

The fleet of the future: Future outlook and fleet renewal



Shipping Forum

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Deloitte.

Who are we?



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We have teamed up with Shell to generate commercial outcomes through a series of sectoral reports focused on decarbonisation



Deloitte.

Report Objectives

We set out to define decarbonisation pathways for harder-to-abate sectors to:

- Provide clarity around the real challenges creating bottlenecks around sectoral decarbonisation
- Create a common language which could be used to help discuss these challenges
- Outline a set of practical solutions which could be adopted today to begin making progress

All Hands on Deck centers around International shipping:

- The first report consisted of 74 one-on-one interviews with executives representing all segments in the sector.
- The most recent report consisted of 26 detailed interviews, with two auto manufacturers being included



Shipping
(2021)



Road Freight
(2022)



Aviation
(2022)



Fleet
(2022)



Construction
(2023)



Steel
(2023)



Shipping 2.0
(2023)

Today's focus:
Future outlook and fleet
renewal

Existing IMO mandates such as EEDI and EEXI are already incentivising ship owners to invest in efficiency and design measures. EU ETS from January. IMO will present policy instruments in the upcoming years.

Selection of current and near-term policy



European Union (EU)

EU Emissions Trading System (EU ETS)

- Introduces the CO₂ “cap and trade” scheme to shipping as of 2024.

Renewable Energy Directive (RED II / III)

- Raises the overall EU target for renewable energy consumption by 2030 to 45% and supports the uptake of alternate fuels for transport e.g. biofuels or methanol

Fit for 55 - FuelEU Maritime

- Mandates shipping companies to reduce carbon intensity by 6% in 2030 and 75% by 2050, for any vessels above 5,000 GT travelling to, from or at berth in EU ports



International Maritime Organization (IMO)

GHG targets

- Overall ambition for global shipping is to reach net zero emissions around 2050.
- Check-points at 2030 (20-30%) and 2040 (70-80%).
- Measure(s) will entry into force in 2027, should comprise:
 - a **technical element**, namely a goal-based marine fuel standard
 - an **economic element**, on the basis of a maritime GHG emissions pricing mechanism.

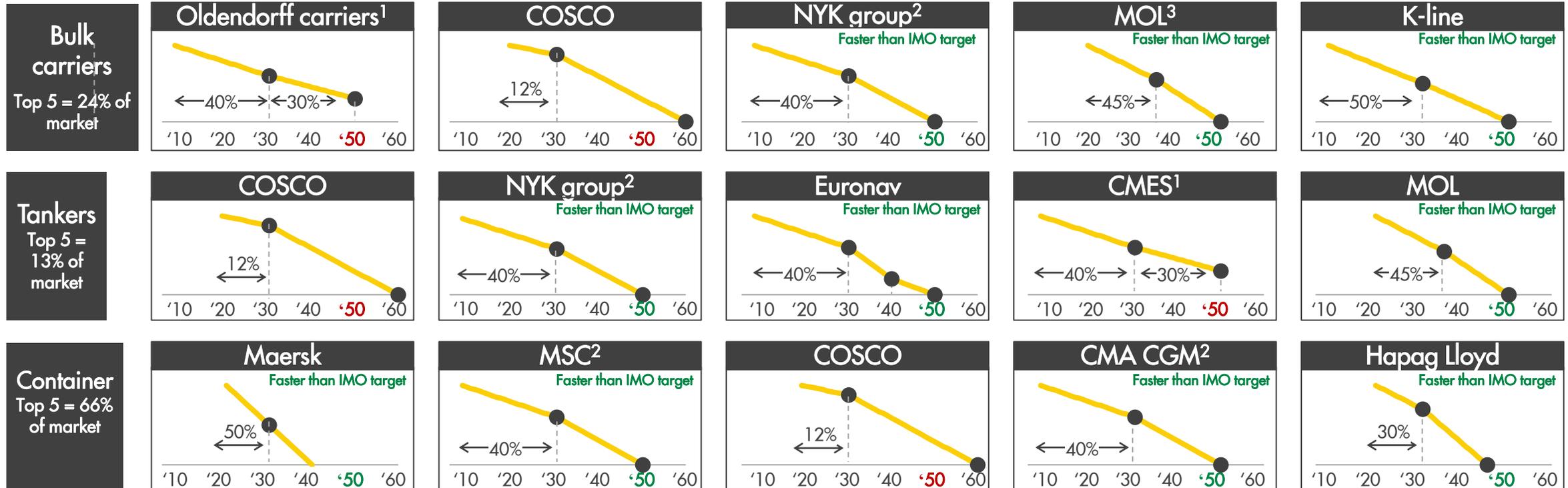
EEDI / EEXI

- Mandated energy efficiency minima for existing and new vessels

Most large shipping companies have already committed to net-zero by 2050

The 2018 IMO initial GHG strategy targeted 50% absolute reduction

Top 5 shipping companies per shipping segment (Overall GHG emissions, indexed, reference year = 100)

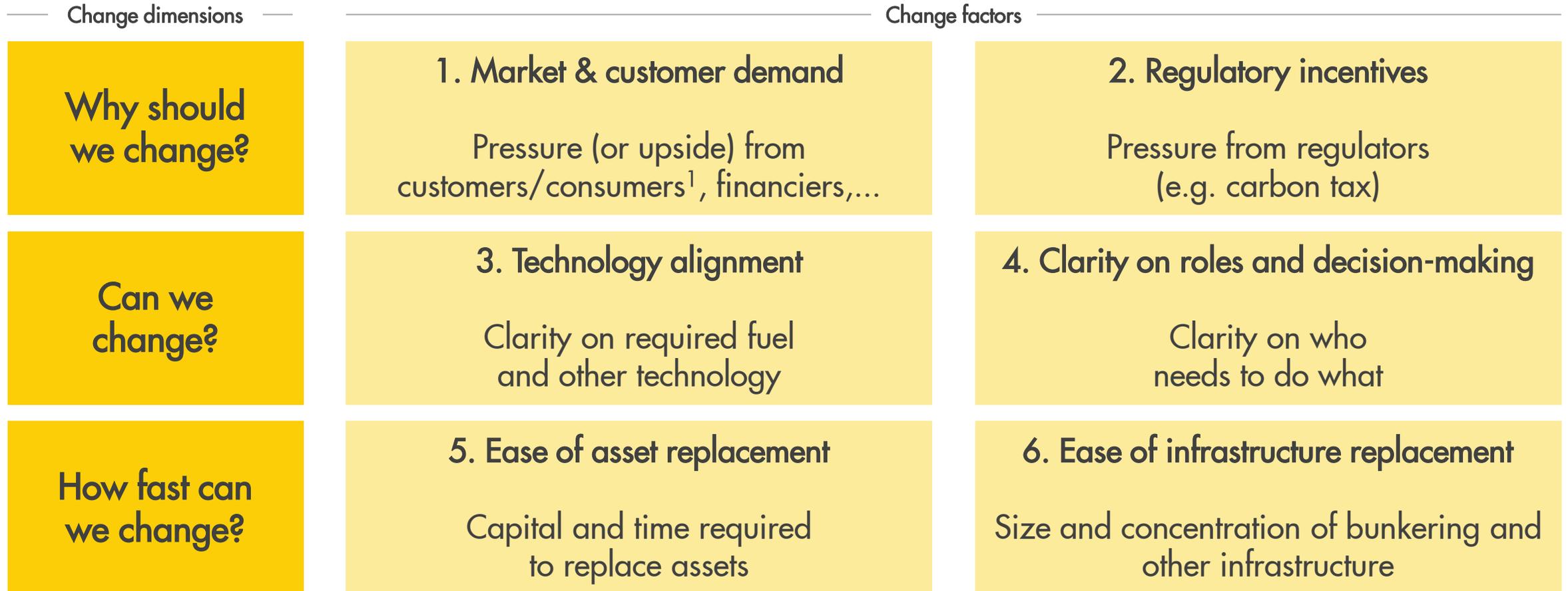


Cargo owners are also increasingly setting scope 3 targets, including shipping, which can increase the pressure for shipping companies to decarbonise. Other smaller shipping segments with higher margins and / or high demand pressure could also spearhead the transition, e.g., cruise or off-shore contractors

Note: 1) Assumed to be in line with IMO's targets of CO2 emission intensity reduction of 40% in 2030 and 70% in 2050, as no company target was set; 2) 2030 target assumed to be in line with IMO's targets of CO2 emission intensity reduction of 40% in 2030, as no 2030 company target was set; 3) GHG emission targets;
 Source: Company announcements and annual/ESG reports; Deloitte

We use a framework of six factors to understand the sector's readiness to decarbonise

What makes an industry ready to decarbonise



Notes: 1) Customers refer to all parties buying shipping services (e.g. freight forwarders, manufacturers, mining companies). Consumers refer to general public that buys goods, directly or indirectly from these companies

The barriers identified in 'All Hands on Deck 1.0' remain, with the largest signs of improvement around market and customer demand, regulation and technology

Decarbonisation readiness framework - Progress

Progress: ■ Higher ■ Lower

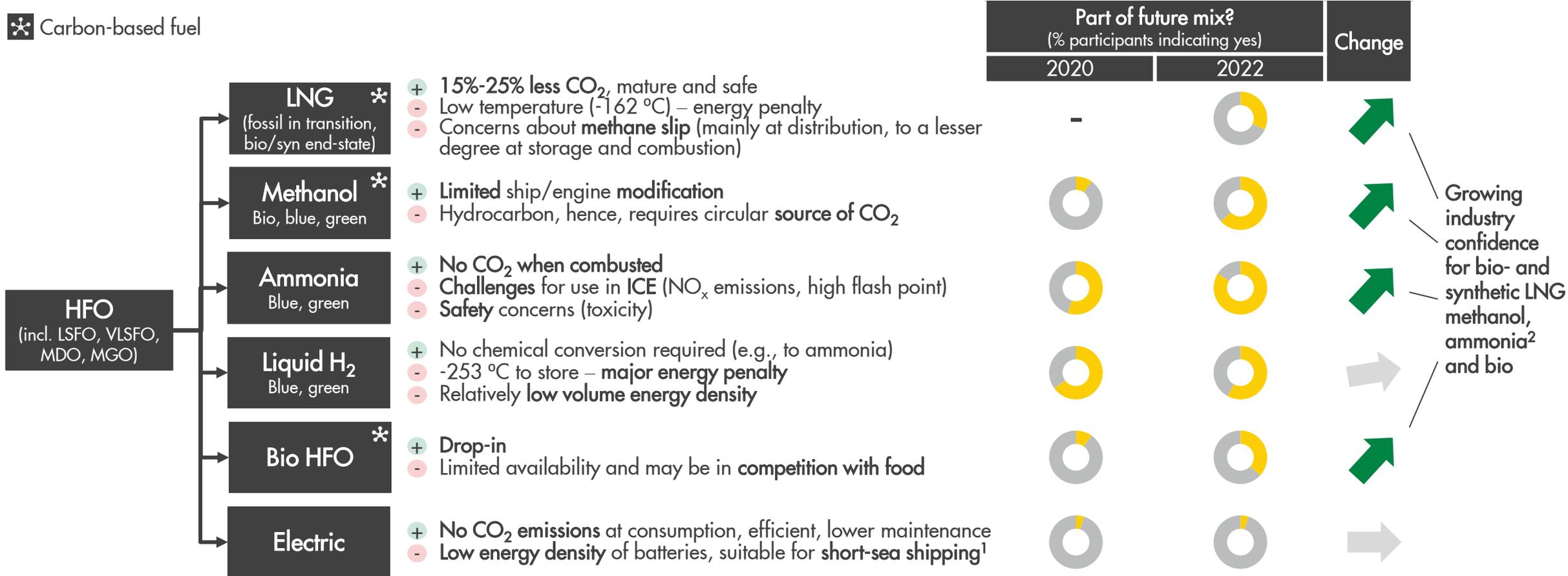
	Readiness factor	Progress	Supporting evidence	Barrier going forward		
Why should the sector change?	1. Market and customer demand	●	<ul style="list-style-type: none"> More requests on emission transparency and some green premiums in Containership segment 	Major barrier 100%	2020 2022	Minor barrier 0%
	2. Regulatory incentives	●	<ul style="list-style-type: none"> CII/EEXI Shipping under EU ETS, RED II (EU) Methanol, RED III IRA (USA) 	Major barrier 100%		Minor barrier 0%
Can the sector change?	3. Technology alignment	●	<ul style="list-style-type: none"> New alternate fuels vs. chapter 1 Dual fuel and Fuel ready new builds, small quantities Several pilots, questions on some fuels e.g. ammonia 	Major barrier 100%		Minor barrier 0%
	4. Clarity on roles and decision-making	●	<ul style="list-style-type: none"> Still too many initiatives, with limited alignment 	Major barrier 100%		Minor barrier 0%
How fast can the sector change?	5. Ease of asset replacement	●	<ul style="list-style-type: none"> Recognition of existing fleet measures and new fleet Role of retrofits and scrapping to date not widely discussed 	Major barrier 100%		Minor barrier 0%
	6. Ease of infrastructure replacement	●	<ul style="list-style-type: none"> Held back by lack of certainty on fuel mosaic and capacity for zero emission fuels Some progress on green corridor thinking 	Major barrier 100%		Minor barrier 0%

Source: Industry interviews

Stakeholders view the role of LNG and methanol as transition pathways, with additional hydrogen derivatives playing an expanding role beyond 2035

Deep-sea shipping decarbonisation pathways

* Carbon-based fuel

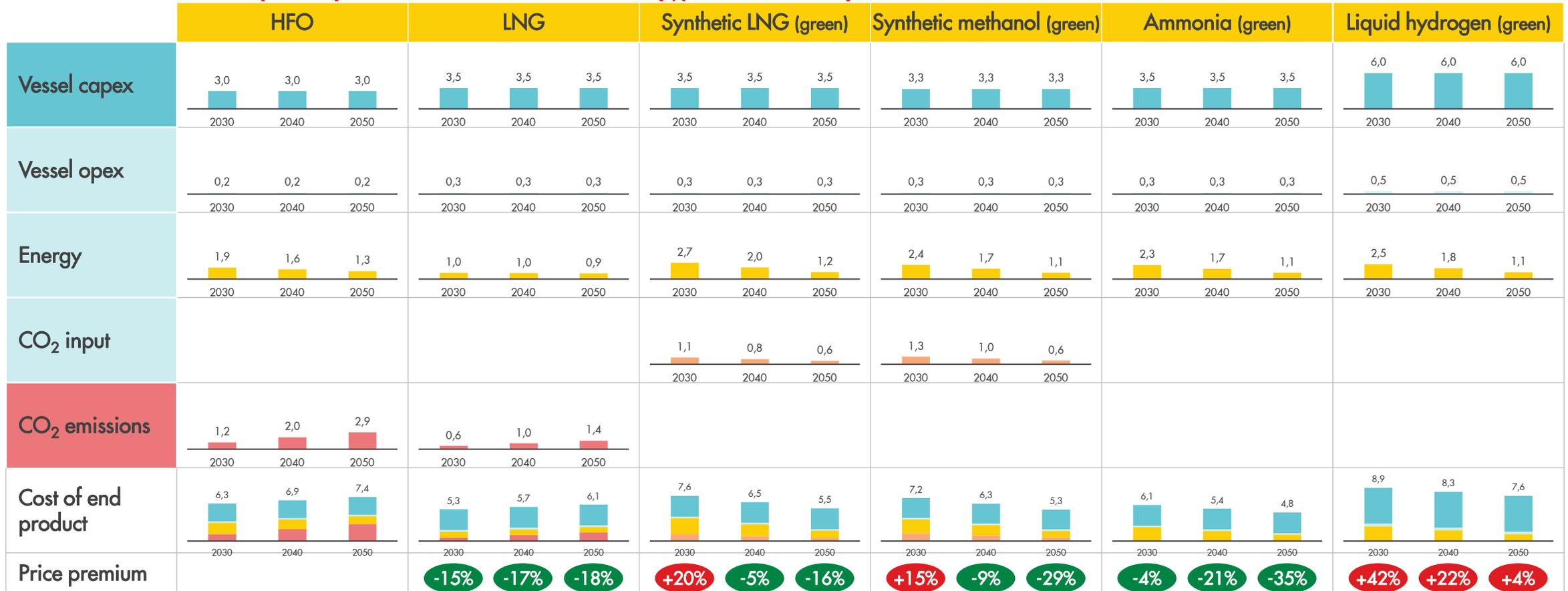


Note: 1) Opportunities for electrifying the short-sea shipping fleet are discussed in the Shell-Deloitte Marine Electrification Report (forthcoming March 2023); 2) Results for ammonia are conditional on if a solution is found for the significant toxicity challenge

Source: American Bureau of Shipping 'Pathways to Sustainable Shipping – 2020', Recharge; Shell-Deloitte "All Hands on Deck" (2020); IEA "Net zero by 2050 – A roadmap for the global energy sector" (2021), Expert interviews

Taking the total cost of ownership view supports the case for creating a level playing field between conventional and alternative fuels through a carbon price

Total cost of ownership comparison of alternative fuels (\$/k tonne-mile)



Notes: Based asset lifetime of 50B tonne-miles and capex of \$150M for HFO, \$174M for LNG, \$167M for methanol, \$174M for ammonia and \$300M for hydrogen; opex of 0.15% of capex; GJ / k tonne-miles of 0.148 oil for HFO, 0.102 for LNG, 0.12 hydrogen + 0.002 electricity for synthetic LNG (incl liquefaction), 0.099 hydrogen + 0.02 electricity for methanol, 0.94 hydrogen + 0.03 electricity for ammonia and 0.10 hydrogen + 0.03 electricity for hydrogen (incl liquefaction); tank-to-wake CO₂ emissions in kg CO₂ / GJ of 0.0774 for HFO and 0.0562 for LNG; CO₂ feedstock need in kg CO₂ / k tonne-miles of 5.6 for synthetic LNG and 6.3 for methanol; CO₂ feedstock assumed from Direct Air Capture at \$200/t by 2030, moving down to \$100/t by 2050
Sources: MMMC, Dechema, PBL, Netherlands Enterprise Agency, Ali et al. - Liquefied synthetic methane from ambient CO₂ and renewable H₂ - A techno-economic study, Deloitte analysis

~60% of shipping decarbonization initiatives globally (excluding LNG) are focused on methanol and ammonia, most in an early stage

Shipping decarbonization initiatives by type and maturity (# of initiatives, Jul '22)

	Vessel design			Bunkering			Fuel production / supply			Σ
	Potential ²	Planned	Operational	Potential ²	Planned	Operational	Potential ²	Planned	Operational	
Methanol	● 2	●●● 7	●● 3	● 1			●● 4	●●●●● 11	● 1	29 (30%)
Ammonia	●●●●●● 16	●● 4	● 1	● 1	● 1		● 2		●● 3	28 (29%)
Liquid H ₂	●●● 6	● 1	● 1				● 2			10 (10%)
Bio						● 1	●●● 6	● 1	● 1	9 (9%)
Electric		● 1	● 1							2 (2%)
Other ¹	● 1						● 1	● 1		3 (3%)
Multiple	● 2			●●● 6			●● 4	● 2	●● 3	17 (17%)
Σ	27	13	6	8	1	1	19	15	8	98 (100%)

E.g., Maersk ordering dual fuel methanol-HFO container vessels



E.g., Yara pre-ordering 15 floating ammonia bunkering terminals for operation in Scandinavian ports in 2024



E.g., Maersk entering in six partnerships with fuel producers for offtake of ~0.8 Mt bio- and e-methanol



Notes: 1) Nuclear, CCS, LPG; 2) Potential includes very early stage announced initiatives without specific plans / timelines; Source: Company announcements, Deloitte analysis

To unlock the next steps, leading & enabling roles have been identified for each solution theme

Stakeholder responsibility matrix

Responsibility: ■ Lead role ■ Enabling role

Barriers	Chapter 2 solution themes	Owners/ operators	Charterers	Cargo owners	Regulators	Financiers	Ports	Fuel providers	Shipyards	Crew
Market & customer demand	1 Demand aggregation	Lead	Lead	Lead	Enabling					
	2 Segment-based approach	Enabling	Enabling	Lead	Lead					
	3 Financing				Lead	Lead				
	4 Transparency	Enabling	Enabling	Lead						Enabling
Regulatory incentives	5 Regulation				Lead	Enabling	Enabling			
Technology alignment	6 Fuel landscape				Enabling			Lead		
Asset replacement	7 Efficiency measures	Lead	Enabling	Lead					Lead	Enabling
	8 Timely fleet replacement	Lead	Enabling						Lead	
	9 Yard capacity								Lead	
Infrastructure replacement	10 Hubs				Lead			Lead		
	11 Green corridors	Lead	Enabling	Lead	Enabling	Enabling	Lead	Lead		
Roles & decision making	12 Health, safety & environment	Lead	Lead		Lead					Lead
	13 Platform strategy	Lead			Lead		Enabling	Enabling	Enabling	Enabling

Takk for oss!



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