BIBBY
MARINE LIMITED

THE ELECTRIFYING PROOF

Introduction

The offshore wind industry has the potential to drive decarbonisation far beyond simply supplying low-carbon electricity. Across the entire value chain, there are significant opportunities to cut carbon emissions and pursue the energy transition at lower cost. The electrification of service operation vessels is one of the most effective steps the industry can take towards this goal. This white paper aims to address some of the frequently asked questions about the benefits of electrification of offshore wind service vessels.

Hybrid-electric vessels soon to enter the market can deliver zero-emission operations and must be an essential goal for the industry. In Europe alone, construction of offshore wind farms is forecast to triple in the next decade. Without action, this growth will lead to far higher emissions.

Deploying the vessel technology and charging infrastructure both on and offshore will enable vessels to operate entirely on battery power. Electrification offers more than environmental benefits; it can also improve budgeting of offshore wind farm development, construction and operations.

As this white paper highlights, the operational costs of electrified vessels are lower than those for fossil fuel-powered vessels, which need to bunker and consume fuel. We are seeing that as technology matures, capital costs for electrified vessels are becoming increasingly competitive.

On the infrastructure side, shore power is already expanding, and offshore charging systems from leading OEMs can be integrated into wind farm projects launching in the coming years.

For operators of these windfarms, fully electrified vessels are especially cheap to power offshore where charging them provides an option to reduce energy wastage in the sector.

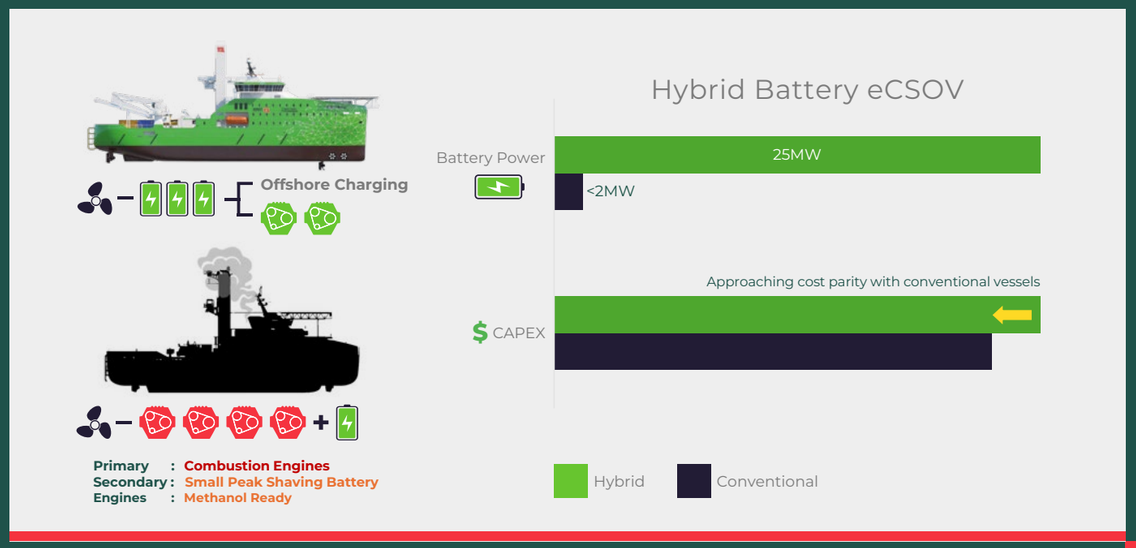
Day-rates

Hybrid-electric vessels are more expensive to build, so surely their day rates will be higher?

Global battery prices have fallen more than 30% in the past two years and energy density has increased by 15%. We expect these trends and improvements in battery life to continue over the next decade, further strengthening the economic case for electrified vessels. When it enters service, Bibby Marine's electric-hybrid commissioning service operation vessel (eCSOV) will be competitive on charter rate, while also delivering immediate OPEX savings through lower fuel use and reduced carbon-cost exposure. Electric-hybrid vessels offer a decarbonisation pathway that is essential to the success and sustainability of the offshore wind industry.

While no area of industry can tackle the climate issues we face alone, success is achievable through collaboration and partnership. By working across sectors to bring together existing hardware and proven technology, it is possible to reduce the investment required in eCSOVs and deliver zero-emission vessels that perform better than conventionally powered vessels. The CAPEX required for the next generation of electric vessel newbuilds is anticipated to continue to decline, making it simpler for owners to offer competitive day rates whilst providing many benefits and future proofing the design.

Charter rates for CSOVs can fluctuate considerably, influenced by changes in supply and demand that operators cannot control at the point of hire. Regardless of charter rates, eCSOVs allow operators to more closely control operating costs because of the lower, more predictable energy demand. Investment in eCSOVs is an environmental responsibility, and by offering lower operating costs than the fossil fuel-powered alternatives, they are likely to be more attractive in a competitive market faced with cost pressures on development and construction.



Case Study

A pragmatic route to decarbonising an asset class

The eCSOV provides battery-first propulsion for the offshore walk-to-work market, delivering unmatched reductions in fuel consumption and emissions. Large marine battery packs are available today at competitive prices compared to conventional propulsion system, and with long manufacturer warranties. The imperative to cut emissions immediately makes hybrid electric vessels a more attractive and practical pathway compared with e-fuels alone. The dual-fuel methanol/diesel engines onboard the Bibby Marine eCSOV are e-methanol ready – able to operate on methanol from day one. E-methanol provides a practical long-term route to true zero emissions, offering a scalable green substitute for conventional marine fuels in offshore service vessels.

While e-methanol is the preferred fuel for our hybrid eCSOV, it carries a significant price premium over traditional marine diesel. Limitations on production infrastructure constrain bunkering opportunities globally, and crucially mean e-methanol prices can be three-times higher than traditional diesel fuels.

With our technology partners, including Kongsberg, and Corvus Energy, we have brought together proven marine technologies in one vessel to achieve high efficiency. The 100% battery-driven propulsion system of the eCSOV means it is operated in a very different way from traditional vessels. The dual fuel methanol/diesel engines, used to charge batteries when offshore charging is not available, are sized for optimal operation and can be run at a fixed load in the most efficient manner. Compared to conventional diesel-electric mild-hybrid set ups, this self-charging hybrid configuration offers significant efficiency gains and reduced maintenance on the engines. This configuration has been made possible through recent advancements in battery technology, which have increased energy density and significantly reduced the cost of large-scale LFP battery packs.

The full potential of electrification can be unlocked by charging batteries from shore power before a voyage and, in future, directly from the field via offshore charging stations, enabling true zero-emission operations without running engines at all. Dual fuel methanol-diesel engine and battery combinations enable seamless switching between energy sources (battery, diesel, e-methanol and biofuels) to deliver maximum flexibility in battery use and fuel choice with no loss to efficiency or operability. Bibby's hybrid-electric eCSOV will represent a future proofed, flexible green asset.

In addition to these benefits, prolonged battery operation – combined with the rim-drive propulsion systems – offers a quieter, more pleasant working and accommodation environment for technicians. This delivers a 40% reduction in underwater radiated noise (URN) and vibration compared to a conventional vessel.

Bibby Marine's first eCSOV, under construction at the Armon Shipyard in Vigo, Spain, will be capable of offshore charging, providing a future route to zero-emission offshore services when it is commissioned in 2027.

Vessel specification

Under construction
Armon, Vigo Spain, 2027

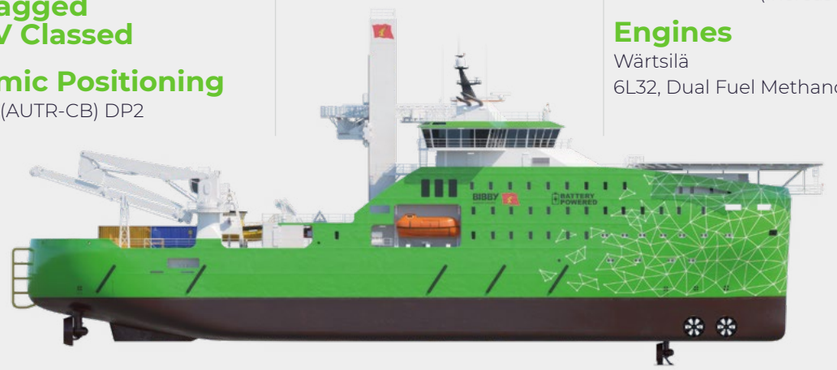
UK Flagged & DNV Classed

Dynamic Positioning
DYNPOS(AUTR-CB) DP2

Accommodation
120 POB with 84 single cabins

Energy storage system
Corvus Energy
Lithium Iron Phosphate (LFP) 24,400 kWh
Total flooding fire suppression
Split across 3 compartments
(Increased Redundancy)

Engines
Wärtsilä
6L32, Dual Fuel Methanol



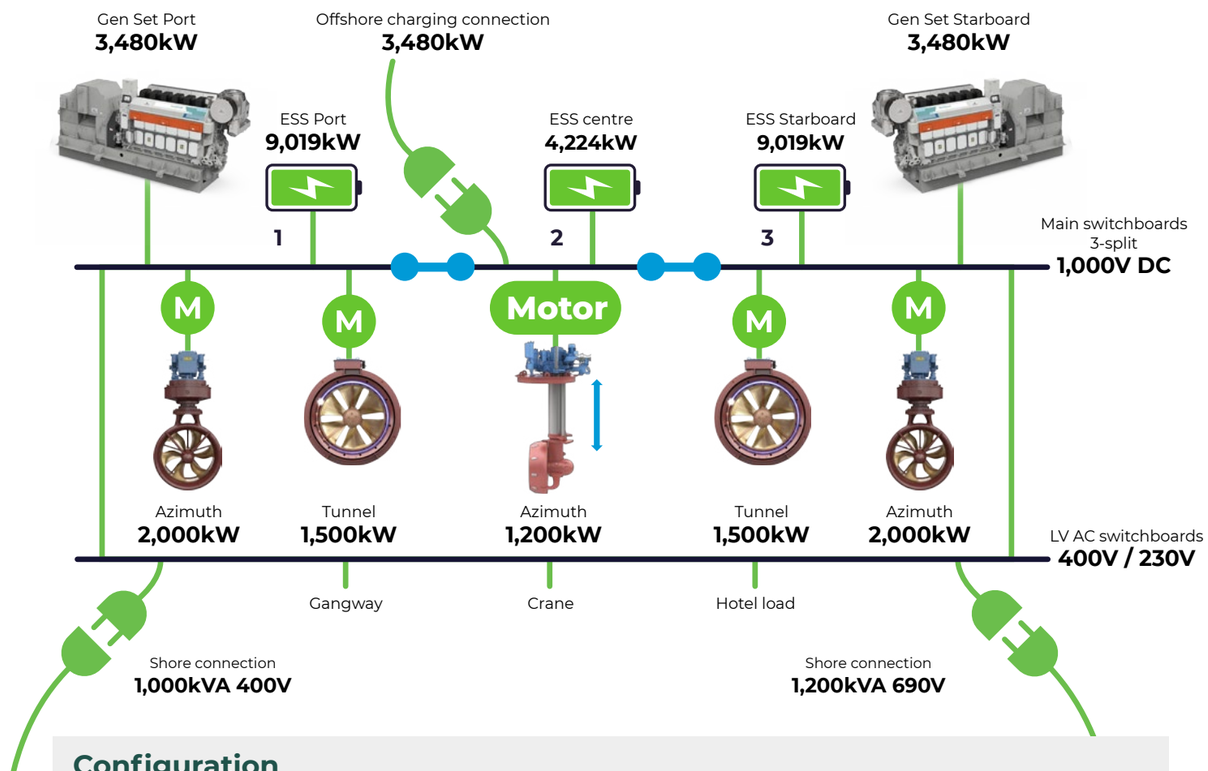
Main particulars

Length overall	89.63m
Breadth moulded	19.80m
Depth moulded	7.55m
Draught (design)	5.00m
Gross tonnage	6773Te

Environmental
Noise and Vibration V(2)C(2)
Expected to Meet:
SILENT E (Environmental)
SILENT A (Acoustic)

Main propulsion
Kongsberg
2 off 2000 KW RIM Drive Main Azimuth Units
2 off 1500kW RIM Drive Tunnel Units
1 off 1200 KW Retractable Unit

A new power philosophy

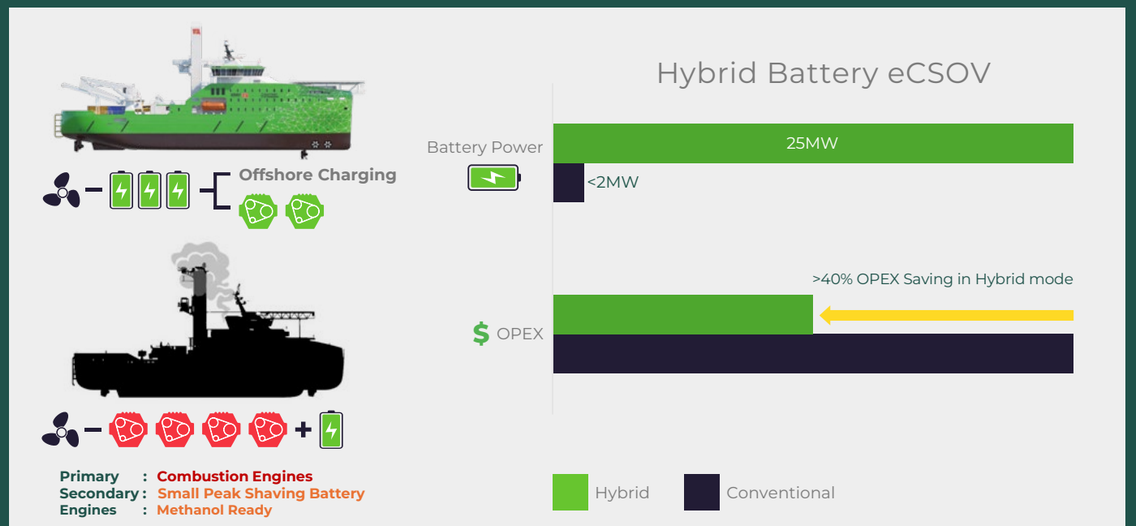


Configuration

- Battery-First-Propulsion; energy storage system (ESS) designed as primary power source
- Azimuth and tunnel thrusters maximise flexibility, performance and flexibility of electric propulsion
- Dual Fuel Methanol Gen sets operate at constant speed/load to charge ESS – Optimal efficiency
- Designed to operate in closed Bus-tie configuration
- Open Bus-tie operation possible with no loss of capability or fuel consumption
- Battery packs are electrically and physically divided into a three-way split for enhanced redundancy and safety.

Hybrid Operations & Servicing

New technologies are always more expensive to start with; can it be cheaper or more efficient to operate than existing CSOVs?



The eCSOV design can cut operating costs by up to 40% compared to similar vessels in the market. The diesel-electric hybrid design of our eCSOV means that from day one, regardless of the availability of charging for the vessel batteries, onshore or offshore, our eCSOV will operate more efficiently than traditionally fuelled CSOVs, cutting energy consumption and carbon costs.

These savings will be realised through the reduction in fuel consumption and anticipated emissions taxes – and a corresponding reduction in carbon costs. Using an average bunker price per tonne for marine diesel oil of USD800 in 2025, and based on 310 operating days a year, in fuel alone, operators will save close to USD500,000 by 2035 - with the accumulation of carbon emissions taxes. Over the lifetime of the eCSOV, this offers close to USD25 million in savings in operating costs compared with a standard SOV.

Cutting energy consumption lowers the cost of fuel. At the same time, lower greenhouse gas emissions reduce the carbon taxes operators need to pay.

Scheduled increases in carbon taxes designed to push decarbonisation mean emitting carbon will only become more expensive. In the 2030s, carbon taxes, as forecast in the UK and EU, could rise to be a significant portion of vessel operating costs.

Electrification Savings

There are many options for decarbonising the CSOV class. Why is electrification such an important part of the solution?

Electrifying the eCSOV asset class will offer a practical pathway to lower-cost zero-emission operations and maintenance in the offshore wind industry. Combining battery systems with low-carbon fuels provides immediate operational flexibility and cost reductions from day one. Alternative fuel pathways remain immature and uncertain for deployment in the offshore wind service vessel fleet. Electrification is currently the only real option for cutting emissions and lowering costs.

Electrification has major system-wide benefits. As well as eliminating operational emissions, battery-powered vessels are significantly quieter, reducing underwater radiated noise by 40-60%. Crucially, the technology is available and deployable today.

Electricity is the fastest-to-scale non-carbon energy source available to operators. With the appropriate charging infrastructure during wind farm construction, electric vessels can recharge offshore, eliminating range constraints and providing service capabilities to match conventional CSOVs.

For an individual charterer, switching to an eCSOV could deliver operational savings of nearly USD1.8m per year by 2035, through the replacement of fuel costs with electricity costs and the reduction of or elimination of carbon taxes. Electricity that would otherwise have been curtailed can be used to charge vessel batteries, optimising energy costs even further.

The North Sea already hosts around 120 windfarms totalling approximately 45GW of capacity – a figure that is expected to grow substantially in the coming decade. Electrifying the service fleet supporting this expansion will avoid a significant increase in emissions by the sector and help stabilise budgeting as the industry scales.

There are no fundamental technological barriers to electrifying offshore wind service vessels, either onboard or through offshore charging, with the technology now fully aligned to the operational requirements of vessels in this sector. What is needed now is regulatory support to enable the deployment of charging infrastructure that will underpin zero-emission operations across the sector.

Savings in OPEX costs

	Standard CSOV Fossil Fuel	eCSOV Self-charging Hybrid mode	Fully Electric
Daily Fuel consumption	5t (MDO)	3t (MDO)	
Average energy price	USD $800	USD $800	
Daily Energy Cost	USD $4,000	USD $2,400	
Daily total CO2 emissions*	20te	12te	
Daily Carbon tax costs**	USD $4,100	USD $2,400	
Total cost per day	USD $8,100	USD $4,800	
		>40% OPEX saving	**70% OPEX saving**
		= $1m / year = $25m / life	**= $1.8m / year = $45m / life**

* Based on IMO MGO emissions factors
** Estimated cumulative to 2035

- Carbon tax rates combination of IMO, Fuel EU and estimated UK ETS
- Carbon tax based on 2035 cumulative price
- Conservative rates for electricity Jan 2025 (UK CFD R7 Admin' strike price)
- Based on 310 days operation
- Avg. Europe Bunker price for MDO 2025
- **Maintenance savings not considered, but as engine maintenance is a significant driver of maintenance costs would be much lower.**

Infrastructure Costs

Full electrification is going to need charging technology infrastructure that simply doesn't seem realistic. Without it, eCSOVs can't realise their full potential.

Offshore charging infrastructure, which is essential to the electrification and low-cost decarbonisation of the offshore wind industry's service vessel fleet, is proven and scalable. Offshore charging OEMs, such as Stillstrom, are collaborating with wind turbine developers to drive the adoption of offshore charging technology, which unlocks the full potential and benefits of an eCSOV. While the integration of charging systems into wind turbine generators (WTG) is already solved, the technology to deliver charging-capable vessels is well-established and commercially available.

Offshore charging extends the capacity of eCSOVs to support operations as needed and eliminate emissions during field deployment, improving the working environment and lowering operating costs, while reducing emissions on return to port voyages.

To deliver the infrastructure for offshore charging, clear licensing and permitting support for its roll out is needed. Developers investing in offshore charging infrastructure for their wind turbines will be seeking assurances that they will see a return on their investment through lower operating expenses and savings on emissions taxes. Regulators need to ensure that the economics will stack up for them today.

In April 2025, Bibby Marine and Stillstrom signed a collaboration agreement to develop a compatibility framework for offshore charging systems on next-generation eCSOVs. This covers technology, safety, and operational alignment. Since then, the initiative has progressed from concept to implementation through joint technical workshops, site visits, and live tracking of vessel-system interfaces. Weekly progress meetings ensure alignment across newbuild construction, connector package development and certification with DNV and other key suppliers.

The teams are addressing complex integration challenges, from dynamic positioning interactions and charging regimes under varying weather conditions, to crew training and operational maintenance, supported by innovative VR training programmes. As the first project of its kind, this joint initiative is helping to establish new classification standards for offshore charging systems and vessels, with DNV developing guidance alongside deployment.

Taxation

Why can't we continue to operate offshore support vessels as usual and simply pay the carbon taxes imposed?

Carbon taxes are set to be implemented in the offshore wind sector, and their future trajectory has become increasingly difficult to predict. While these taxes will evolve over time with new legislation and regulation, vessel owners will typically contract this carbon risk away to developers—meaning deploying zero-emission vessels as early as possible is the most effective way to mitigate this risk and avoid escalating carbon-related costs.

The most effective and comprehensive carbon tax system applicable to offshore wind operations is the EU ETS – an emissions trading system in the EU that has applied to power, heavy industry, and some areas of transport since 2005. Recently, maritime transport came under the jurisdiction of the EU ETS. And offshore support vessels greater than 5000 GT, which includes the CSOV class, will be regulated by this process from January 2027. The UK has introduced an ETS mirroring EU ETS. Operators must pay for permits known as allowances (EUA) to emit carbon. In 2025, EUAs have averaged around EUR70 per tonne CO2e. Assuming a 310-day operating year, and emissions of 20 tonnes of CO2e per day, an operator could expect to be paying over €400,000 per year, just to the EU ETS, if they do nothing to mitigate their carbon emissions.

FuelEU Maritime regulates the carbon intensity of fuel used in vessels over 5000GT in Europe. Over time, the carbon intensity will reduce against a baseline. Operators that fail to meet the thresholds will face fines of €2,400 per tonne CO2e.

The International Maritime Organisation (IMO), a UN body, recently failed to pass regulations similar to FuelEU Maritime and EU ETS that would have applied to deep-sea vessels globally. While a global regulation would be easier to follow and allow like-for-like comparisons across assets, failure at the IMO makes it more likely that countries committed to decarbonisation and the development of offshore wind will pass their own regulation. Emissions taxes are part of the future of offshore wind development, construction and maintenance. Developers can take greater control of their budgets and avoid rapidly rising costs due to carbon taxation by working with suppliers to launch an electric fleet for the industry.

Savings in Carbon Taxes

	Standard CSOV Fossil Fuel	eCSOV Self-charging Hybrid mode	Fully Electric
Daily Fuel Consumption	5t (MDO)	3t (MDO)	
Daily total CO2 emissions*	20te	12te	0
		>40% CO2e saving	**100% CO2e saving**
		= 2,480te / year = 62,000te / life	**= 6,200te / year = 155,000te / life**

* Based on IMO MGO emissions factors

- Carbon tax rates combination of IMO, Fuel EU and estimated UK ETS
- Carbon tax based on 2035 cumulative price
- Conservative rates for electricity Jan 2025 (UK CFD R7 Admin' strike price)
- Based on 310 days operation
- Avg. Europe Bunker price for MDO 2025
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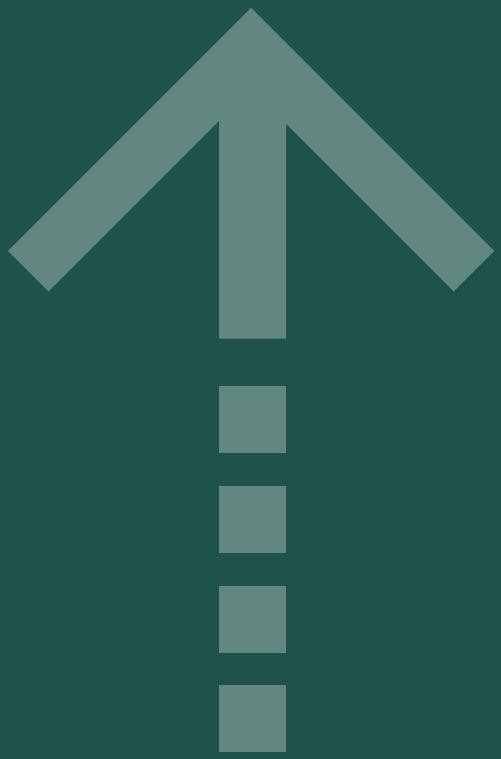

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