De-carbonization in shipping / GHG reduction

Implications for the Maritime Industry

Pawan Sahni

Dubai 3rd July 2019

Is Shipping GHG Emissions Bad ?

- Carbon Disclosure Project (CDP) – Non profit Charity runs the global disclosure system for environmental impact
- Shipping accounts for about 3% of total global emissions and 10% of transport emissions. Roughly equivalent to that of aviation but it transports some 80% of global goods.
- CDP's head of investor research, Carole Ferguson "Marine freight is one of the least emission-intensive modes of transport; therefore critical to the low-carbon transition. But as the global economy grows, the industry could account for 17% of global emissions by 2050, if nothing is done
- Maersk and Bolloré Logistics committed to a 20% cut in CO2 emissions by 2025 on Bollore shipments at the Paris Air show last week .

Tuesday morning at the IMO - opening of GHG intersessional


NO MORE
DIRTY SECRETS
1.5 TO
SURVIVE
IMO DONT
SINK PARIS
100%
BY 2050

IMO strategy on GHG reductions – vision and ambitions

- Vision:

"IMO remains committed to reducing GHG emissions from international shipping and, as a matter of urgency, aims to phase them out as soon as possible in this century"

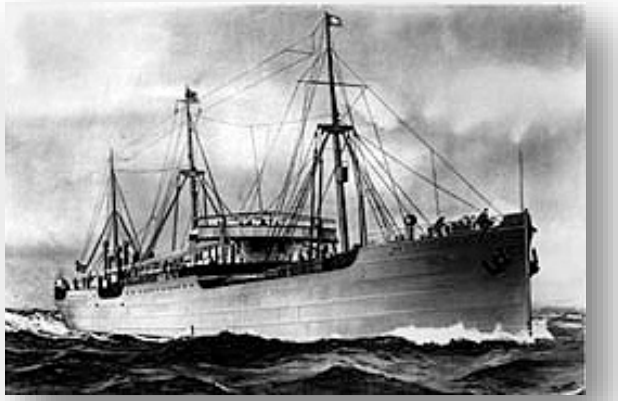
- Ambitions:
  - review EEDI with the aim to strengthen requirements
  - reduce the average carbon intensity (CO2 emissions per transport work) by **40% in 2030 and 70% in 2050** compared to 2008
  - reduce total GHG emissions from shipping by at least **50% in 2050** compared to 2008

IMO

COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

IMO strategy and workplan on GHG reductions - impacts

- Will start to impact vessel design and operation in the early 2020s
- In the long term, development and wide-spread use of **carbon neutral fuels** is essential, in addition to energy efficiency and logistics measures
- Ships have changed a lot over the last 150 years; nevertheless, **further radical changes can be expected by 2050…**



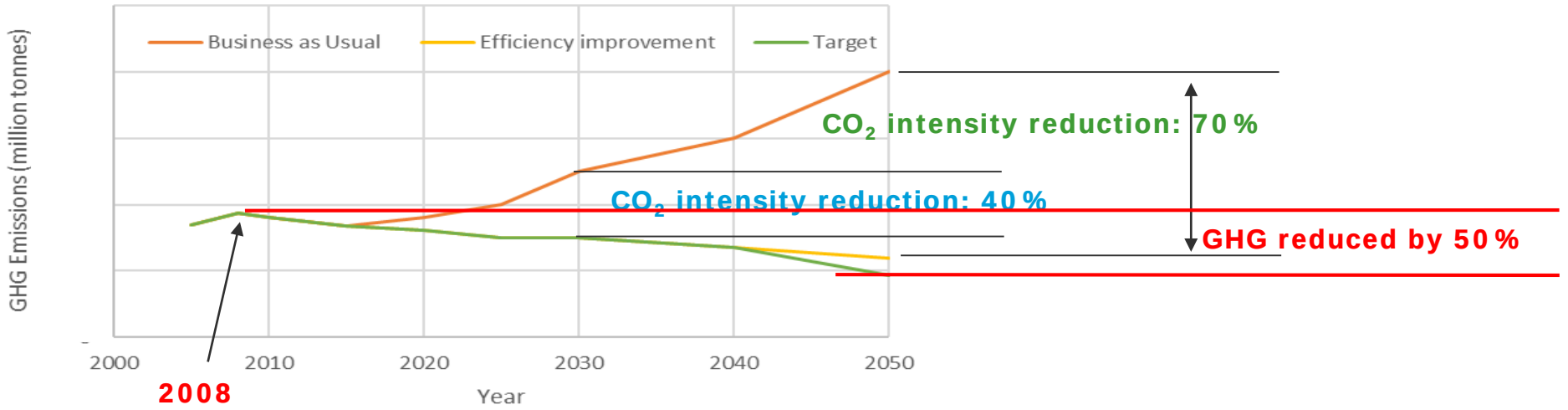
MEPC 74 - Reduction of GHG emissions from ships

- Procedure for "**assessing impact on states of candidate measures"** approved
- 4th GHG study Terms of Reference agreed. **Study will conclude at MEPC 76 in 2020** and will be significant for review of GHG strategy and agreement on further measures
- Reductions discussed with **primary focus on short-term EEDI- and SEEMP-based measures**. Consensus that these need to be approved at MEPC 76 latest for entry into force by end-2022
- Around **40 measures in 14 categories** proposed. Further consolidation and legal text discussions at **two intersessional meetings prior to MEPC 75**

Illustration of steps and possible time frames for GHG regulation(s)expected to enter into force end-2022 at the latest

Time frame	Example 1	Example 2	Associated work	Impacts on States
Autumn 2019	ISWG-GHG 6 initiates development of draft amendment	ISWG-GHG 6 initiates development of draft amendment	Update or development of guidelines, as appropriate	Assessment of impacts on States
Spring 2020	MEPC 75 further develops draft amendment	MEPC 75 approves amendment		
Autumn 2020	MEPC 76 approves amendment	MEPC 76 adopts amendment		
Spring 2021 (at least six months later)	MEPC 77 adopts amendment			
Autumn 2021		Acceptance		
Beginning 2022 (at least 10 months later)	Acceptance			
Mid 2022		Entry into force		
End of 2022 (six months later)	Entry into force			

IMO GHG timelines



Initial GHG strategy

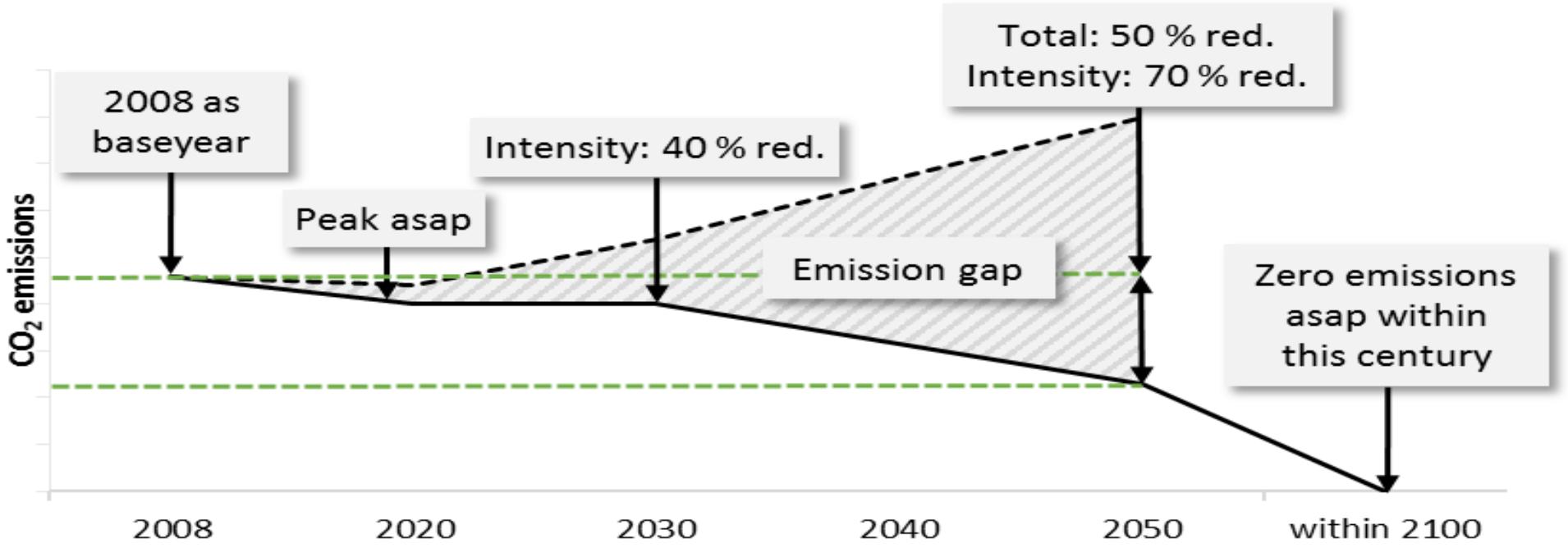
- 2008: Base year
- 2030: 40% carbon intensity improvement
- 2050:
  - 70% carbon intensity improvement
  - GHG reduced by 50%

Short-term measures: 2018 – 2023

Mid-term measures: 2023 – 2030

Long-term measures: 2030 – 2050

Initial IMO Strategy on reduction of GHG emissions - vision and ambitions



Short-term 2018 – 2023

- Tighter EEDI & SEEMP
- Energy efficiency indicators
- Speed reduction
- National Action Plans

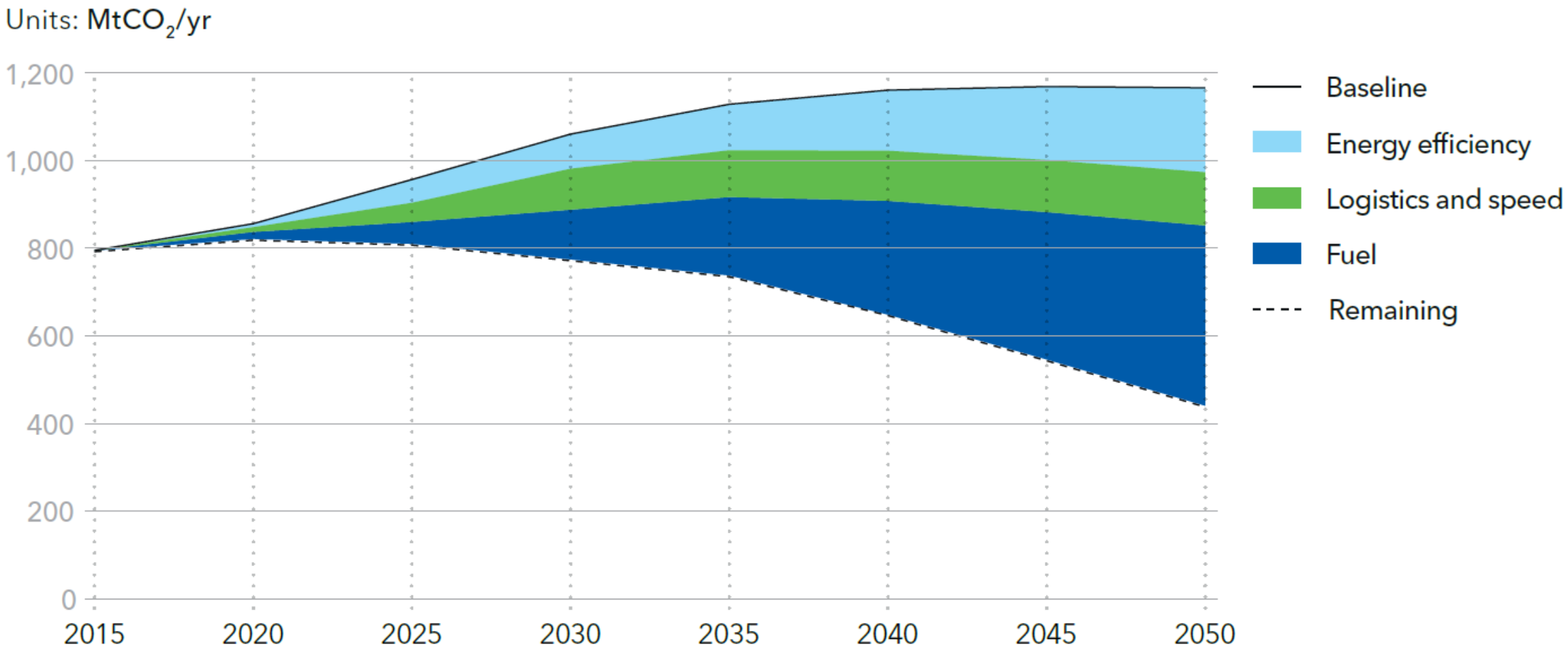
Mid-term 2023 - 2030

- Energy efficiency measures for new and existing ships, using new indicators
- Carbon pricing / MBM
- Plan for low carbon fuels

Long-term 2030 →

- Development of carbon neutral / zero carbon fuels
- New/innovative emission reduction mechanisms

Possible emission pathway 2015 - 2050



Source: DNV GL Maritime Forecast to 2050 Published 2018

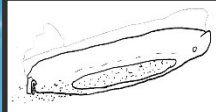
There is a range promising CO_2 measures and effective reduction strategies

In addition to **energy-efficiency measures**, reaching the IMO target for reducing GHG emissions from shipping will most likely require widespread uptake of **fuels** with a high GHG reduction potential

LOGISTICS & DIGITALIZATION

- Speed reduction
- Vessel utilization
- Vessel size
- Alternative routes

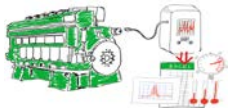
>20%



HYDRODYNAMICS

- Hull coating
- Hull form optimization
- Air lubrication
- Cleaning

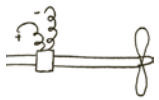
10-15%



MACHINERY

- Machinery improvements
- Waste heat
- Engine de-rating
- Battery hybridization

5-20%



FUELS AND ENERGY SOURCES

- LNG/LPG
- Electrification
- Biofuel
- Synthetic/hydrogen etc

0-100%

Energy Efficiency Measures

- Effectiveness of energy efficiency measures depends on ship
  - Segment
  - Size
  - Operational pattern

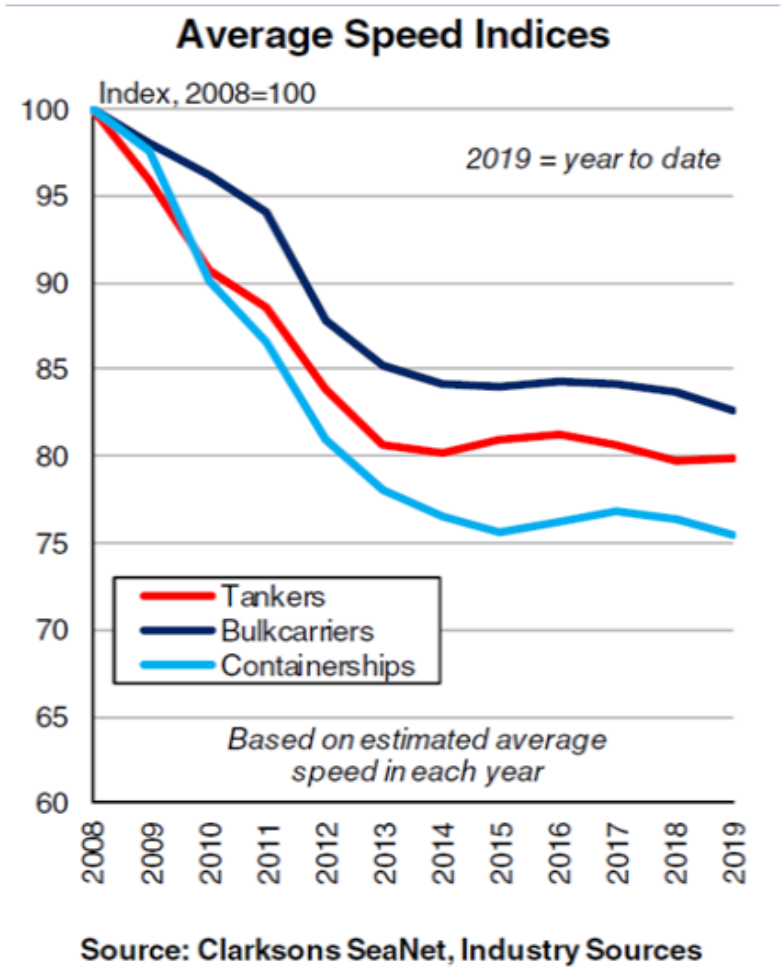
- **Barriers:**
  - **Split incentives**
  - **High capital costs**

- **Enablers:**
  - **Regulations**
  - **High fuel prices**
  - **New financing schemes**

FUEL OPTION	GHG EMISSIONS CHANGE (RELATIVE TO BASELINE)	ENERGY EFFICIENCY	FUEL SAVINGS (DEPENDING ON SHIP TYPE AND SIZE)	
			MAIN ENGINE	AUXILIARIES
Baseline: Switch to Low S Fuels	-	Hull Form – New buildings	12-17%	-
HFO with scrubbers	+5%	Hydrodynamics – Retrofit	13-20%	-
LNG	-20%	Machinery improvements	4-8%	12-23%
LPG	-17%	Waste Heat Recovery	0-8%	-
Methanol (from Natural Gas)	+5%	Hybridization	3-15%	
Biodiesel	-50%	Operational measures	3-11%	-
Biomethanol	-50%	Cold Ironing	-	30-70%
LBG (Liquefied Biogas)	-90%	Renewable Energy (Solar, Wind)	0-10%	0-2%
Electricity from renewables	-50% to -20%	Air Lubrication	3-5%	-
Hydrogen	Depending on H_2 production	CUMULATIVE PER VESSEL	21-37%	
Nuclear	-99%	Speed reduction	Fuel savings depend on % of speed reduction. New vessels may have to be used to cover transport demand, therefore reducing the overall savings.	

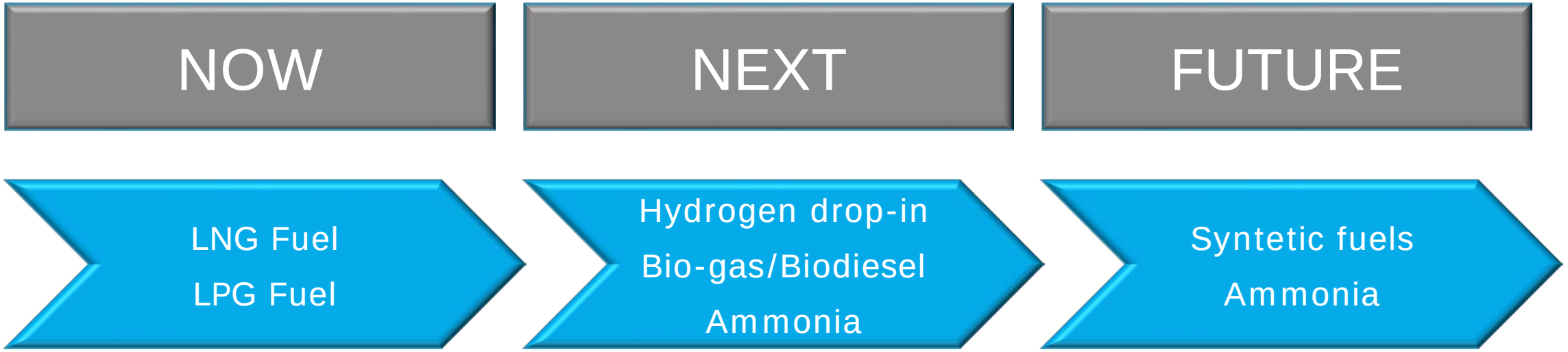
Speed Reduction

- Speed already reduced by approximately 20%
- Potential for limited additional savings from existing vessels
  - Aggressive speed reduction may require re-design of:
    - Hulls
    - Propellers
    - Machinery systems
    - Logistics value chains

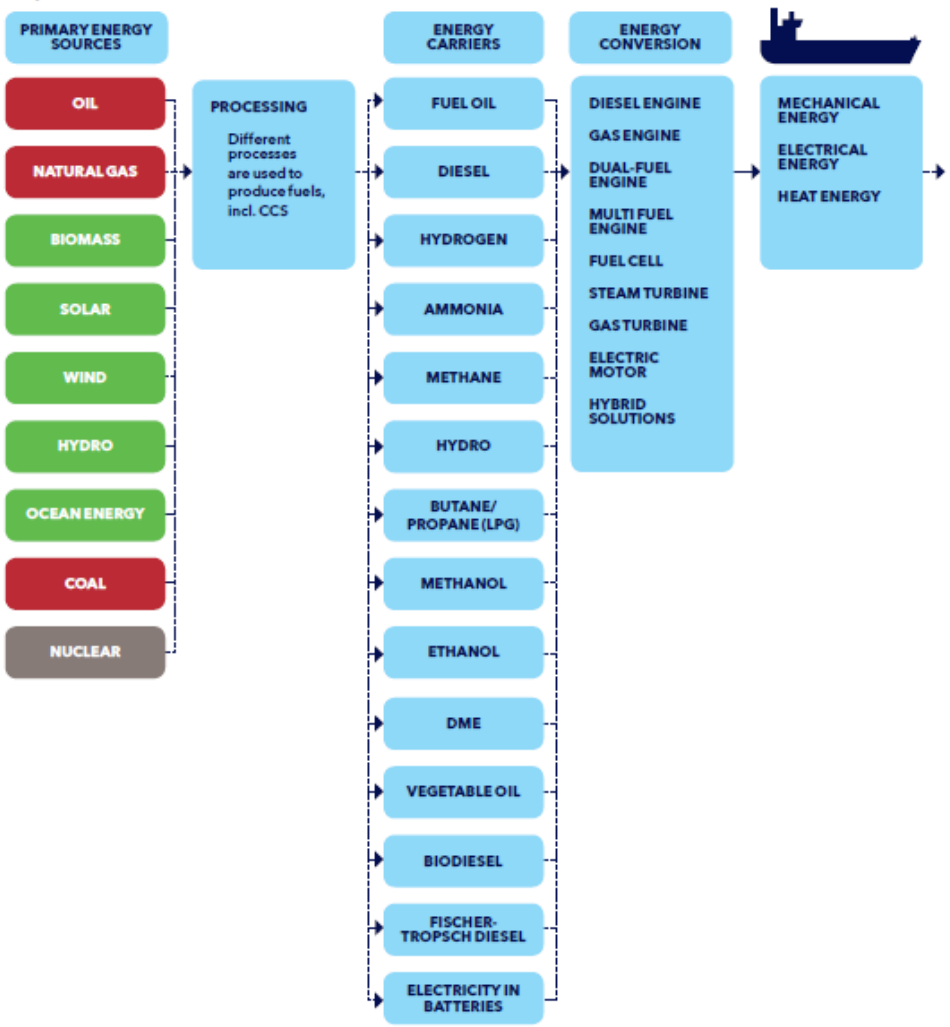


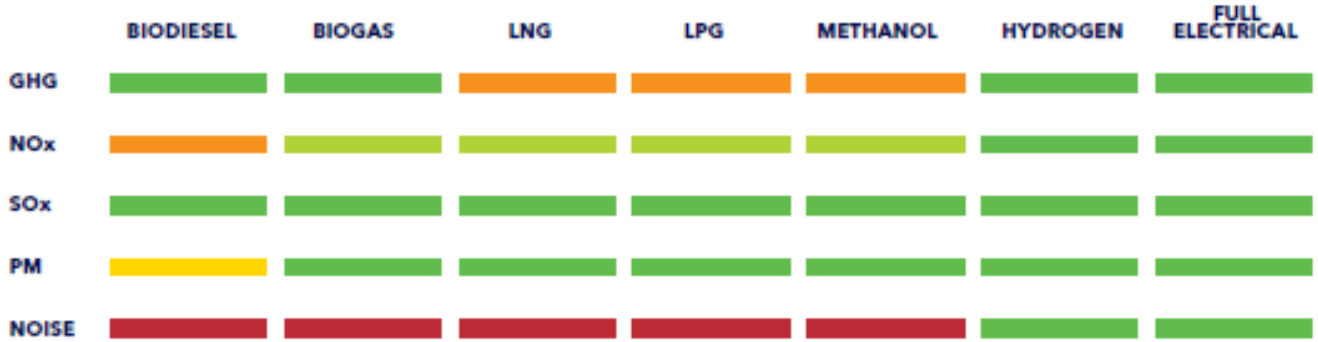
Source: Clarksons SeaNet, Industry Sources

EXAMPLE: A possible development towards carbon neutral shipping



A multi-solution future?

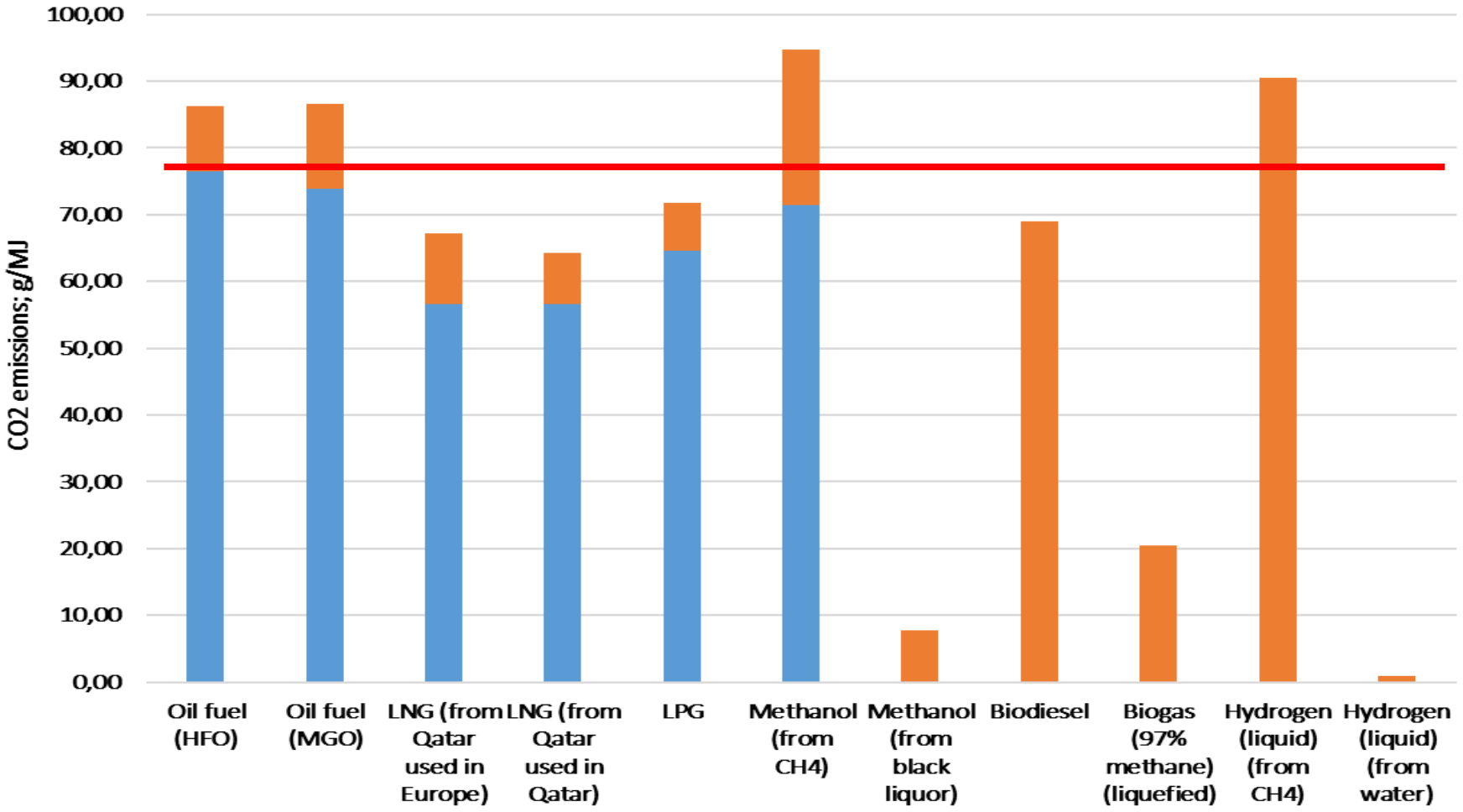




(tank-to-propeller)

- **A range of alternative fuels and technologies** possibilities
- **The reduction potential varies widely**, depending on the primary energy source, the fuel processing, the engine type / converter, and the supply chain
- **Cost, applicability & scalability** will be critical
- Vital to also recognize the **footprint of other types of emission** from alternative fuels and technologies; mainly NOx, SOx, and PM

CO2 equivalent emissions of some fuel alternatives in shipping



WTT Well To Tank

TTP Tank To propeller

For TTP no slip effects considered

For WTT slip is considered

What can owners do now?

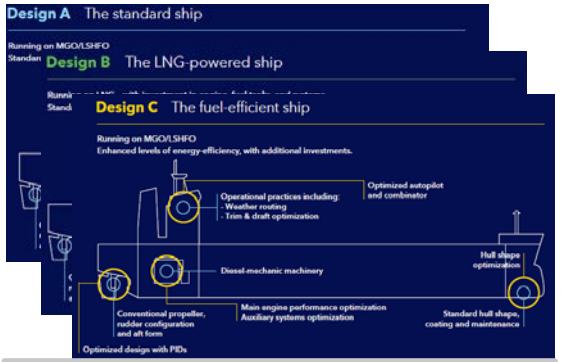
Carbon Robust Model

The Carbon Robustness Framework
Ensuring a competitive ship under possible future scenarios

Your designs

vs

Competing fleet



Design choices

Design C

Design A

Design B

Competitiveness

Top 5 %

Bottom 5 %

Break-even cost:

- Capital costs
  - 30% equity/70% loan
  - 20 year repayment
- Voyage costs
- Operational costs

Fuel prices

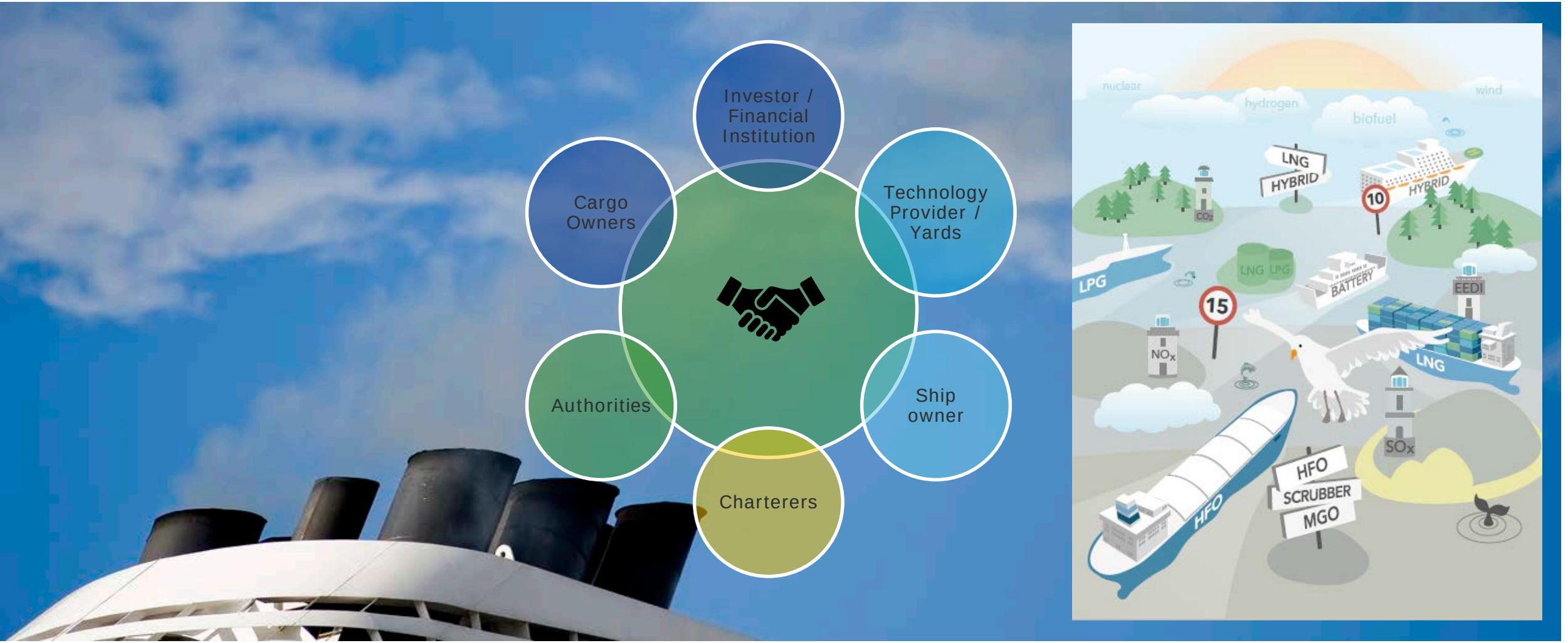
CO_2 Price

Variables

Year

Policy scenarios

How can industry stakeholders work together?

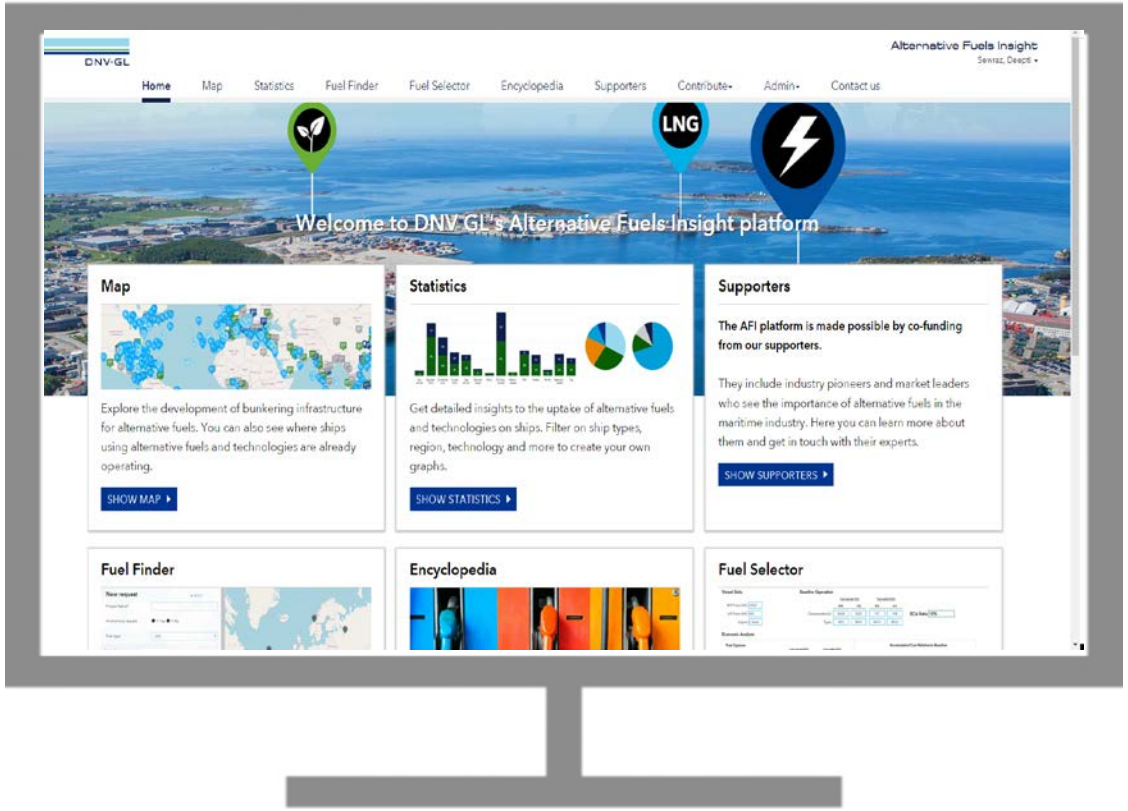


The way ahead

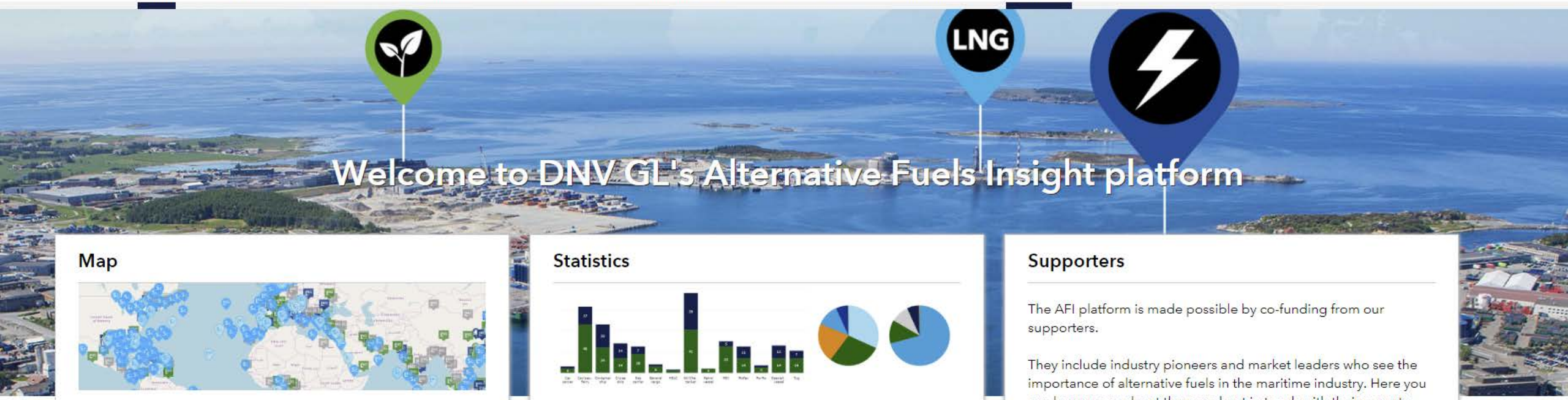
- ⇒ More diversified fuel mix
- ⇒ Fuel & technology cost: main deciding factor
- ⇒ Alternative fuels will be introduced at a slow pace, if not driven by regulations
- ⇒ Focus on energy efficiency

DNV GL's Alternative Fuels Insight (AFI): the maritime industry knowledge hub for alternative fuels

- **Freely available platform** on alternative fuels and technologies
- **Interactive map and statistics** with current status on ship uptake and bunkering infrastructure
- **Fuel Finder** lets ship owners connect with suppliers of alternative fuels for specific projects
- **Encyclopedia** with environmental, technical and financial information on a wide range of fuels and technologies
- **Alternative fuels benchmarking tool** to compare financial performance of alternative fuels for a specific project



AFI enables users to navigate a constantly changing landscape on alternative fuels through comprehensive, up-to-date and objective information



Welcome to DNV GL's Alternative Fuels Insight platform

Map

Explore the development of bunkering infrastructure for alternative fuels. You can also see where ships using alternative fuels and technologies are already operating.

Statistics

Get detailed insights to the uptake of alternative fuels and technologies on ships. Filter on ship types, region, technology and more to create your own graphs.

Supporters

The AFI platform is made possible by co-funding from our supporters.

They include industry pioneers and market leaders who see the importance of alternative fuels in the maritime industry. Here you can learn more about them and get in touch with their experts.

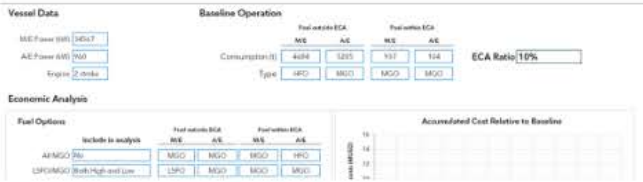
Fuel Finder

Connect instantly with suppliers of alternative fuels by submitting your own bunker request.

Encyclopedia

Learn more about the properties of a wide range of alternative fuels and technologies.

Fuel Selector



Compare the financial performance of LSFO, HFO with scrubber, LNG, LPG and methanol for your ship. Use DNV GL's assumptions or apply your own to calculate lifecycle costs, payback time and

AFI has been made possible by co-funding from our supporters

AFI aims to accelerate the uptake of alternative fuels and technologies

These companies support AFI – read more about them on the AFI platform

Thank You

Pawan.Sahni@dnvgl.com
+ 971 54 5860988

www.dnvgl.com

SAFER, SMARTER, GREENER