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The decarbonisation of maritime transport: navigating between a global and EU approach

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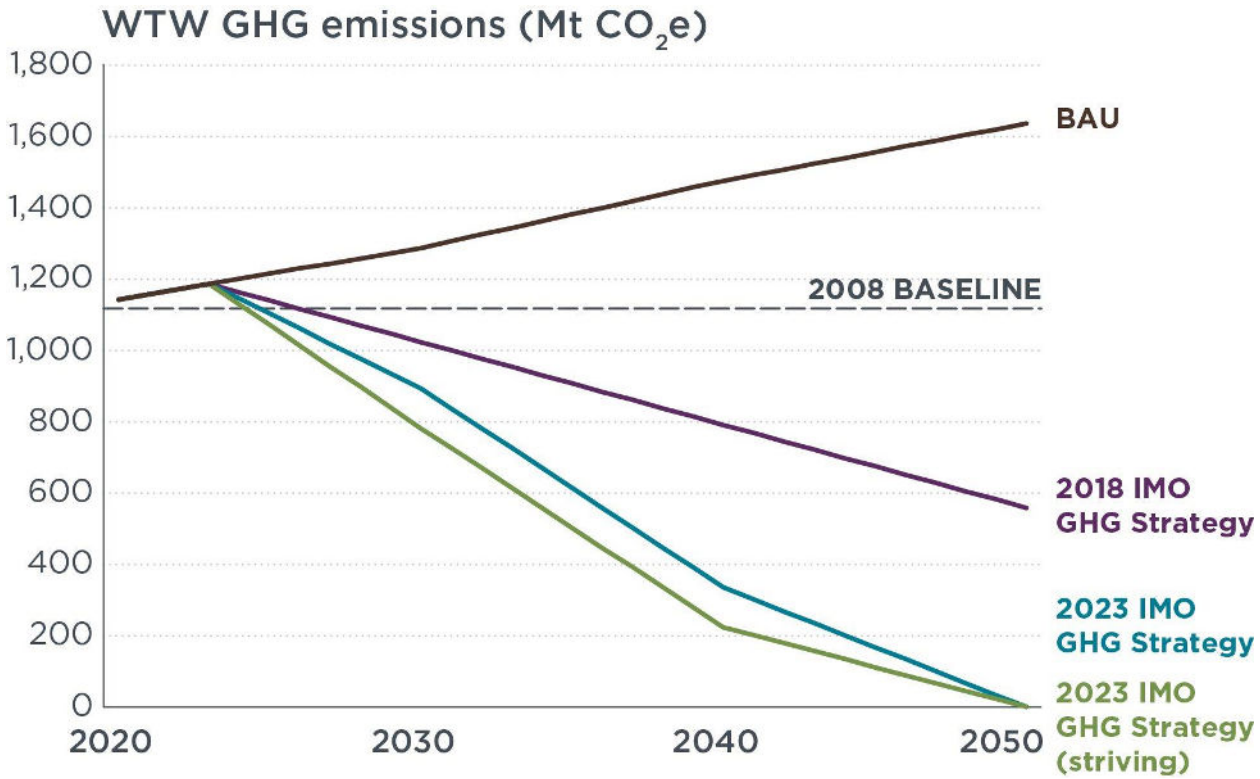
FSR-OIES webinar: Maritime transport decarbonization - what to expect from the new regulatory frameworks?

14 February 2024

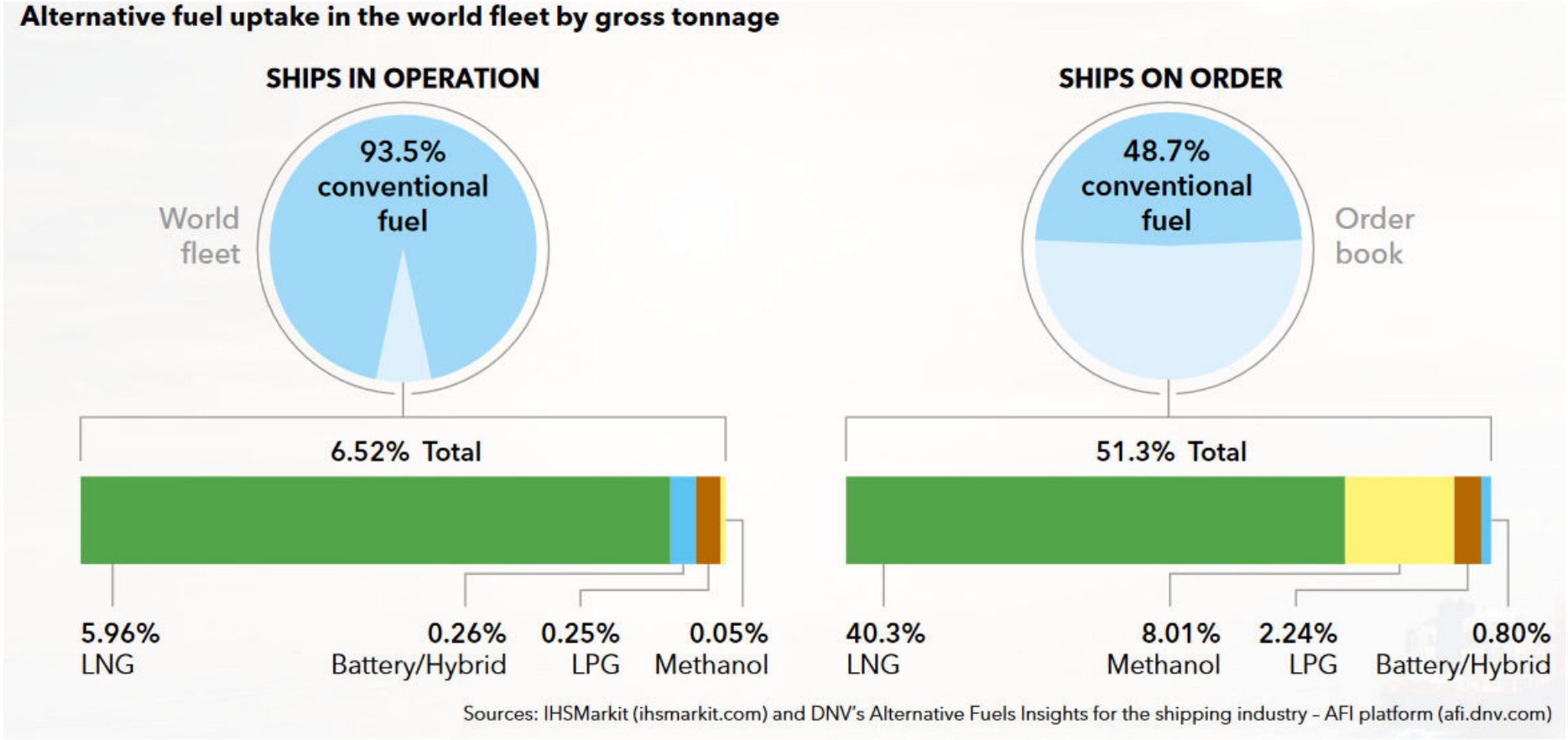
Shipping facing the decarbonisation challenge

- Maritime transport accounts for ~3% of global man-made greenhouse gases (GHGs)
- Shipping emissions increased by ~10%, from 977 million tonnes to 1076 milion tonnes of CO2e between 2012 and 2018
- CO2 is the major GHG, while methane (CH4) is the fastest growing: +151-155% between 2012-2018, compared to 5-9% increase in nitrous oxide, N2O)
- The International Maritime Organisation (IMO) is the main sector's regulator
- 2023 IMO GHG strategy: net-zero GHG emissions „by or around, i.e. close to, 2050"



Source: ICCT, 2023. WTW = Well-to-wake.

The growing importance of LNG



Source: DNV, 2023.

…and GHGs associated with LNG shipping

Balcombe et al. 2022

LNG cargo

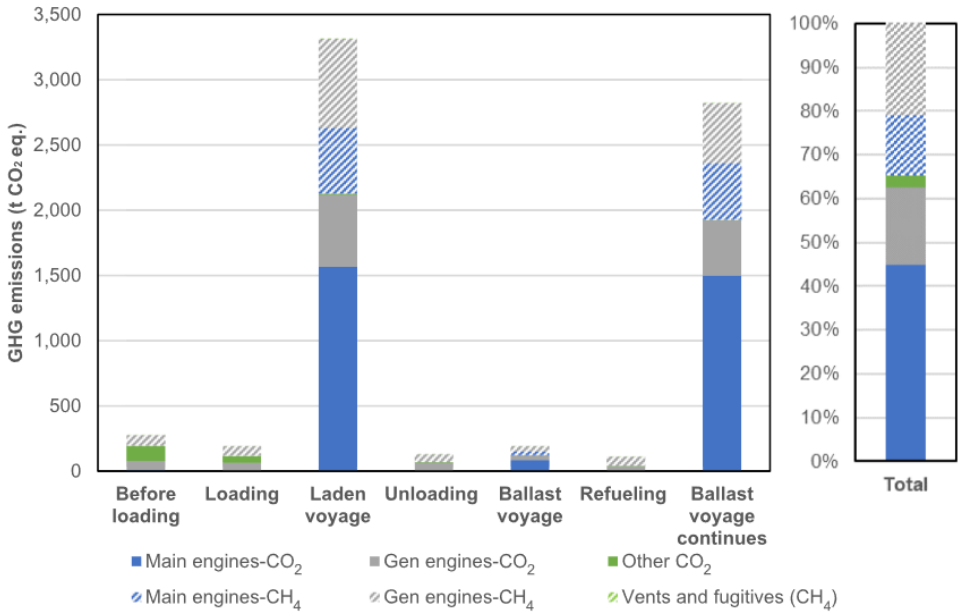
Round-trip voyage the USA-Belgium

Total CO2 = 4600 t CO_2 and CH4 = 68 t CH_4

Emissions per unit of LNG deliverd:

104 g CO_{2equiv}/kg LNG (GWP100, 36)

156 g CO_{2equiv}/kg LNG (GWP20, 87)

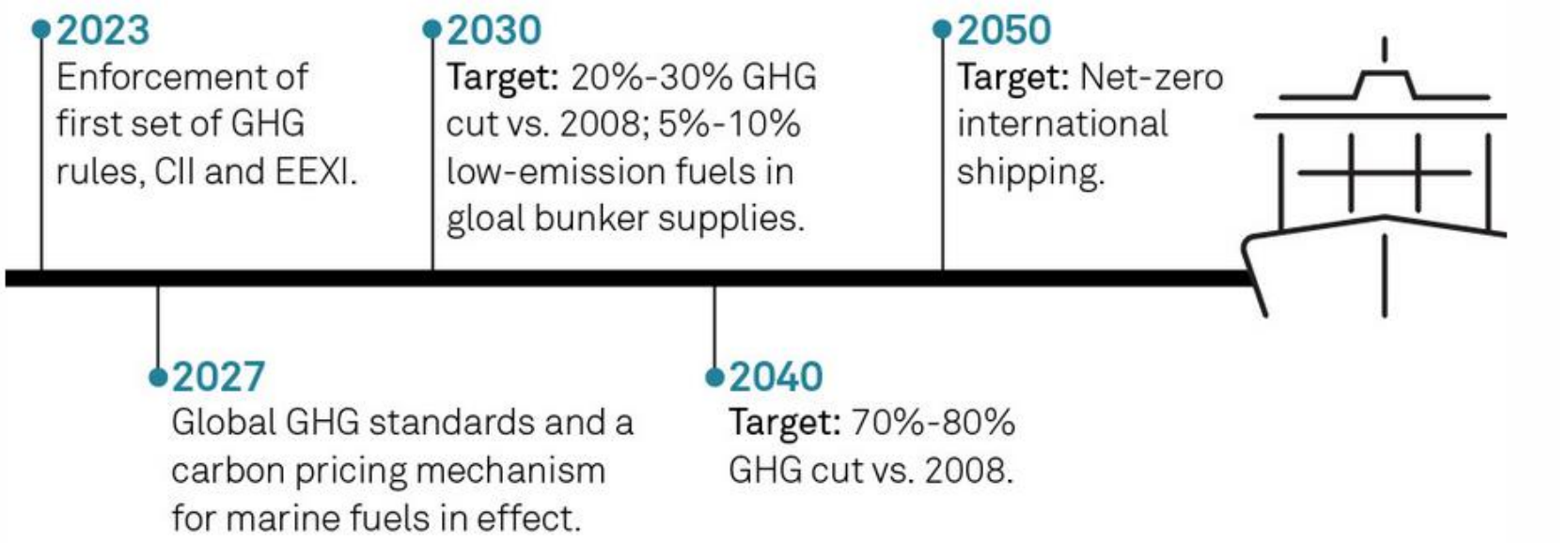


What does it mean?

- **CO_2 and methane slip:** main engines (LPDF 2-stroke; 45% of total GHGs) and the generator engines (LPDF 4-stroke; 18%) = the main cause of methane emissions.
- **Venting and fugitives** were very low < 0.1% of total GHGs (or 0.23% of methane emissions).
- **GWP matters**: methane accounts for 35% of the total GHG (GWP100 = 36)… or 56% (GWP20 = 87).
- **Engine load matters:** operating engines at higher load (80% instead of 40-45%) would app. halve CH4, lower loads = higher slip.
- **LNG shipping fleet** = 668 vessels, and 312 under construction – more direct measurements needed.

GHG emissions from different voyage segments, split by the emission source, using a GWP100 of 36. “Other CO2” includes CO2 emissions from the GCU and from the auxiliary boiler. LPDF = Low-pressure dual-fuel.

Major regulatory changes: International Maritime Organisation

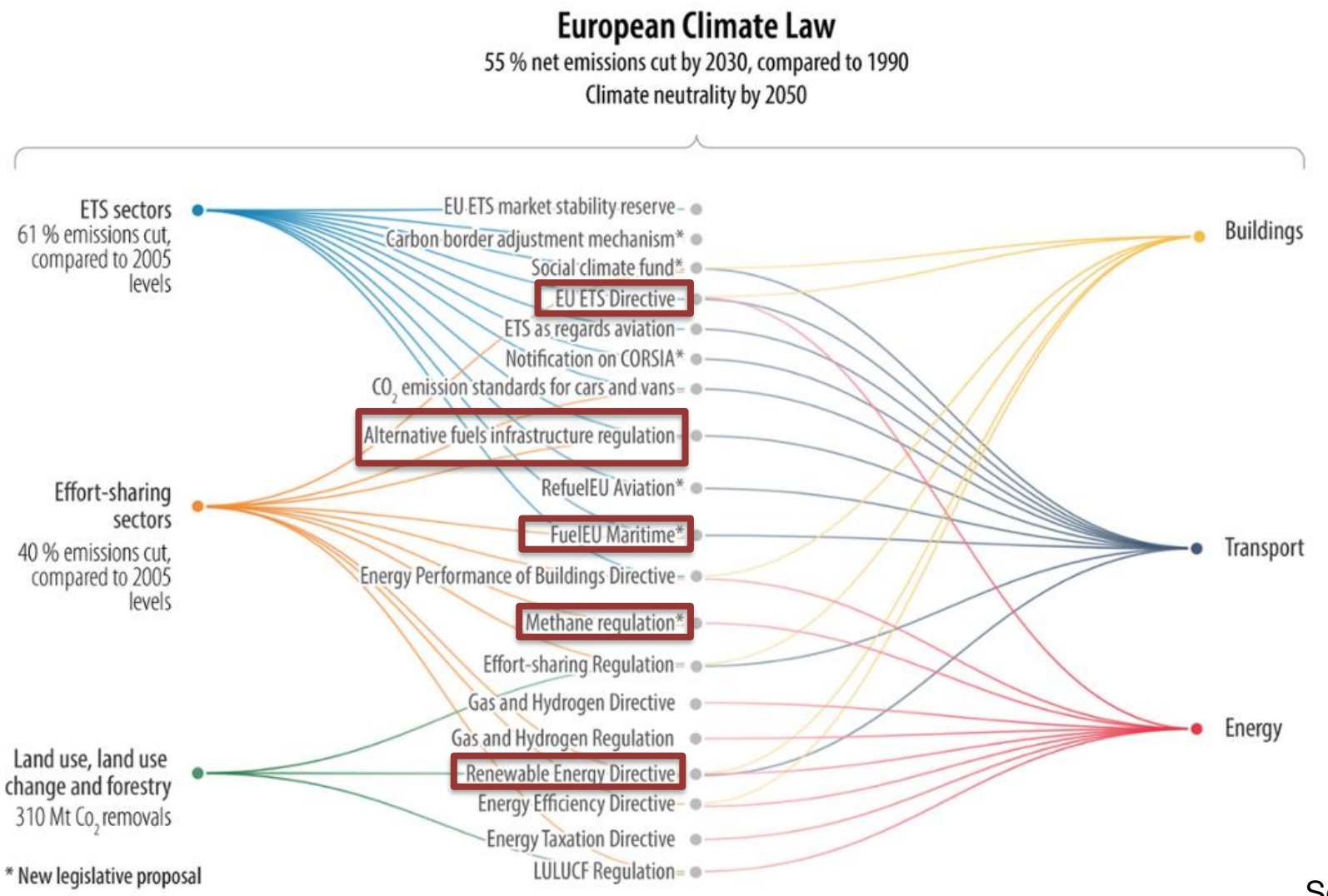


GHG = greenhouse gas; CII = Carbon Intensity Indicator;
EEXI = Energy Efficiency Existing Ship Index.

Source: International Maritime Organization; 2023 IMO Strategy on Reduction of GHG Emissions from Ships.

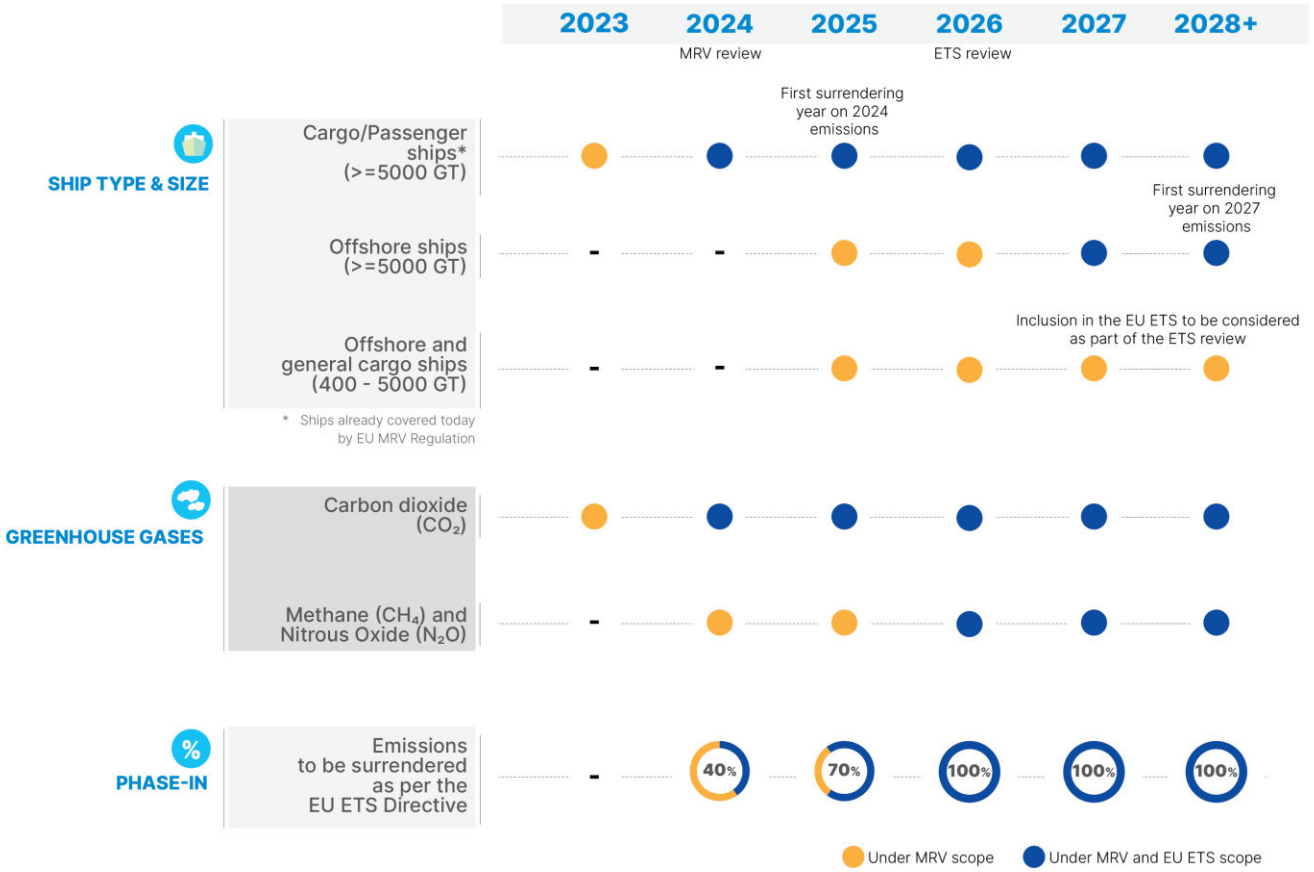
Source: S&P Global Commodity Insights, 2023.

Major regulatory changes: EU Fit for 55



Source: EPRS, 2022.

Maritime sector in the EU ETS: what is changing?



Source: EMSA, 2023.

- The EU Emissions Trading System (EU ETS) is a carbon market covering ~40% of the EU's total greenhouse emissions.
- Geographical scope of ETS:
  - 100% of emissions from voyages within the EU & when ships are within EU ports
  - 50% of the emissions from voyages starting or ending outside of the EU
- Member States are responsible for the enforcement: penalties and revenues.
- 20 mln allowances allocated for the shipping sector = €1.7 bilion using and avg 2022-2025 of €84.5 per tCO2.

How will shipping companies estimate their GHG emissions?

- Scope: combustion of fuels used onboard, tank-to-wake.
- The companies can choose between a calculation, direct measurement or a combination of methods.
  - Method A: BDN (Bunker Delivery Note) and periodic stocktakes of fuel tanks
  - Method B: Bunker fuel tank monitoring on board
  - Method C: Flow meters for applicable combustion processes
  - Method D: Direct greenhouse gas emissions measurement
- The calculation of CO2eq:

For the purposes of calculating greenhouse gas emissions, companies shall apply the following formula:

$$GHG_{MRV} = CO_{2_{MRV}} + CH_{4_{MRV}} \times GWP_{CH_4} + N_2O_{MRV} \times GWP_{N_2O}$$

GWP 100; CO2 = 1; CH4 = 28; N2O = 265

The implications for shipping, methane mitigation and LNG

- **Shipping under the growing decarbonisation pressure – it's just a beginning:**
  - The EU ETS will be revised, depending on the IMO adopting (or not) the a global market-based measure by 2028 (the revision clause, Art. 3gg of EU ETS Directive)
  - The same applies to the FuelEU Maritime with regards to the global GHG fuel standard

- **Methane regulated under two EU regulatory regimes (2027): ETS and Methane Regulation's importer requirements:**
  - Direct measurements vs estimates
  - LNG as a fuel (ETS) vs LNG as a cargo (Reg): will regulated companies need to report emissions under two different MRV schemes? What if boil-off gas (BOG) is used as a fuel?
  - Some emissions are not directly regulated, e.g. emissions associated with LNG loading/unloading

- **The cost of compliance and the impact on LNG:**
  - Significant financial exposure, EUA price volatility and the risk of non-compliance fines
  - A revolution in the contractual arrangements: will continous emissions monitoring systems (CEMS) become more prevalent, also to comply with the FuelEU Regulation (2025)?
  - An impact on the national LNG policy targets and LNG orderbook?

Summary and outlook

- **Decarbonization**: a critical decade for setting the shipping on course for net zero.
- **Regulatory uncertainty (EU ETS vs IMO)**:
  - will the IMO to agree on the mid-term measures by 2028? Or will there be more regional regulations, e.g. the EU?
  - flat levy on the GHGs is more acceptable among the IMO members – if and how the ETS should be adjusted?

- **Brussels' dilemma:** EU decarbonisation policies vis-a-vis the growing LNG imports
  - Europe's pivot to LNG at odds with the mid- and long-term decarbonisation targets? How to ensure a balance between energy security, sustainability and affordability?
  - Will there be enough renewable fuels available for the maritime sector after 2030?
- **LNG industry dilemma:** changes needed across the LNG industry and supply chain
  - how and how fast will the LNG demand evolve across sectors and regions?
  - what's the best strategy in the short-term and in the long-term, given the increasing regulatory uncertainty?

Thank you!

November 2023

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The decarbonisation of maritime transport: navigating between a global and EU approach

1. Introduction

Maritime transport accounts for ~3% of global anthropogenic greenhouse gases (GHGs), yet is not covered by the Paris Agreement objectives. Earlier this year, the sector's main regulator, the International Maritime Organisation (IMO) adopted a revised GHG strategy setting an enhanced common ambition to reach net-zero GHG emissions from international shipping close to 2050. The strategy also set indicative targets for 2030 (to reduce total annual GHG emissions from international shipping by at least 20%, striving for 30% compared to 2008) and 2040 (to reduce total annual GHG emissions from international shipping by at least 70%, striving for 80% compared to 2008). By 2025, IMO expects to finalize mid-term measures to achieve revised decarbonization objectives.

As of 2024, maritime transport emissions will be incorporated under the European Union cap-and-trade program – the Emissions Trading System (EU ETS).[1] As a result, shipping companies using European ports will have to monitor and report their emissions and purchase and surrender EU allowances (EUAs) for each tonne of reported carbon dioxide (CO_2) emissions. From 1 January 2026, this obligation will be extended to two short-lived GHGs – methane (CH_4) and nitrous oxide (N_2O). In parallel, the EU has finalised the Fit for 55 package legislation, including FuelEU maritime regulation, creating demand for alternative marine fuels[2] and the EU Methane regulation covering emissions from imported energy[3], including Liquefied Natural Gas (LNG).

These developments give rise to the following questions:

1) Are the IMO and EU regulatory frameworks complementary or contradictory?
2) Should the EU ETS be extended to other methane-relevant sectors in the EU?
3) What does it mean for the future of LNG as a marine fuel in Europe, given that additional LNG supplies are projected to come online after 2025[4]?

This paper aims to address these questions and is organised as follows. Section 2 presents an overview of the current decarbonisation approach at the IMO and the EU level. Section 3 analyses new obligations for the shipping companies under the EU ETS. Section 4 discusses the research questions. Section 5 presents conclusions and further research questions.

Energy Insight: 141

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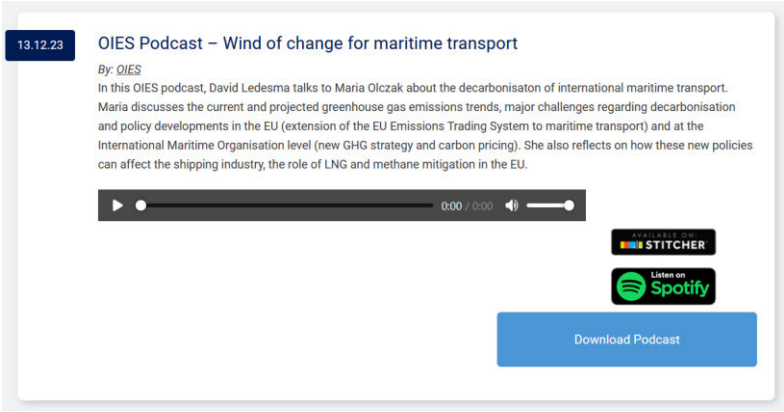

13.12.23

OIES Podcast – Wind of change for maritime transport

By: OIES

In this OIES podcast, David Ledesma talks to Maria Olczak about the decarbonisaton of international maritime transport. Maria discusses the current and projected greenhouse gas emissions trends, major challenges regarding decarbonisation and policy developments in the EU (extension of the EU Emissions Trading System to maritime transport) and at the International Maritime Organisation level (new GHG strategy and carbon pricing). She also reflects on how these new policies can affect the shipping industry, the role of LNG and methane mitigation in the EU.

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