

# Business Briefing Will EU ETS promote the uptake of alternative shipping fuels?



#### **Executive summary**

Since the start of the year 2024, maritime transport related emissions are included into the EU Emissions Trading System (ETS). This Royal HaskoningDHV Business Briefing investigates to what extent the EU ETS incentivises shipping companies to switch from traditional shipping fuels towards low(er) carbon fuels. The alternative fuels in scope of this analysis are LNG, e-methanol and e-ammonia.

Based on current market prices, the results show that EU ETS provides no financial incentive to switch towards greener fuels. The EU ETS price is simply too low and/or the alternative fuel prices are too high. Based on the expectation that alternative fuel prices will decrease going forward, the results will gradually change. The study shows there will be a financial incentive to switch to LNG and e-methanol by 2040 and to e-ammonia only by 2050. Based on the scenarios developed for the ETS price and fuel prices, we expect that subsidies will be required at least until 2040 to promote the uptake of alternative shipping fuels.

Do these results imply that alternative shipping fuels are not forthcoming? Not necessarily. In addition to EU ETS, there are legislative steps being taken to stimulate the uptake of alternative fuels going forward, like FuelEU Maritime (FEUM) and the translation of the IMO strategy into technical and economic components. Further, other public and private initiatives are developed or under development to bridge the cost gap in favour of alternative fuels, like the EU Innovation Fund or the German H2Global auctions to better align supply and demand of hydrogen.



## Introduction

As outlined by the European Commission, the inclusion of maritime transportation into the EU ETS, together with the monitoring, reporting and verification (MRV) of ships' emissions, is one of the Commission's main tools to reduce greenhouse gas emissions of maritime transport.

Under the new legislation, shipping companies need to surrender EU ETS allowances (EUAs) for greenhouse gases (GHG) emitted by commercial cargo and passenger ships of 5,000 gross tonnage (GT) and above<sup>1</sup>. This Business Briefing investigates to what extent EU ETS incentivises shipping companies to switch from traditional shipping fuels towards greener fuels. The alternative fuels in scope of this analysis are LNG, e-methanol and e-ammonia.

<sup>1</sup> The greenhouse gases in scope are carbon dioxide (CO2) and from 2026 also methane (CH4) and nitrous oxide (N2O). Ultimately by 2026, the Commission shall review whether it is feasible to lower the threshold of vessels in scope from 5,000 GT towards 400 GT.



### Methodology

This study takes the perspective of the operational costs of a container shipping company. The study analyses the 1) fuel costs, 2) charter costs and 3) expected EU ETS costs for different fuel types. The charter costs are included to reflect the premium that container shipping companies pay for investing in newbuild vessels that are powered by alternative fuels, or for chartering those vessels. This study includes the 'steady state' ETS costs, where 100% of the emissions must be covered by EUAs<sup>2</sup>.

The operational costs for a shipping company are calculated for a specific case i.e. sailing from Marsaxlokk (Malta) to Rotterdam (Netherlands) with a 20k TEU container vessel. Please note this route has a 100% EU ETS application as it is intra-European. The results of this analysis change in case of a 50% EU ETS application, e.g. sailing from Shanghai to Rotterdam. Royal HaskoningDHV notes the relevant 'markets' for some alternative fuels are not mature (or even existing) yet and assumptions have to be made to assess the operational costs for vessels using alternative fuels. To reflect this uncertainty, several alternative scenarios are calculated using different fuel prices, emission factors and charter premiums. Table 1 shows the main assumptions, further details can be found in the Annex.

Assumption	Unit	HFO	LNG	e-methanol	e-ammonia
Charter price	USD/day	62,000	HFO +20%	HFO +15%	HFO +30%
Emission factor	tonCO <sub>2eq</sub> /ton fuel	3.17	2.79	1.38 / 0 3	0
EU ETS price	€/tonCO2	73	73	73	73
Energy density	MJ/kg	40	48	20	19
Fuel price	USD/ton	574	722	1200	875

Table 1: Main assumptions

In order to estimate the future impact of EU ETS, assumptions are made regarding alternative fuel prices and the EU ETS price in 2030/2040/2050. Although there is a high degree of uncertainty regarding these future prices, the expectation is that fuel prices of e-methanol and e-ammonia will decrease going forward as a result of technological development and economies of scale. The future price of LNG - similar to HFO - is assumed to remain constant going forward. The assumptions shown in Table 2 are based on reports from IRENA<sup>3</sup> and the International Energy Agency (IEA)<sup>4</sup>.

Table 2	: Main	assumptions	2030-2050
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Assumption	Unit	2024	2030	2040	2050
Fuel price e-methanol	USD/ton	1200	580	510	440
Fuel price e-ammonia	USD/ton	875	713	587	460
Fuel price LNG	USD/ton	722	722	722	722
EU ETS price	€/tonCO <sub>2</sub>	73	126	174	206

<sup>4</sup> IEA World Energy Outlook 2023.

<sup>&</sup>lt;sup>2</sup> The share of emissions that must be covered by allowances gradually increases from 40% (2024) towards 70% (2025) and finally 100% (2026). <sup>3</sup> IRENA innovation outlook renewable methanol (2021) and renewable ammonia (2022).



## **Results**

Figure 1 shows the operational cost comparison from the perspective of a container shipping company to sail from Marsaxlokk to Rotterdam with a 20k TEU vessel, assuming current 'market rates' for charter costs, fuel costs and ETS costs. It can be concluded that there exists a significant cost disadvantage for e-methanol and e-ammonia powered vessels, which is mainly the result of higher fuel costs (based on the price in HFO energy equivalent). The EU ETS costs for e-methanol are shown dotted in the graph as the carbon emission factor for e-methanol under EU ETS is still uncertain. The operational costs for an LNG powered vessel are relatively close to an HFO powered vessel. The results show that based on current 'market rates', the EU ETS price should be much higher to provide a financial incentive for shipping companies to switch towards especially e-methanol and e-ammonia.

## The key question is whether a decrease of alternative fuel prices and an increase of the EU ETS price will promote the uptake of alternative fuels going forward.

Royal HaskoningDHV has calculated the ceteris paribus (assuming all else equal) impact of lower emethanol and e-ammonia prices and a higher EU ETS price. Figures 2/3/4 show that the cost difference with HFO is expected to decrease significantly going forward. An EU ETS 'break-even price' is calculated, which is the theoretical EU ETS price for which the operational costs are identical between an HFO powered vessel and an alternative fuel powered vessel. If the theoretical break-even price is above the forecasted EU ETS price, this implies that there is no financial incentive for shipping companies to switch towards alternative fuels. Figure 5 shows that, based on current market insights, there will be a financial incentive to switch to LNG and e-methanol (assuming a zero-carbon emission factor) by 2040 and to e-ammonia only by 2050.

Please note in practice shipping companies will also take into account non-financial reasons to consider a shift towards alternative fuels, like climate ambition, reputation, or preferences from clients. That said, from a financial point of view, the results of this study imply that for the next years to come relatively high subsidies will be required, albeit for relatively small amounts of fuel. The funding could potentially come (partly) from EU ETS revenues. When the volumes of zero/low carbon fuels used increase, the amount of support needed per unit of fuel could decrease to a point at which it is no longer needed.







Source: Royal HaskoningDHV

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Figure 3: Cost comparison (2040 prices)



#### Figure 4: Cost comparison (2050 prices)



Source: Royal HaskoningDHV





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### What's next?

Do these results imply that alternative shipping fuels are not forthcoming? Not necessarily. There are several reasons to anticipate an increasing share of alternative fuel powered vessels going forward. Firstly, the European fit-for-55 package also includes FEUM, which provides an obligation for shipping companies to gradually reduce the GHG intensity of their activities. As the FEUM reduction targets become more stringent over time, the required reduction of the GHG intensity cannot be achieved via fossil LNG, given its high carbon emission factor. Secondly, the global IMO strategy on reduction of GHG emissions from international shipping has been updated in 2023 and is far more ambitious than its predecessor. The IMO strategy to reach net-zero GHG emissions by or around 2050 is currently being translated into more detailed technical and economic components. IMO guidelines have a wellto-wake basis which provide a further financial stimulus for alternative fuels compared to the tank-towake basis of EU ETS. Thirdly, several other public and private initiatives are developed or under development to bridge the cost gap in favour of alternative fuels. These initiatives either aim to reduce the future price of alternative fuels (e.g. future EU Innovation Fund subsidies to the benefit of hydrogen and alternative fuel production or contracts for difference schemes initiatives) or aim to better align and aggregate supply and demand (e.g. the German H2Global auctions or green corridor initiatives). The gradual substitution of fossil fuels by zero/low carbon fuels requires both the carrot (EU ETS) and the stick (FEUM, IMO).

Royal HaskoningDHV supports all measures that help boosting decarbonisation of the maritime sector. Please reach out to Royal HaskoningDHV in case you would like to further discuss the potential impact of EU ETS or alternative fuels for your business or market segment.



### Annex

The HFO charter price is based on Royal HaskoningDHV's own regression models using historical data of among others Seaweb and Clarksons. For LNG, e-methanol and e-ammonia the assumed charter price premium is based on among others available newbuild prices from Clarksons' container vessel order book and other publicly stated newbuild prices. As this premium is defined as a percentage, higher or lower charter prices due to supply or demand shocks will not have a material impact on the results.

The carbon emission factors are derived from European legislation<sup>5</sup>. The factors reflect not only the tank-to-wake carbon emission factor for CO<sub>2</sub> but also the CO<sub>2</sub> equivalent emission factors of methane and nitrous oxide. Please note the nitrous oxide emissions of ammonia powered vessels are not included as it is not quantified yet in the European legislation<sup>6</sup>. The energy density factors are derived from IMO's MEPC resolution<sup>7</sup>.

The HFO and LNG fuel prices are based on 6-month historical average Rotterdam bunker prices. The e-methanol and e-ammonia price assumptions are based on external reports from among others the International Renewable Energy Agency (IRENA).

<sup>5</sup> The emission factors under EU ETS remain to be determined by implementing legislation which is expected in the course of 2024. The factors assumed in this study are based on the FEUM Regulation (2023/1805) and the linked EU Directive 2018/2001. A sensitivity analysis is performed as it is uncertain whether the factor of e-methanol will follow FEUM (1.38 tonCO2/tonfuel) or will be put at 0.

<sup>&</sup>lt;sup>6</sup> Based a study from the Maersk Mc-Kinney Moller center for zero carbon shipping (Managing emissions from ammonia fueled vessels, 2023), nitrous oxide emission levels are expected to be at most around 0.06 g/kWh. This would imply that ammonia powered vessels emit around 1.5% of the carbon emissions of an HFO powered vessels, measured in CO2 equivalent emissions <sup>7</sup> IMO Marine Environment Protection Committee (MEPC) resolution 281 (2016).



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