



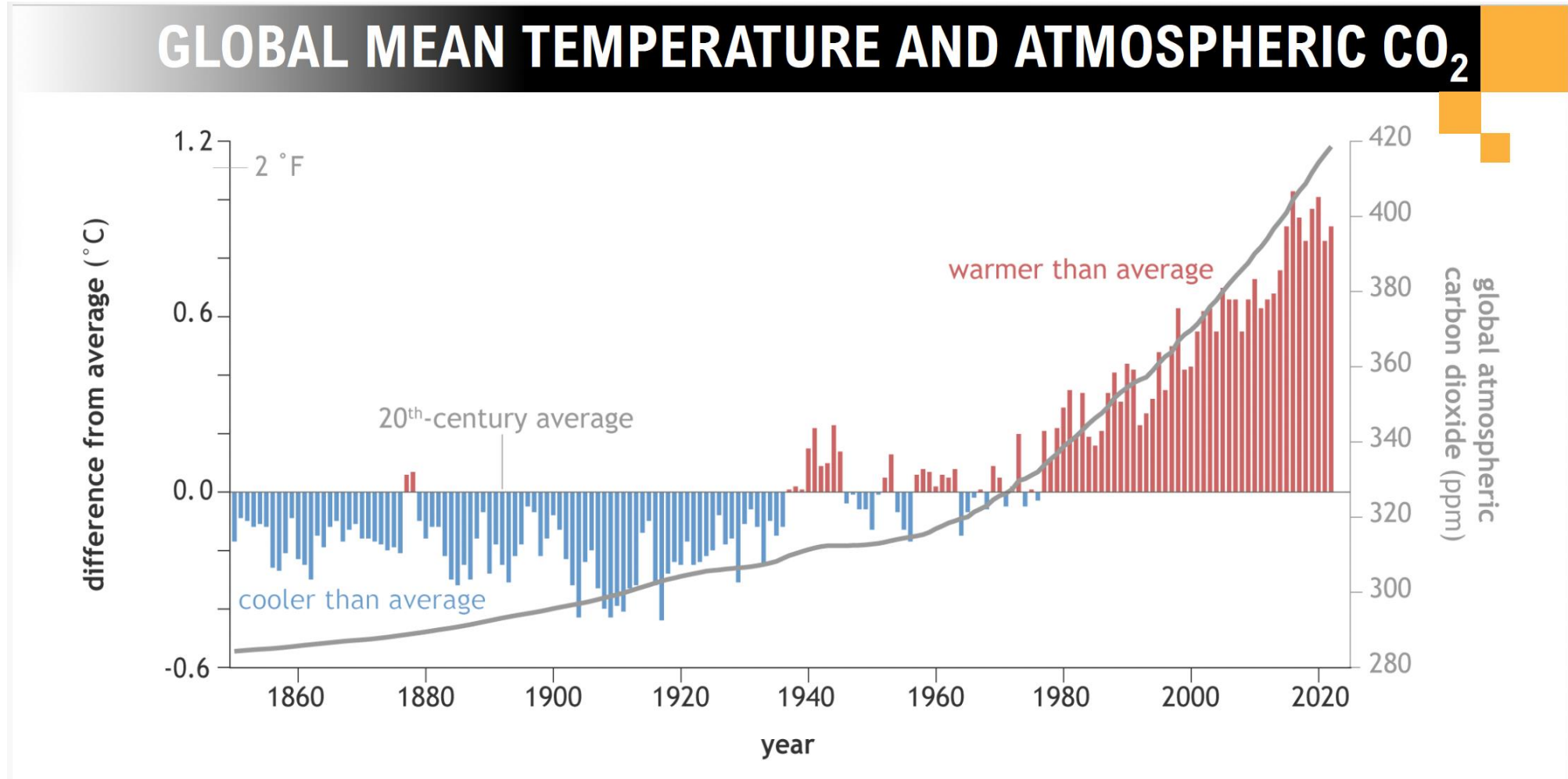
CEM-Hubs and GCMD's perspectives on maritime transition

Dr Sanjay C Kuttan, Chief Strategy Officer

Green Fuels Transition for International Shipping Workshop

22 November 2024

Our existential threat



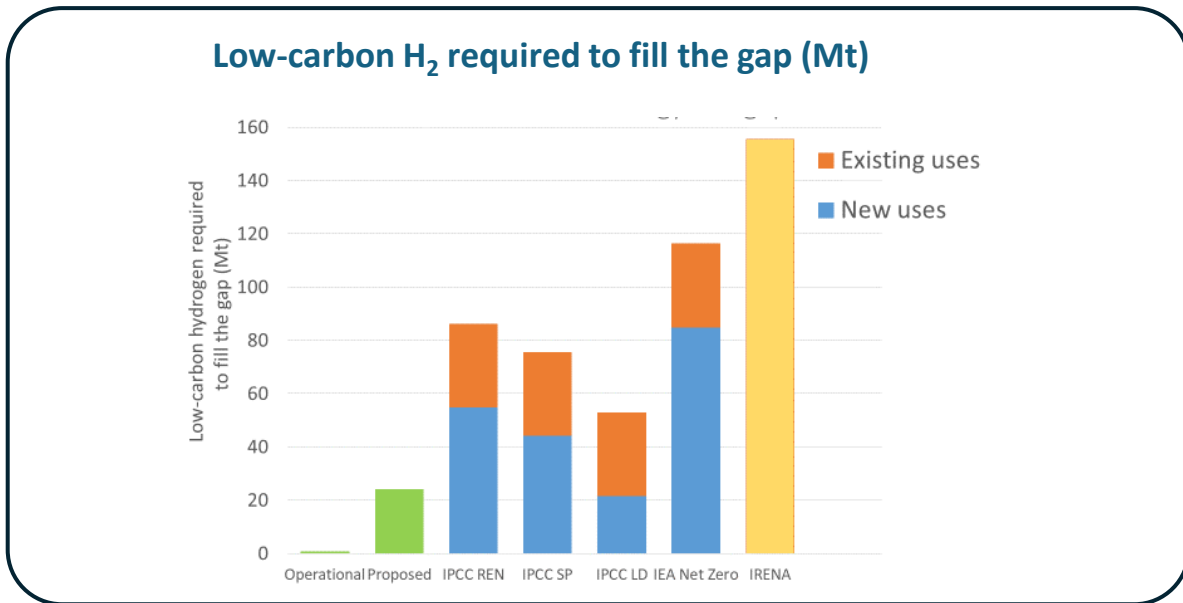
Annual global surface temperature compared to the 20th century average from 1850-2022 and atmospheric CO₂ concentration

The maritime energy transition is constrained by the availability of low-carbon hydrogen

Which is in turn limited by green electrons

Limited low-carbon hydrogen

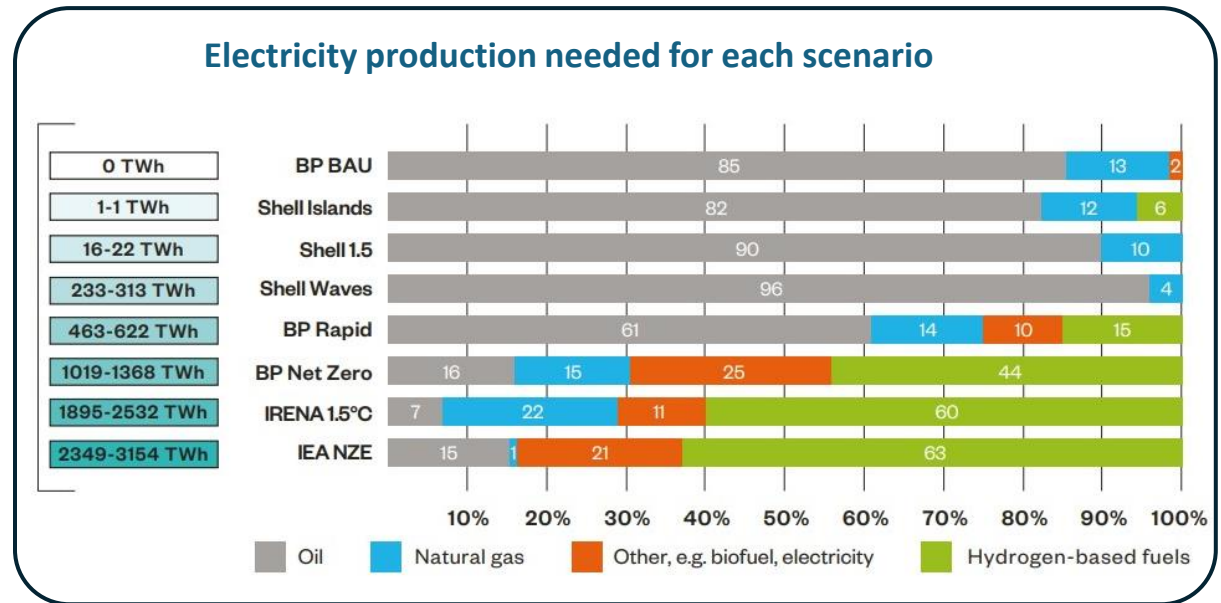
Significant gaps exist between government announcements and real progress.



Source: Tyndall Centre/ International Chamber of Shipping, 2022

Limited green electrons

> 3,000 TWh of electricity required to reach net zero; the energy transition demands scale and speed.

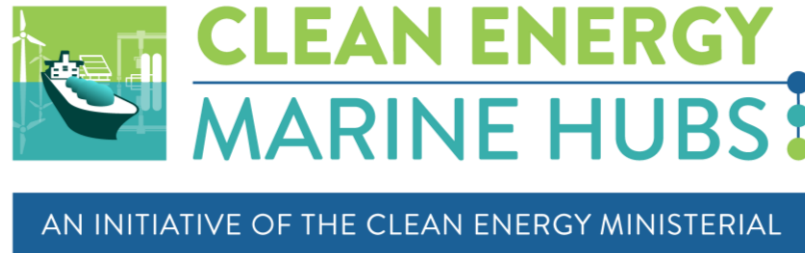


Source: Clean Energy Marine Hubs, October 2024

About Clean Energy Marine Hubs (CEM-Hubs)

The Energy-Maritime high-level global initiative established to deliver scale and pace of decarbonisation

First-of-its-kind, cross-sectoral public-private platform

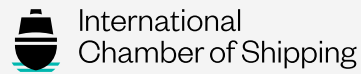


- + **Public-Private Platform:** bridging the energy-maritime value chain (ports, energy and fuel producers, shipping, finance and governments)
- + **Global cross-sectoral platform:** sharing knowledge and data to de-risk investments; establish hubs to accelerate production, transportation and demand aggregation of low-carbon fuels
- + **Co-led by government and industry:** industry taskforce of CEOs and energy ministers

Initiative proposed by



CEM members represent 90% of installed clean energy generation capacity, 80% of global clean investments.



ICS represents national ship-owners associations, representing over 80% of the global fleet.



IAPH members represent 60% of seaborne trade and 60% of world container traffic.

CEM-Hubs partnerships key to success

Co-leading governments



Canada



UAE

Seven supporting governments



Brazil



Canada



Greece



Norway



Panama



UAE

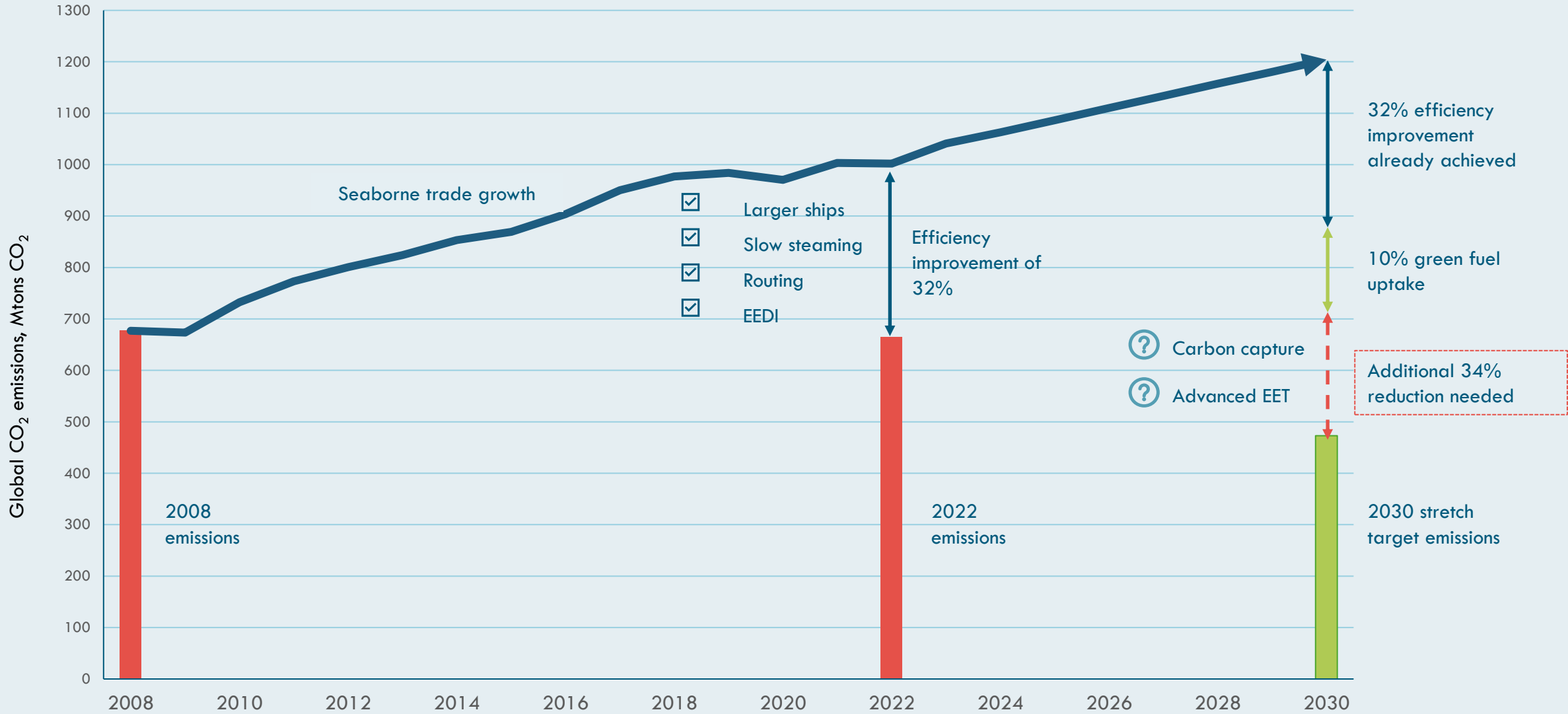


Uruguay

Supporting organisations



Massive gains needed to achieve 2030 stretch targets



Source: GCMD analysis, UNCTAD review of maritime transport 2023, IMO DCS fuel consumption report 2019-22, Review of Evidence On Emissions Reduction Pathways MEPC 79/INF.29, Report on annual carbon intensity and efficiency of the existing fleet MEPC 81/6/1, IMO 4th GHG Study

Use of alternative fuels has many considerations

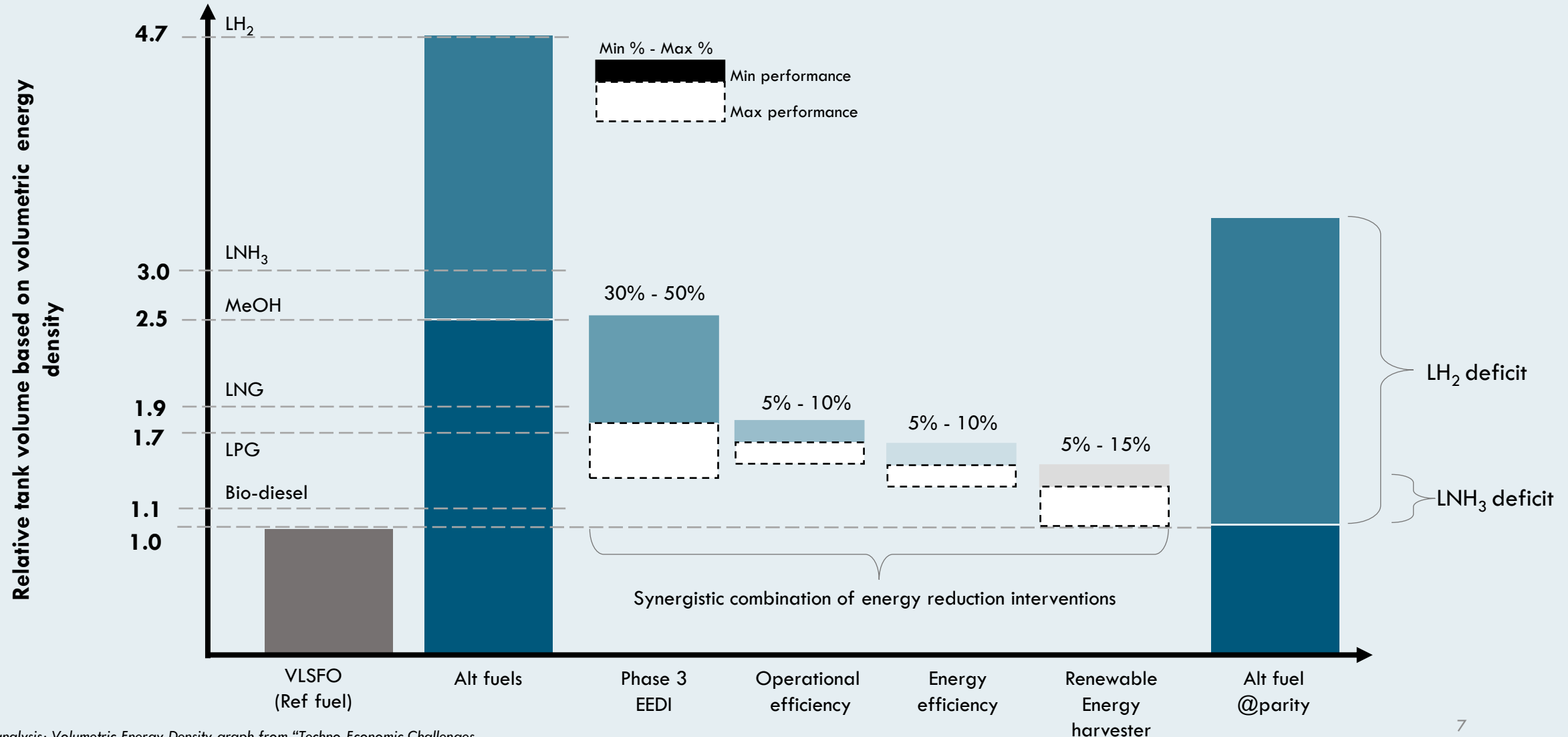


- Sustainable feedstock availability
- Fuel production scalability
- Storage infrastructure
- Handling safety
- Volumetric Energy density
- Regulations
- Conversion technology
- Cost drivers

	Sustainable feedstock availability	Fuel production scalability	Storage infrastructure	Handling safety	Volumetric Energy density	Regulations	Conversion technology	Cost drivers
Fossil fuels	No sustainable feedstock	Full scale	Developed infrastructure	Mature	~ 36 MJ/L depending on type of fossil fuel	Mature	Mature	Global market demand
Biofuels	Limited (high sectoral competition)	Feedstock dependent	Can leverage existing infrastructure	Mature	~33 MJ/L depending on feedstock	Mature	Available with long term tests ongoing	Dependent on feedstock + demand
Hydrogen	Unlimited (water)	Limited by electricity only	New dedicated infrastructure needed	Flammable + safe handling still being developed	4.5 MJ/L (compressed) – 8.0 MJ/L (Liquid)	Under development	R&D stages	Green electrons / CCS + storage + handling
Methanol	Limited (carbon + water)	Limited by carbon (DAC, CCS) tech	More dedicated buildout needed	Mature	15.8 MJ/L	Mature	Available in early stages	Cost of H ₂ + carbon + synthesis
Ammonia	Unlimited (air & water)	Limited by electricity only	More dedicated buildout needed	Toxic + safe handling still being developed	12.9 MJ/L	Under development	R&D stages	Cost of H ₂ + synthesis

A holistic approach for adopting alternative fuels

Alternative fuels are higher in prices, lower in energy densities and have lower availabilities than conventional fuel oil



Respondents plan to adopt ammonia as early as 2029

Current and planned adoption of future fuels



Frontrunners

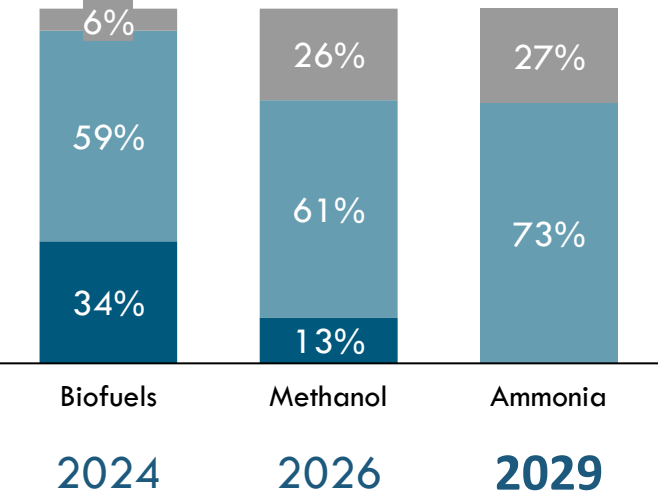


Followers

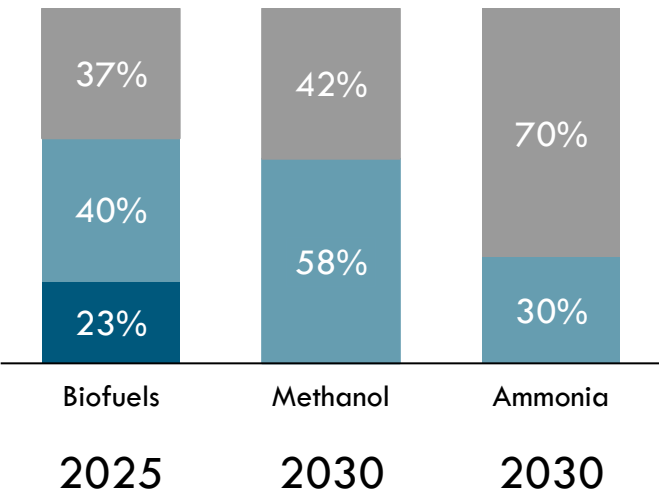


Conservatives

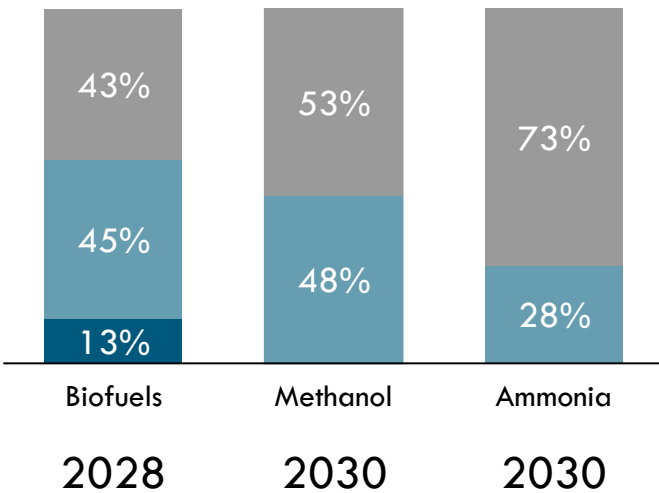
% of respondents



% of respondents



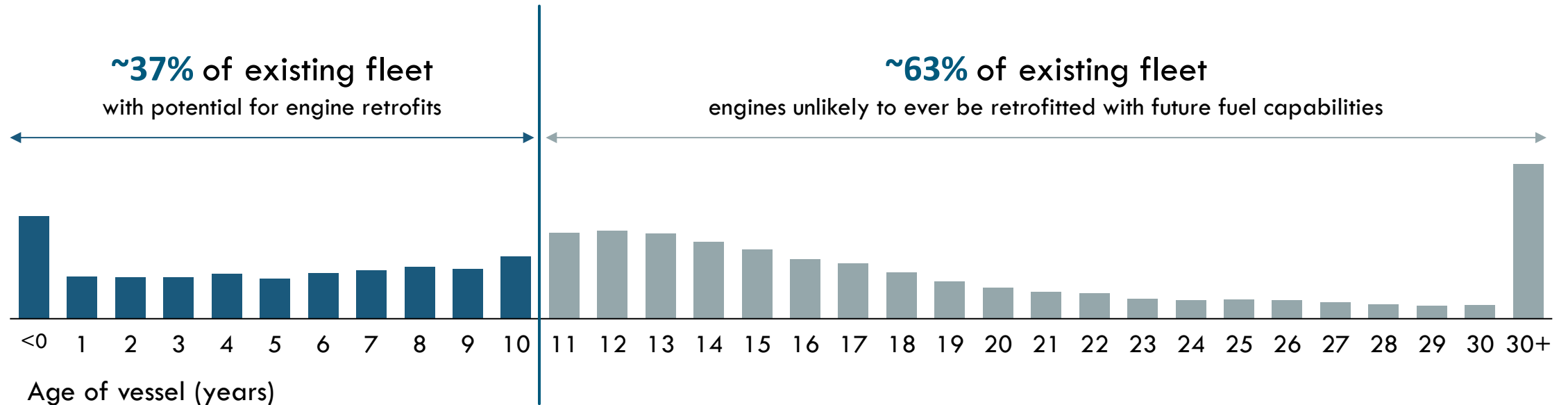
% of respondents



Already adopted
 Plans to adopt
 Not sure/no plans

Fuel transition will take time; new builds will most likely drive demand

Most survey respondents would **not** equip vessels **>10 years old** with future fuel capabilities



Actual volumes to be retrofitted likely **lower** given constraints on shipyard capacity, willingness to spend, fuel supply availability, engine availability, and port readiness

Ammonia engines will be ready within the next two years



- + Wärtsilä will be building the engine for Equinor’s ammonia-powered supply vessel. The vessel will be fully converted and put into operation with low emissions in 2026. ([Link](#))



- + Engine maker MAN says it will deliver about 30 ammonia dual-fuel engines in the next three years. ([Link](#))



- + Japan Engine Corporation expects to complete development of its first ammonia-fuelled engine in 2025. ([Link](#))



- + WinGD on track to deliver its first X-DF-A dual-fuel ammonia engines by 2025. ([Link](#))



- + World’s first commercial-use ammonia-fuelled tugboat, Sakigake, currently on trial in Tokyo Bay. Engine installed by IHI Power Systems. ([Link](#))

“Investment into alternative fuel continued in first half 2024, accounting for around one third of all newbuild orders and 41% of all tonnage placed and with orders announced for vessels capable of using either LNG (109 orders, 51 excluding LNG Carriers), methanol (49 orders), ammonia (15 orders), LPG (42 orders) and Hydrogen (4 orders).” – Clarksons, 17 Jul 2024.

Shipyard capacity constraints will thwart decarbonisation efforts, with only one dry dock opportunity before 2030

A PART OF WATCH MEDIA

SHIPPINGWATCH


TUESDAY 26 MARCH 2024

CARRIERS SUPPLIERS OFFSHORE PORTS LOGISTICS REGULATION PEOPLE


25/03/2024 | at 13:22 CARRIERS

Borealis Maritime founder warns of labor shortage in shipyards

Yards in Asia are struggling to meet their delivery times, posing a problem for shipping companies, says Borealis Maritime chief Christoph Toepfer.



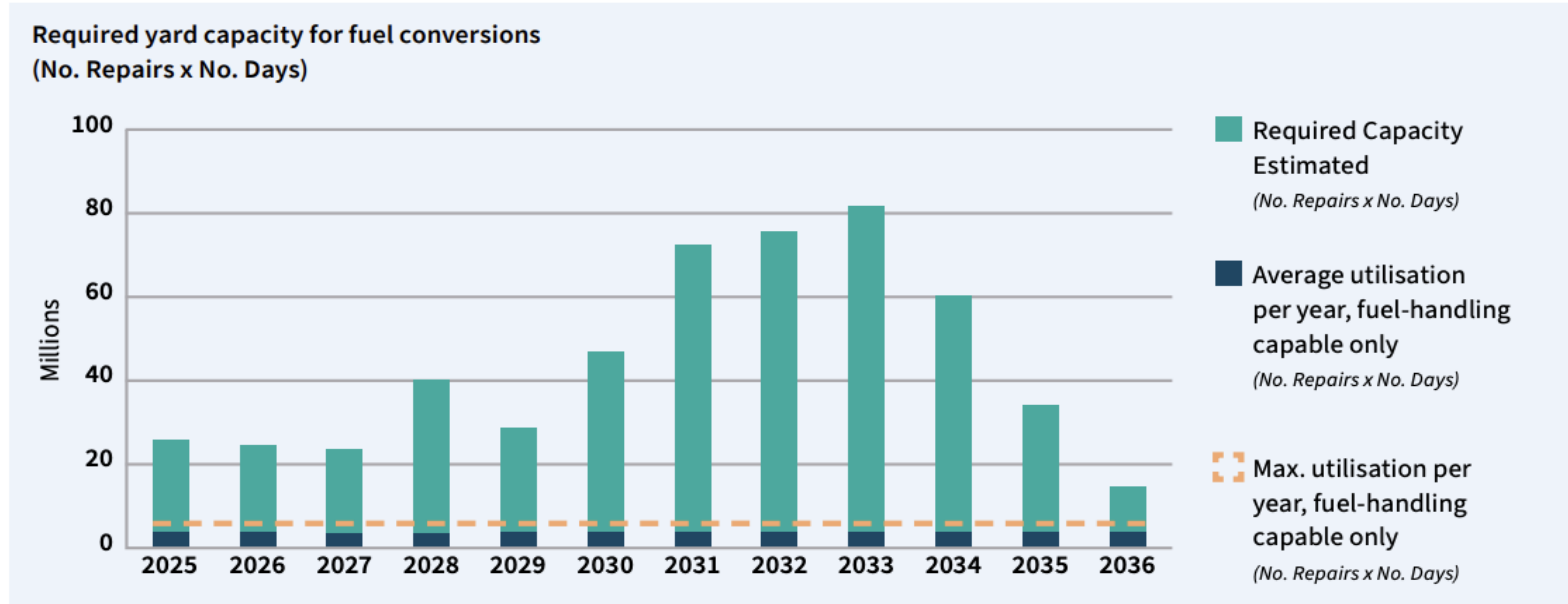
riviera))) Events Bus



Stena Germanica was the first vessel retrofit to burn methanol in 2015 (source: Stena Line)

Shipyard capacity shortfall jeopardies transition of existing fleet to future fuels

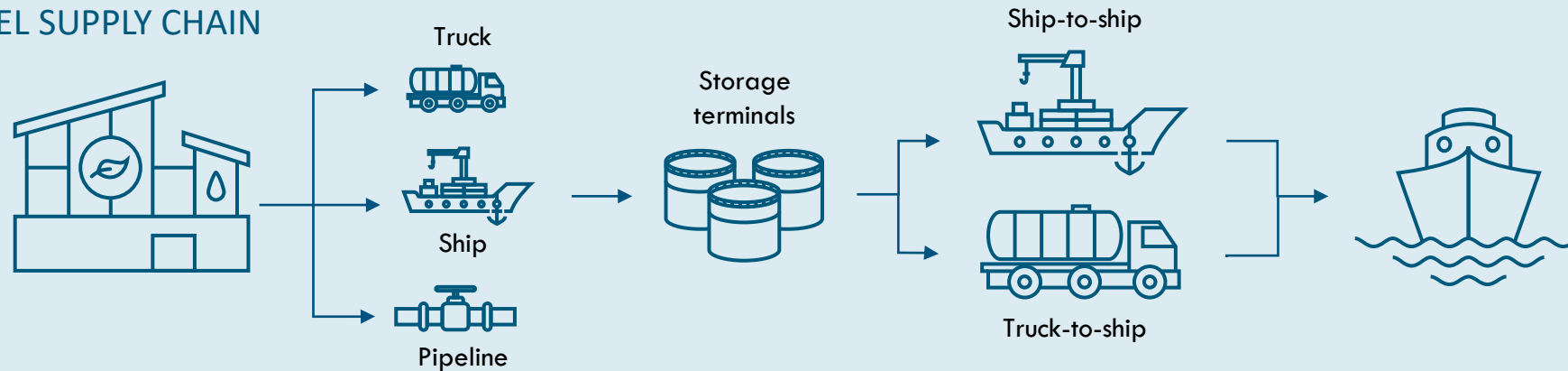
11 Oct 2023 by John Snyder



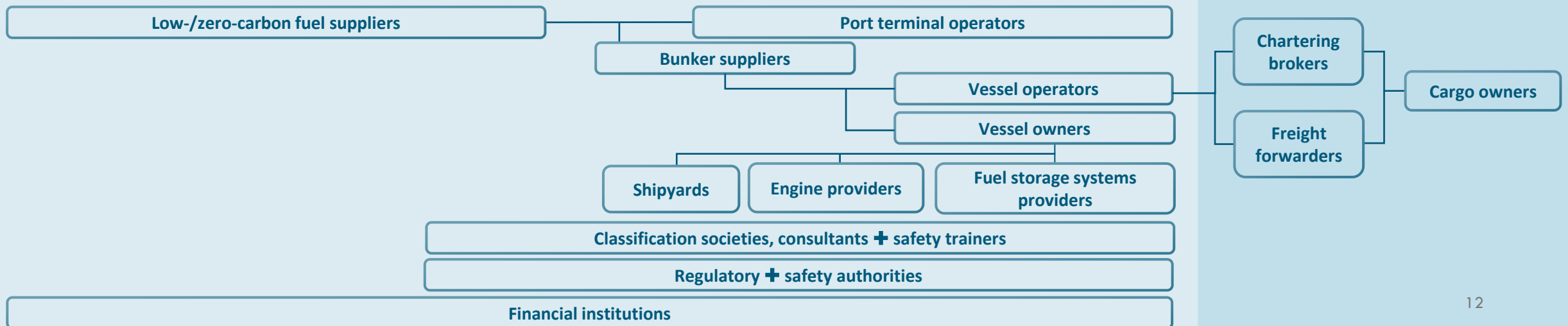
- + Lloyd's Register has identified 15 yards capable of handling 308 alternative fuel retrofits in total each year assuming a 60-day conversion period
- + Capacity would need to be increased dramatically to fulfil potential demand for methanol and ammonia conversions

Complete greening of the maritime supply chain requires all stakeholders across the value chain to play their role

FUEL SUPPLY CHAIN










STAKEHOLDERS



Drivers to accelerate maritime decarbonisation

GCMD has identified eight key levers, of which we are currently focused on six.

<p>01</p>  <p>Policy</p> <ul style="list-style-type: none"> + International Maritime Organisation + Regional + National + Standards 	<p>05</p>  <p>Supply accessibility</p> <ul style="list-style-type: none"> + Production capacity + Supply chain reliability + Custody transfer + Ports and terminals readiness + Standards (safety & operations)
<p>02</p>  <p>Low/ zero carbon solutions</p> <ul style="list-style-type: none"> + Availability + Performance validation / verification of EET + Lifecycle assessment of fuels 	<p>06</p>  <p>Financing</p> <ul style="list-style-type: none"> + Green financing + Business models + Adoption incentives + Market based mechanisms
<p>03</p>  <p>Data/ information</p> <ul style="list-style-type: none"> + Sensors + Communication + Algorithms + Analytics + Interoperability standards 	<p>07</p>  <p>Demand signals</p> <ul style="list-style-type: none"> + Consumer/ customer + Green procurement + Demand aggregation
<p>04</p>  <p>Training</p> <ul style="list-style-type: none"> + Capacity + Skills & knowledge + Certification + Timeliness 	<p>08</p>  <p>Shipyard</p> <ul style="list-style-type: none"> + Capacity + Availability + Capability + Quality

How GCMD is helping to support maritime decarbonisation


Our initiatives:

- + Enabling ammonia as a marine fuel
- + Assuring the quality, quantity and emissions abatement of drop-in green fuels
- + Unlocking the carbon value chain
- + Scaling adoption of energy efficiency technologies

Our contributions to standards and guidelines:


- + Representation on Singapore Standards Development Organisation (SSDO) and Society for Gas as a Marine Fuel (SGMF)
- + Co-author for ABS's methanol bunkering advisory
- + Contributed to IMO's paper (MEPC 81/INF.4) "Carriage of biofuels and their blends by ships"



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