Concawe

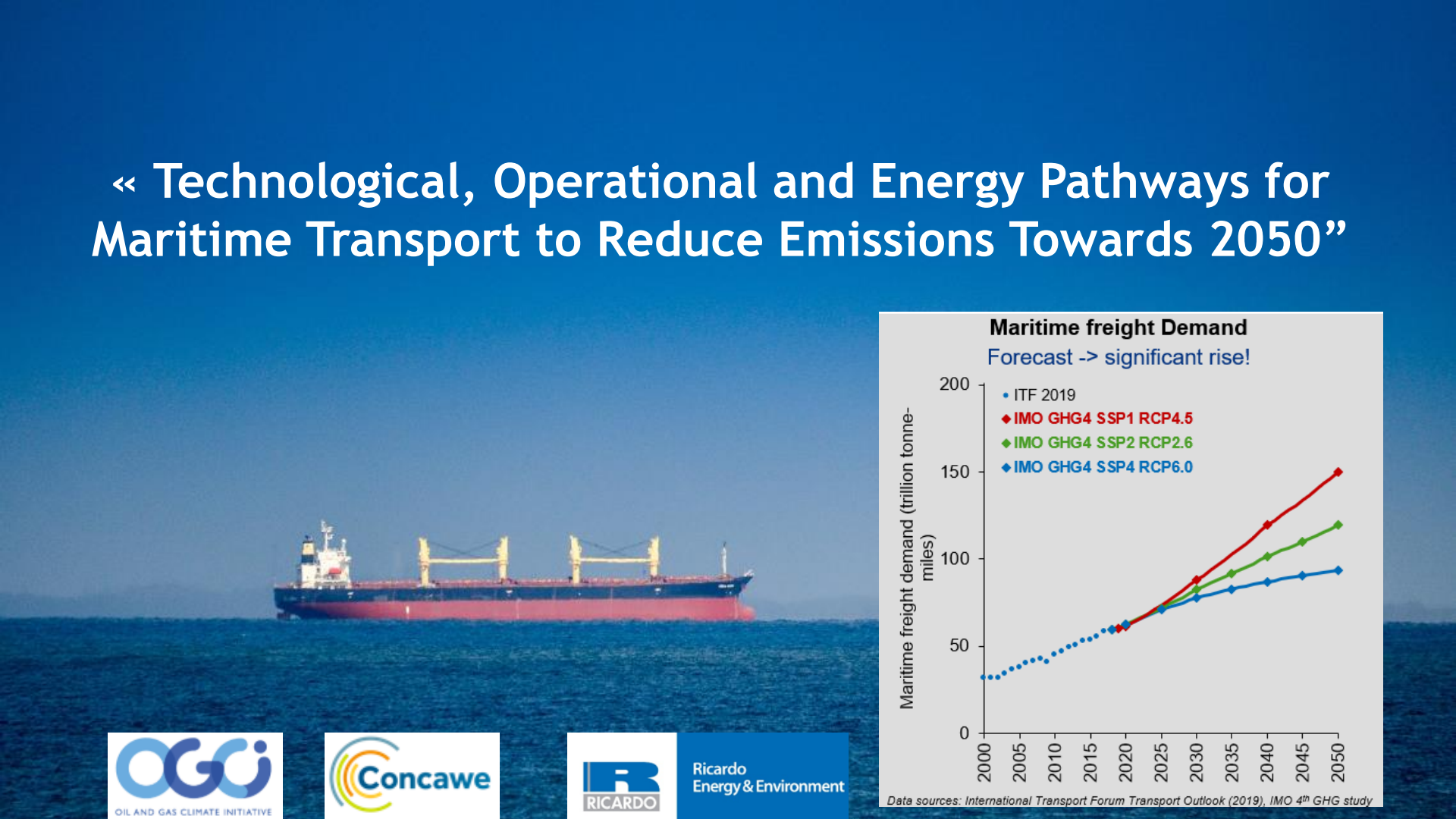
Environmental Science for European Refining

Sectorial Deep Dive – Maritime Transport

SAE PF&L Meeting - 8th September 2022 - Krakow

Damien Valdenaire
Roland Dauphin

« Technological, Operational and Energy Pathways for Maritime Transport to Reduce Emissions Towards 2050”



OIL AND GAS CLIMATE INITIATIVE

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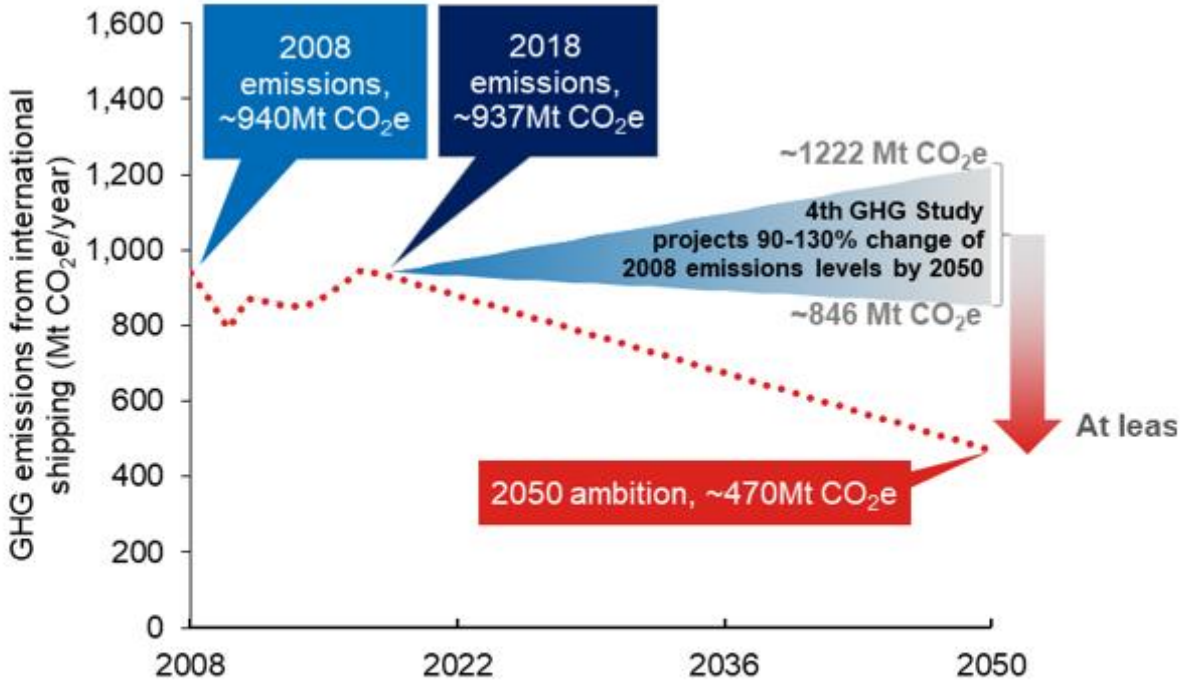
RICARDO

Ricardo Energy & Environment

1- Context: IMO ambition to reduce total annual GHG emissions from international shipping by at least 50% by 2050 compared to 2008.



These projections emphasised the considerable challenges that the industry faces to meet the 2050 ambition.

- IMO's short-term measures at the vessel level supporting this ambition:
  EEDI, EEXI, CII, SEEMP
- **Revised** IMO strategy planned for **2023**
- Current "**tank-to-wake**" estimates may give way to "**well-to-wake**"
- New vessels should start using zero GHG energy carriers by 2030

Available NOW, Tech. & Operational measures

Options to decarbonise shipping

Vessel design

↓ CO_2 0.5 - 10%*

Voyage optimisation

↓ CO_2 0 - 38%*

Engine technology

↓ CO_2 3 - 8%

Future energy carriers

↓ CO_2 up to 100%*

Power assistance

↓ CO_2 0.5 - 50%*

Alternative propulsion technologies

↓ CO_2 0.5 - 15%*

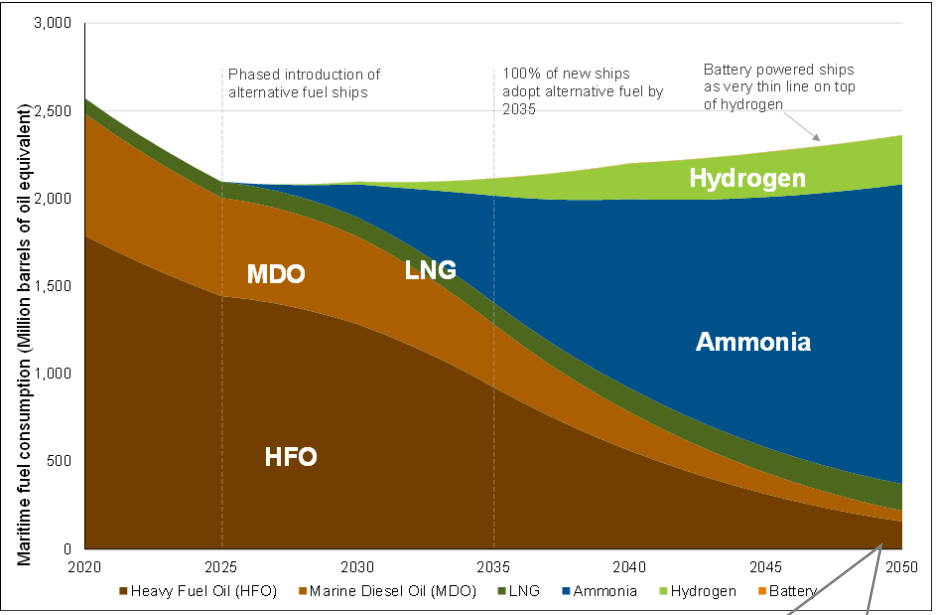
On-board carbon capture

↓ CO_2 up to 100%*

** % CO_2 refers to range of possible emission reductions for different technologies within each group of measures.*

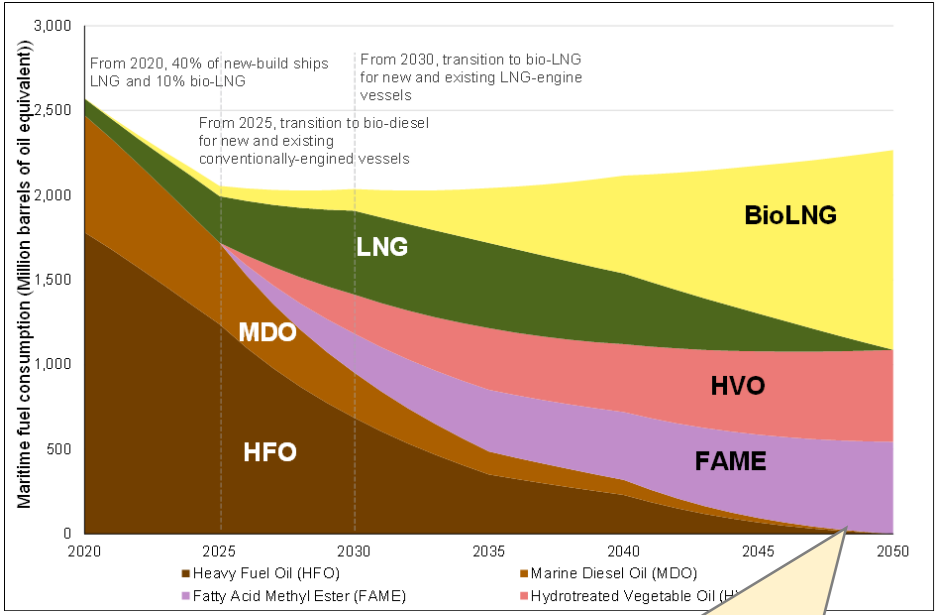
2- Fuel consumption to 2050 (1/2)

Package 1



Focus on zero carbon e-fuels

Package 2

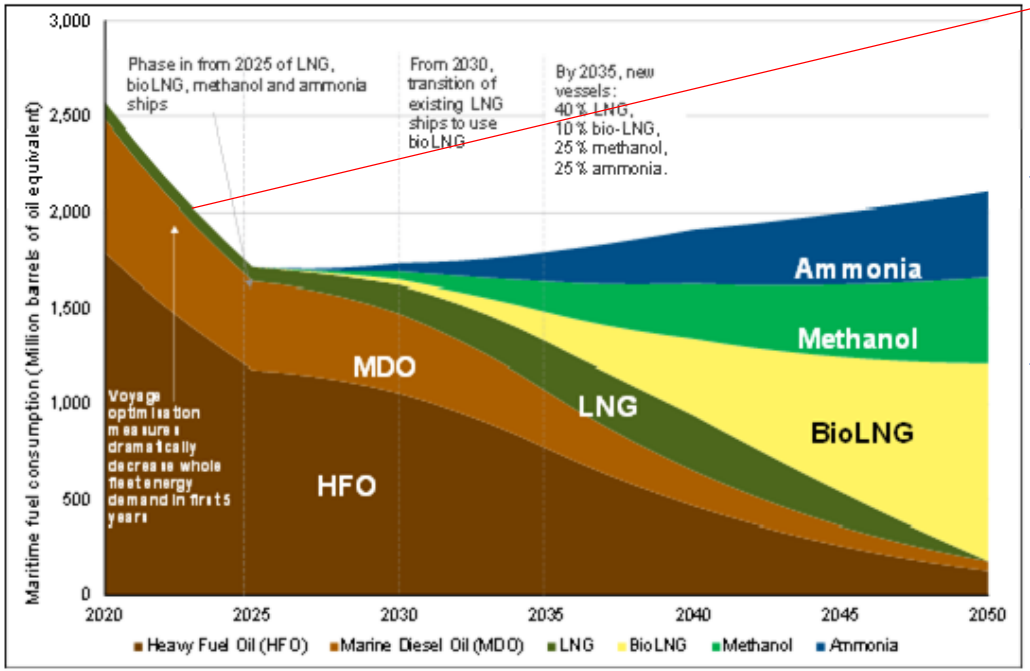


Carbon containing drop-in biofuels create low performance on TtW but reaching the -80% on WtW

2- Fuel consumption to 2050 (2/2)

Package 3

Figure 7-5: Fuel consumption to 2050 under the central scenario for package 3



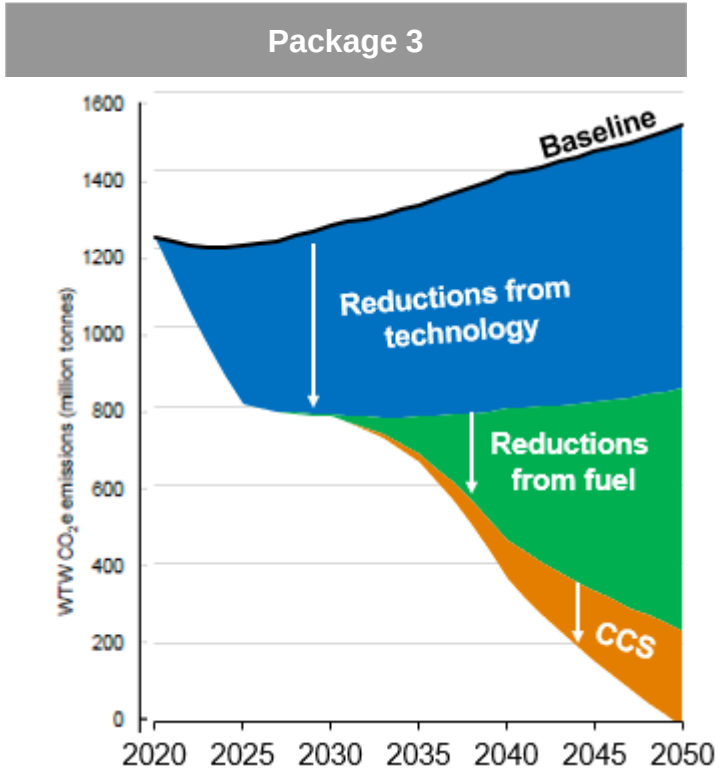
Efficiency measures maximized

50%/50% allocation of biofuels/e-fuels

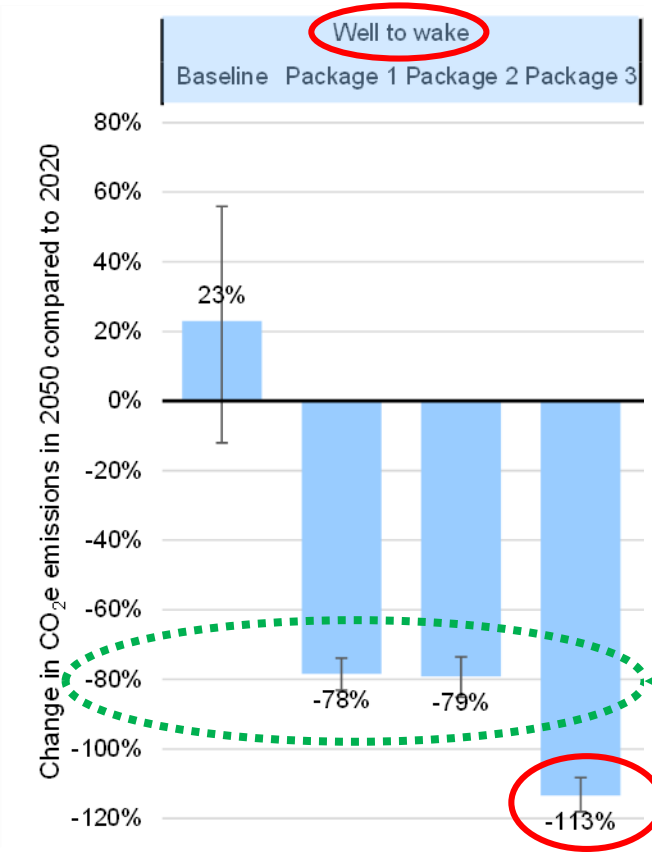
- e-Ammonia share set to match the WtT CO2 emission target
- e-methanol present only in Pack. 3

2- Energy efficiency technologies are key in providing shorter term GHG reductions but are insufficient alone to meet IMO ambition; higher risk CCS a small benefit.
The largest reductions in WTW GHG emissions result from fuel switching

WTW CO_2e emissions - contribution of technology and fuels - Central scenario



2- The IMO ambition is estimated to be met by all three packages when emissions are calculated on a well-to-wake basis



- Package 1, "early pursuit of zero carbon fuels"
- Package 2, "moderate uptake of interim and drop-in fuels".
- Package 3, "initial maximisation of vessel decarbonisation measures". For the central scenario, by 2050, approximately **65%** of the **global fleet** is equipped with **carbon capture** technology. Carbon capture then contributes approximately 24% of the total well to wake emissions reductions under this package

This study ambition

Over-achievement due to Carbon Capture and Bio-LNG

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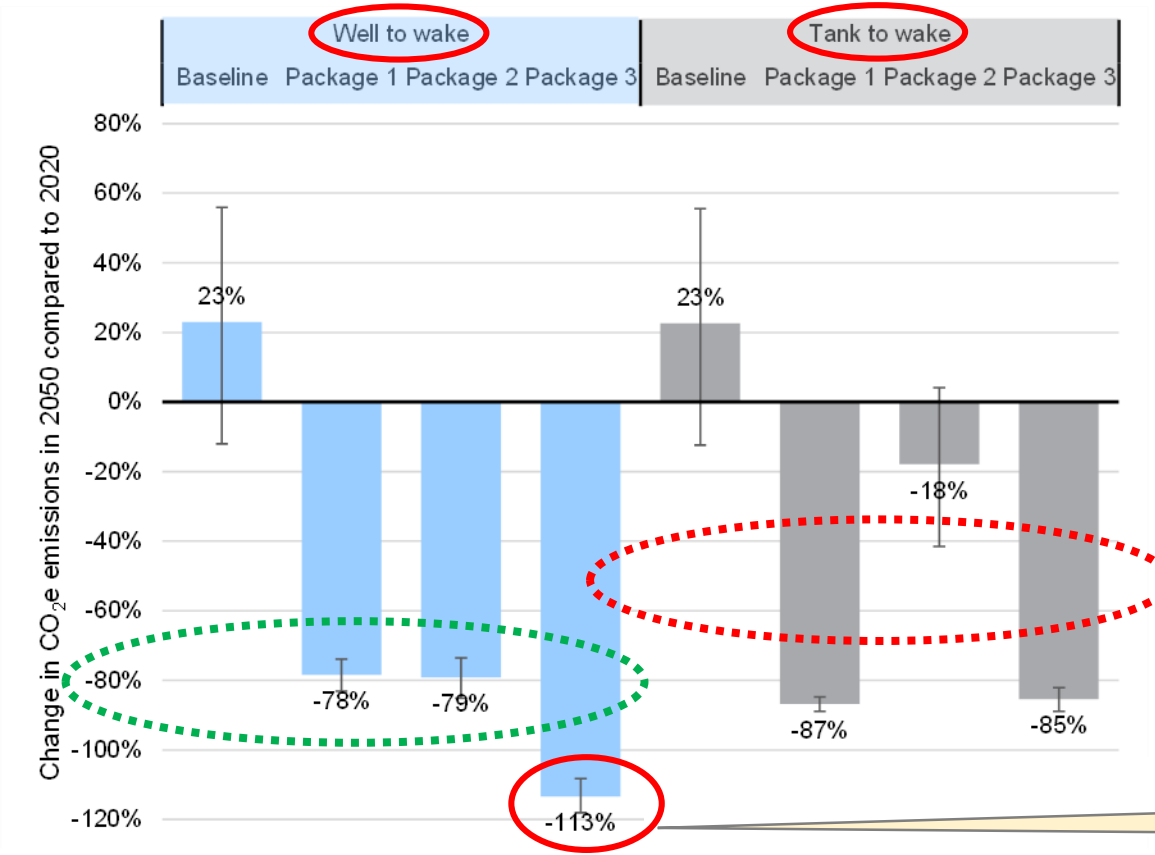

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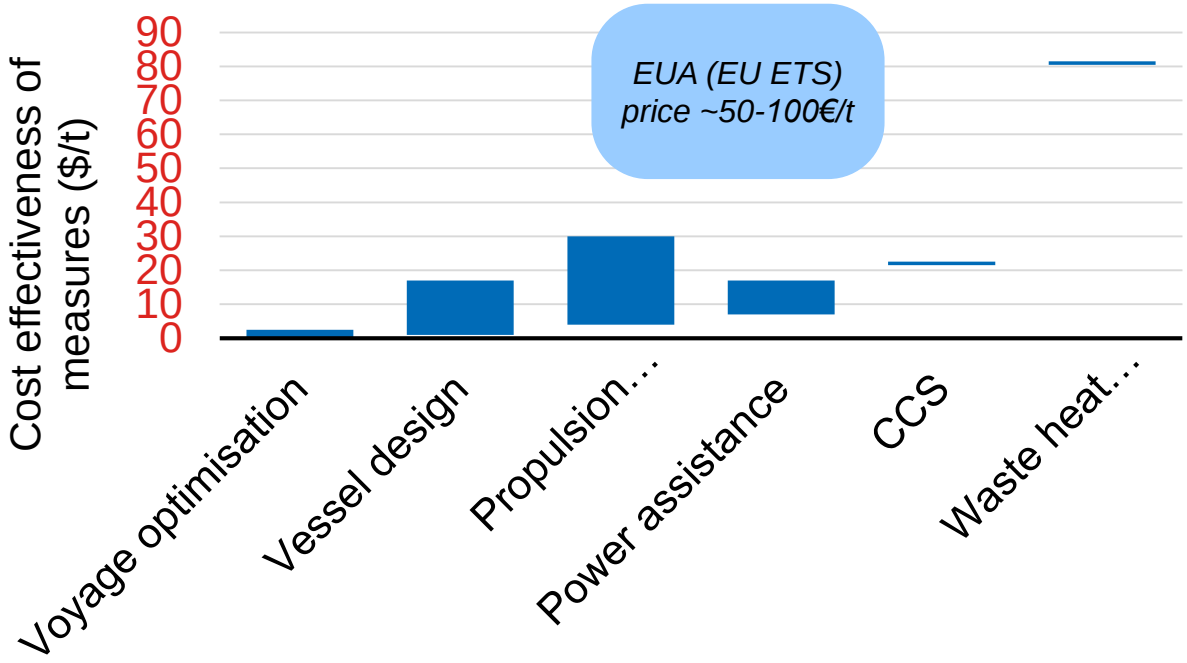
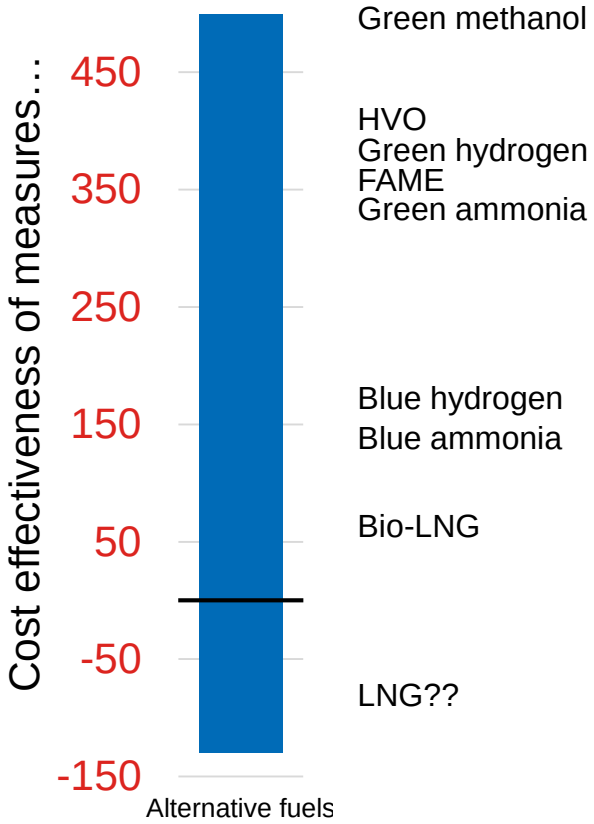
Current IMO ambition

This study ambition

Over-achievement due to Carbon Capture and Bio-LNG

3- Technology measures identified to have wide range of cost effectiveness, mostly below today's current EU ETS prices





Risks and barriers

This study and others show it should be technologically possible to decarbonise the global shipping sector to the level of the IMO ambition. However, despite this technical feasibility we have not so far seen rapid decarbonisation at the rate and scale required; barriers to decarbonising the shipping sector remain.

GHG reduction potential

- **Uncertainty** between TtW and WtW, and in how WtW defined
- 20 year GWPs make LNG/bio-LNG less palatable

Price differential

- HFO price and scale difficult to match
- Regulatory intervention may help reach price parity

Infrastructure

- Bunkering infrastructure and port refuelling facilities need to be scaled up
- *(Not a barrier for 'drop-in' fuels)*

Production increase, location

- Alternative fuel production needs to substantially increase and be appropriately located (→ dedicated new facilities? Or convert existing assets?)
- Renewable electricity sources may be in different geographies to existing assets

Split incentives

- Customers and charterers not willing to pay or co-fund lower emission solutions
- No clarity on how the preferred fuel(s) will be chosen to allow for scale

Sustainability certainty

- Chemically identical brown/blue/green fuels need reliable certification schemes to provide assurance / guarantees
- Uniform / standardised sustainability criteria may also need global consensus

Want to know more?

Download the full report on our website https://www.concawe.eu/wp-content/uploads/Technological-Operational-and-Energy-Pathways-for-Maritime-Transport-to-Reduce-Emissions-Towards-2050.pdf

Thank you for your attention

The different alternative fuels and technology options were combined into three “fuels and technology” packages for subsequent analyses of their impacts