is going to be done practically. Therefore, a solution fit for effective installation is key.

Floating offshore wind turbines are new types of units for the offshore industry, which come in a range of designs, with a new logistics philosophy, as well as congested subsea spaces and fabrication/assembly sites. There are many factors at play in a deepwater, floating environment that need to be considered, such as the seabed, current, strong wind, distance to shore and equipment fatigue. The value of involving the personnel who will deliver the practical solution should not be underestimated.

10 Key Questions to Ask During Planning

What is the most efficient installation sequence?

Consider weather window, port limitations, marine asset availability...

What are the site conditions?

Consider soil conditions, water depth, sea state, local regulations, marine traffic...

What is the field layout?

Consider exclusion zones, substation location, distance between turbines and moorings...

What is the best mooring solution?

Consider flexibility requirements, anchor pattern, mooring line composition, tensioning requirements...

What are the associated logistics?

Consider the timeline of equipment and floating structure production, fabrication, storage, integration...

How will the interfaces be managed?

Consider creating a lean value chain, syncing up schedules, ensuring accountability...

Where are people involved?

Consider floating structure accessibility, passengers on board restrictions, diving requirements...

What scale can the value chain support?

Consider timeline, bottlenecks, equipment availability...

How is cable being installed?

Consider unit by unit or across field, how to connect to the grid as soon as possible...

How will the field be maintained?

Consider in-port versus onsite maintenance, turbine accessibility, moorings inspection, contingency plan and maintenance patterns, navigating the congested surface and subsea wind farm layout...

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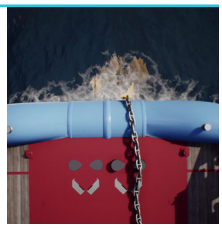
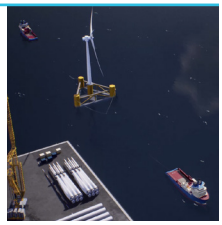
2 Pre-lay: Achieving manoeuvrability in a congested subsea space



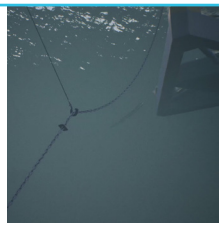
During this phase anchors are installed and proof load tested, mooring lines are pre-laid and sometimes buoyed off, ready for the turbines to arrive on site for connection. In a field of 100 turbines with 4-5 mooring lines each, there is going to be a lot of 'subsea spaghetti.' It is essential that manoeuvrability for the vessels carrying out installation is considered during planning to ensure minimised risk of damage to any mooring equipment.

3 Tow Out: Ensuring a seamless transition between interfaces



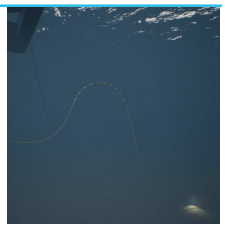
During tow out, the turbine is collected at port, towed an initial distance to carry out ballasting operations, and finally towed to the installation site. A primary concern is for availability of the required vessels and equipment for a seamless transition from floating unit fabrication, integration of the turbine and floating structure, and transition to field. There are many stakeholders and project elements that need to be coordinated. To ensure alignment, flexibility and cost minimisation, the right interface management in this phase should be considered during Planning.

4 Hook Up: Getting in place to begin supplying clean energy



This phase involves connecting the floating offshore wind turbines to the pre-laid mooring system. This is then followed by tensioning the mooring system in place to withstand the environmental conditions.

5 Cable Installation: Leveraging the most effecient assets



Inter-array cable installation and hook up, depending on your installation sequence, can be included as part of the Hook Up phase or, like the export cable, as a separate phase altogether. A key consideration here are the assets that will be used. Can it be done by the vessels already present in the field? For example, would it be more cost effective to utilise the anchor handler already on location for Hook Up, fitted with a reel system/product spooler and tensioner lay spread instead of a dedicated cable installation vessel? It all depends on early planning.

Operation & Maintenance: Preparing for mooring system remediation

In addition to turbines and floating structures, mooring system maintenance needs to be managed. Offshore regulations require subsea inspection at a minimum of every 2-5 years, depending on the system. From there, new mooring lines and anchors may need to be procured and installed over time. Some industry averages indicate that one in every 100 mooring lines needs to be replaced in a year. On a field of 100 turbines with 4-5 mooring lines each, this would mean between 4-5 mooring line replacements per year. Finally, a contingency plan must be in place for emergency repair in response to worst case scenarios such as mooring line breakage.

Scan to watch an animated end-to-end floating wind turbine installation:

Example: How marine knowledge can lead to cost savings

When mooring analysis is carried out by an engineering house, it is possible that the project may not be designed around certain practical constraints that occur down the road. For example, we have seen cases where three different sizes of chain have been selected for the mooring system. While mooring analysis would back this up, it may not be a practical solution from an installation point of view - potentially leading to more port calls or additional vessels.

With in-house mooring engineers and 50 years of hands-on offshore experience, Maersk Supply Service ensures your solution is optimised from the marine perspective.

2-5 years

Between each subsea inspection

4-5

Potential mooring line replacements per year

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Leveraging offshore experience

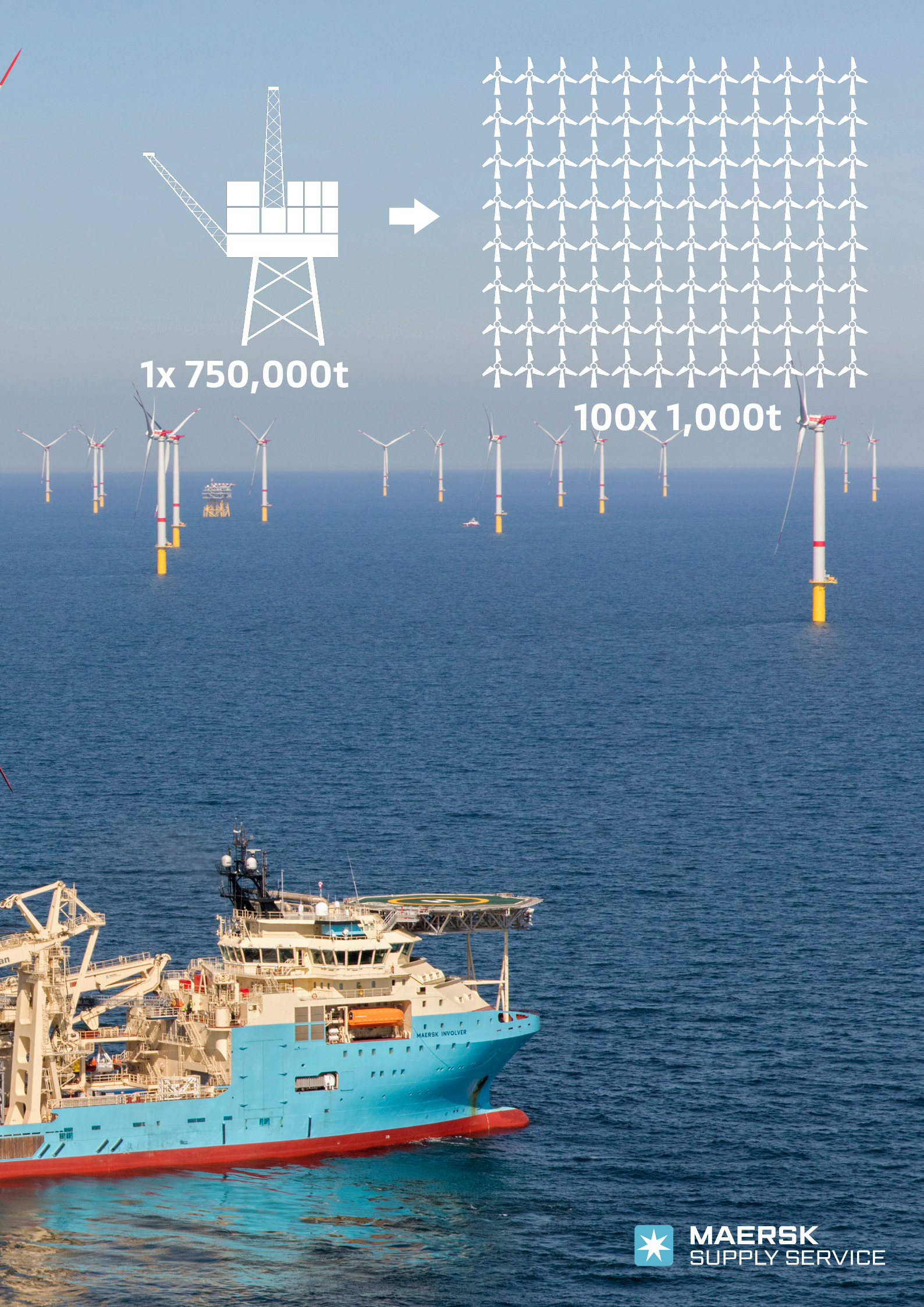
The main difference between installing floating wind turbines compared to traditional floating assets in offshore energy, such as floating production storage and offloading units used in the oil and gas sector, is that we are not installing a singular, large structure. The key challenge is now achieving efficiency at scale, being able to install 100 of the same unit in steady succession.

The demonstration projects being installed today are an opportunity for us to test the efficiency of our methodologies. We need to use these learning opportunities to find areas where we could create stronger synergies throughout the value chain and manage interfaces in a way that limits risk of delays, while enabling effective maintenance and contingency planning.

Success in any offshore installation project - whether it is in oil and gas or renewables - depends on three main criteria: calling on offshore experience as early as possible, reducing interfaces and ensuring clear accountability; creating mutual trust and aligning incentives across the value chain.

"Success in any offshore installation project depends on three main criteria: calling on offshore experience, reducing interfaces, and aligning incentives."

Olivier Trouvé, Head of Integrated Solutions



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Five decades of towing and mooring

Towing and mooring operations is the DNA of Maersk Supply Service – one of the largest operators of anchor handling tug supply vessels in the world. With an in-house fleet of more than 40 vessels and up to 10 of the same specification in a given series, we can minimise the risk of delays by ensuring vessel availability and our customers' technical solution from the very beginning.

Over the years, we have been performing towing and installation operations as well as moorings management across various industries, for all sort of floating units and mooring systems in both deep and shallow water, and in harsh weather conditions. By combining the role of vessel owner with project contractor, we deliver full scope solutions including project management, systems interface and installation engineering, and execution as one consolidated team. We involve our offshore team as early as possible during planning to ensure the solution design is optimised from the marine perspective.

operations

Maersk Supply Service is a leading provider of marine services and integrated solutions to the energy sector worldwide with a large fleet of anchor handling tug supply vessels and subsea support vessels. The company provides solutions to the oil and gas industry in areas such as towing and mooring installation, subsea construction, and light well intervention services, and supports other industries such as offshore wind, deep sea mineral recovery and ocean cleaning.

Maersk Supply Service employs an international staff of approximately 1100 offshore and 250 onshore people. Headquartered in Lyngby, Denmark, Maersk Supply Service is represented globally with offices in Aberdeen, Accra, Luanda, Manila, Mexico City, Perth, Rio de Janeiro, St. John's, and Singapore. We have the capability to support our customers with strong local content across our regions. We leverage local networks and operating knowledge from around the world, and are focused on developing the local communities where we operate.

Maersk Supply Service is a part of A.P. Møller – Mærsk A/S which employs roughly 70,000 employees across operations in 130 countries.

For more information about Floating Wind Solutions, contact:

Yvan Leyni, Floating Wind Solutions Director

yvan.leyni@maersksupply.com, +44 1224 976 289

Torben Van Wyk, Floating Wind Commercial Manager

torben.van.wyk@maersksupply.com +45 7373 7349

Olivier Trouvé, Head of Integrated Solutions

olivier.trouve@maersksupply.com +45 7373 7034

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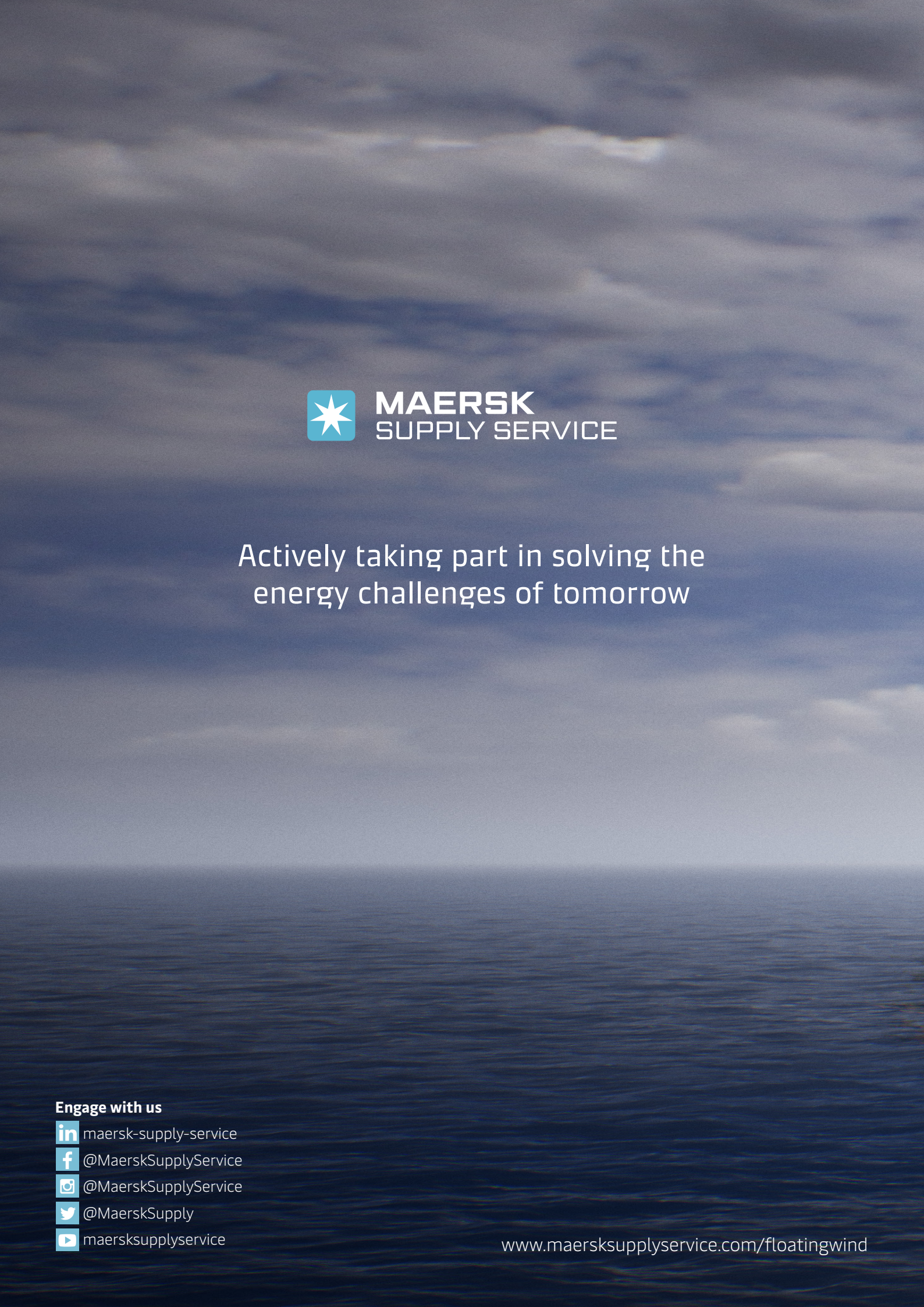
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