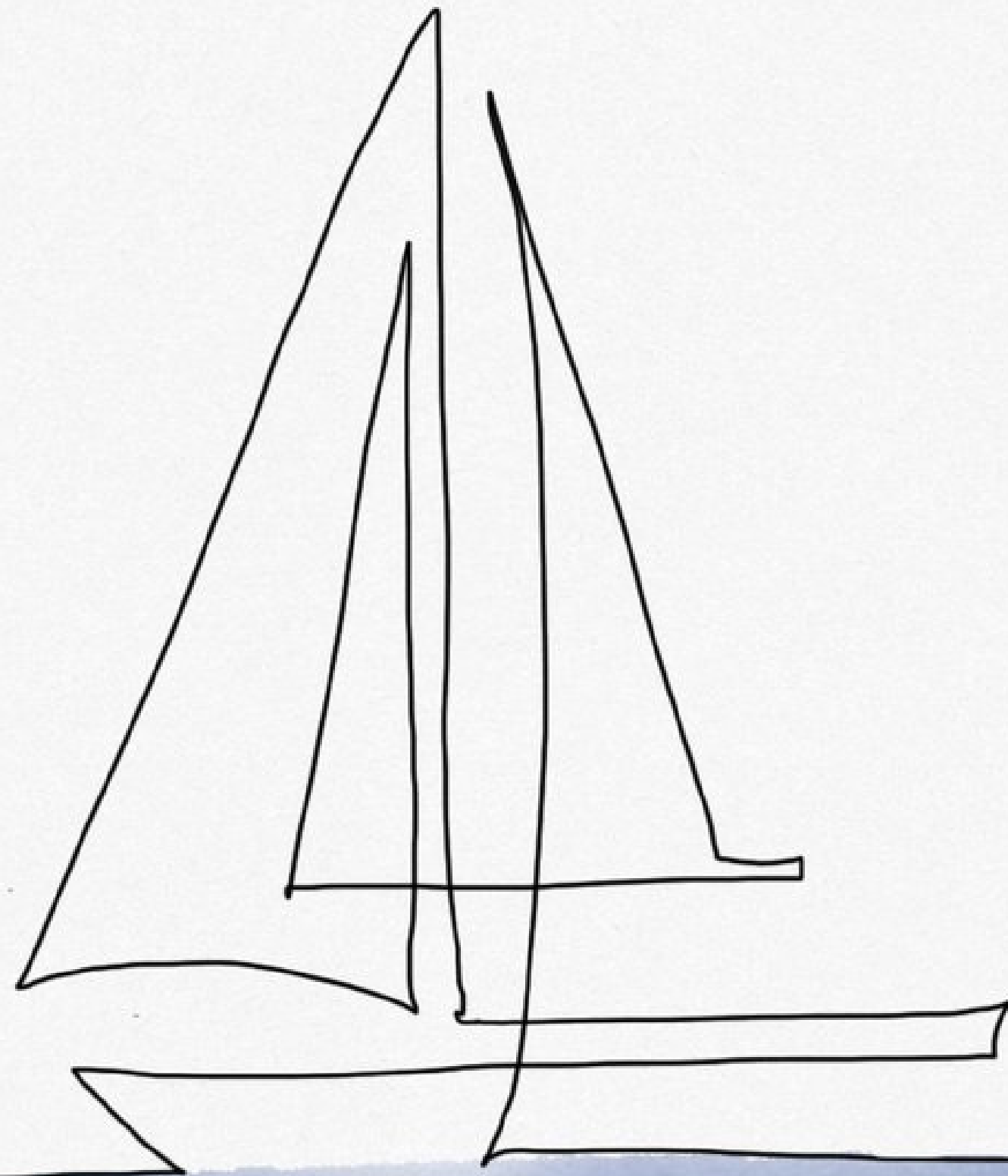




FURSTENBERG
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FMA

FURSTENBERG MARITIME ADVISORY

MARITIME AMMONIA WEBINAR FOR THE AMMONIA ENERGY ASSOCIATION, DEC 13, 2023

WHO WE ARE



- Micro consultancy since 2019
- Holistic sustainability for maritime
- Immediate past Maritime Directors to the AEA



www.furstenbergmaritime.com

Content of this webinar

- Recap from 2 years of maritime webinars
- Progress of maritime ammonia - looking back
- Perspectives from outside AEA - maritime ammonia
- Next steps for maritime ammonia - where to get involved

Maritime Ammonia Insights
 (Thursday 31 March, 11AM CET, online via Zoom Webinar)

Zero Emission Energy Distribution at Sea – ZEEDS

In conversation with:
Sofia & Conor Fürstenberg Stott
 (Maritime Directors, AEA & Partner, Fürstenberg Maritime Advisory)

Vidar Lundberg (CBDO, Grieg Maritime Group & CEO, North Ammonia)
Knut Nyborg (CEO, Aker Clean Hydrogen)

Maritime Ammonia Insights
 (Tuesday 24 May, 4PM SGT, online via Zoom Webinar)

Ammonia bunkering in Singapore – GCMD & DNV




In conversation with:
Conor Fürstenberg Stott
 (Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory)

Lau Wei Jie (Director, Research & Projects, Global Centre for Maritime Decarbonisation)
Dr Imran Ibrahim (Principal Consultant and Head of Research and Development, DNV Maritime Advisory)



Maritime Ammonia Webinars 2022

Maritime Ammonia Insights
 (Monday 13 June, 9AM CET, online via Zoom Webinar)

Amon Maritime – Ammonia fueled ships and networks




In conversation with:
Conor Fürstenberg Stott
 (Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory)

André Risholm (Chief Executive Officer, Amon Maritime)
Karl Arthur Bråin (Chief Commercial Officer, Amon Maritime)



Maritime Ammonia Insights
 (Tuesday 12 July, 12PM EDT, online via Zoom Webinar)

NETSCo & ABB – Maritime Ammonia Synergies Using Inland Waterways




In conversation with:
Sofia Fürstenberg Stott
 (Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory)

Jan Flores (Vice President, NETSCo)
Edward Schwarz (Vice President Sales-Marine Systems, ABB)




Maritime Ammonia Insights
 (Wednesday 17 Aug, 9AM CEST, online via Zoom Webinar)

MAN ES and MPA Singapore: collaboration & leadership on maritime ammonia




In conversation with:
Sofia Fürstenberg Stott
 (Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory)

Peter H. Kirkeby (Principal Specialist, Promotion Manager and BDM dual fuel, MAN ES)
Yi Han Ng (Director - Innovation, Technology & Talent Development, Maritime and Port Authority Singapore)




Maritime Ammonia Insights
 (Thursday 15 Sept, 4PM JST, online via Zoom Webinar)

ITOCHU – a Japanese trading house propelling maritime ammonia



In conversation with:
Conor Fürstenberg Stott
 (Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory)

Takeo Akamatsu (General Manager, Green Innovation Business Unit, Machinery Company, ITOCHU Corporation)




Maritime Ammonia Insights
 (Thursday 13 Oct, 15:00 CET, online via Zoom Webinar)

Port of Roenne, Rambøll & DBI – Safe ammonia bunkering & port operations: digging into detail





In conversation with:
Conor Fürstenberg Stott
 (Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory)

Maja Felicia Bendtsen (CBO Bulk, Port of Roenne)
Nicklas Koch (PM – Advanced Fire Engineering, Maritime and Energy, DBI)
Jan Gramkov (Risk & Safety Engineer, Rambøll - HAZOP)




Maritime Ammonia Insights
 (Friday 16 Dec, 15:00 CET, online via Zoom Webinar)

Offshore Ammonia – part of the future





In conversation with:
Conor Fürstenberg Stott
 (Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory)

Philippe Lavagna (Product Account Manager – Terminals for New Energies, SBM/IMODCO)
Sebastian Kihle (Chief Technology Officer, H2Carrier)
Puneet Sharma (Founder & CEO, CyanH3)




Maritime Ammonia Webinars 2023



Maritime Ammonia Insights
(Friday 24 Feb, 11:00 GMT, online via Zoom Webinar)

Ammonia at Sea: exploring potential impact of ammonia on marine ecosystems

Marie Cabbia Hubatova
Director of Global Shipping, Environmental Defense Fund

Samie Parkar
Decarbonisation Risk Specialist, Lloyd's Register

Steve Coates
Associate Director, Ricardo PLC

In conversation with:
Sofia Fürstenberg Stott
Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory

EDF, R, AMMONIA ENERGY ASSOCIATION

Maritime Ammonia Insights
(Thurs 6 April, 11:00 GMT, online via Zoom Webinar)

CAMPFIRE GreenBalticCruising – Feasibility of Marine Renewable Ammonia in Rostock for Baltic Sea Cruise Liners

ROSTOCK PORT, **CARNIVAL MARITIME**, **CAMPFIRE**

In conversation with:
Sofia Fürstenberg Stott
Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory

YARA, **DNV-GL**, **AMMONIA ENERGY ASSOCIATION**

Maritime Ammonia Insights
(Tues 16 May, 10:00 CEST, online via Zoom Webinar)

Safety and the marine ammonia engine

Kaj Portin
General Manager Sustainable Fuels & Decarbonization, Wärtsilä

John Mott
Affiliate Board Member, Ammonia Safety & Training Institute (ASTI)

In conversation with:
Conor Fürstenberg Stott
Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory

WÄRTSILÄ, ASTI, AMMONIA ENERGY ASSOCIATION

Maritime Ammonia Insights

The integrated role of low carbon ammonia in maritime strategy

Tues 8 August, 4PM JST

hosted by:
Conor Fürstenberg Stott
Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory

Akihiro Yonehara
General Manager, Environment Team, Environment & Sustainability Strategy Division, MOL

Shinichi Taguchi
Associate General Manager, Green Bunker Fuel Project, Energy Business Strategy Division / Marine Fuel GX Division, MOL

MOL, AMMONIA ENERGY ASSOCIATION

Maritime Ammonia Insights

Amogy's ammonia-powered tugboat

Wed 13 Sept, 10AM EST

hosted by:
Conor Fürstenberg Stott
Maritime Director, AEA & Partner, Fürstenberg Maritime Advisory

Abigail Jablansky
Head of Project Management, Amogy

Herbert Fowlkes
Chief Safety Consultant, Chief Safety Solutions

AMOGY, AMMONIA ENERGY ASSOCIATION

Maritime Ammonia Insights

Risk analysis for ammonia-fueled vessels

Tues 24 Oct, 10AM CET

hosted by:
Sofia Fürstenberg Stott
Partner, Fürstenberg Maritime Advisory

Matt Dunlop
Director of Sustainability & Decarbonisation, V.Group; Seconded to MMAGZCS

Samie Parkar
Decarbonisation Risk Specialist, Lloyd's Register

Maersk Mc-Kinney Møller Center for Zero Carbon Shipping, R, AMMONIA ENERGY ASSOCIATION

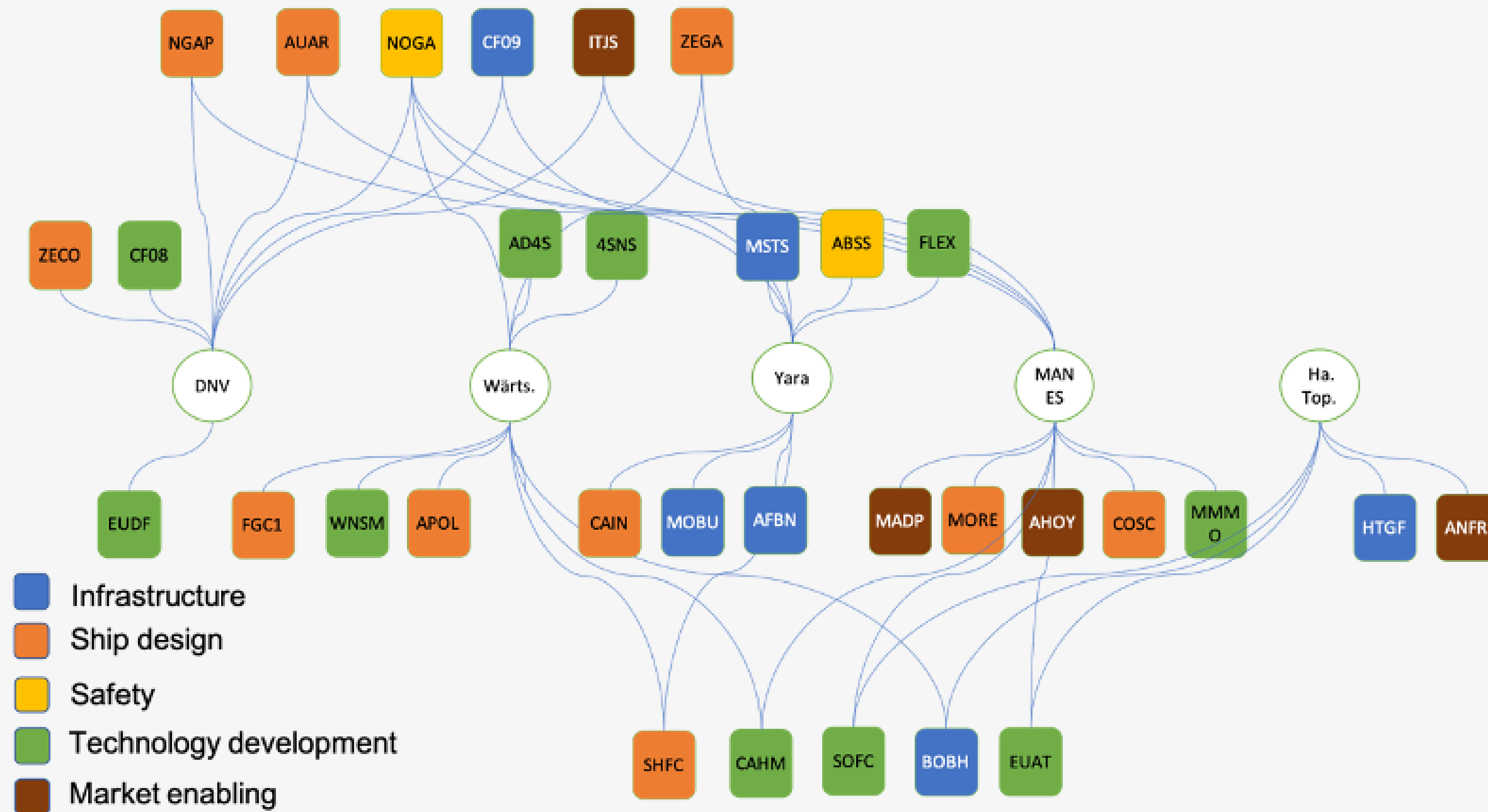
The maritime ammonia value chain...



Source: Global Maritime Forum, Workshop material produced during NoGAPS 1

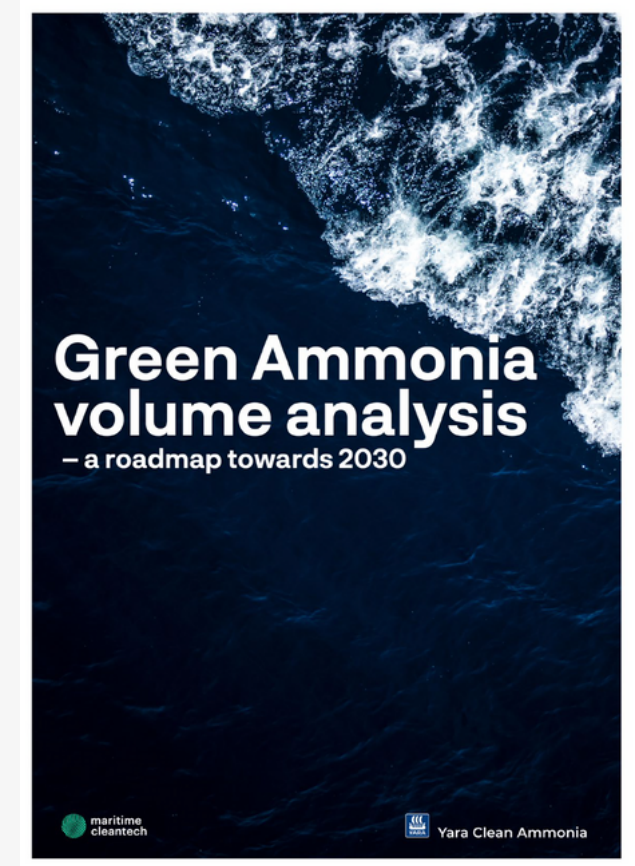
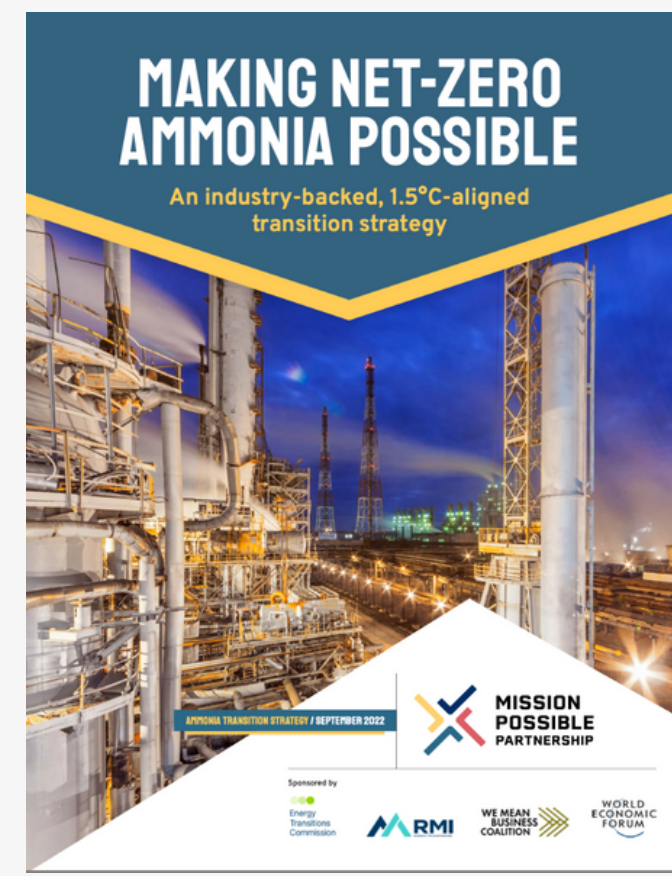
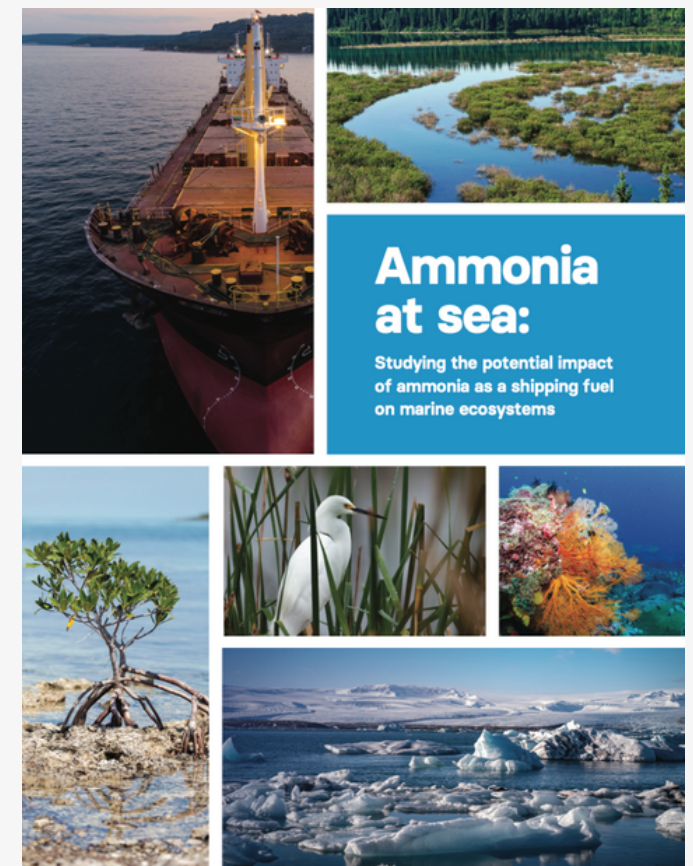
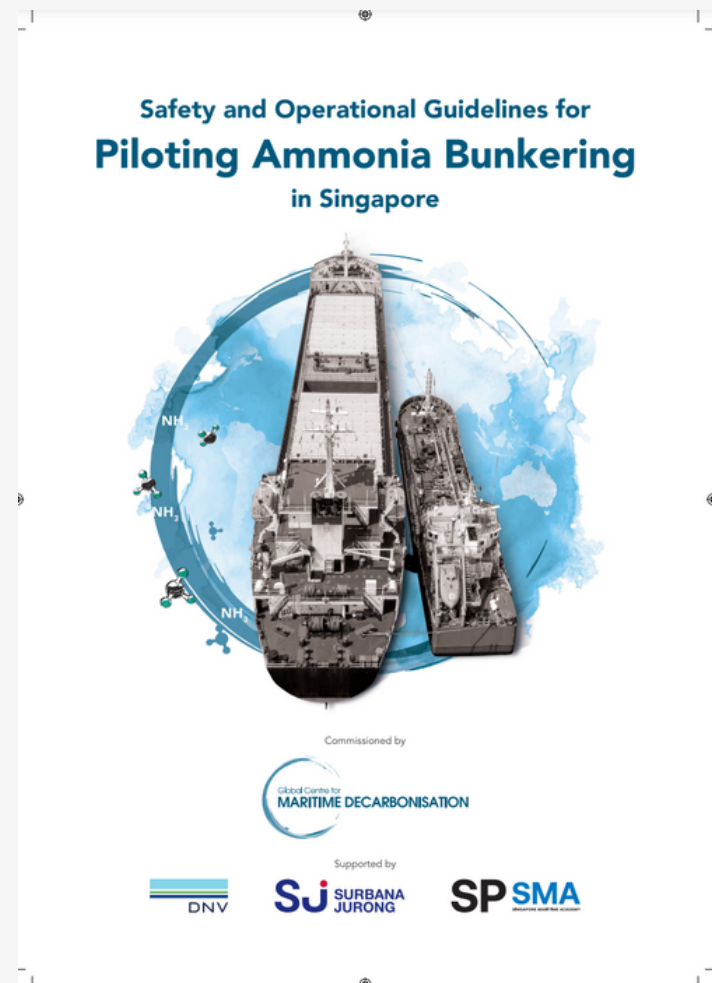
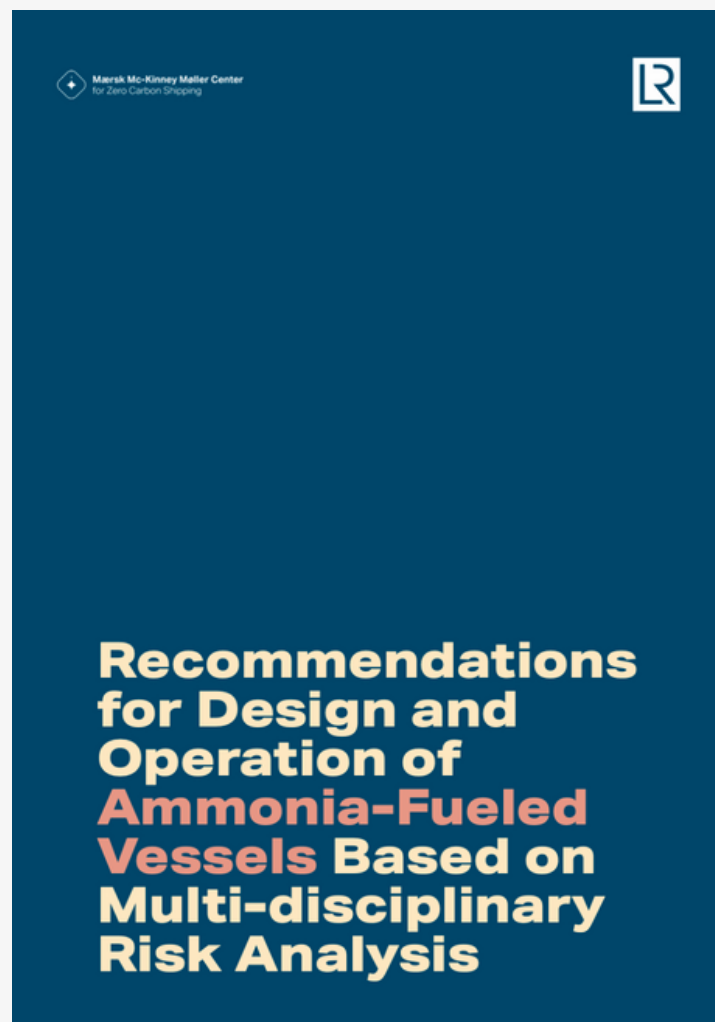
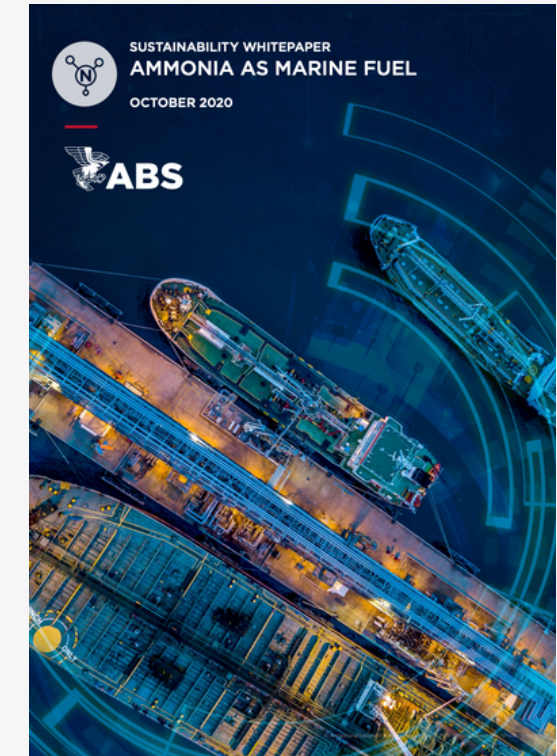
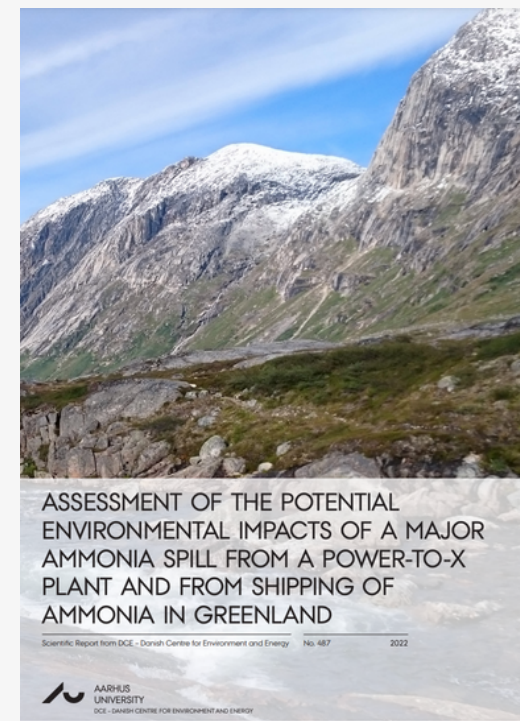
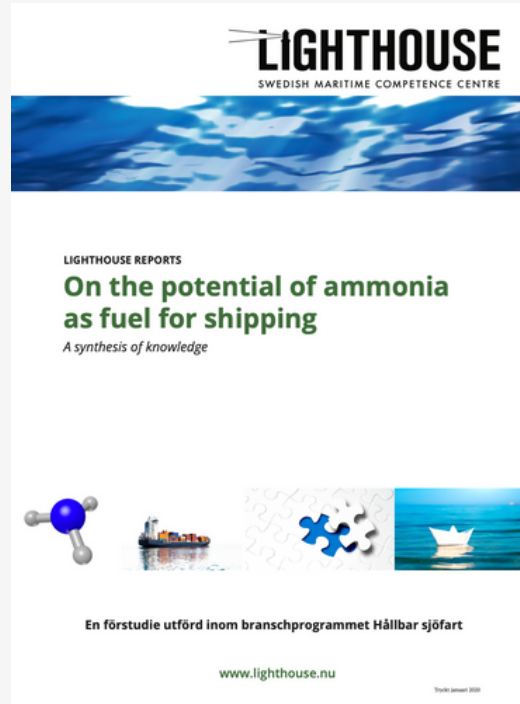
...this is how we thought about it in 2020

3 years ago, it was all about the Nordics

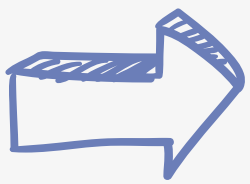
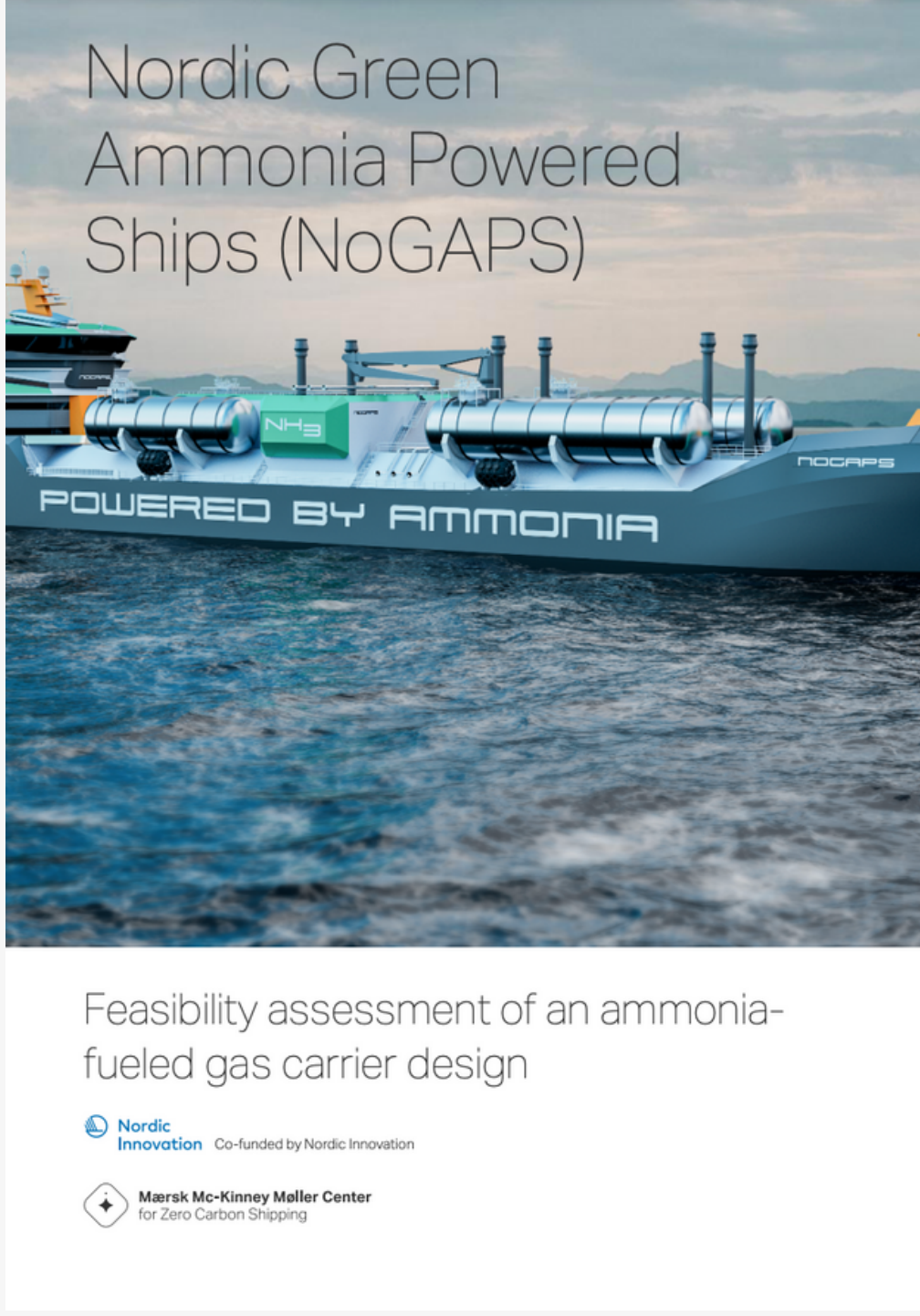
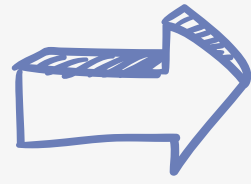
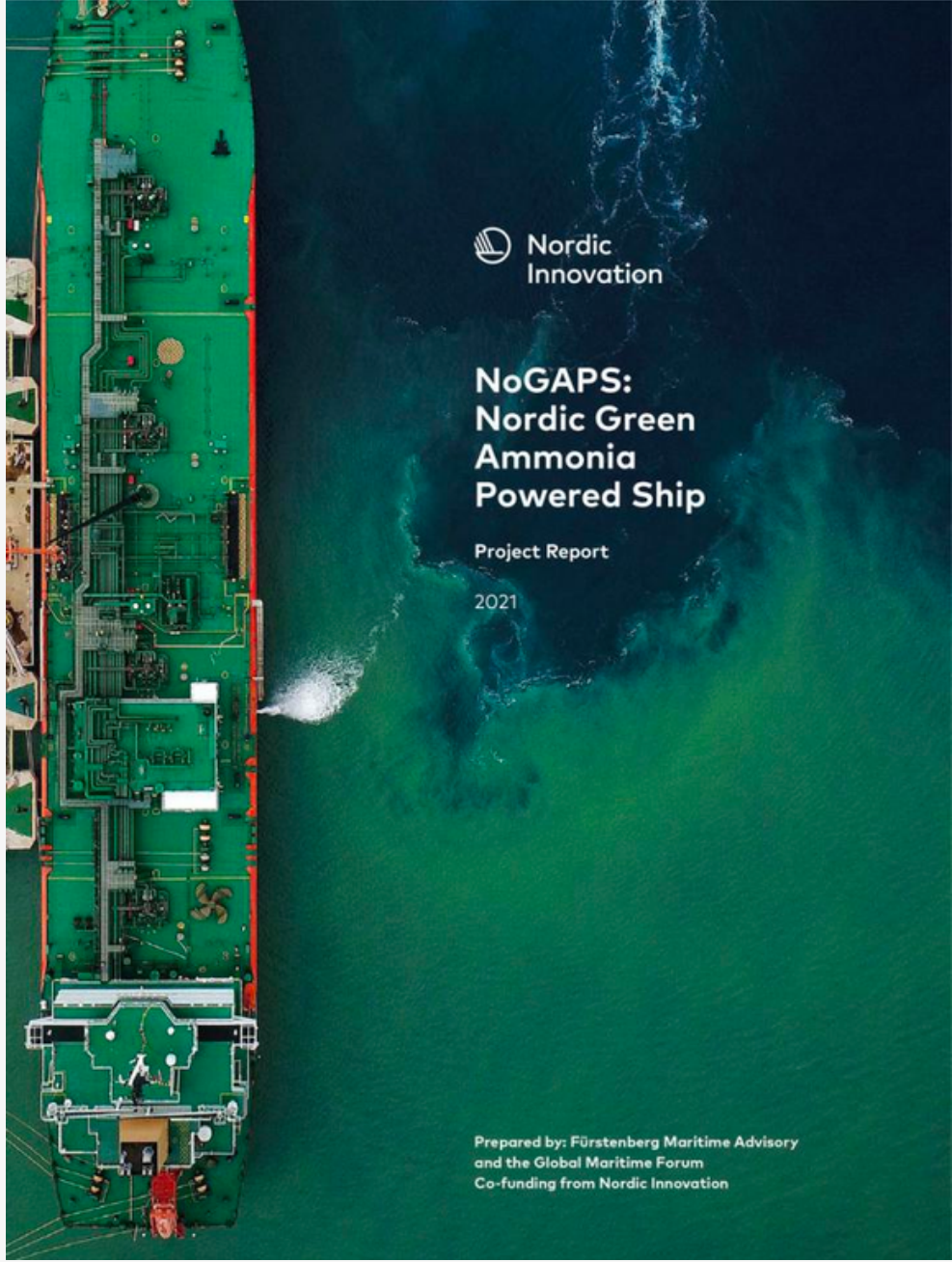


Out of 100 mapped projects in 2020, a third involved DNV, Wärtsilä, Yara, MAN ES or Haldor Topsoe, all HQ in the Nordics.

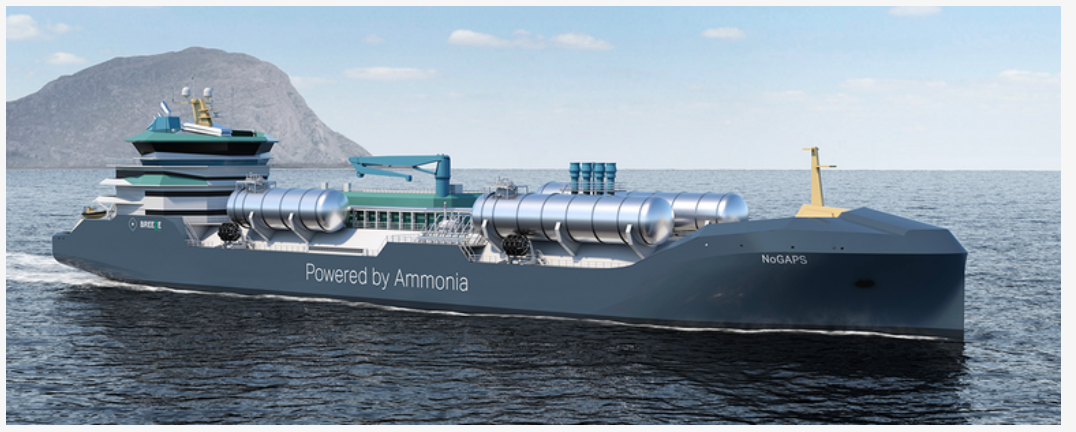
Maritime ammonia - knowledge acceleration



From gaps identification to concept design



AiP Presentation at the DNV stand at Nor-Shipping (L to R: Anna Rosenberg, Project Coordinator, Decarbonisation, GMF, Martin Cartwright, Business Director Gas Carriers at DNV, Eystein Leren, Director Industry and Market Leads at Yara International, Thomas Woideemann, Commercial Director BW Epic Kosan, Tuva Flagstad-Andersen, Regional Manager Region North Europe, DNV, Claus Graugaard, Chief Technology Officer, MMMCZCS, Reinert Nordtveit, COO, Breeze Ship Design, Pål Einar Spilleth, Ship Type Expert Gas Carrier and FSRUs DNV, Kjeld Aabo, Director New Technology 2 stroke promotion at MAN Energy Solutions.)

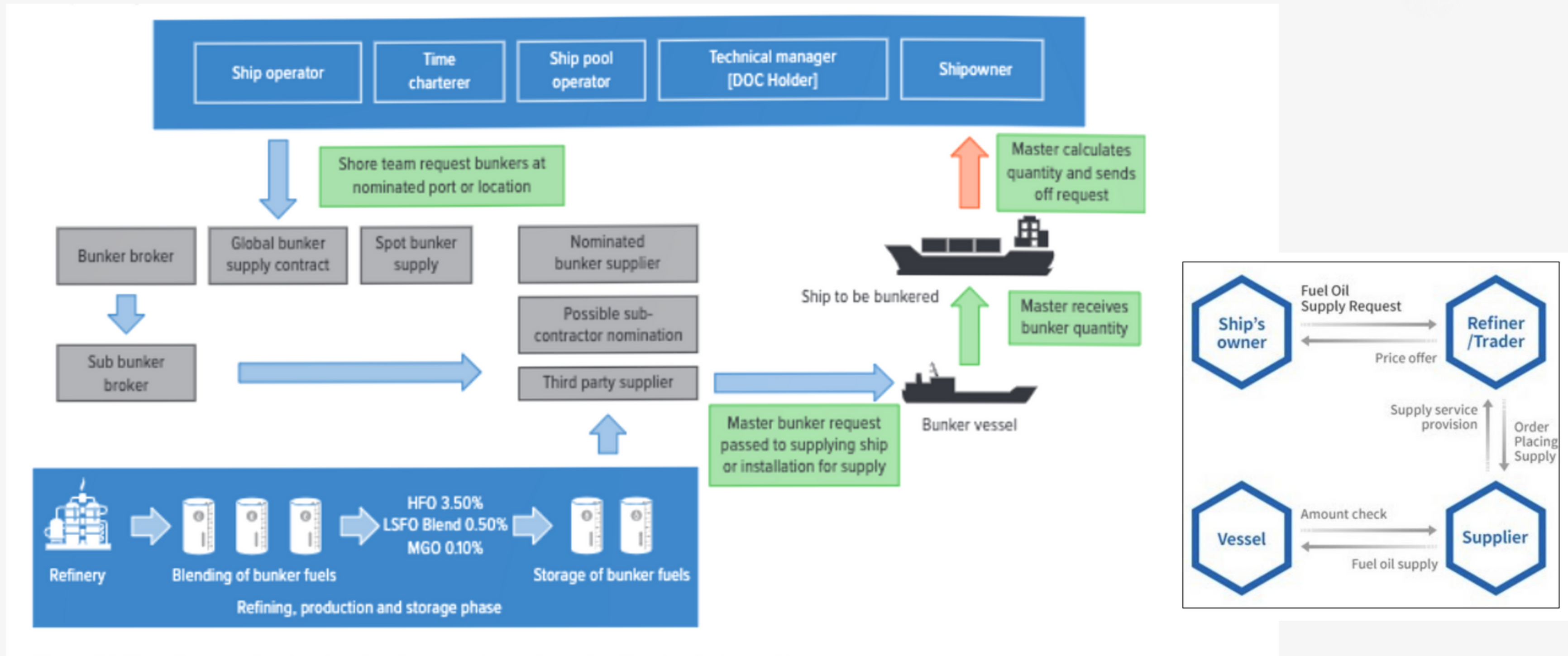


June 2021

March 2023

June 2023

The value chain of bunkering operations



InterSessional Working Group submission by IBIA to the IMO



May 2023



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INTERSESSIONAL MEETING OF THE WORKING GROUP ON REDUCTION OF GHG EMISSIONS FROM SHIPS
15th session
Agenda item 3

ISWG-GHG 15/3/5
12 May 2023
ENGLISH ONLY
Pre-session public release:

FURTHER CONSIDERATION AND FINALIZATION OF THE ASSESSMENT AND SELECTION OF MEASURE(S) TO FURTHER DEVELOP IN THE CONTEXT OF PHASE II OF THE WORK PLAN FOR THE DEVELOPMENT OF MID- AND LONG-TERM MEASURES

**Alternative fuel producer perspectives:
capabilities, future potential and support for a Well-to-Wake approach**

Submitted by IBIA

SUMMARY

Executive summary: This document aims to highlight the strong benefits of a Well-to-Wake (WtW) approach for the assessment of marine fuel GHG emissions, and how the adoption of a sole Tank-to-Wake (TtW) approach has the potential to negatively impact the future marine fuel landscape as well as jeopardize IMO's overall ambition to phase out GHG emissions associated with international shipping. It also outlines the potential for low-GHG fuel production, along with existing and under-development certification mechanisms that align with a WtW approach.

Strategic direction, if applicable: 3

Output: 3.2

Action to be taken: Paragraph 25

Related documents: MEPC 79/7/12 and MEPC 80/7/4

- Alternative fuel producers perspectives
- Capabilities, future potential and support of a well-to-wake approach
- Contribution by Ammonia Energy Association, Methanol Institute, European Biodiesel Board

Call to Action for Sustainable Maritime Fuels

June 2023



Call to Action for Sustainable Maritime Fuel Production

Call to Action for the Clean Energy Transition

Maritime shipping is responsible for 3% of global greenhouse emissions. For the shipping industry to play its role in limiting global warming to 1.5°C, emissions must be rapidly reduced within this decade and reach zero by 2050.

These signatories vocalize their support by calling on countries to develop ambitious policies that account for fuel emissions on a Well-to-Wake (WtW) basis within the International Maritime Organization (IMO) and pledge to play their part in facilitating emissions reductions through the production and uptake of sustainable fuels at the scale and pace necessary to meet the 1.5°C aligned ambition.

Fuel Production Incentives and Developing Countries

A robust and comprehensive framework that incentivizes sustainable fuels is also likely to greatly benefit developing countries. Unlike in the case of fossil fuels, production of many sustainable fuels is not related to scarce reserves that only a handful of countries possess - the main ingredient for these new fuels is renewable energy. That means many more countries can join in, become producers, and diversify their economies. This opportunity can only materialize if policies make a clear distinction between the different fuel production pathways and reward options that are in line with 1.5°C.

Well-to-Wake Emissions Regulations, Transparency, and Certification

In 2018, the IMO set an ambition for shipping to reduce its greenhouse gas emissions by at least 50% by 2050, compared to 2008. While this was an important first step, this is not ambitious enough to limit warming to 1.5°C or even keep us under the well below 2°C scenario. Now is the time for the IMO to set a clear target for the shipping industry to run entirely on sustainable and renewable energy sources by the year 2050.

While we applaud the IMO members initiative to introduce "robust lifecycle GHG/carbon intensity guidelines for all types of fuels", without proper regulations incentivizing the production of sustainable, WtW accounted, fuels significant emissions sources will be missed and the first-mover market for the transition will be jeopardized.

edf.europa.org/shipping

Industry Action Coupled with Government Action

Fuel and technology production stakeholders are prepared to lead the energy transition and provide sufficient support to push the industry towards full decarbonization by the year 2050.

We, the signatories of this Call to Action, are ready to take the baton and prove that the urgent energy transition will be less disruptive, more equitable, and lower cost, so long as policies provide necessary confidence for investment in fuel production, scale, and uptake.

In support of the responsibility which lies on the shoulders of policy makers, we have come together to state, clearly and unambiguously, that the sustainable energy transition is practical and holds huge economic potential.

Unlocking the investment, which is ready and waiting, is firstly a matter of regulators providing clarity and form.

We therefore voice support for:

- **The full decarbonization of the maritime shipping industry by the year 2050** at the latest, and develop practical and cost-effective pathways for the maritime sector to be in line with a pathway that limits global warming to no more than 1.5°C.
- **Ensuring the adoption of 1.5°C-aligned interim targets¹ for 2030 and 2040**, that are essential to kick-start the maritime industry's decarbonization. Ambitious interim targets will galvanize prompt investment in sustainable fuels, reduce ambiguity, and increase the uptake of existing efficiency measures promoting a first-mover market that can stimulate the energy transition.
- **The adoption of Well-to-Wake emission policies to clearly and without ambiguity reach real and effective decarbonization of the industry.** The absence of a lifecycle (or Well-to-Wake) approach disincentivizes investment in, and production of, sustainable fuels and other technological development opportunities. This would be most damaging for developing countries where opportunities for sustainable fuels production are often greatest while also most vulnerable to uncertainty.

Collectively, we are prepared to facilitate the energy transition so long as the necessary measures are put in place to motivate our production of sustainable fuels.

We encourage others to join us.

To fully decarbonize the maritime shipping industry by the year 2050 we call upon world leaders to work together to deliver the right enabling environment with clear timelines, ambitious policies, and updated regulations ensuring that we, the fuel and technology production stakeholders, can maintain the energy transition.



Knowledge Partners

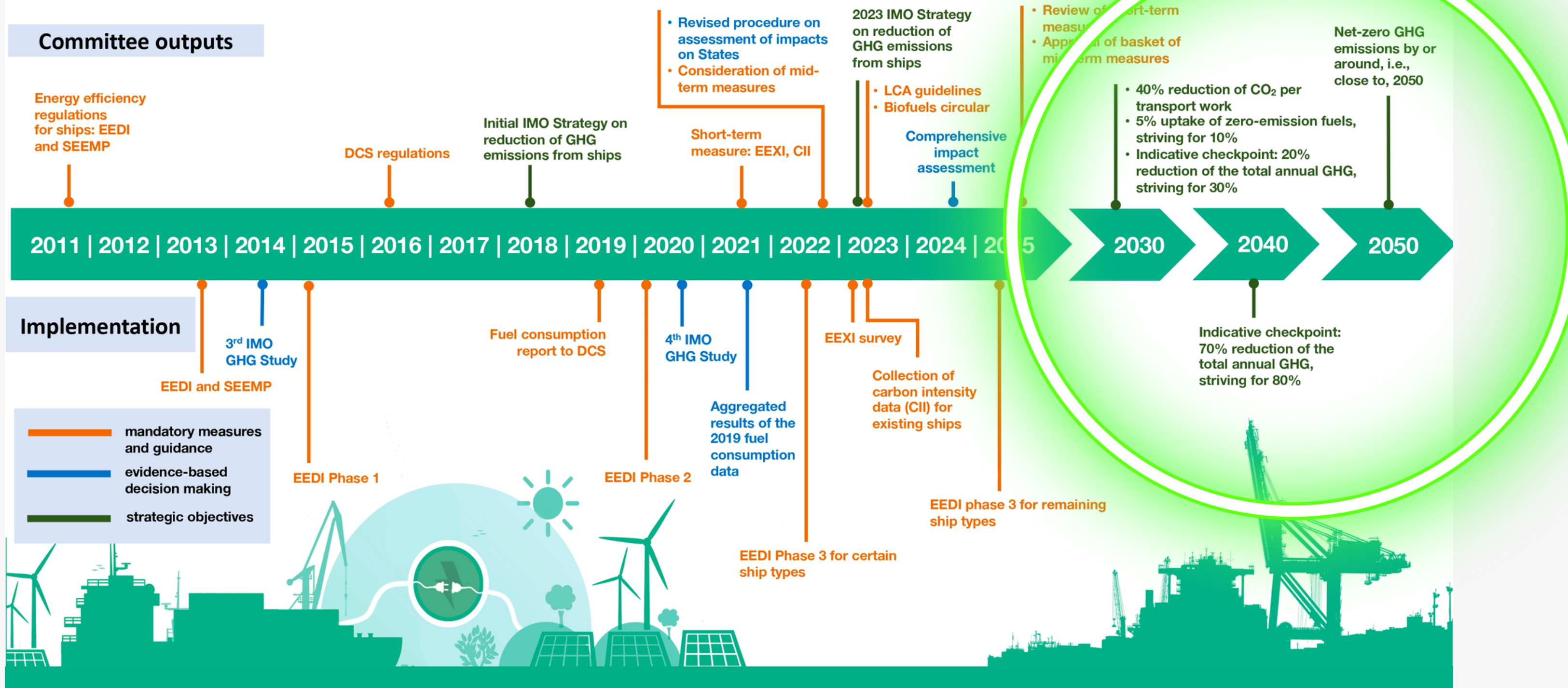


¹ Interim targets defining a pathway of GHG reduction consistent with avoiding temperature rise above 1.5 degrees Celsius by 2100: un.org/sites/un2.un.org/files/high-level_expert_group_n7b.pdf

Revised strategy at the IMO approved

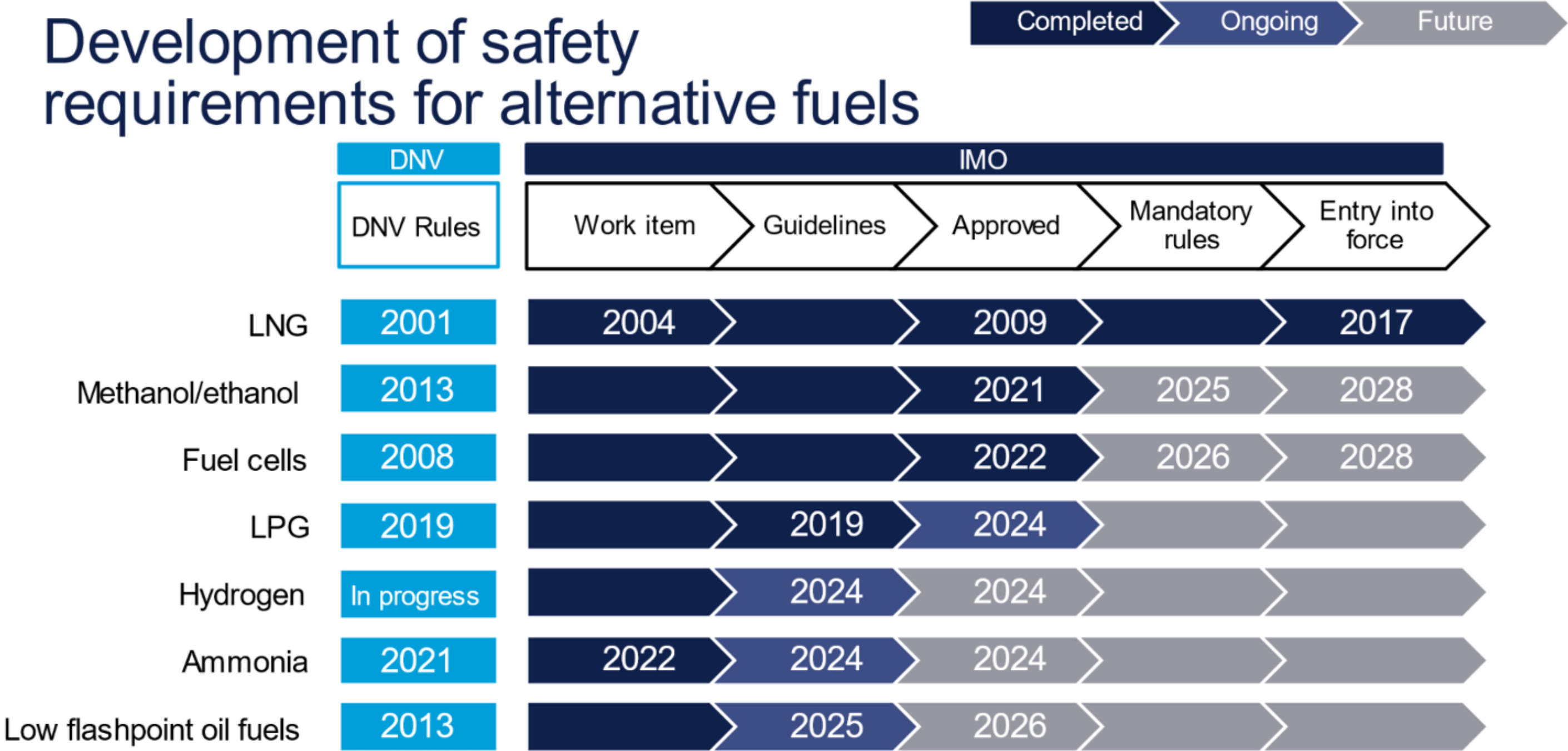
Addressing climate change

Over a decade of regulatory action to cut GHG emissions from shipping



Safety guidelines on ammonia in 2024

Development of safety requirements for alternative fuels



Source: Updated work plan for the development new alternative fuels under the IGF Code, CCC 9/WP.3, Annex 3, various IMO documents and DNV estimates. Future dates are indicative.


Maersk announcement Dec 1st 2023

01/12/2023, 13:15 Maersk Tankers orders up to 10 ammonia carriers in South Korea - Splash247

Asia Europe Gas Shipyards Tankers

Maersk Tankers orders up to 10 ammonia carriers in South Korea

Adis Ajdin • December 1, 2023 0 372 1 minute read



Denmark's Maersk Tankers has answered the call for a clean ammonia shipping solution with a newbuilding deal for up to 10 vessels in South Korea.

The subsidiary of AP Moller Holding has penned a contract with Hyundai Samho Heavy Industries for the construction of four firm 93,000 cu m units for delivery from 2026 onwards, with options for six additional ships, potentially worth in total more than \$1bn.

Japanese trading house Mitsui & Co will join as a co-investor in the first four vessels in a deal worth around \$432m.

The newbuilds will be among the largest ammonia carriers in operation, capable of carrying a full cargo of ammonia.

Maersk Tankers re-entered the gas sector in 2023, 10 years after selling the business, and today provides voyage management services for a growing fleet of nearly 30 very large gas carriers.

Maersk Tankers' CEO, Tina Revsbech, said: "Concrete actions are needed for the tanker industry to progress the energy transition, and

<https://splash247.com/maersk-tankers-orders-up-to-10-ammonia-carriers-in-south-korea/>

1/2

01/12/2023, 13:15 Maersk Tankers orders up to 10 ammonia carriers in South Korea - Splash247

in Maersk Tankers, we want to play our part in making transportation of clean energy a reality. We are building on our legacy of operating gas carriers to offer a crucial transportation service that will aid the transition. With this initiative, we will be able to service clean ammonia producers and users in many parts of the world with highly energy efficient and safe ships."

Maersk Tankers said it is working with MAN Energy Solutions and Hyundai Heavy Industries' engine machine division to make the vessels capable of running on clean ammonia, but that a decision to install ammonia-capable engines requires both regulatory and customer support.

AP Moller Holding's liner giant Maersk identified around three years ago both methanol and ammonia as its likely fuels it would use for the 2020s. It has since ordered more than 20 methanol-powered boxships and sourced methanol supplies around the world. The ammonia side of the fuel quest is now coming into view.

Alphaliner reported this week that Maersk is reportedly closing in on orders for a new series of up to twelve 3,500 teu boxships with ammonia considered as a propulsion option.

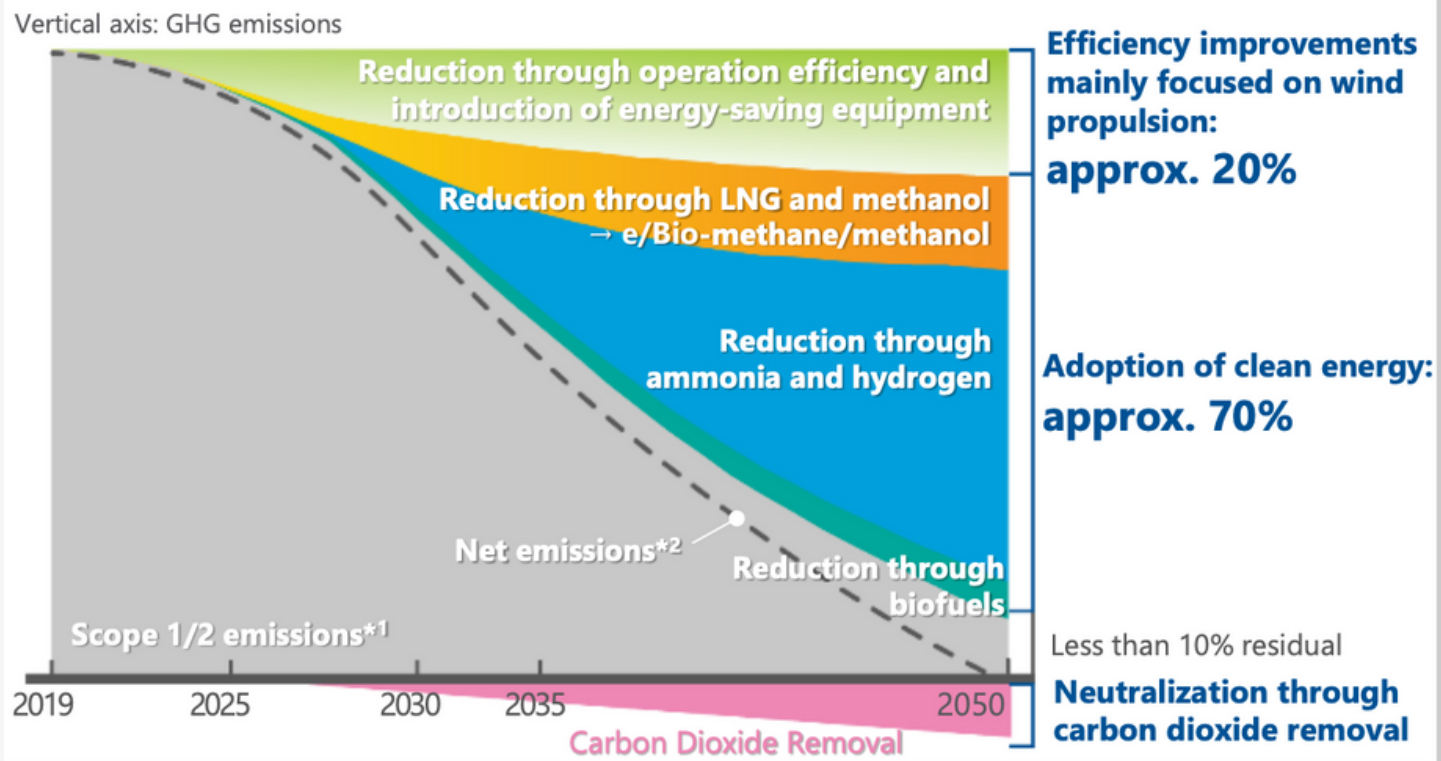
#Ammonia #Denmark #South Korea

<https://splash247.com/maersk-tankers-orders-up-to-10-ammonia-carriers-in-south-korea/>

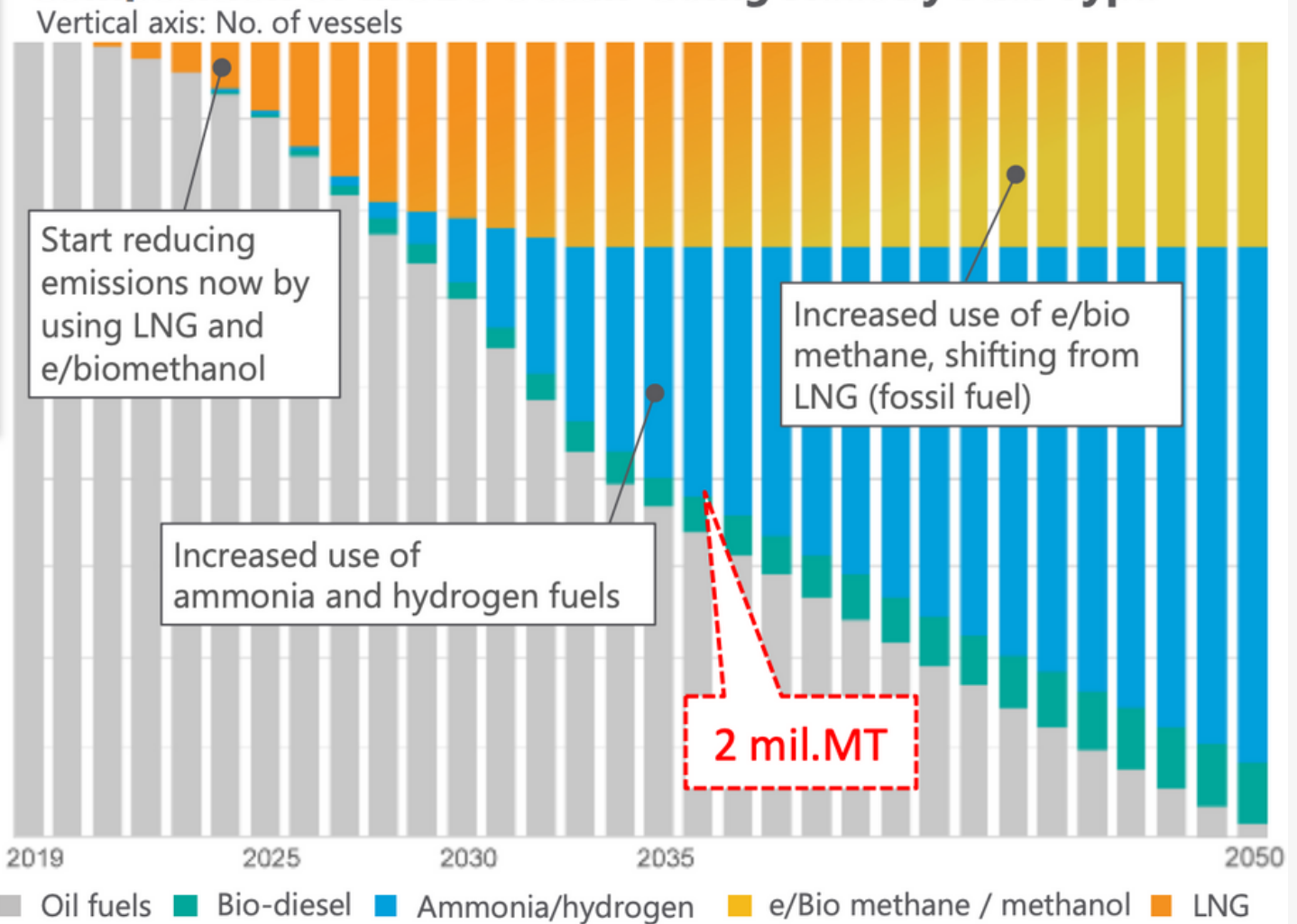
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MOL Pathway to Net Zero is about ammonia

Clarifying the "Pathway to Net Zero Emissions"



Composition of MOL's Ocean-Going Fleet by Fuel Type



The obstacles ahead

Harmonisation of fuel standard in view of other fuels

Safe design and human factors

Bunkering infrastructure

LCA certification

Public perception

Sustainability factors -
nitrogen loading

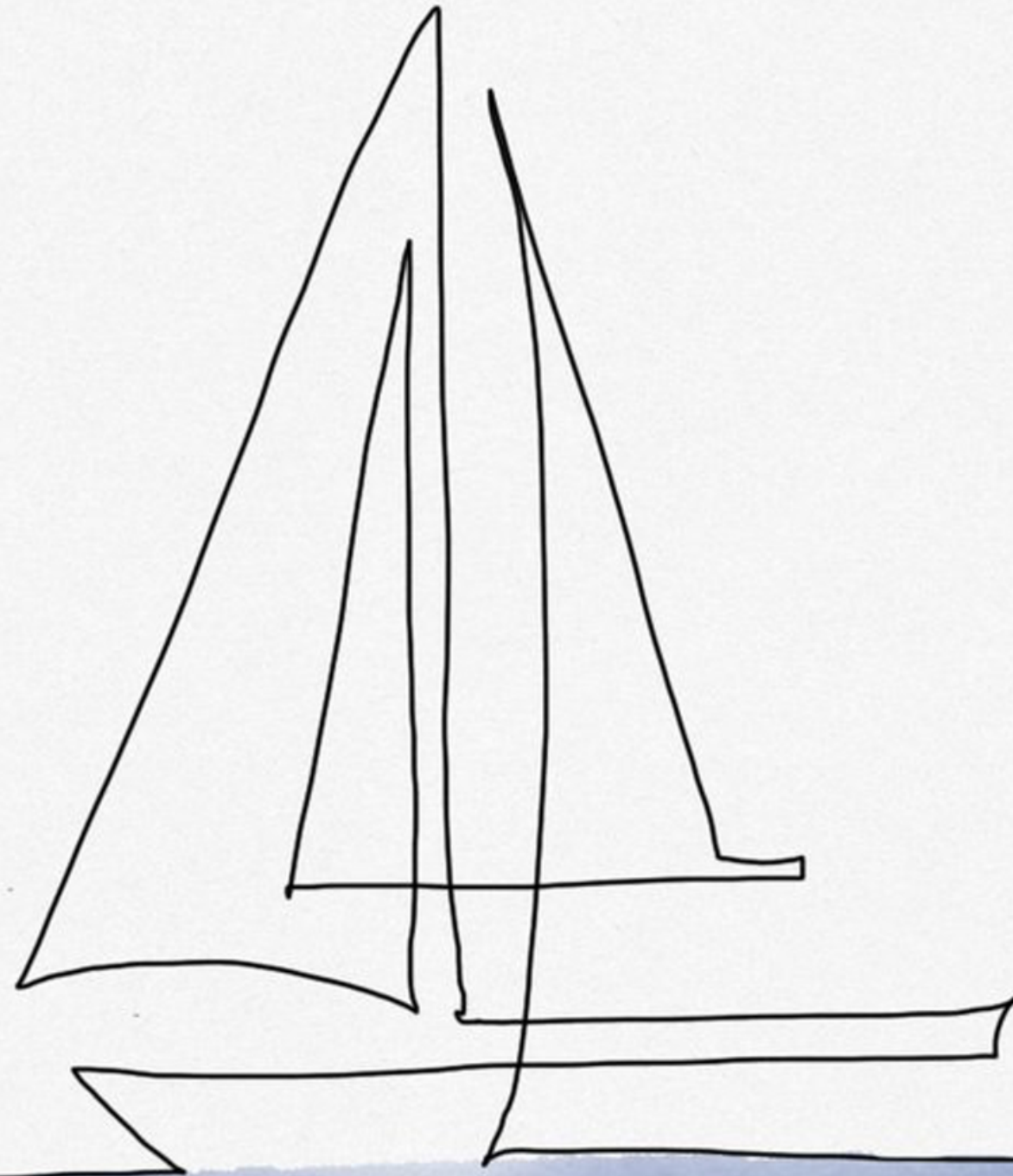
Supply and Demand

Bunker delivery notes

Looking ahead next 12 months:
Where to be and how to engage?



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