



The build-out of offshore wind energy and the need for robust O&M strategies

Since 1991 when Denmark became the first country to harness offshore wind to generate renewable energy, the offshore wind industry has been on a steep learning curve. The larger and more complex offshore wind farms require robust Operations and Maintenance (O&M) strategies, with efficient, capable, and reliable solutions. The O&M market has seen the introduction of Service and Operation Vessels (SOV) for day-to-day operations that will be needed over the 20- to 25-year design life of the latest wind farms. These vessels can perform the tasks they were designed for, but they will be challenged further by the wind farms of tomorrow and, more importantly, the environment they will be in. This is where GustoMSC started the journey toward developing the Modular Service and Operations Vessel (MSOV) concept.

The need for a new class of vessel

The key to any good vessel design is understanding how it will be used, what equipment it will host, and what operations it will perform. GustoMSC went back to the drawing board and conducted a detailed study of the current and future operational challenges.

By speaking with industry experts, multiple O&M-related activities were identified and refined into several key work packages so a vessel design specification could be created.

It was clear that no one vessel could cover the entire O&M scope; hence, the Enhydra MSOV was conceived. This concept allows multiple vessel configurations in one design. It provides a modular solution on a highly capable platform that can work in increased sea states beyond today's practical limit of ~2 to 2.5 m Hs.

Preconfiguring the vessel for multiple scopes of work will allow developers and O&M service suppliers to optimize their operational uptime and, in turn, maximize the power generated from the wind farm(s). This ability to manage and plan their operations with a multipurpose asset like the Enhydra MSOV, which is under their control, will de-risk their operations considerably.

Understanding the life-cycle scope of the vessel

With over a century of experience in offshore mobile units, GustoMSC understands the importance of the vessel design philosophy. In order to gain the additional capabilities, a vessel design needs to have certain main characteristics, such as sufficient size and space, positioning capability, endurance, and personnel capacity.

The design philosophy and resulting requirements led GustoMSC to create the MSOV as part of the Enhydra vessel family. The vision is to deliver the next step in

offshore wind O&M. The key attributes of the MSOV concept are a capable vessel platform based on the Enhydra series and modular equipment spreads.

In addition to the modular equipment spread(s), the MSOV will host the standard SOV equipment, such as boat landings, integrated motion compensated gangway, and under-deck storage for spare parts. It will also feature a daughter craft, 2 x working class ROVs, helideck, drone and AUV hangers, and more.

A scalable people on board (POB) and deck size are two supporting but critical specifications to consider. Having the right number of beds to allow for larger scopes of work in combination with free deck space capable of installing larger mission equipment, such as a cable replacement spread, is crucial.

A larger footprint also provides a more stable platform to work from. The MSOV has been designed to work in sea states of up to 4 m Hs, an increase compared to the current SOV fleet. This will open the operational window

for both time and scope of work. The larger vessel also increases endurance: Staying in-field and working 24/7, 365 days a year will be possible.

Use cases and equipment spreads

Cable damage: a growing problem

Cable loss represents 75% of all claims during operations, and there are many factors for this. However, with more than 20,000 km of cable in place today and an average cost to repair an inter-array failure of between USD 8 and 10 million, it is a challenge that needs to be addressed.

Access to special equipment and vessel types will become increasingly scarce for these repairs. Cable lay vessels are chartered on long-term projects with big order books. Subsea Inspection, Maintenance, and Repair (IMR) vessels are also in tight supply and returning to their target oil and gas markets. Due to the limited access to these assets, delays of up to six months have been seen in recent years to restore power.



Unlike other energy sources, the wind of yesterday cannot be generated. The commercial viability of these complex and expensive projects requires efficient and effective power generation.

In addition, the emerging importance of energy security and our reliance on wind as it becomes a higher ratio of our energy mix is a new area of concern. Keeping the power flowing and managing unplanned events will be crucial.

Having the capabilities within your available assets to mobilize a repair spread in a timely manner will minimize this risk.

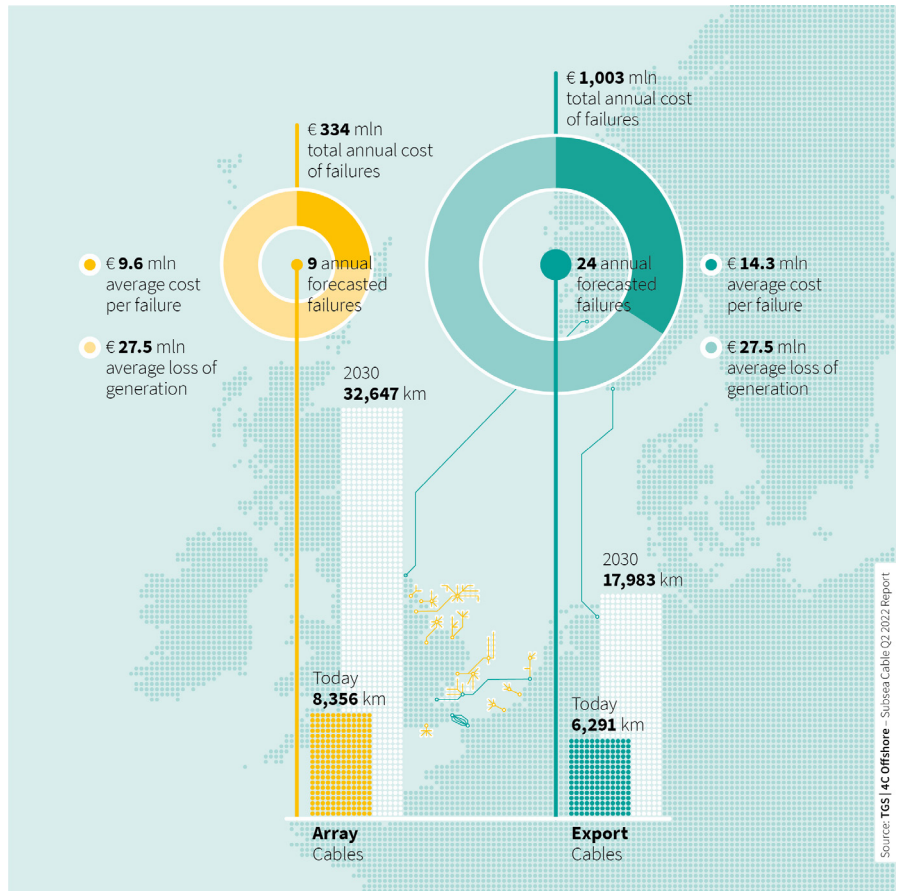
The main components of the cable repair spread are the permanently installed underdeck carousel, the quadrant landing system, and the required winches and tensioners. This equipment package is modular yet fully integrated into the design for efficient deck and equipment layouts, power supply and regeneration, and controls. This mission equipment can therefore be efficiently mobilized and fully integrated into the Enhydra MSOV.

Floating wind: the next challenge

Floating wind is becoming more tangible, with demonstrations and small-scale farms installed and operating. The road to making these commercially viable will require full-scale production to begin in earnest. This includes the vessels needed to install, connect, and maintain them.

GustoMSC has been active in the floating foundation market from the beginning with its Tri-Floater design. This has provided an insight into the complexities and variety of operations that will need to be performed. For GustoMSC, that means analyzing the challenges and engineering solutions to eliminate and/or mitigate them.

Everything that relates to floating wind is large, complex, and new. Mooring line installation for anchor or suction pile tethering and dynamic cable deployment will be new challenges for offshore wind,



Source: TGS 4C Offshore – Subsea Cable Q2 2022 Report

especially at this scale. Installing and maintaining this infrastructure in a dynamic and challenging environment will require a new class of vessel(s).

Sufficient chain locker storage and deck area have been designed into the MSOV to allow for both anchor and suction pile mooring systems. Installation and production of the dynamic cable is something the industry is still engineering. A reel or vertical lay system, either through the moonpool or over the side, is the most likely installation method currently being looked at. The flexibility to

design the vessel for either or both is part of the modularity of the MSOV concept.

Sustainability at its core: future fuels

An environmentally-friendly vessel will become a 'license to operate' in the offshore wind industry. The vessels of tomorrow need to be designed with this in mind. Replacing marine gas oil (MGO) is a clear goal, and many future fuel types are currently being discussed. All have pros and cons, some being more technically challenging, less power dense, or less economical.

The industry must move forward on this, and for the Enhydra MSOV development, methanol was identified as the 'future fuel of today.' It's available, compatible with little to no modification to the engine or containment setup, and greatly benefits the environment. Also, the MSOV comes standard with a hybrid battery solution with regenerative power and (off)shore-based charging to maximize the efficiency of the system. Additionally, the vessel design can implement other fuel types such as ammonia and hydrogen.

The need to advance the energy transition is clear, but the path to get there is less so. At GustoMSC, the journey is well underway, and our commitment to helping the industry innovate to meet the challenges ahead is certain.

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