Sustainability Through Standards

Maritime Energy Transition

NUS: Sustainability Connect Series
September 2023

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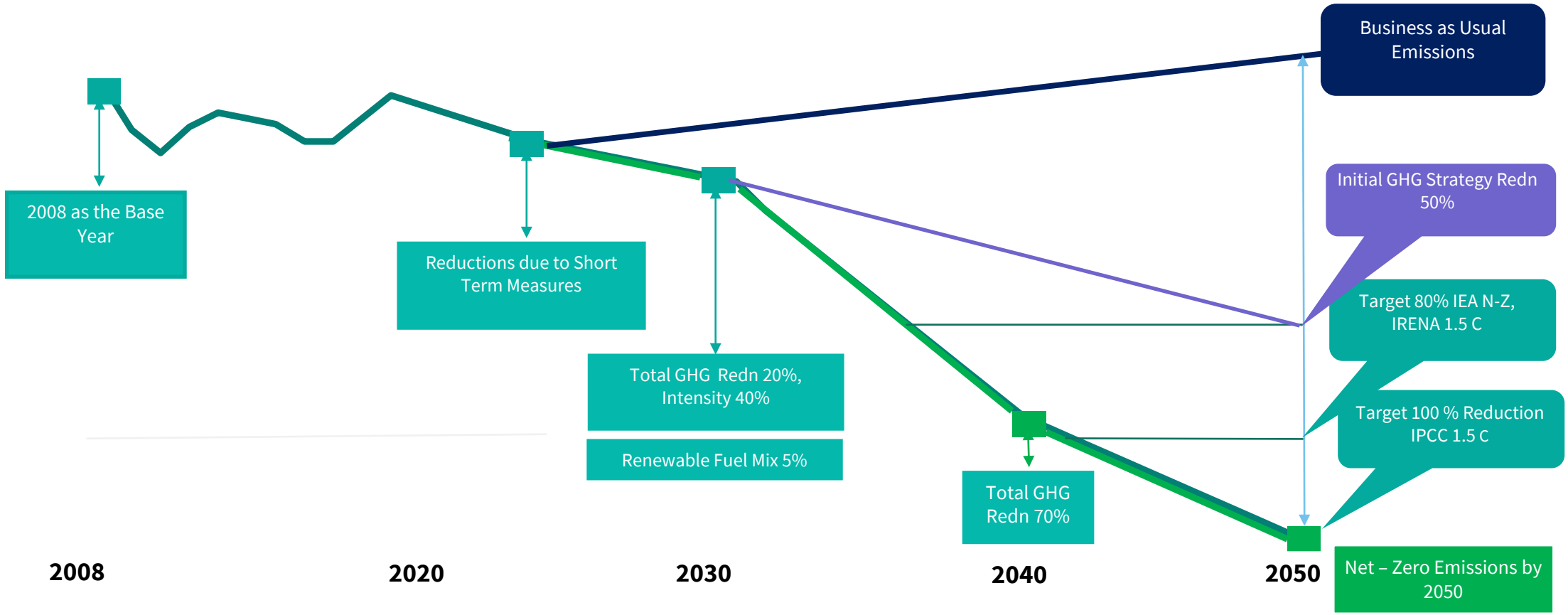
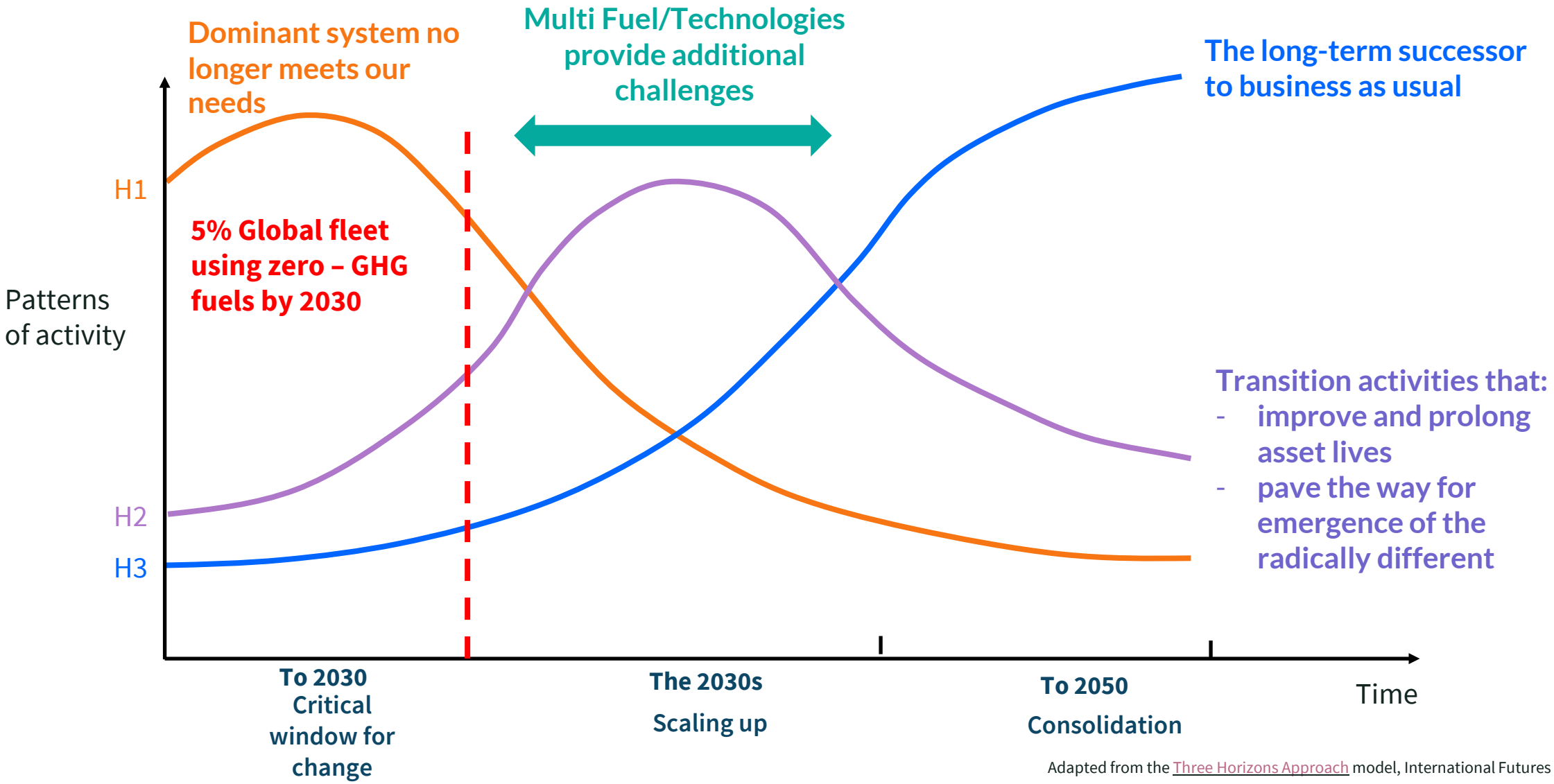
IMO – MEPC 80: 2023 IMO GHG Strategy



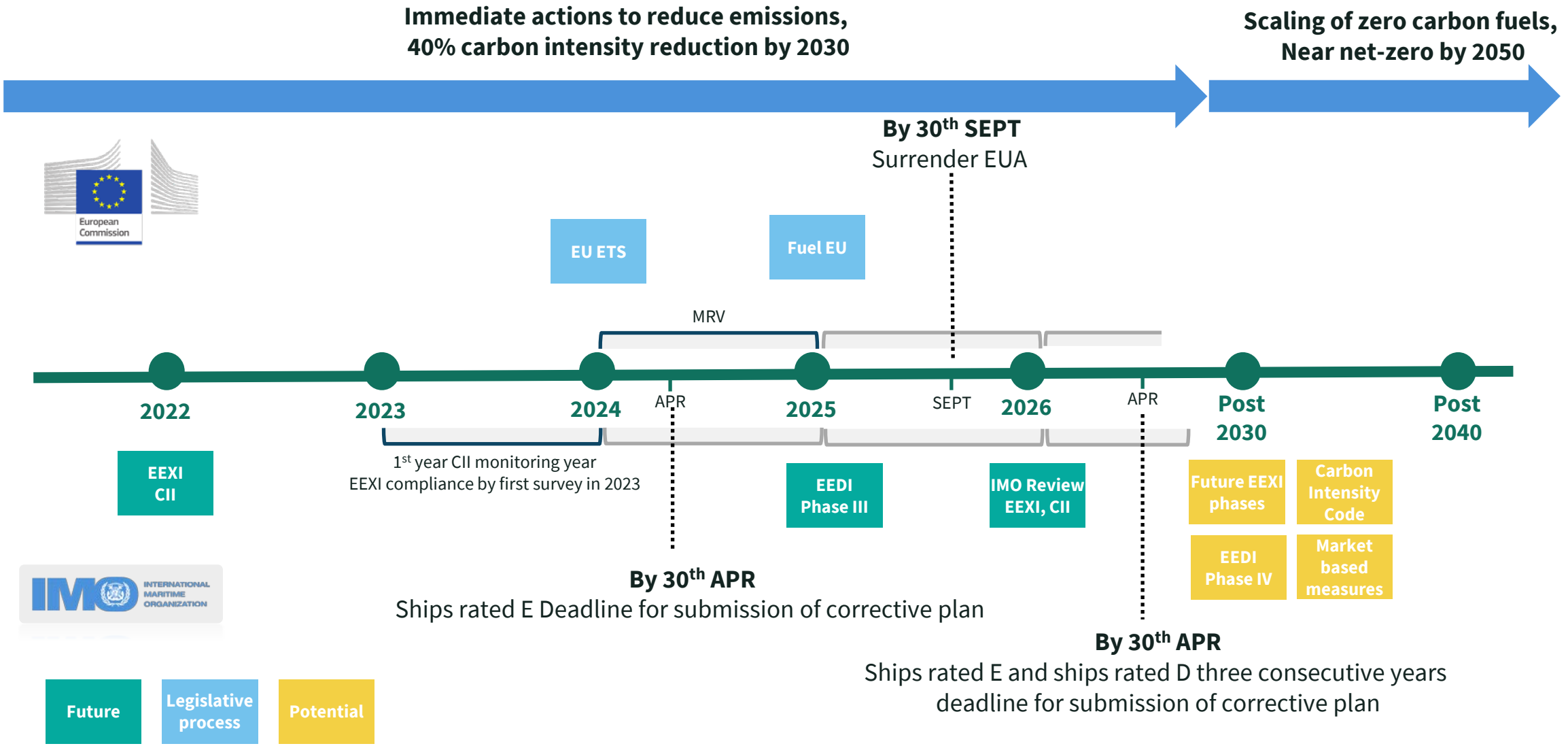
- The IMO agreed to establish new emissions reduction targets at the MEPC-80 meeting held in July 2023.
- Revisions are significantly stricter than previously agreed – the new agreement will target net-zero in 2050, compared with the previous target of a 50% reduction in emissions by 2050.
- New interim targets for total emissions and intensity for 2030 and 2040 have been set.
- Similarly, the IMO has set a target of 5% for renewable fuel in use by 2030.

Shipping's energy transition in three stages and time horizons



Adapted from the Three Horizons Approach model, International Futures Forum.

Short- term Regulatory Horizon

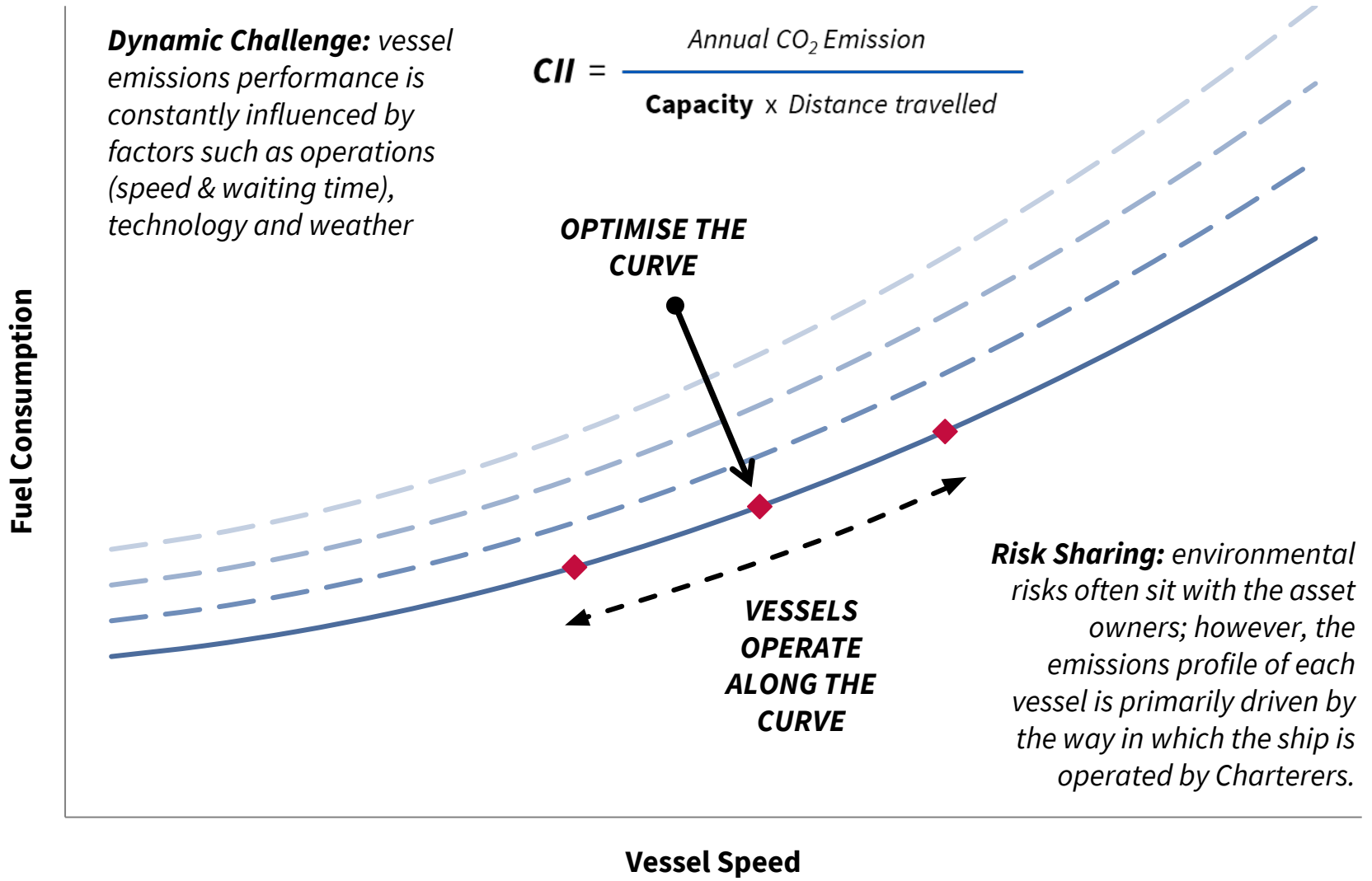


Visualising the emissions reduction challenge

Ship owners are faced with a complex & dynamic challenge to reduce emissions across assets that they may not operate

Dynamic Challenge: *vessel emissions performance is constantly influenced by factors such as operations (speed & waiting time), technology and weather*

$$CII = \frac{\text{Annual } CO_2 \text{ Emission}}{\textbf{Capacity} \times \text{Distance travelled}}$$



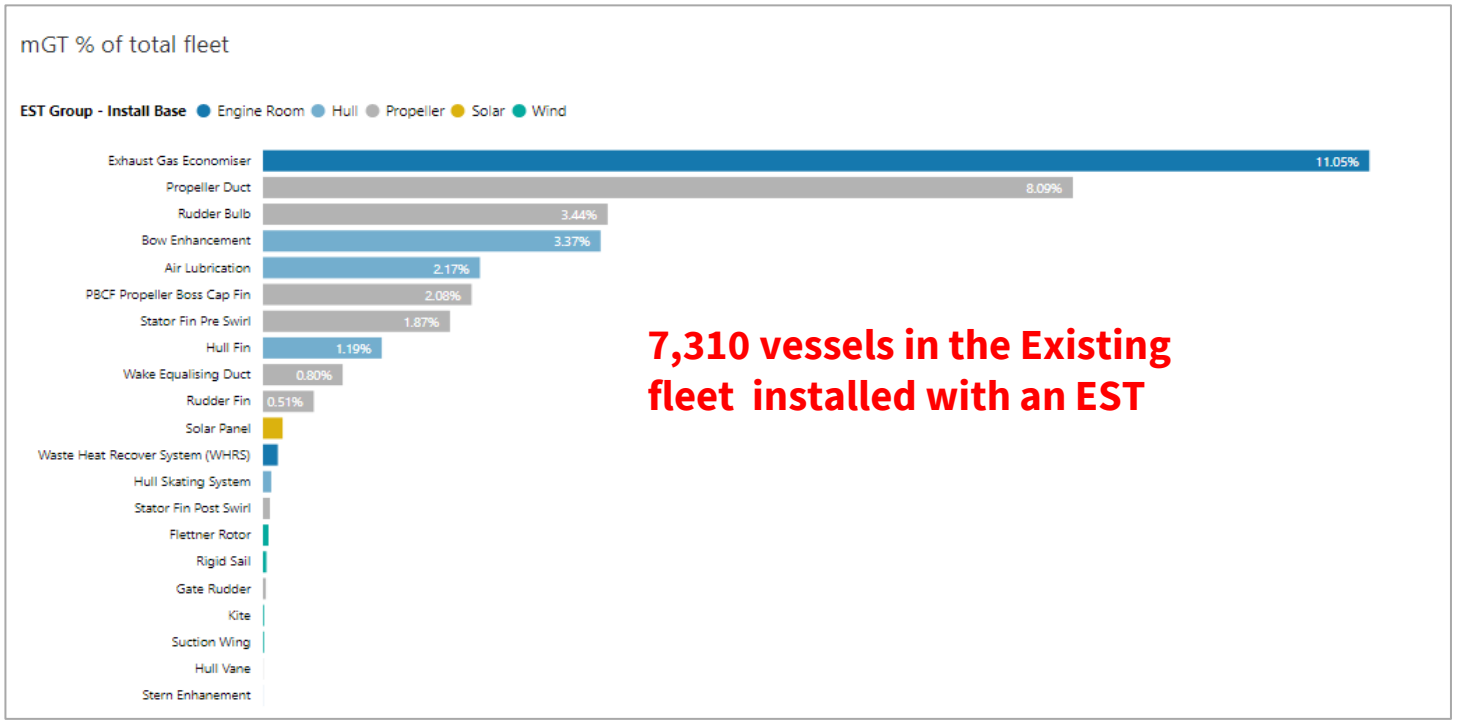
Risk Sharing: *environmental risks often sit with the asset owners; however, the emissions profile of each vessel is primarily driven by the way in which the ship is operated by Charterers.*

Key Challenges for Stakeholders

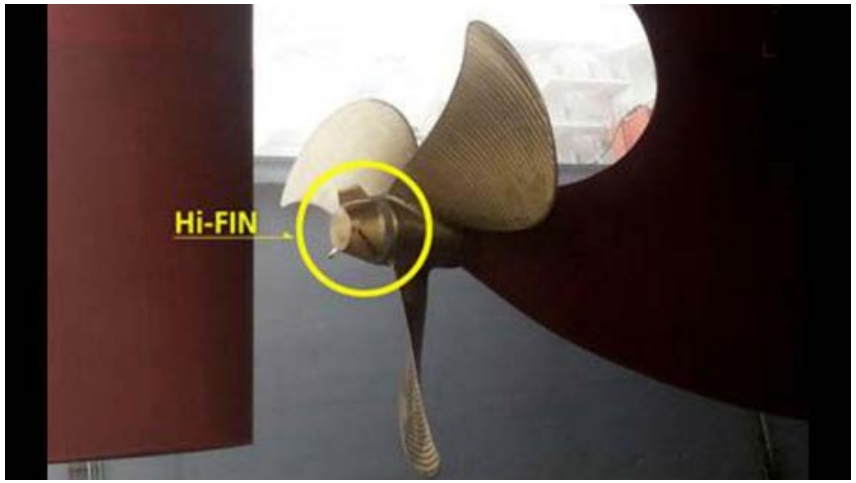
- **Operational Control & Charterer collaboration (incl. CII Clauses)**
- **Monitoring & Understanding of Vessel Emissions**
- **Optimisation of Speed-Consumption Curves**
- **Fleet-wide Emissions Reductions**
- **Regulatory Uncertainty**
- **Reduction Target Uncertainty**

Technology will play a vital Role in reducing GHG emissions

Energy Saving Technology (EST) Uptake – Existing Fleet and Orderbook (%mGT)



7,310 vessels in the Existing fleet installed with an EST



- ESTs improve efficiency and reduce fuel demand But will not be sufficient to meet IMO or Paris agreement aligned goals.

Source: IHS data, Clarksons – Renewable Intelligence Network

Fuelling Future Ships - Alternative Fuel Options

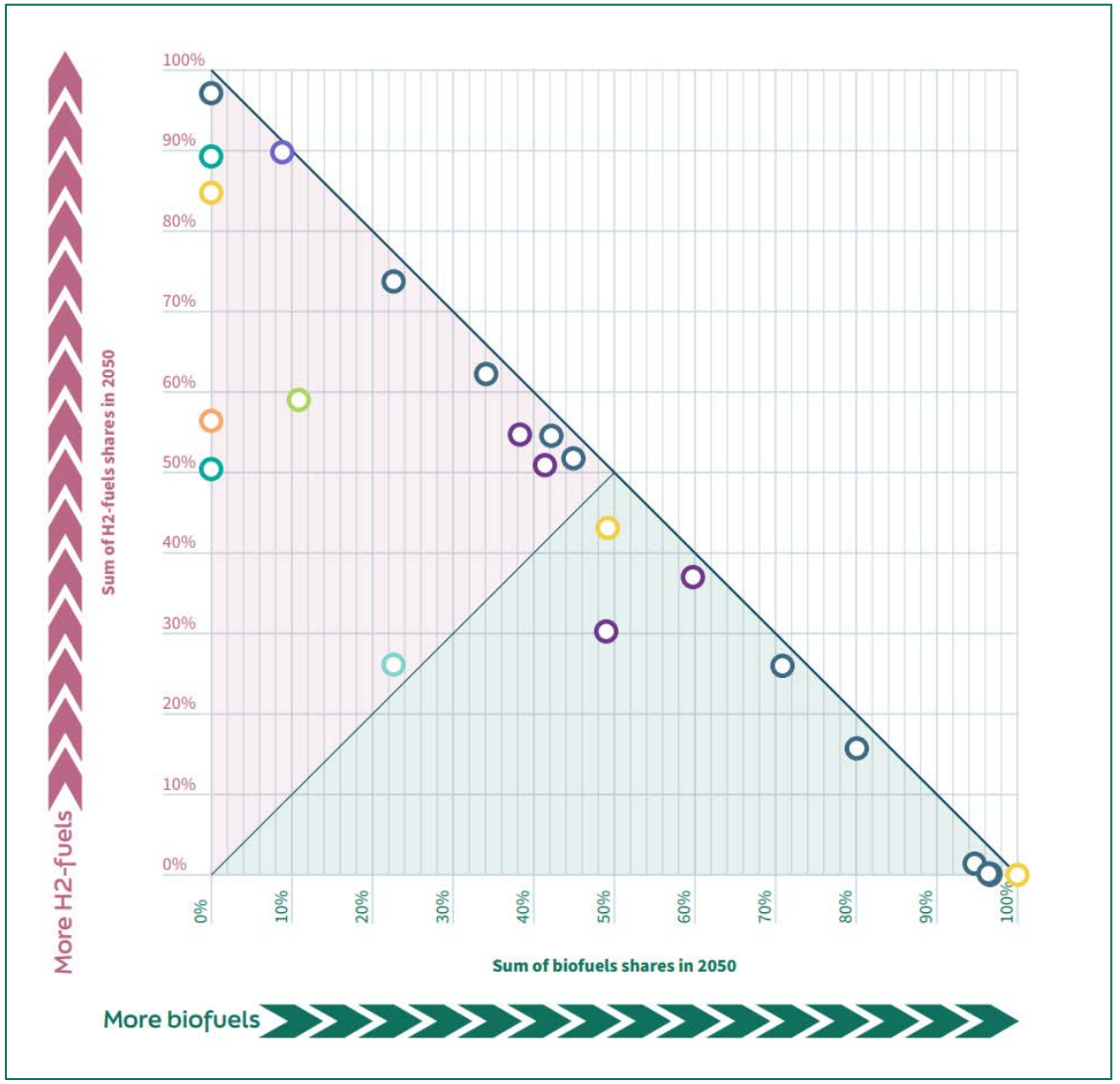
Liquified Natural Gas (LNG)
(Mass 0.8x MGO, Vol. 2x MGO)

Methanol
(Mass 1.8x MGO, Vol. 2.4x MGO)

Ammonia
(Mass 1.8x MGO, Vol. 2.9x MGO)

Hydrogen
(Mass 0.3x MGO, Vol. 3.3-15.5x MGO)

LPG, Biofuels, Electricity, Nuclear

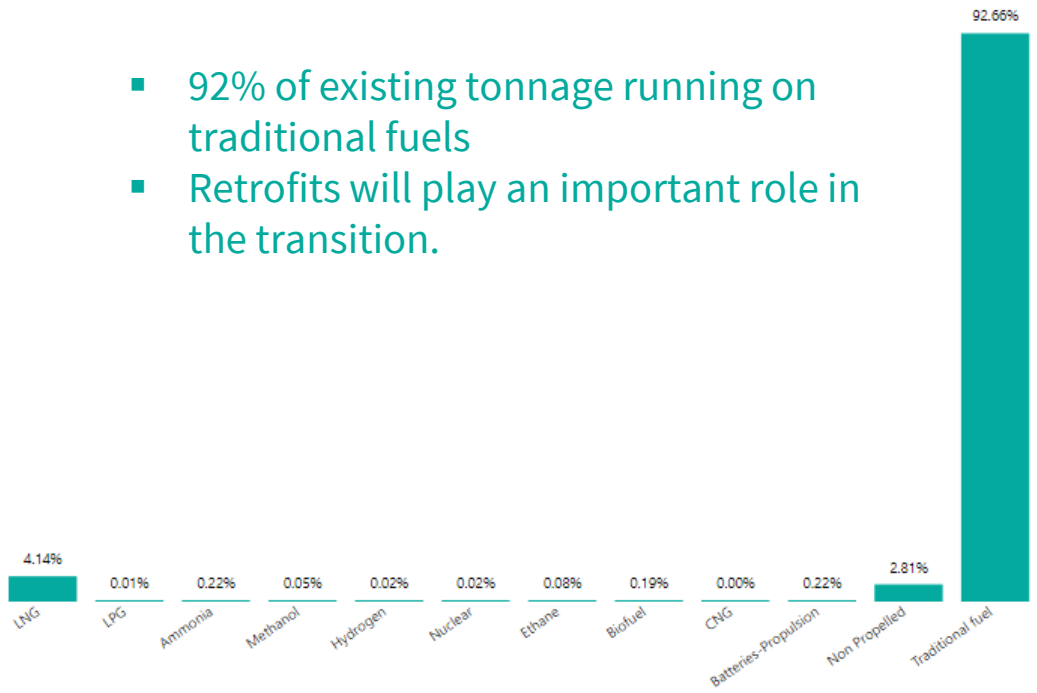


Mapping most recent fuel mix scenarios: Hydrogen (H2) – fuels scenarios versus Biofuel Scenarios.
Source: The Future of Maritime Fuels | LR

Uptake of Future Marine Fuels

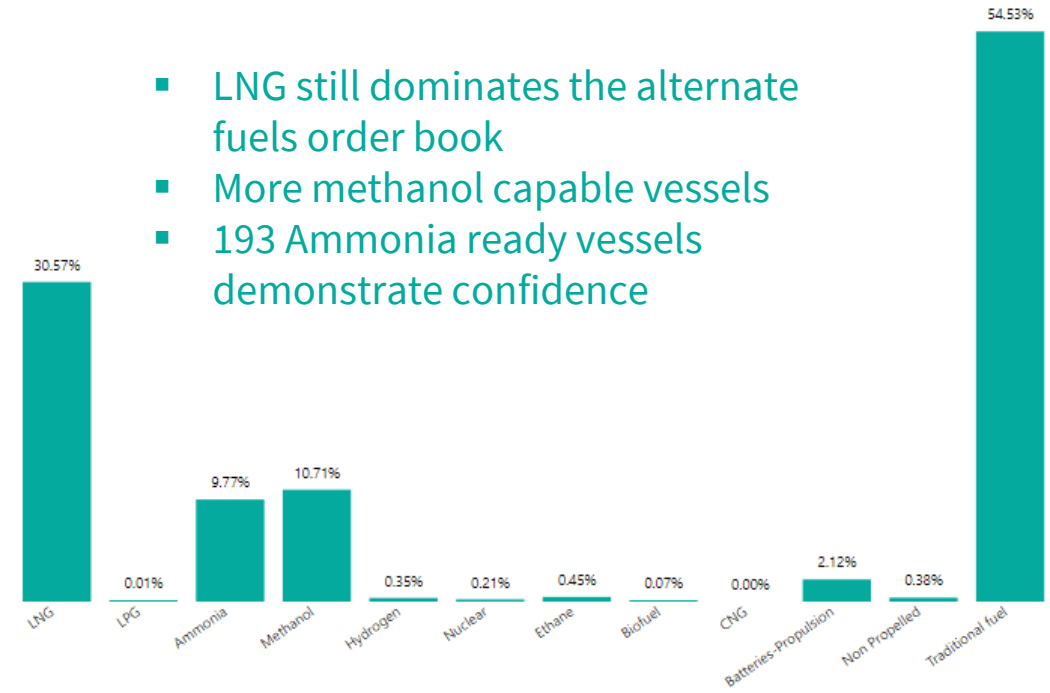
Fuel capable/Ready fleet –Existing fleet (ex LNG vessels)

- 92% of existing tonnage running on traditional fuels
- Retrofits will play an important role in the transition.

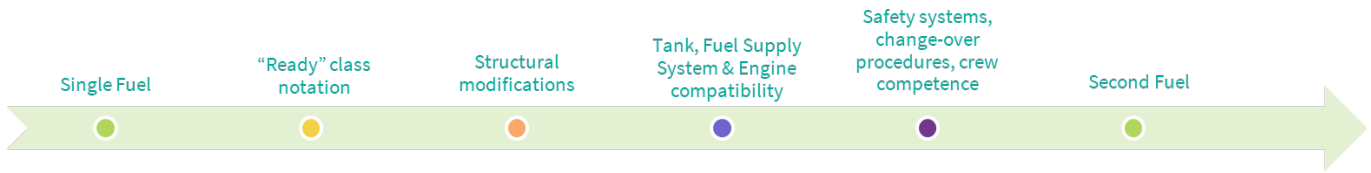


Fuel capable/Ready fleet –Orderbook (ex-LNG vessels)

- LNG still dominates the alternate fuels order book
- More methanol capable vessels
- 193 Ammonia ready vessels demonstrate confidence



Ready vs Capable



Source: IHS data, Clarksons – Renewable Intelligence Network

Future Fuel Regulatory Framework - Ammonia

As Cargo

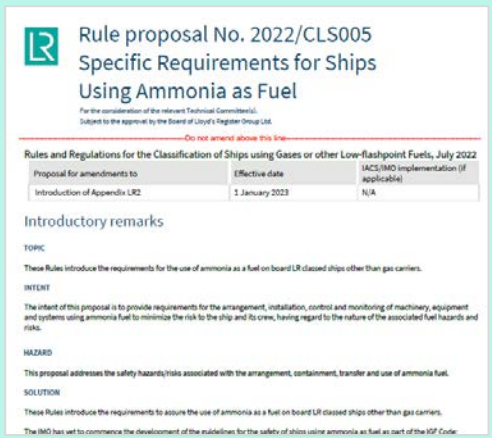
- IGC Code
- Lloyd's Register Rules for Gas Ships

As Refrigerant

- Rules and Regulations for the Classification of Ships Part 6, Chapter 3 Refrigerated Cargo Installations

As Fuel

- IGF Code: Safety philosophy, goal based approach
- Lloyd's Register Guidance notes, Technical Reference
- Rules and Regulations for the Classification of Ships using Gases or other Low-flashpoint Fuels
  - Appendix LR2 – Requirements for Ships Using Ammonia as Fuel
- Rule Development for Ammonia Fueled Engines


Rule proposal No. 2022/CLS005
Specific Requirements for Ships Using Ammonia as Fuel

Rules and Regulations for the Classification of Ships using Gases or other Low-flashpoint Fuels, July 2022

Proposal for amendments to	Effective date	IACS/IMO implementation (if applicable)
Introduction of Appendix LR2	1 January 2023	N/A

Introductory remarks

TOPIC

These Rules introduce the requirements for the use of ammonia as a fuel on board LR classed ships other than gas carriers.

INTENT

The intent of this proposal is to provide requirements for the arrangement, installation, control and monitoring of machinery, equipment and systems using ammonia fuel to minimize the risk to the ship and its crew, having regard to the nature of the associated fuel hazards and risks.

HAZARD

This proposal addresses the safety hazards/risks associated with the arrangement, containment, transfer and use of ammonia fuel.

SOLUTION

These Rules introduce the requirements to assure the use of ammonia as a fuel on board LR classed ships other than gas carriers.

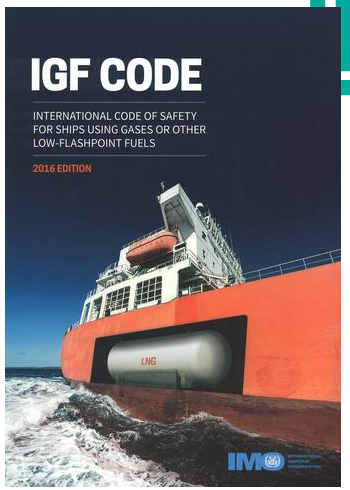

Design & Safety Aspects of using Ammonia (NH3) as a Marine Fuel

Report for: JDP for Ammonia Fuelled ship (Restricted Circulation)

Revision no.: 5

18 August 2021

Lloyd's Register



Status at IMO

- Considered as part of amendments to IGF Code
- Development of guidelines underway
- Could go to MSC 109 (likely Oct/Nov 24) or 110 (likely May/June 25) for approval/adoption

LR Risk Based Certification

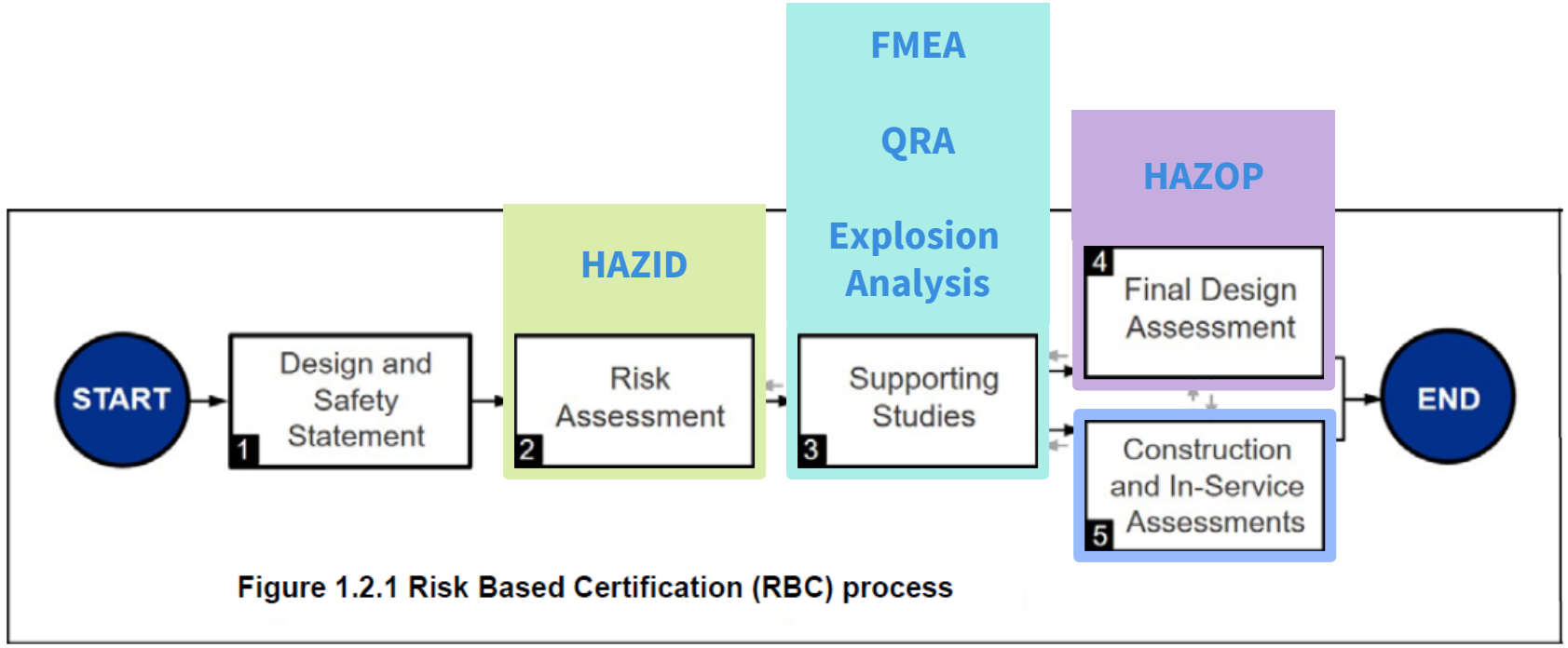


Figure 1.2.1 Risk Based Certification (RBC) process

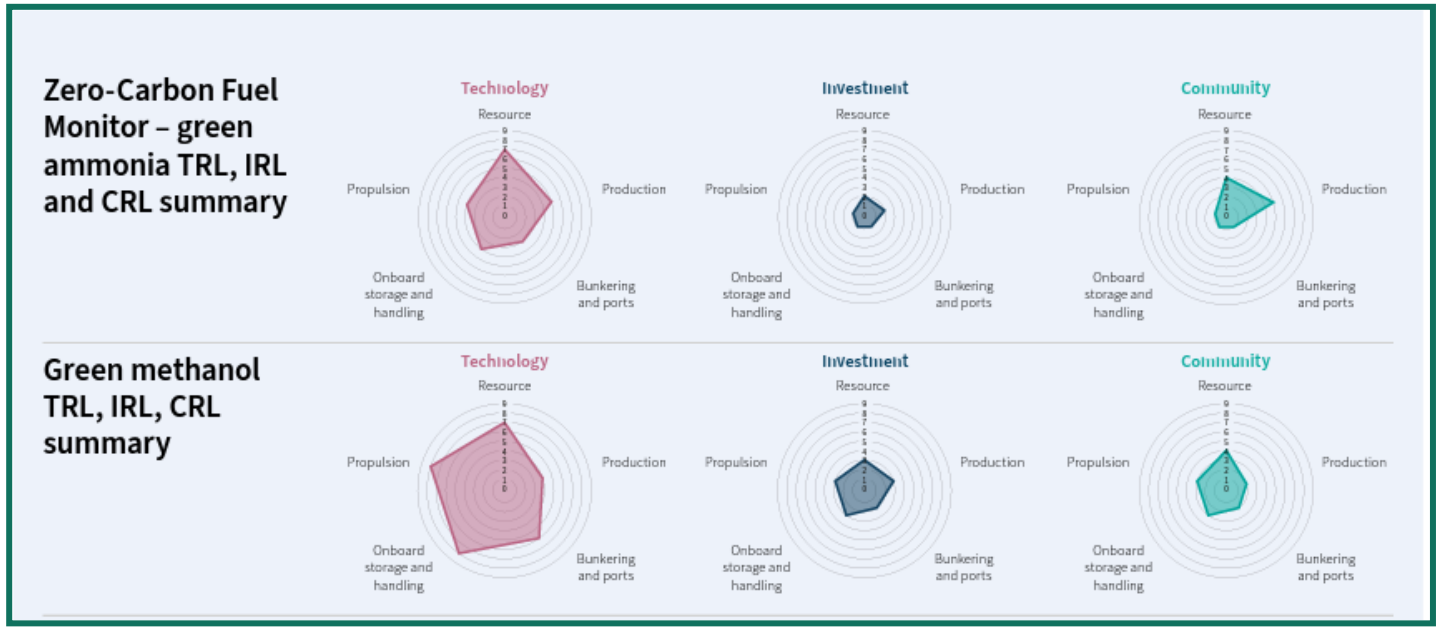
ShipRight
Design and Construction

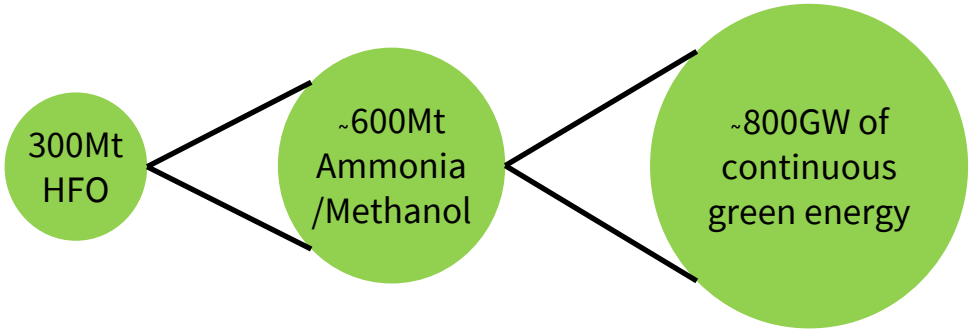
Risk Management

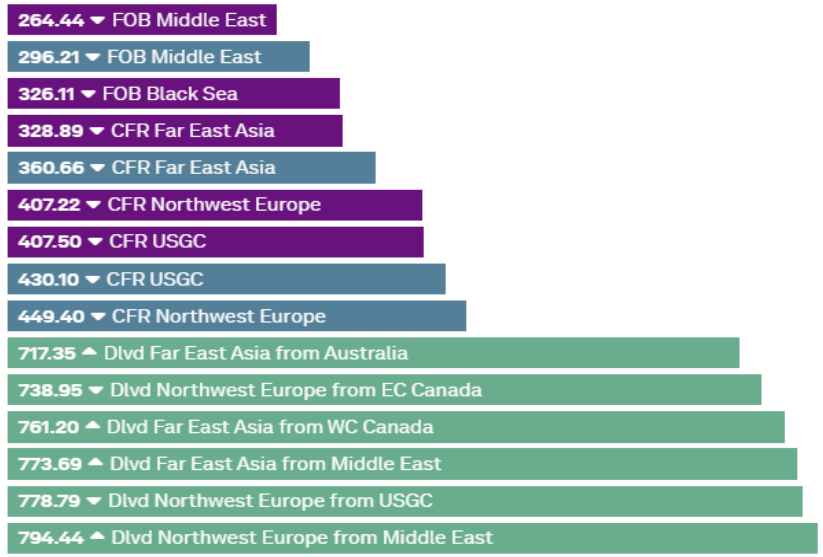
Risk Based Certification (RBC)

September 2021

Assessing Future Fuel Readiness





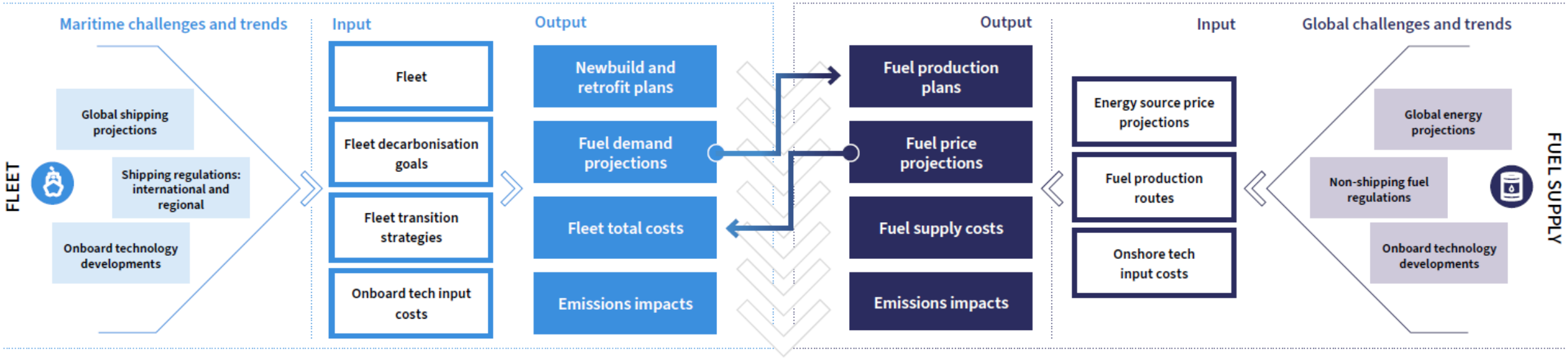


- Zero carbon fuels are more expensive today and future supply remains uncertain
- Deadlock between fuel supply infrastructure and fleet infrastructure investments

Source: S&P Global Commodity Insights

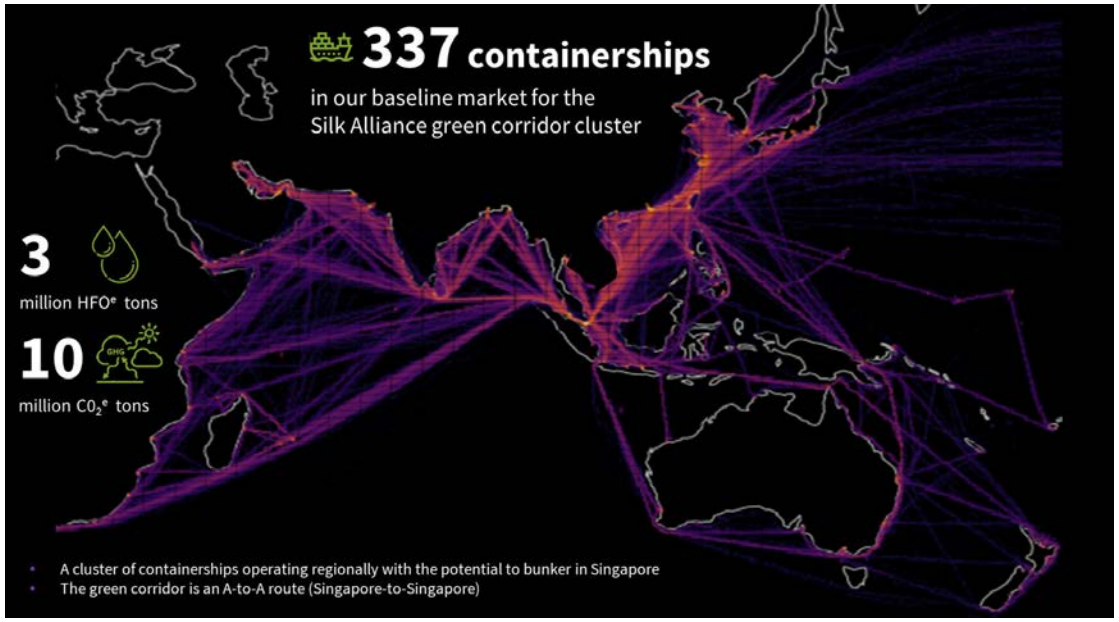
The First Mover Framework

A successful fleet decarbonisation strategy is dependent on the Fuel Supply partners effectively collaborating with Shipping Demand creators.



Making the move

Green Corridors, bring like indeed stake holders together to tackle the problem over a specific trade route. Reducing emissions while enabling spill over.



First Movers, help pave the way for others developing demand.

the CASTOR INITIATIVE

EASTERN PACIFIC SHIPPING

MAERSK

X-PRESS FEEDERS

Even with fast followers this only accounts for a relatively small proportion of the shipping fleet

Shipping Part of a larger system

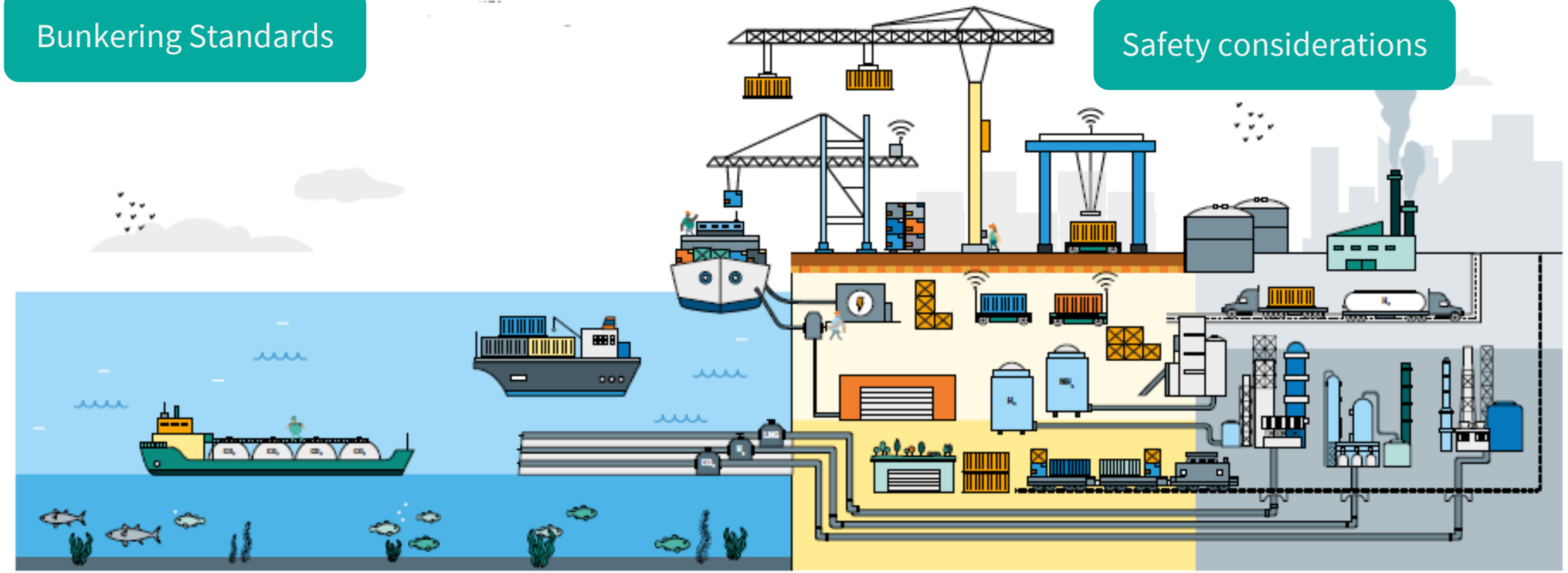
Prepare for multifuel scenario

Operations planning and cooperation

Permitting for storage

Bunkering Standards

Safety considerations



Thank you

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