ROYAL WAGENBORG

STAKEHOLDER INFO BULLETIN
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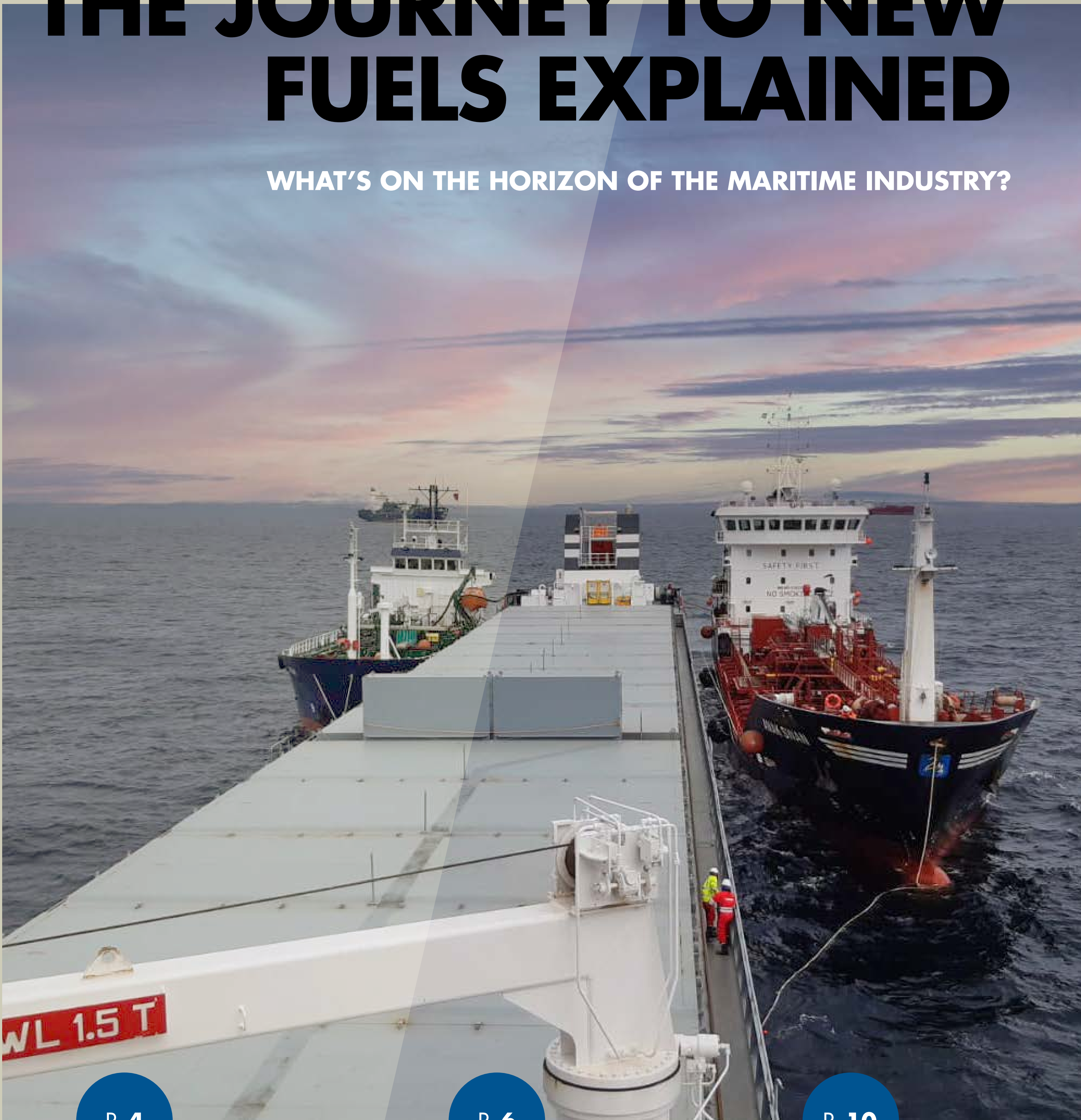
THE JOURNEY TO NEW FUELS EXPLAINED

WHAT'S ON THE HORIZON OF THE MARITIME INDUSTRY?



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Wagenborg's focus towards 2050

Phased-in introduction **IMO and EU rules** between 2023 and 2050

Global shipping's determination to reach carbon zero is admirable—but what will this endeavour actually require? In our first information bulletin (November 2022: 'Decarbonization rules explained') we learned that both the IMO and EU are developing legislation to reduce GHG emissions of the shipping industry. Only a few months later, developments have accelerated: IMO regulations entered into force as off January 1st 2023 and Brussels has reached a final agreement on the Emission Trading System for maritime transport. In this 2nd information bulletin we give you an update on these regulations and look forward on how to select the right alternative fuels.

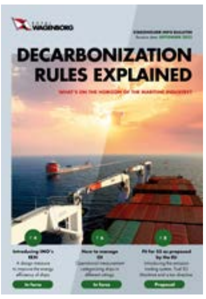
The Wagenborg MPP fleet is **100% compliant** with both the EEXI and CII regulations.

IMO

Since 01-01-2023 the EEXI and the CII regulations have entered into force. The Energy Efficiency Index for Existing Ships (EEXI) determines the ship's efficiency based on design parameters resulting in a one-time certificate. The Carbon Intensity Indicator considers how efficient ships operate and transport cargo on an annual basis. Last year Wagenborg has prepared her fleet to comply with this upcoming regulation to guarantee continuity of sustainable service to her customers.

EU Emission Trading System (EU ETS)

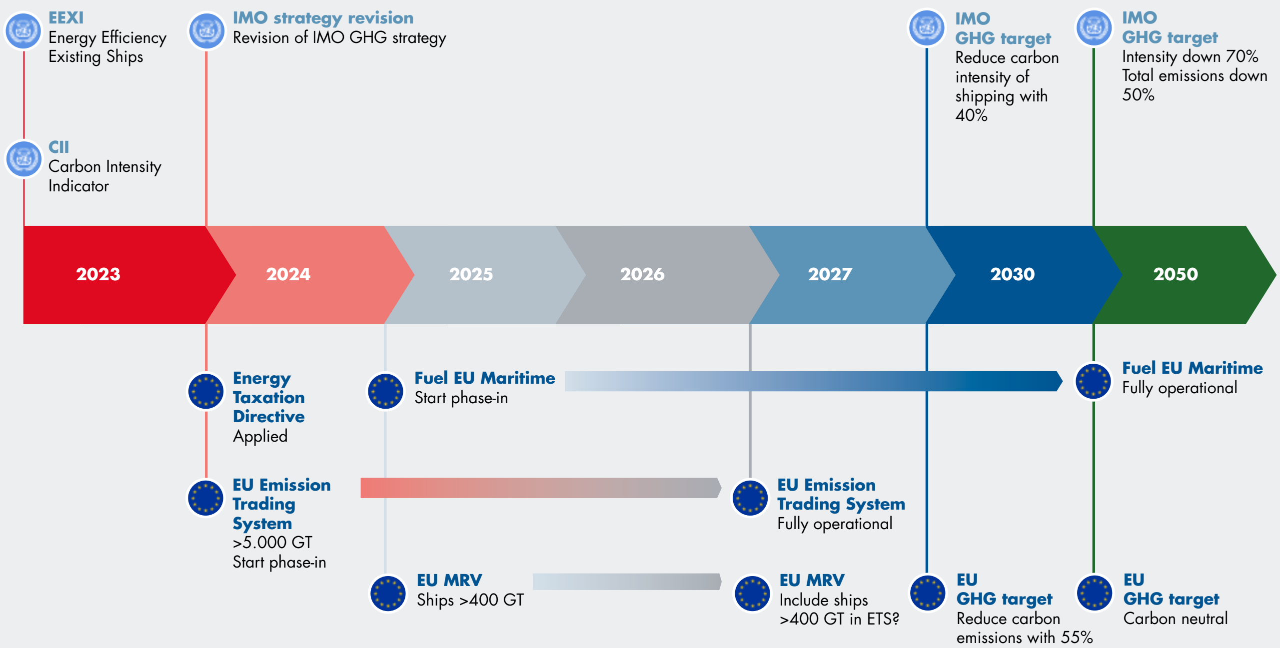
In December 2022, a final agreement was reached on the outlines of the EU ETS for maritime transport after months of negotiations between the European Parliament, European Commission and European Council (EU Member States). This also includes the revision of the entire EU ETS that also applies to other sectors making the framework for ETS final for the shipping industry.



November 2022 you received the information bulletin 'Decarbonization rules explained' with a focus on IMO (EEXI and CII) and proposed EU regulations (Fit for 55). Following various developments, an updated version is now available on **www.wagenborg.com/imo** which also includes the outlines of the EU ETS agreement and an updated timeline.

Download here

TIMELINE IMPLEMENTATION IMO AND EU REGULATIONS



Enabling alternative fuel pathways

Following recent developments, we expect an increasing demand for sustainable shipping. Following our current strategy, which focuses on fuel efficiency, we are also researching and testing alternative and new fuels. Although it might sound easy, selecting the right fuel of the future is not that simple. We present you an overview of selecting criteria and the pros and cons of various fuel types.

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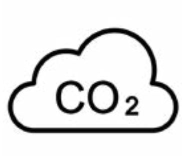
Agreement on outlines ETS

EU Emission Trading System

A final agreement was reached on the main characteristics of the EU ETS for maritime shipping after months of negotiations between the European Parliament, the European Commission and the European Council (EU member states). Details will follow in 2023 by further elaboration of a number of definitions and how to monitor certain GHG emissions. Below you will find a summary of the main points of what has been ratified and which are relevant for Wagenborg and her customer base.



Starting in 2024 ETS will put **a price on CO_2 emissions** for ships >5.000 GT.

Scope

- Ships of >5.000 GT that carry cargo and/or passengers that already monitor and report CO_2 emissions under the European monitoring, reporting and verification system (EU-MRV) will (at the earliest in 2024) fall under EU ETS;
- The emissions from journeys between EU ports, Norwegian and Icelandic ports count for 100%. The emissions from trips from (outgoing) or to (incoming) those ports count for 50%;
- From 1 January 2025, general cargo ships between 400 and 5.000 GT will also fall under the EU MRV. The European Commission will consider in 2026 whether these ships will also be part of EU ETS;
- Other greenhouse gases such as methane and nitrous oxide will be included in the EU MRV from 1 January 2024 and under the EU ETS from 1 January 2026.

Phase-in period

- 40% of reported 2024 emissions must be settled by 2025;
- 70% of reported 2025 emissions must be settled by 2026;
- 100% of the reported 2026 emissions must be settled by 2027

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EU MRV Regulation will be applicable to ships of > 400GT by 2025.

Role of charterers/cargo owners

In the event that the (commercial) charterer determines how efficiently the ship must operate (e.g. speed), the charterer must also bear responsibility for the ship's emissions and therefore also for the ETS costs.

Exceptions and special provisions

- Ships with an ice class (Super 1A and 1A) receive partial compensation based on a number of (pre)conditions;

Revenues from EU ETS

At least the proceeds of 20 million emission allowances will go to the shipping sector back to the European Innovation Fund. Projects that promote energy efficiency and/or the use of alternative cleaner marine fuels and have an added value for maritime transport in Europe are entitled to these innovation funds;

Future IMO measure for CO_2 pricing

As soon as a form of CO_2/greenhouse gas pricing is adopted in an IMO context, the European Commission will carry out a review aimed to create coherence between the EU ETS and the future IMO measures.

The negotiations on the Fuel EU Maritime fuel standard have been postponed and will continue early 2023.

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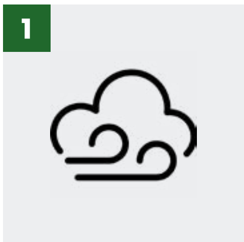
Enabling alternative
fuel pathways

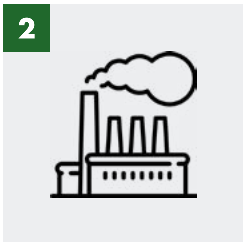
Nowadays the global shipping industry uses about 300 million tonnes of fossil fuel, resulting in more than 1 gigatonne of GHG emissions. To reach the 2050 decarbonization goals, we have to replace traditional fuel oils with low-GHG alternatives. The most bespoken alternatives include bio fuels, HVO, methane, hydrogen, ammonia and methanol.

Key indicators as selecting tools

Due to production and technology limitations, no single alternative fuel can meet the (future) demand of the entire shipping industry in the short term. As a result, we expect that multiple types of fuels will be used in the future by the shipping industry. However, all alternative fuels face technical, safety, commercial and regulatory challenges. In this chapter we describe various indicators to illustrate these challenges.

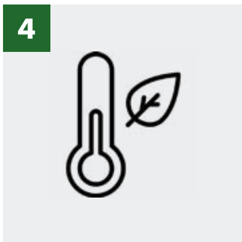


1 Harmful emissions
We aim to minimize the emission of CO_2, SOx, NOx and particulate matter.

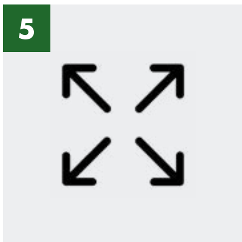


2 Scalability and production
Global availability is vital for a global mode of transport.

3 Safety
We make no concessions to the safety of our crew, cargo, ship and people living and working near the ports where we call with our ships.



4 GHG emission reduction potential
We choose a life cycle approach to assess emissions, instead of the end of pipe approach.



5 Energy density
Storability is important considering the limited dimensions of ships and the space required for cargo intake.

1 **HARMFUL EMISSIONS**

Emissions of carbon dioxide (CO_2), sulphur oxides (SOx), nitrogen oxides (NOx) and particulate matter (PM) from ships depend on the fuel used and the engine/converter used.

2 **SCALABILITY AND PRODUCTION**

Different alternative fuels will have different possibilities for maturing and scale-up, depending on factors such as cost, environmental performance and applicability. In addition, factors such as current usage, availability and global production are important for scalability, and they are closely linked to supply chain development and infrastructure on land.

To enable sufficient demands, future alternative marine fuels must be available on the market. The current availability of alternative fuels is far from covering the current energy requirements of the shipping industry. In addition, infrastructure is lacking or limited for most of the fuels. A rapid rise in demand would require massive investments in production capacity and infrastructure.

3 **SAFETY**

The bunkering, storage and consumption of traditional bunker fuels is a well-known and relatively safe process. The potential risks of these fuels can be mitigated in existing ship designs and onboard procedures. Because new alternative fuels have a considerably different nature, safety conflicts can arise when combining it with existing techniques and procedures. Consider, for example, the highly toxic ammonia if it were to be released in an engine room. Or the flammability of hydrogen?

Did you know our ferries to the Wadden Islands Ameland and Schiermonnikoog use **Change XL**?

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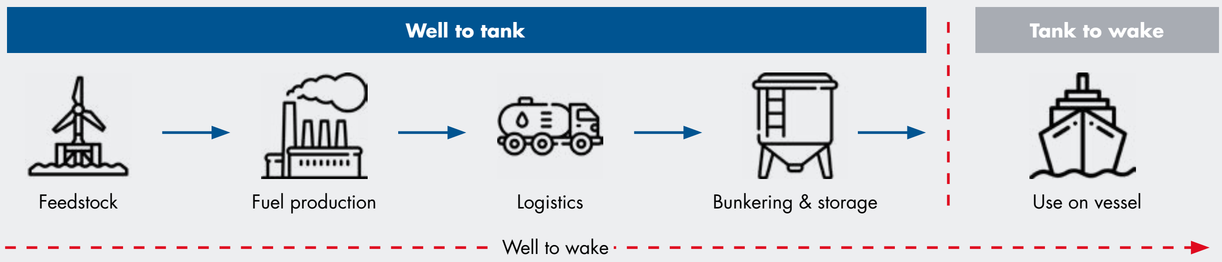
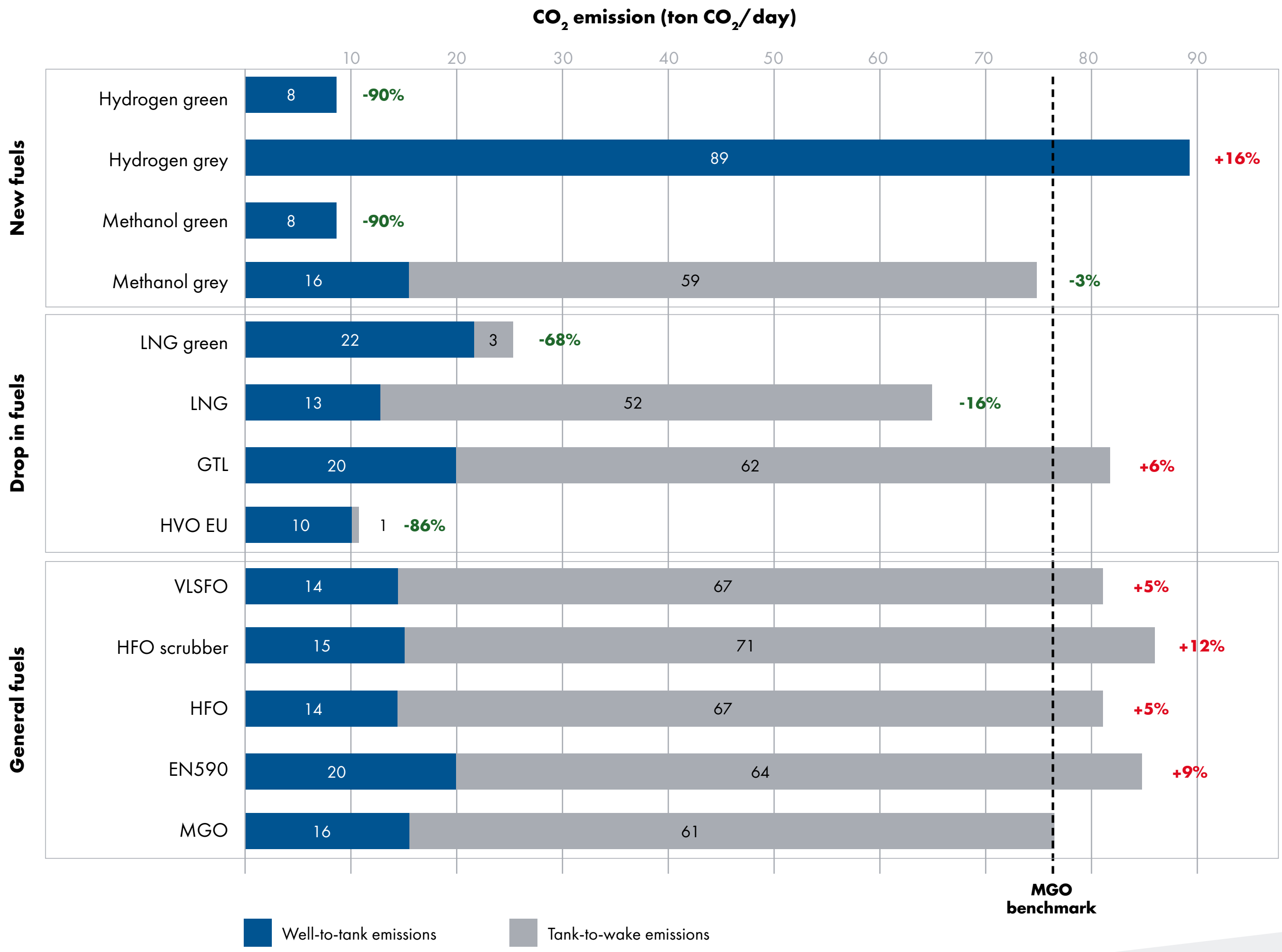
Note: The ETS regulation as decribed on page 4 and 5 only takes Tank to Wake emissions into account.



4 GHG EMISSION REDUCTION POTENTIAL

The well-to-wake GHG emissions includes emissions from production, transport and storage of each fuel, as well as combustion/conversion to mechanical energy onboard the vessels.

The resulting comparative measure of well-to-wake emissions is the mass of CO_2 equivalent emissions per unit output energy. The results show that the emission ranges are substantial for some of the alternative fuels, illustrating variations in modes of production, transport and storage.



Source: Based on data from www.CO2emissiefactoren.nl

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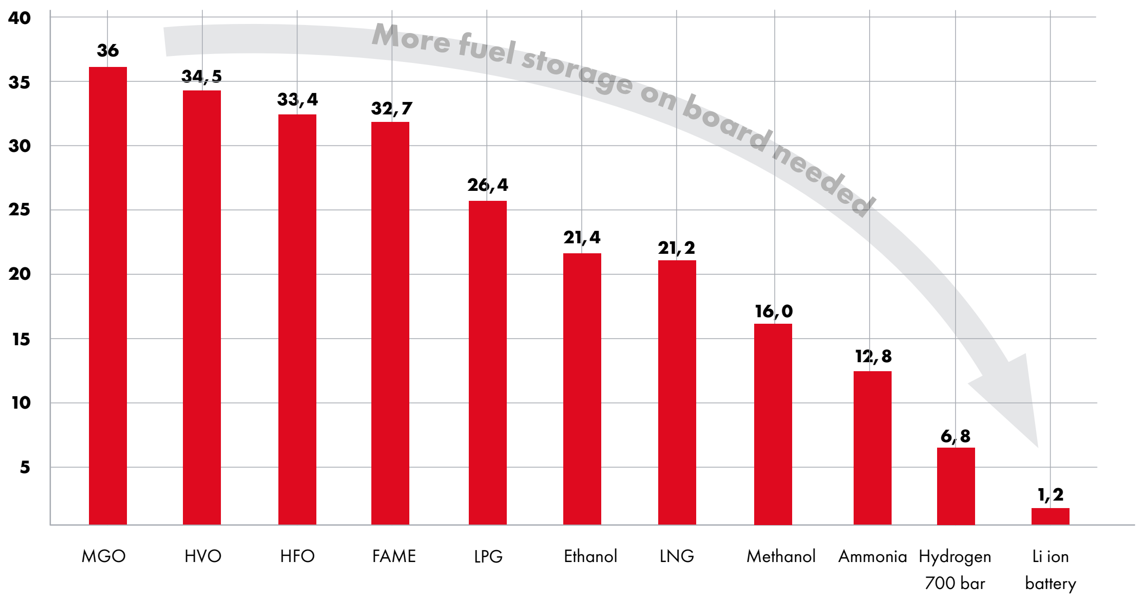
None of the alternative fuels can match conventional diesel on energy density

5 ENERGY DENSITY

The energy density of a fuel partly determines how suitable the fuel is for certain ship types and ship operations. Because of its low volumetric and gravimetric densities, employing batteries to propel deep-sea operation is challenging and in most cases simply not feasible/realistic.

The figure below shows the volumetric energy densities of several fuels, including the fuel storage system needed on board a vessel. It is clear from this figure that none of the alternative fuels can match conventional diesel on energy density. The required storage volume roughly doubles when diesel is substituted with methanol or LNG, and for the storage of hydrogen up to six times more volume is needed.

ENERGY DENSITY (IN MEGAJOULE PER LITER)



Source: Energy content of maritime fuels 2020, Martin Placek, December 1st, 2021, Statista

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Wagenborg's focus **towards 2050**

Wagenborg has set ambitious CO_2 reduction targets for which the application of alternative fuels are likely. However, in the current business cases, state of technology and global developments it is not possible yet to make progress. In fact, selecting the right alternative fuel will be quite a challenge since different businesses may require different solutions.

OUR VISION ON ALTERNATIVE FUELS

Not all alternative fuels seem to be an option for Wagenborg. We apply a number of principles. We:

- focus on **well-to-wake GHG emissions**. We believe that looking into the entire supply chain (including sourcing, production, transport and use on ship) makes the biggest difference;
- the use of alternative fuels produced with natural gas and/or palm/rapeseed not likely since the total GHG emissions are exceeding the GHG emissions of traditional MGO and/or VLSFO bunker fuels;
- consider **LNG not a probable option** given the relatively low GHG reduction potential. In addition methane from burning LNG will be included in ETS as off 2026;
- **aim for e-fuels** or fuels produced by renewable electrolysis to reduce GHG emissions significantly. However, these fuels are not widely available yet;
- have entered into **partnerships** with customers and suppliers to research, test and apply new fuels.

ENERGY EFFICIENCY AS A PRIORITY

Since alternative fuels are not in reach yet, we consider energy efficiency a top priority within Wagenborg. This does not only minimize the use of fossil fuels nowadays, adopting new techniques and procedures will significantly help when introducing new (probably more expensive) alternative fuel types in the future.

Energy efficiency offers cost-effective opportunities for decarbonizing and the emissions reduction potential is significant. A number of energy efficiency measures and technologies and solutions are available or are ready for use today but are commercially unfeasible. Wagenborg has reduced over 23% CO_2 due to operational and technical solutions in her energy efficiency program.

Area	Category	Examples	Potential max saving	Short sea	Deep sea
Operational measures	Voyage optimization	Voyage planning, weather routing, trim and speed optimization, vessel nominations, live data	10%	Growing adaptation	Best practise
	Fleet development	Fleet portfolio optimization, refits, maintenance, lifetime extention	15%	Growing adaptation	Major adaptation
Technical measures	Hull & superstructure	Hull design optimization, anti fouling systems, deepening, cleaning & brushing	10%	Growing adaptation	Major adaptation
	Energy management & systems	Engine technology, electrification, waste heat recovery, fuel flow meters	5%	Limited adaptation	Growing adaptation
	Power & propulsion systems	Propeller design, Wind assisted propulsion, combinator sailing, shore power	20%	Limited adaptation	Growing adaptation

Limited adaptation · Growing adaptation · Major adaptation · Best practise

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Founded in 1898, Royal Wagenborg is an international maritime logistics conglomerate. The family-owned and managed company offers a variety of sustainable maritime logistics services with regard to shipping, ports & terminals and offshore services. Managed out of the Delfzijl (NL) headquarters, Wagenborg has built a global commercial network. With about 2,900 employees Wagenborg serves clients predominantly in the Baltic, northwest Europe, the Mediterranean, the Americas and the Far East.

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