TAL TECH
ESTONIAN MARITIME ACADEMY

PRACTICAL DECARBONISATION ACTIONS IN SHIPPING

Professor Ulla Tapaninen, Dr Tech, maritime transport

Estonian Maritime Academy

Tallinn University of Technology

BALTIC-FIT

25.11.2025

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TALLINN UNIVERSITY OF TECHNOLOGY 2024

9,100
students

797 International students
from **82** different countries
80 study programmes
5 joint programmes
22 international programmes

2,242
employees

64 nationalities
44.31 average age
173 professors

1,249
publications

73 PhD degrees awarded
49% international PhD students

82,507
alumni

3.7% international alumni

Statistics 2024

TALTECH ESTONIAN MARITIME ACADEMY

Only higher education institution in Estonia offering maritime higher education, training and carrying out research

Research areas:

Maritime Transport

Maritime Cybersecurity

Blue Economy and Aquatic Resources

Green Maritime Technology

Waterway Safety Management

Nautical Sciences, Safety, Security and Navigation

International Maritime Law and Regulations

In numbers:

- 105 years experience
- 7000 alumni (since 2000)
- 480 students incl 25 PhD students
- 90 employees
- 8 professors + 22 researchers
- Budget 6,5 milj euros

Study programs:

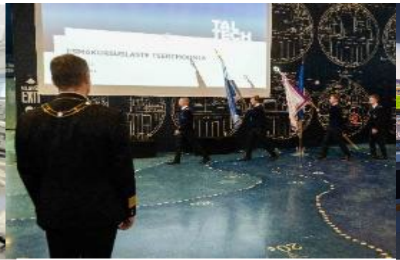
Doctoral studies: Main Speciality „Maritime“ in Engineering

Master studies: Maritime, Maritime Digitalization

Bachelor studies: Navigation, Ship Engineering, Port and Shipping Management, Waterway Safety Management








ULLA TAPANINEN

Finnlines
a Grimaldi Group company

University of Turku
CENTRE FOR MARITIME STUDIES

Meriturvallisuuden ja -liikenteen tutkimuskeskus
Kotka Maritime Research Centre
MERI KOTKA

ESL Shipping

Helsinki

TAL TECH
EESTI MEREAKADEEMIA

She has experience in three different fields of expertise related to maritime field: **academic, business and public administration.**

→ PhD from **Helsinki University of Technology** (later Aalto University) 1997

→ Professor of maritime logistics in **University of Turku** 2005 -2012, Centre for Maritime studies. Adjunct Professor/Docent of maritime economics and logistics of University of Turku since 2010.

→ Key positions in two Finnish shipping companies: a development and environmental manager in **Finnlines** (1996-2005) and member of board in **ESL Shipping** (2012 - 24) and member of the board of **Port of Helsinki** 2025 -

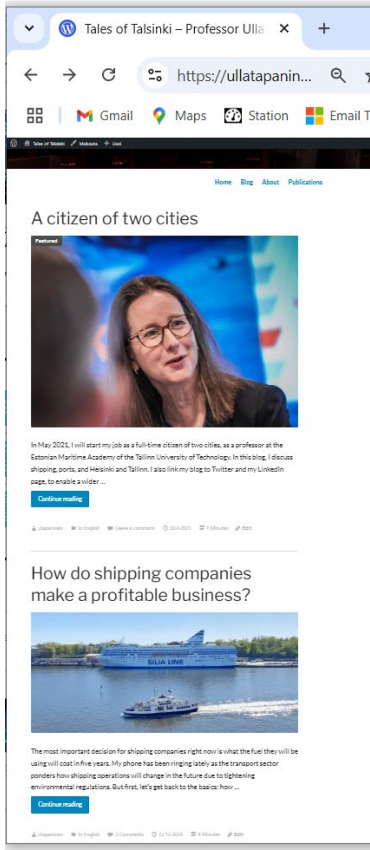
→ **City of Helsinki**, varius positions related to transport, City logistics, port operations, head of unit in city economic development department (2012-2021).

→ Tallinn University of Technology, **Estonian Maritime Academy**, tenured associate professor, maritime transport (2021-).

→ She has carried out dozens of research projects in academic, business and public administration, published dozens of academic journal articles, written several text books, is keen writer of blogs and invited speaker in seminars.

→ She is also particularly well connected to Finnish and European maritime field, European Union, academies and business sector. Member of Finnish Intelligent Transport Society (ITS-Finland), Finnish Association of Purchasing and Logistics LOGY and The Finnish Maritime Society – Meriliitto.

→ **Vuoden logistikko 2022** (Logistics professional in Finland).



Full tenured professor *Ulla Pirita Tapaninen*
Book: *Maritime Transports 2020, Kogan Page*
Blog: *ullatapaninen.net*

MARITIME TRANSPORT RESEARCH GROUP
ESTONIAN MARITIME ACADEMY

- **Smart and Energy Efficient Environments (business studies)**
  How tightening environmental regulations affect shipping companies, ports and maritime markets?
  The studies analyse the present shipping business, and study how the new fuels, vessel design and operative changes will affect the shipping business models and operations.

- **Maritime and Port Governance (social sciences)**
  The functioning and competitiveness of maritime cluster: shipping companies, port and maritime sectors in various shipping market situations: cargo and passenger volumes, economics, policies, law and public opinion.

9 Ph.D students, 3 post-docs, 2 adj. prof., 3 assistants
5 large international projects (Horizon + CB)

Full tenured professor *Ulla Pirita Tapaninen*
Book: *Maritime Transports 2020, Kogan Page*
Blog: *ullatapaninen.net*

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WE HAVE A MISSION!

"In the next 20 years the maritime industry must rebuild its cargo fleet. If this is done with the radical technologies now available, it will lead to the biggest change in ship design since steam replaced sail in the 19th century."

Coronavirus, Climate Change & Smart Shipping
THREE MARITIME SCENARIOS
2020 – 2050

TAL TECH

Levels of ambition directing the 2023 IMO GHG Strategy are as follows:

.1 carbon intensity of the ship to decline through further improvement of the energy efficiency for new ships

to review with the aim of strengthening the energy efficiency design requirements for ships

.2 carbon intensity of international shipping to decline

to reduce CO2 emissions per transport work, as an average across international shipping, by at least 40% by 2030,compared to 2008;

.3 uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to increase

uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to represent at least 5% striving for 10% of the energy used by international shipping by 2030; and

.4 GHG emissions from international shipping to reach net zero

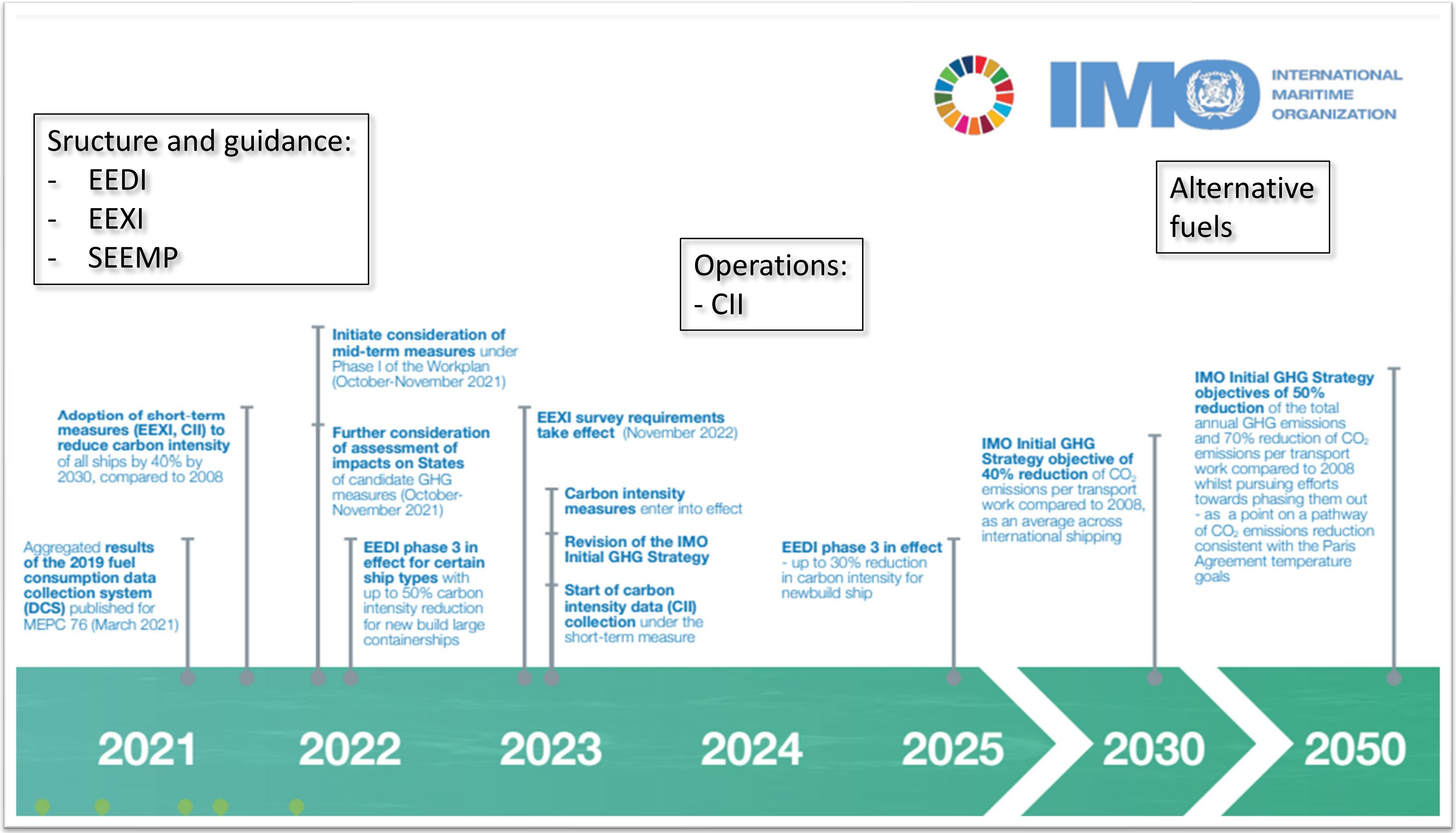
to peak GHG emissions from international shipping as soon as possible and to reach net-zero GHG emissions by or around, i.e. close to, 2050, taking into account different national circumstances, whilst pursuing efforts towards phasing them out as called for in the Vision consistent with the long-term temperature goal set out in Article 2 of the Paris Agreement.

IMO REGULATIONS

Sructure and guidance:
- EEDI
- EEXI
- SEEMP

Operations:
- CII

Alternative fuels

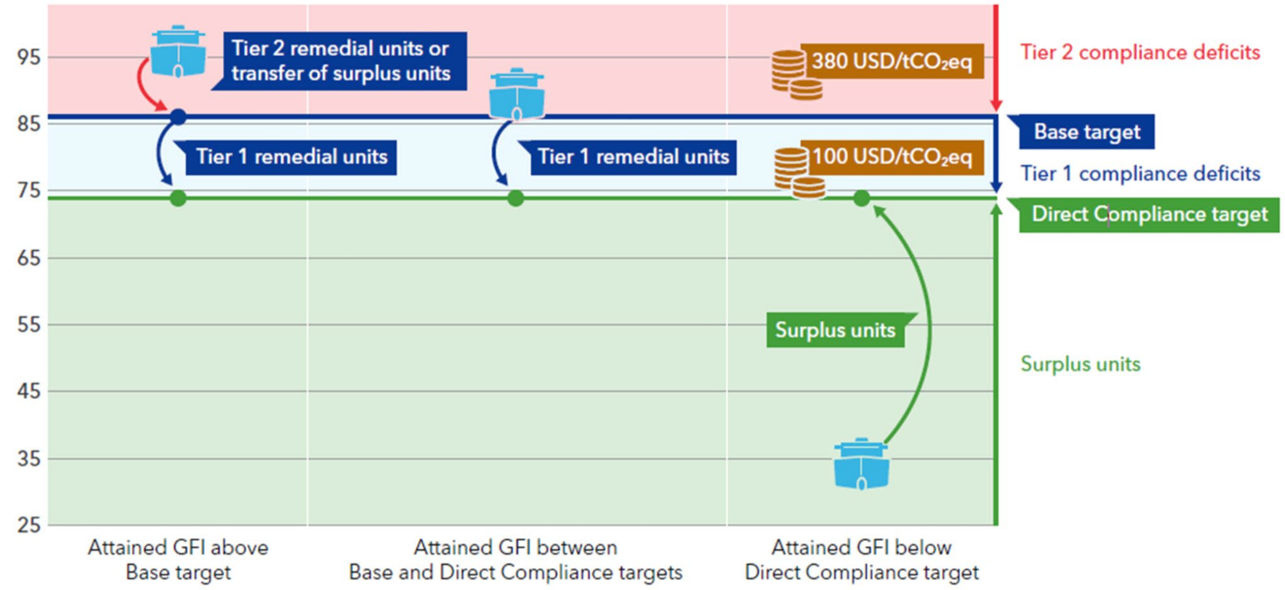


IMO TARGET BASED MEASURES

FIGURE 3-3

Illustration of compliance approaches in the NZF exemplified for the 2030 targets

Units: GFI (gCO_2eq/MJ)



IMO fails to agree Net-Zero Framework, pushes talks to 2026

Adis Ajdin · October 18, 2025 · 1 · 3,926 · 2 minutes read

Negotiations at the International Maritime Organization (IMO) have broken down without agreement on the Net-Zero Framework, leaving the shipping industry facing another year of uncertainty over how its decarbonisation will be regulated.

TAL TECH

Press release | 14 July 2021 | Brussels

European Green Deal: Commission proposes transformation of EU economy and society to meet climate ambitions

Page contents

Today, the European Commission adopted a package of proposals to make the EU's climate, energy, land use, transport and taxation **policies fit for reducing net greenhouse gas emissions by at least 55% by 2030**, compared to 1990 levels. Achieving these emission reductions in the next decade is crucial to Europe becoming the world's first climate-neutral continent by 2050 and making the European Green Deal a reality. With today's proposals, the Commission is presenting the legislative tools to **deliver on the targets agreed in the European Climate Law** and fundamentally transform our economy and society for a fair, green and prosperous future.

EU: FIT FOR 55

1. FuelEU Maritime,
   carbon intensity of fuels
2. EU ETS, Emission trading system
3. ETCD - Energy Taxation Directive
4. (AFIR)- Shore-side electricity

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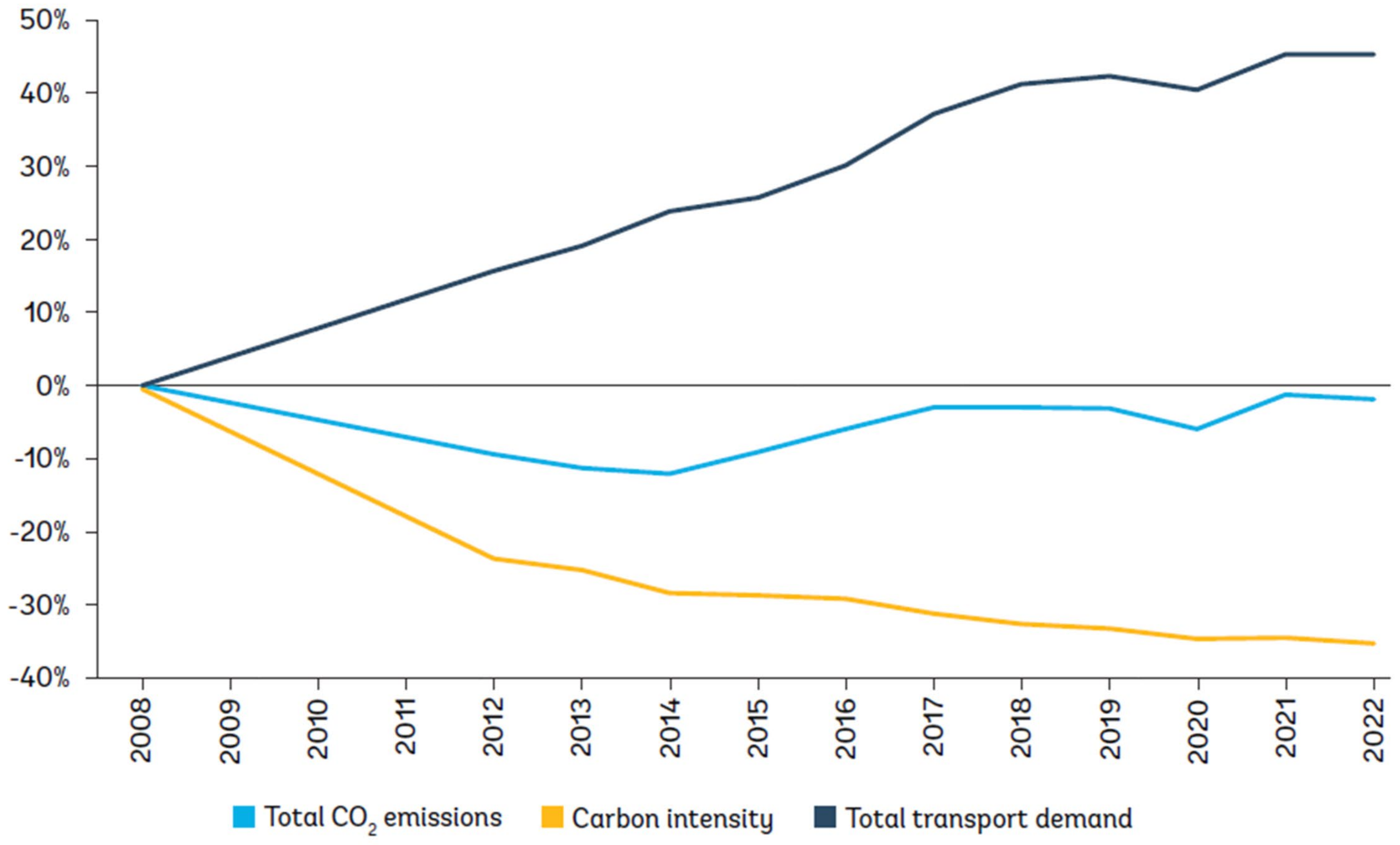
TRENDS IN TRANSPORT WORK AND GHG EMISSIONS 2008



Source: Smith and Francis (2024b); Clarksons (ongoing). Carbon intensity is the EEOI, which measures the CO2 emissions per unit of transport work.

World Bank, 2025. Keys to Energy-Efficient Shipping.Washington DC: World Bank,

SHIPPING EMISSIONS

Inventory of GHG Emissions from International Shipping 2012-2018

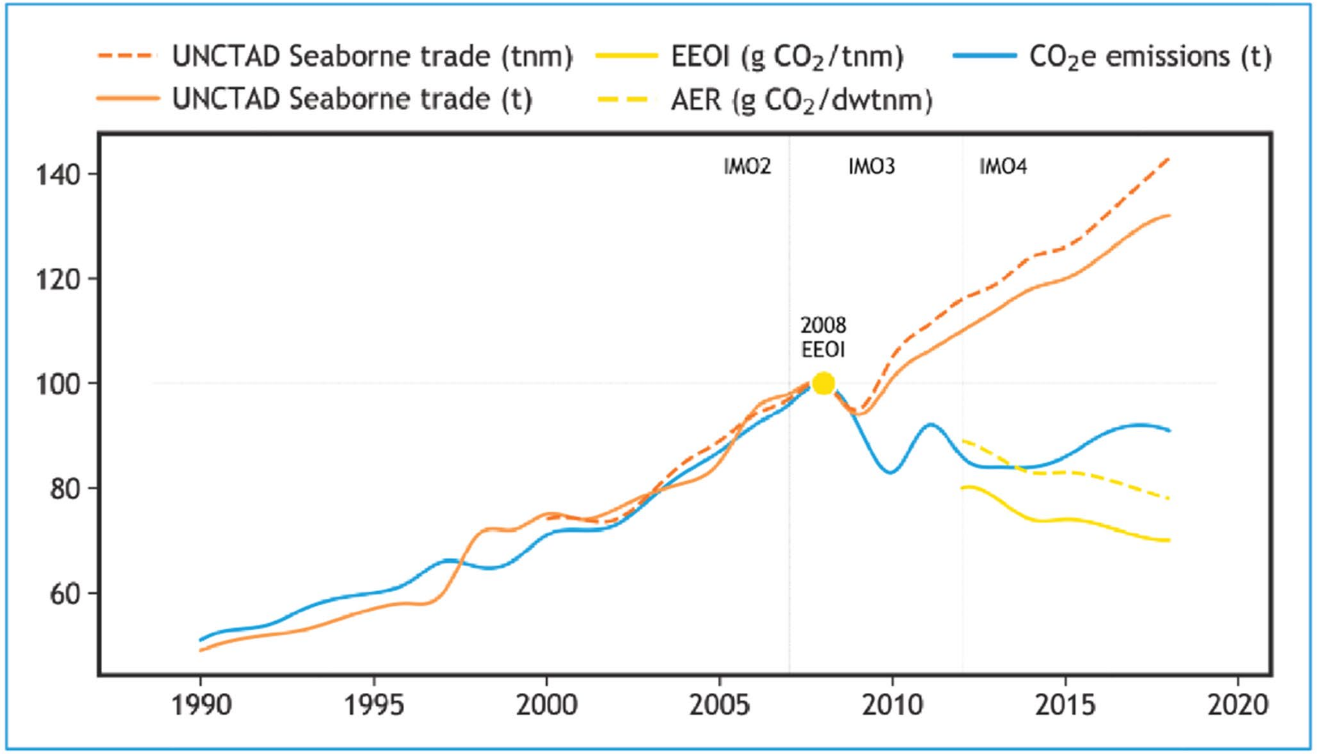
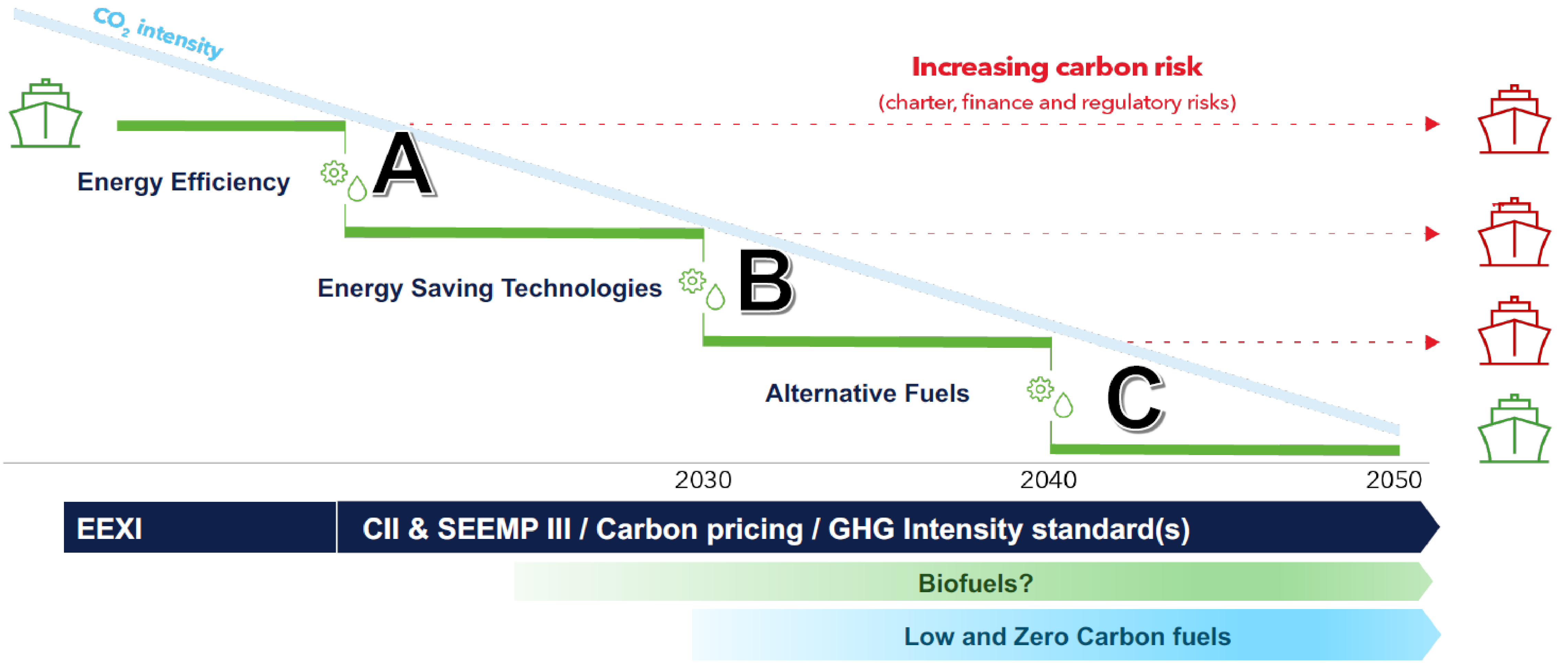


Figure 2 – *International shipping emissions and trade metrics, indexed in 2008, for the period 1990-2018, according to the voyage-based allocation[1] of international emissions[2]*

Source: Fourth IMO GHG Study 2020

Develop your future readiness – ***as a muscle***



SHIP ENERGY EFFICIENCY

Table 3
Energy efficiency trends on differen types of cargo ships.

Type of cargo ship	Efficiency improvements of new ships relative to the baseline EEDI value of 2013.	Share of ships built in 2013–2017 already complying with the post-2025 EEDI target.
Containerships	58% more efficient	71% of built containerships
General cargo ships	57% more efficient	69% of built general cargo ships
Gas carriers	42% more efficient	13% of built gas carriers
Oil Tankers	35% more efficient	26% of built oil tankers
Bulk Carriers	27% more efficient	1% of built Bulk Carriers

Table 7
Design measures that assesed their impact using the EEDI.

Type of modification employed	Description of the method	Type of ship examined	Impact	Source
Modification of hull parameters	Restoring historical adimensional design parameters like block coefficient.	Tankers and bulk carriers of all sizes.	The EEDI values are reduced between 10 and 15% in the fleets examined.	(Kristensen and Lützen, 2012)
	Reduction of main ship dimensions like length and beam	Panamax tankers with influence of bulk carriers.	The EEDI values diminish between 2.5% and 0.7% per meter subtracted.	(Lützen and Kristensen, 2012)
Propulsion system optimization	Innovative propulsion methods like the Organic Rankine Cycle	LNG carriers.	The EEDI diminishes up to 0.3 below the reference case in the best systems.	(El Geneidy, 2018)
	Electric propulsion systems.	Passenger vessels.	Both structures examined comply with phase 3, but the COGES system has greater margin of error.	(Ammar and Seddiek, 2021)
	Specific LNG carrier propulsion	LNG carriers exclusively.	Of the systems examined, only the diesel electric complies with phase 3, but with a heavy methane slip.	(Attah and Bucknall, 2015)
Hybrid propulsion systems	Hybrid systems on general cargo carriers	Small and fast general cargo carriers.	Two of the investigated cases comply even with the strictest phase of the EEDI.	
	Fleets of hybrid systems	Ro-Ro and Passenger ships.	Both types of systems examined have EEDI values below the reference of the ship.	
Alternative fuel sources	Varied array of alternative technologies like shaft generators.	Very large crude carrier.	The combined effects of innovative technologies produces a drop in the EEDI of up to 0.34, around 16%.	
	Propulsion for Liquid hydrogen tankers.	Liquid hydrogen tankers exclusively.	The optimal system analysed was a steam turbine with a hydrogen boiler and complies even with phase 3 of the EEDI.	

Review of ship energy efficiency
Julio Barreiro, Sonia Zaragoza, Vicente Diaz-Casas
Ocean Engineering

Table 9
Operational measures.

Type of modification employed	Description of the method	Type of ship examined	Impact	Source
Slow steaming	Reduction of travel speed.	Bulk carriers, tankers, and containerships	For a speed reduction of 5%, bulk-carriers and tankers have fuel savings of 13% and containerships of 16–19%	(Hochkirch and Bertram, 2010)
	Auxiliary system compliance to slow steaming.	Containership	The coordination of the auxiliary systems reduces the CO_2 emissions by 948 t/year and fuel consumption by 296.2 tons per year.	(Dere and Deniz, 2019)
Route optimization	Optimal speed under varying sea conditions.	Inland Cruise ship but is specifically noted to work on different ships.	Both fuel consumption and emissions can be reduced by about 28% in ideal cases, saving around 2961 kg/trip.	(Wang, 2018)
Trim optimization	Optimal trim configuration.	Bulk carriers	The highest reduction in resistance was almost 14%, depending on the draft and the speed.	(Moustafa et al., 2015)

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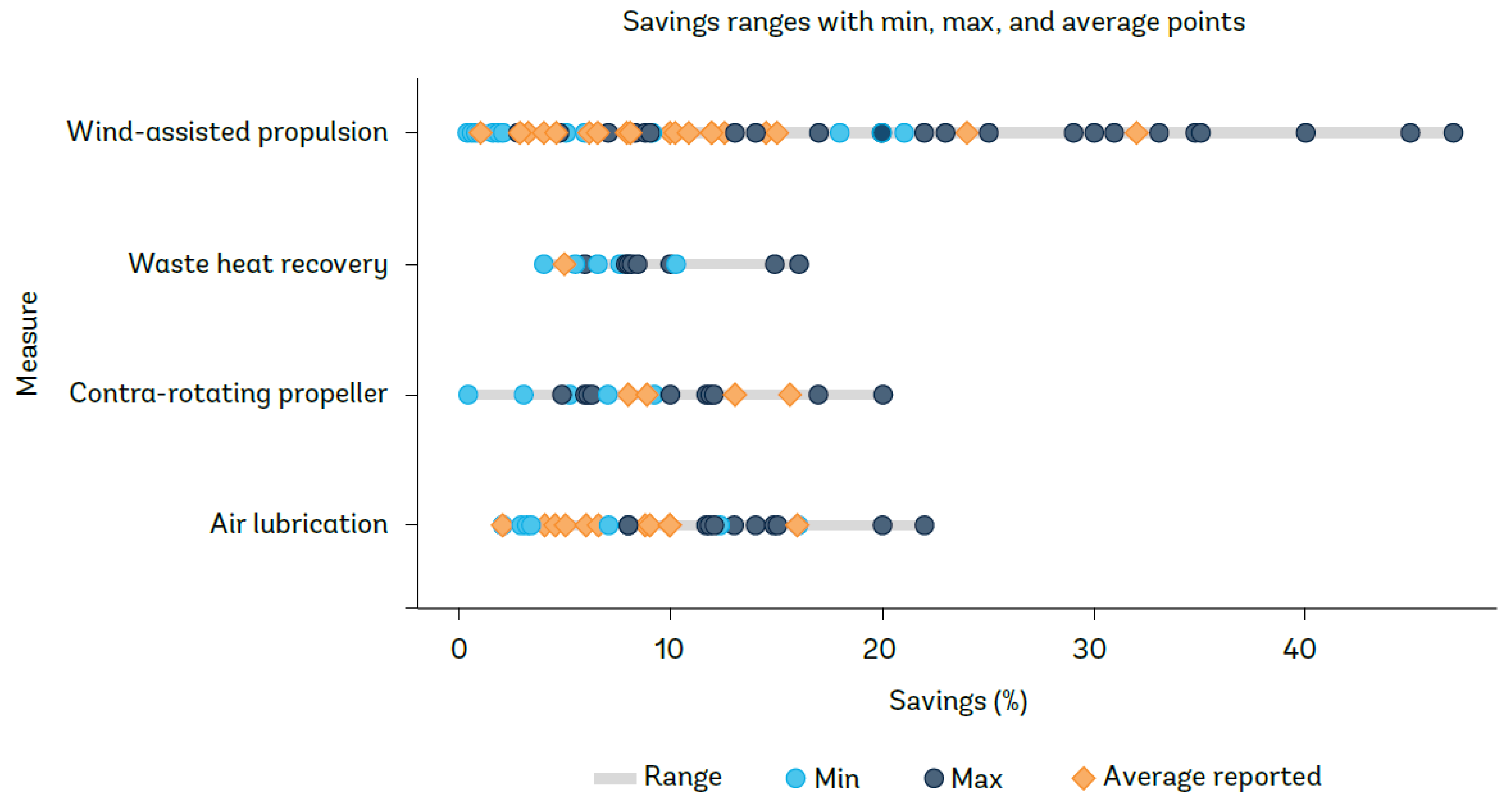
Source: Julio Barreiro, Sonia Zaragoza, Vicente Diaz-Casas, 2022, Review of ship energy efficiency, Ocean Engineering, 257, https://doi.org/10.1016/j.oceaneng.2022.111594.

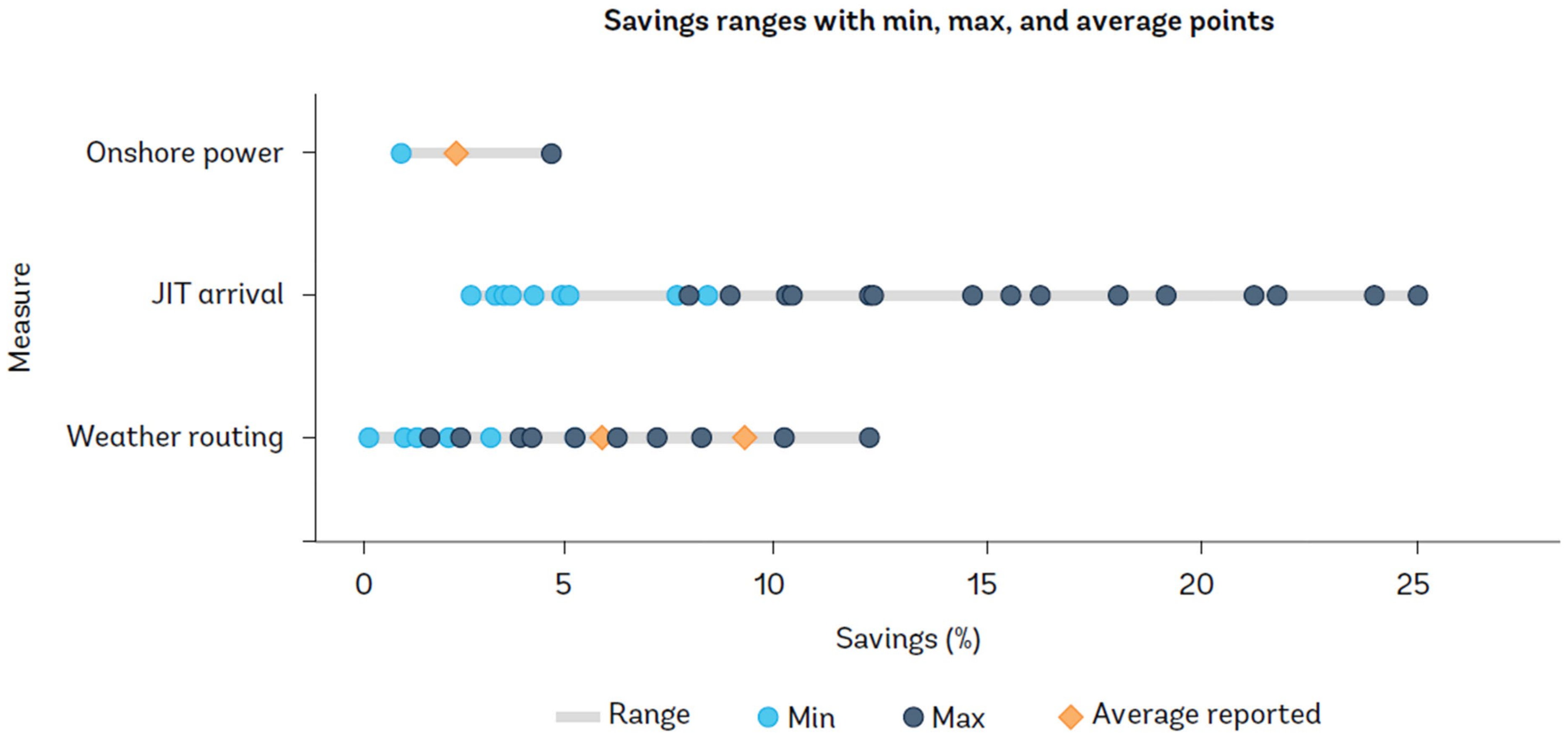
Figure 2.2 Range of savings from different technical measures



Source: World Bank.

World Bank, 2025. Keys to Energy-Efficient Shipping.Washington DC: World Bank,

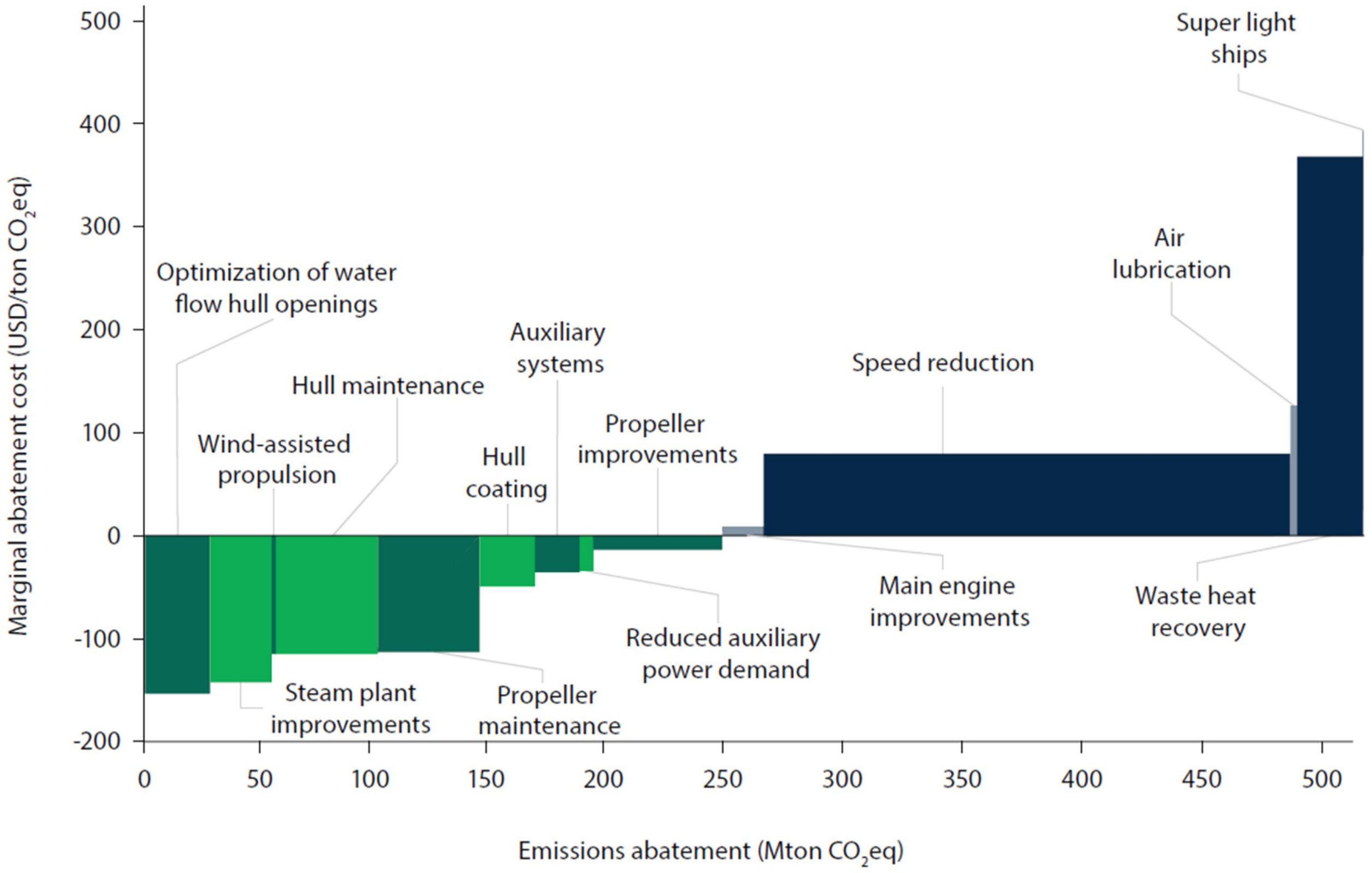
Figure 2.3 Range of savings from different operational measures



Source: World Bank.

World Bank, 2025. Keys to Energy-Efficient Shipping.Washington DC: World Bank,

Figure 2.5 Cost-effectiveness and abatement potential of individual measures for the total fleet in 2030 under fossil fuel prices



Source: World Bank. Results are presented for the Maximum Efficiency-High Demand scenario. Solar panels were included in the modelling but were omitted from the visual for presentation purposes due to their small contribution to emissions abatement.

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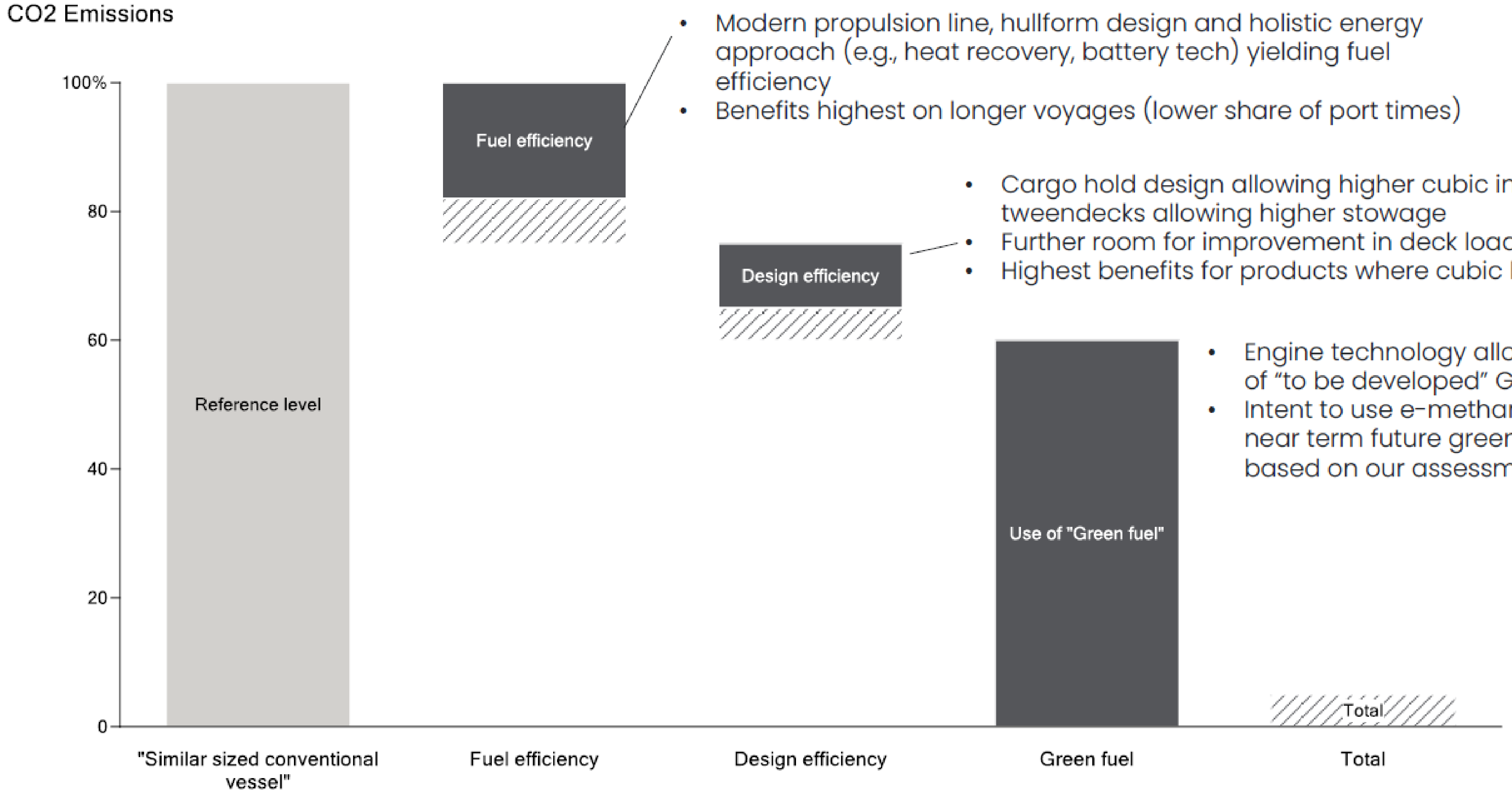
World Bank, 2025. Keys to Energy-Efficient Shipping.Washington DC: World Bank, License: Creative Commons Attribution Non-commercial CC BY-NC 3.0 IGO.

ESL Green Shipping concept brings GHG efficiency in variety of ways – illustrative example

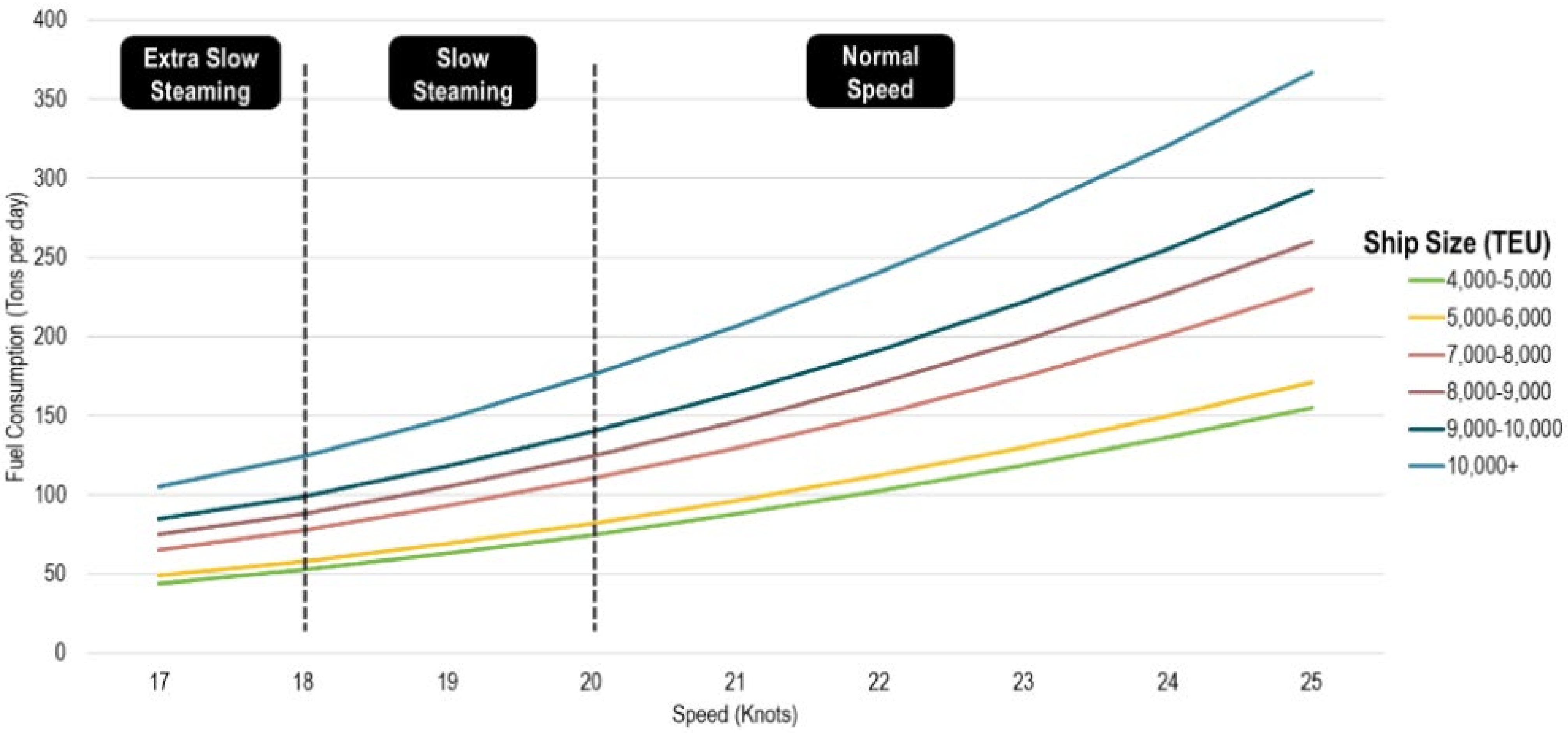


- Modern propulsion line, hullform design and holistic energy approach (e.g., heat recovery, battery tech) yielding fuel efficiency
- Benefits highest on longer voyages (lower share of port times)

- Cargo hold design allowing higher cubic intake, tweendecks allowing higher stowage
- Further room for improvement in deck loading
- Highest benefits for products where cubic bottleneck

- Engine technology allowing use of “to be developed” Green fuels
- Intent to use e-methanol (best near term future green fuel based on our assessment)

Fuel Consumption by Containership Size and Speed



Fuel Consumption by Containership Size and Speed

The Geography of Transport Systems
Jean-Paul Rodrigue (2020)

AUTOMOORING SYSTEM IN HELSINKI AND TALLINN

Tallinn's Old City Harbour to introduce automated mooring system

Port of Tallinn has signed contracts with maritime engineering companies Trelleborg and Cavotec for the instalment of automated mooring systems at quays 5, 12 and 13 of the Old City Harbour, which is used by passenger vessels serving the Tallinn-Helsinki route.

According to Peeter Nõgu, head of the infrastructure development division of Port of Tallinn, technological development has greatly contributed to the maritime sector, including the mooring processes of ships. "The new automated mooring equipment installed in the Old City Harbour will fasten our mooring operations while also requiring less man-hours and contributing to environmental sustainability. The new systems are primarily used by the ships sailing on our busiest route between Tallinn and Helsinki, where every extra minute saved either at sea or in port is highly valued."

The shipping industry uses either automated vacuum mooring or automated magnetic mooring systems. According to Peeter Nõgu, Port of Tallinn opted for a vacuum-pad based system, while the magnetic mooring systems are still at an early stage of development and usage. For this reason, the full impact of the electromagnetic waves on either a ship's electronics or the surrounding environment isn't yet fully known.

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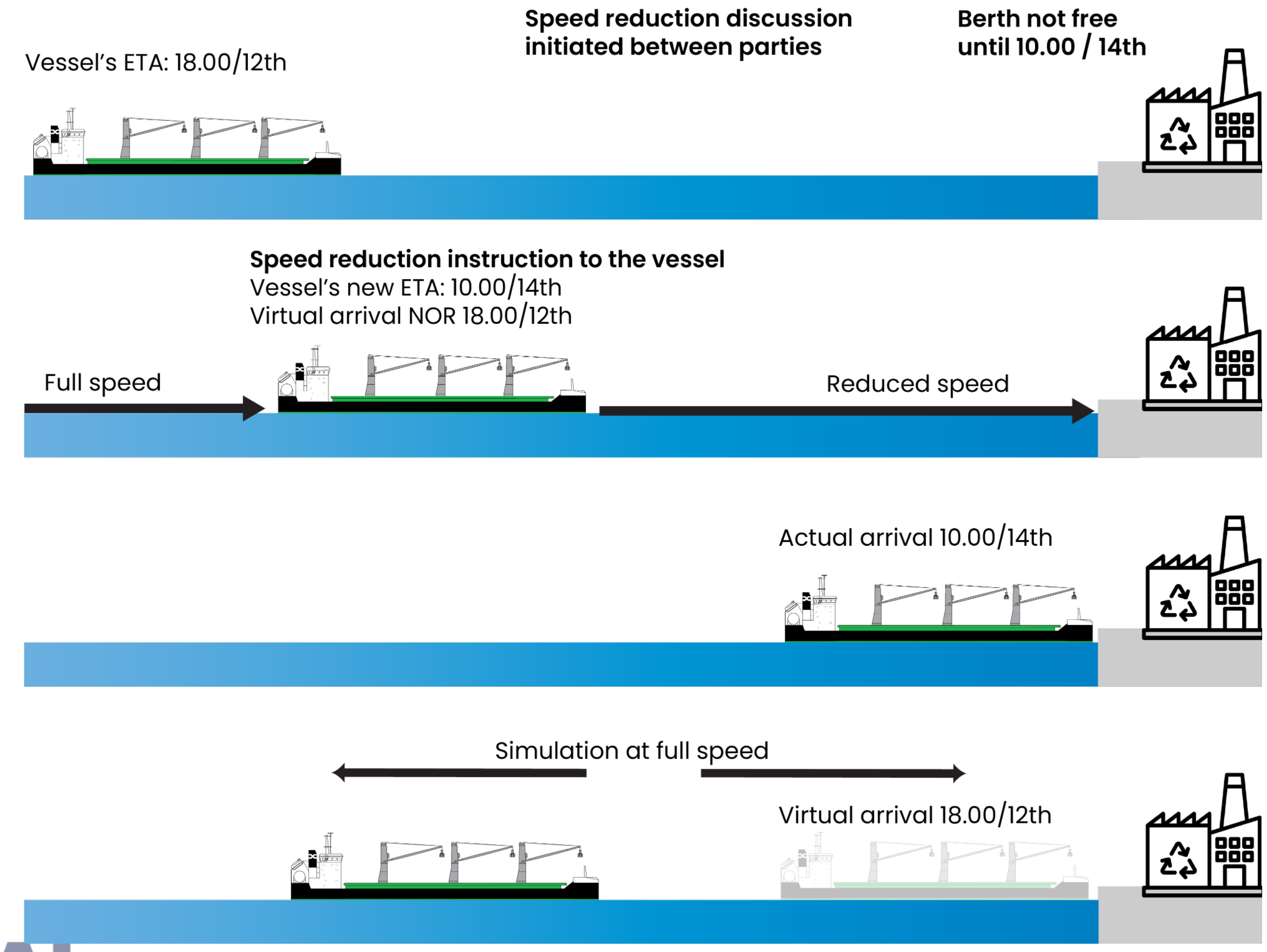
VIRTUAL ARRIVAL



Benefits of Virtual arrival

- reduced energy consumption
- reduced emissions
- less congestion in the port and anchorage area
- more reliable scheduling and line-up of vessels in port
- more efficient resource planning for port operators
- savings are shared between owners and charterer

−24%

Average reduction of CO_2-emissions

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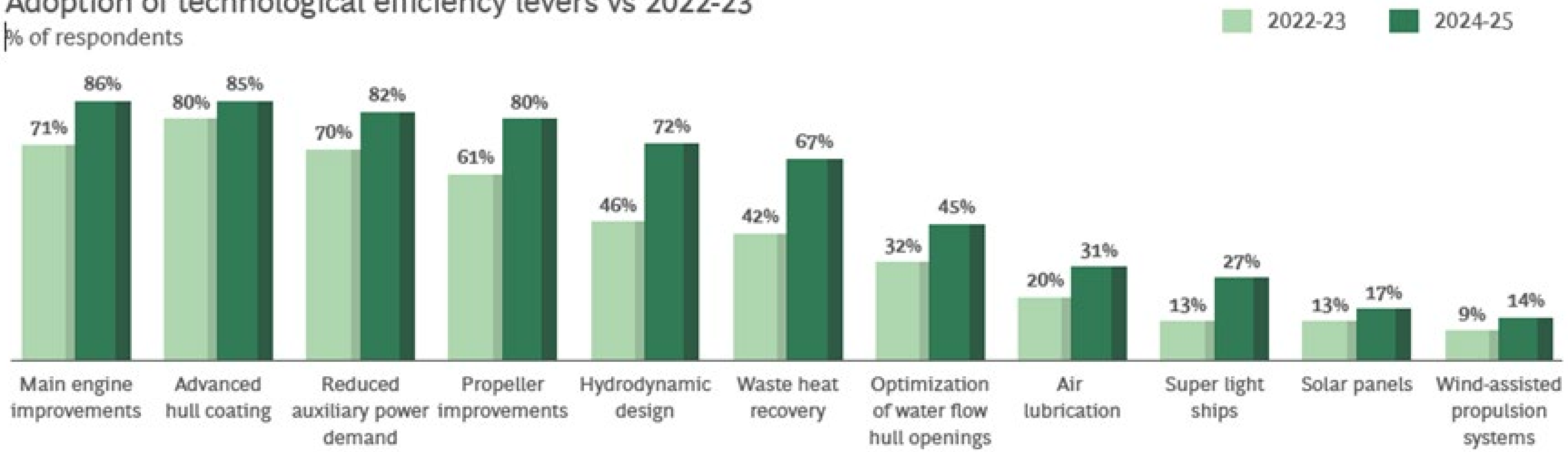
Exhibit E1 - Adoption of efficiency levers has increased compared to 2022-23

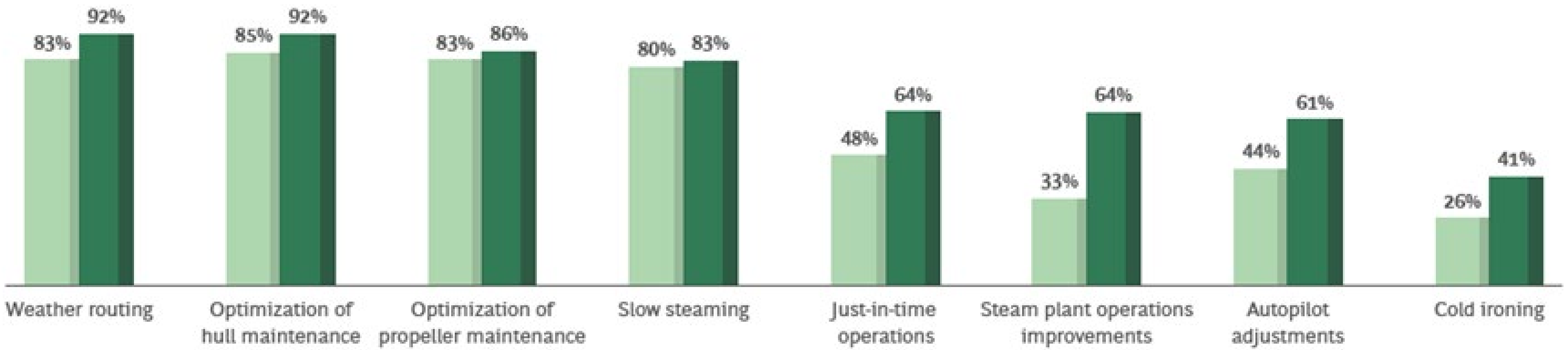
Adoption of technological efficiency levers vs 2022-23

% of respondents



Adoption of operational efficiency levers vs 2022-23

% of respondents



Note: N = 113 for 2024-25 survey; N = 128 for 2022-23 survey

Source: BCG 2025: Advancing Maritime Decarbonization: Insights from the GCMD-BCG Global Maritime Decarbonization Survey (2nd edition)

SIX STEPS TO PROMOTE SUSTAINABLE MOBILITY OF GOODS AND PEOPLE

1. Improve the energy efficiency in newbuildings.
2. Pilot various technical solutions to increase energy efficiency, e.g. rotor sails; smart IT- solutions to manage data for maintenance, bunker optimization and safety; air lubrication systems; use of batteries in ports and fairways; information for port arrivals, etc.
3. Reduce speed and improve port operations.
4. Be prepared for the new low or zero carbon fuels.
5. Shippers: evaluate alternative transport modes and operations.
6. Regulators: introduce rules and support mechanisms and carbon taxes to help shipping industry to move towards carbon-neutrality

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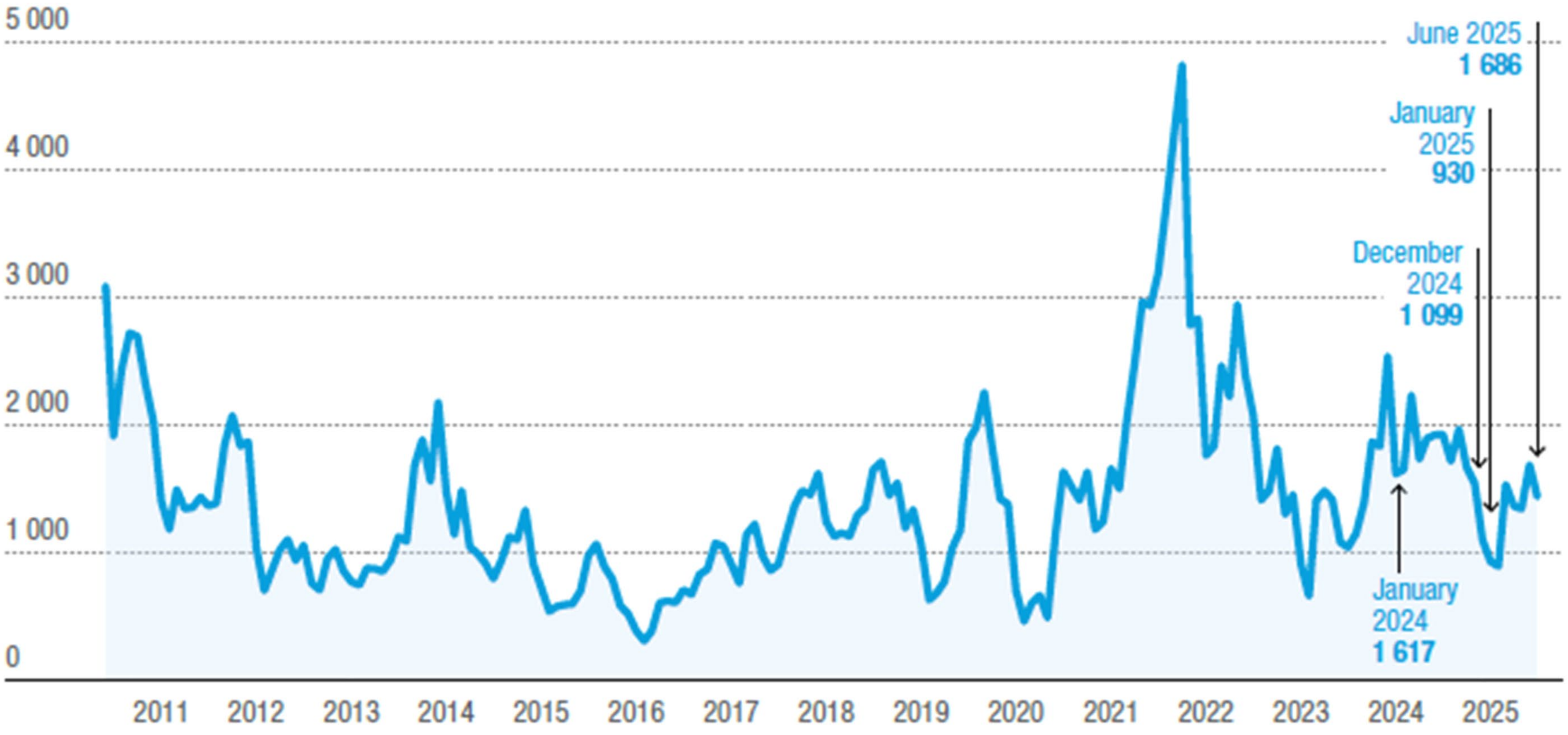
U. 2021 ”Six steps to reach carbon-free shipping” in K. Liuhto (ed.) Baltic Rim Economies, -oundation, 5/2021. https://sites.utu.fi/bre/six-steps-to-reach-carbon-free-shipping/

BALTIC DRY INDEX 2011 - 2025

Figure III.4
The Baltic Dry Index was strong in 2024 but softened in 2025



Source: UNCTAD calculations, based on data from Clarksons Shipping Intelligence Network.

Source: Unctad: Review of Maritime Transport 2025

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Table 1: Emissions reported in MRV for different shipping segments

Ship type	Emissions	Emission per distance	Emissions per transport work
	Mtonnes CO_2	kg CO_2/NM	g CO_2 / tonne-NM
Bulk	18.1	290	8.48
Container	44.4	570	20.13
General cargo	6.13	185	28.02
Oil Tanker	18.1	435	8.82
Ro-ro	6.06	338	91.03

Source: Mellin *et al*. 2020

EMSA THETIS-MRV | EU MRV | CO_2 EMISSION REPORT | REGISTER | FAQ | Login

Publication of information in accordance with Article 21 of Regulation (EU) 2015/757 on the monitoring, reporting and verification of CO_2 emissions from maritime transport. Information is accessible through the search tool or can be exported in a spreadsheet for further analysis. Since 30 June 2020, all the verified information submitted by companies to the European Commission for the reporting year 2019 is accessible.

It should be noted that 2021 is the first year for which THETIS-MRV data reflect the impact of the United Kingdom's withdrawal from the EU (see notice to stakeholders)

IMO Number: | Ship Name: aurora botnia | Reporting Period: | Ship type:

Search | Reset

	IMO ↑	Name	Ship Type	Technical efficiency		Reporting Period	Total CO_2 emissions [m tonnes]	CO_2 emiss. per distance [kg CO_2 / n mile]	CO_2 emiss. per transp. work
				Type	($gCO_2/t{\cdot}nm$)				
Actions	9878319	AURORA BOTNIA	Ro-pax ship	Not Applic...		2023	12829.04	207.17	215.48 g CO_2 / pax · n miles 233.94 g CO_2 / m tonnes · n miles
Actions	9878319	AURORA BOTNIA	Ro-pax ship	Not Applic...		2022	16003.65	266.21	281.77 g CO_2 / pax · n miles 267.68 g CO_2 / m tonnes · n miles

	IMO ↑	Name	Ship Type	Technical efficiency		Reporting Period	Total CO_2 emissions [m tonnes]	CO_2 emiss. per distance [kg CO_2 / n mile]	CO_2 emiss. per transp. work
				Type	($gCO_2/t{\cdot}nm$)				
Actions	9827877	VIKING GLORY	Ro-pax ship	EIV	3.5	2023	41315.32	347.19	61.46 g CO_2 / pax · n miles 210.75 g CO_2 / m tonnes · n miles
Actions	9827877	VIKING GLORY	Ro-pax ship	EIV	3.5	2022	48797.78	460.36	71.48 g CO_2 / pax · n miles 293.64 g CO_2 / m tonnes · n miles

	IMO ↑	Name	Ship Type	Technical efficiency		Reporting Period	Total CO_2 emissions [m tonnes]	CO_2 emiss. per distance [kg CO_2 / n mile]	CO_2 emiss. per transp. work
				Type	($gCO_2/t{\cdot}nm$)				
Actions	9892690	MYSTAR	Ro-pax ship	EIV	2.3	2023	53668.59	568.50	470.37 g CO_2 / pax · n miles 110.16 g CO_2 / m tonnes · n miles
Actions	9892690	MYSTAR	Ro-pax ship	EIV	2.3	2022	3633.88	797.74	583.81 g CO_2 / pax · n miles 137.82 g CO_2 / m tonnes · n miles

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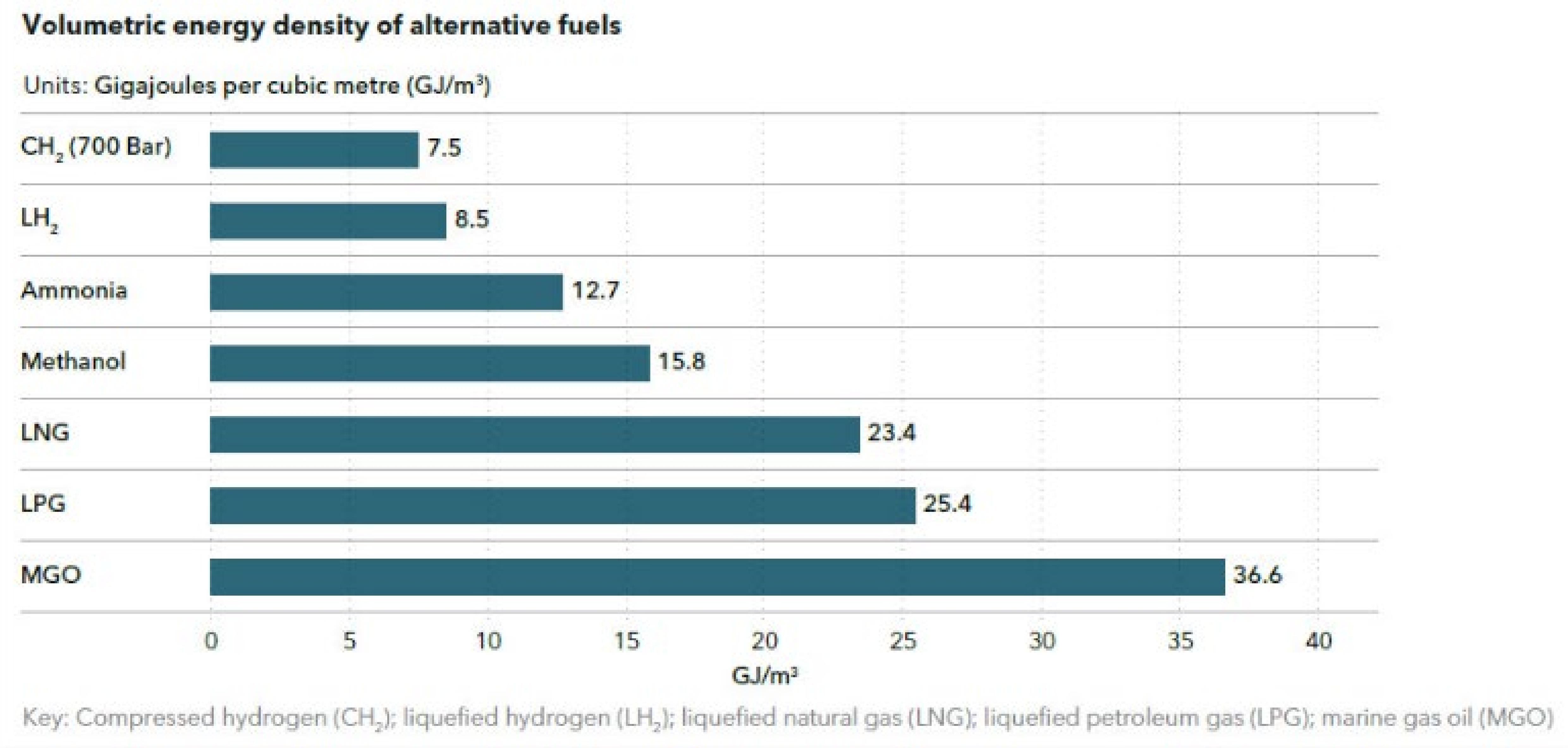

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Source: DNV

ENERGY

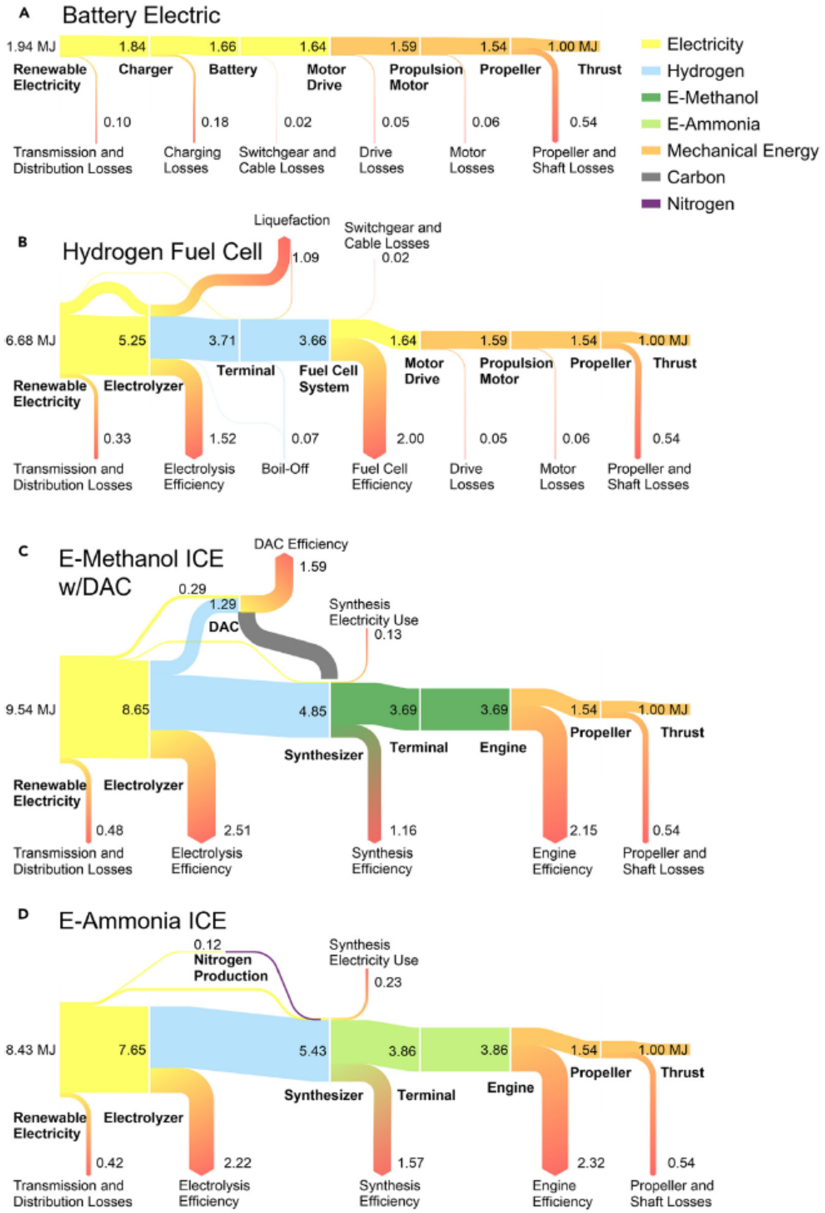
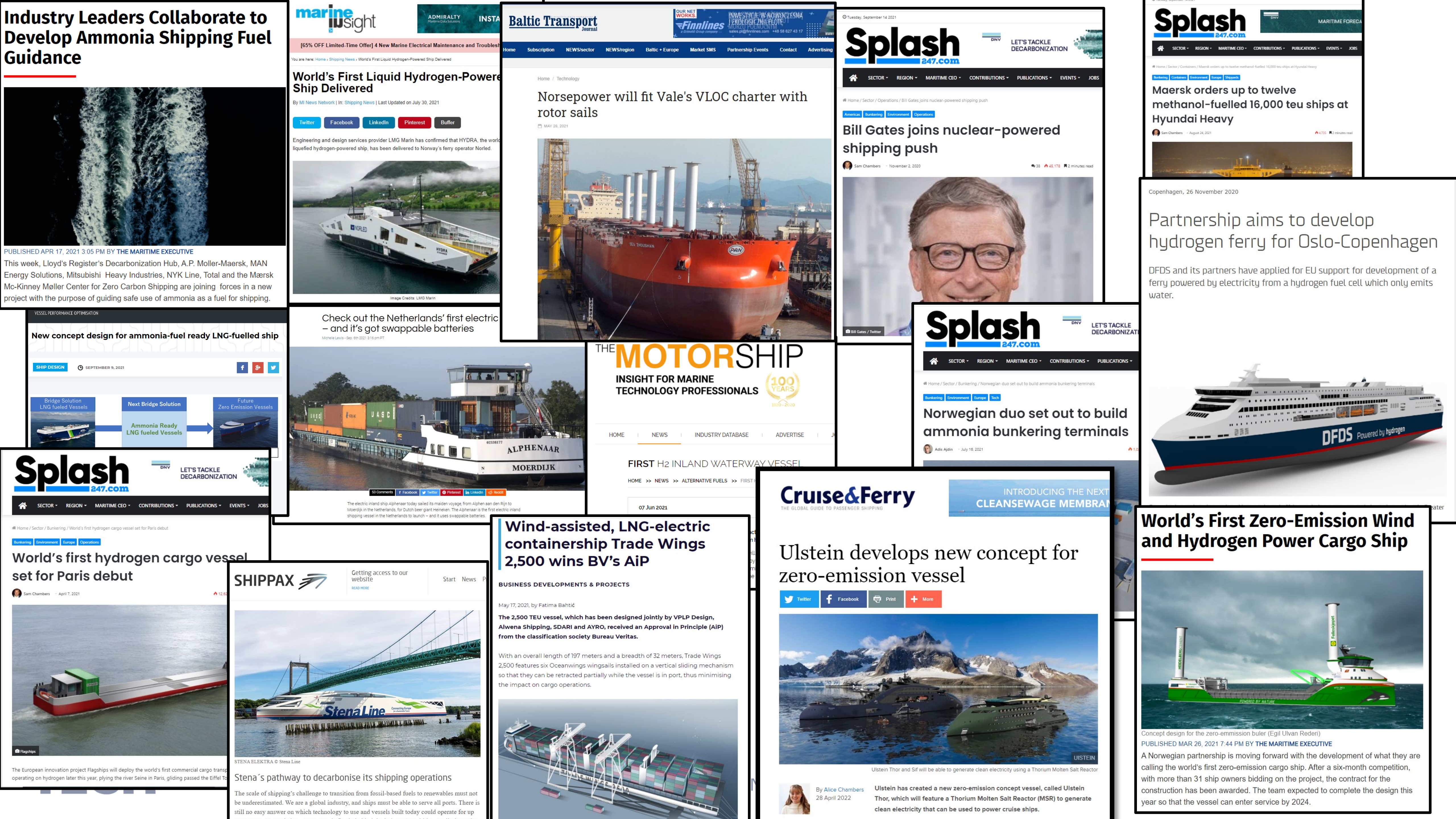


Figure 6. Marine Sankey diagrams

Sankey diagrams illustrating the renewable electricity input needed to provide 1 MJ of thrust for the following powertrain options: (A) battery electric, (B) liquid hydrogen fuel cell, (C) internal combustion engine running on e-methanol including direct air capture (DAC) of CO_2, and (D) internal combustion engine running on e-ammonia.



Industry Leaders Collaborate to Develop Ammonia Shipping Fuel Guidance

PUBLISHED APR 17, 2021 3:05 PM BY THE MARITIME EXECUTIVE

This week, Lloyd's Register's Decarbonization Hub, A.P. Moller-Maersk, MAN Energy Solutions, Mitsubishi Heavy Industries, NYK Line, Total and the Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping are joining forces in a new project with the purpose of guiding safe use of ammonia as a fuel for shipping.

World's First Liquid Hydrogen-Powered Ship Delivered

By MI News Network | In: Shipping News | Last Updated on July 30, 2021

Engineering and design services provider LMG Marin has confirmed that HYDRA, the world's first liquefied hydrogen-powered ship, has been delivered to Norway's ferry operator Norled.

Image Credits: LMG Marin

Norsepower will fit Vale's VLOC charter with rotor sails

MAY 28, 2021

Bill Gates joins nuclear-powered shipping push

Sam Chambers · November 2, 2020

Maersk orders up to twelve methanol-fuelled 16,000 teu ships at Hyundai Heavy

Sam Chambers · August 24, 2021

Copenhagen, 26 November 2020

Partnership aims to develop hydrogen ferry for Oslo-Copenhagen

DFDS and its partners have applied for EU support for development of a ferry powered by electricity from a hydrogen fuel cell which only emits water.

VESSEL PERFORMANCE OPTIMISATION

New concept design for ammonia-fuel ready LNG-fuelled ship

SHIP DESIGN · SEPTEMBER 9, 2021

Check out the Netherlands' first electric – and it's got swappable batteries

The electric inland ship Alphenaar today sailed its maiden voyage, from Alphen aan den Rijn to Moerdijk in the Netherlands, for Dutch beer giant Heineken. The Alphenaar is the first electric inland shipping vessel in the Netherlands to launch – and it uses swappable batteries.

THE MOTORSHIP

INSIGHT FOR MARINE TECHNOLOGY PROFESSIONALS

FIRST H2 INLAND WATERWAY VESSEL

07 Jun 2021

Norwegian duo set out to build ammonia bunkering terminals

Adis Ajdin · July 16, 2021

World's first hydrogen cargo vessel set for Paris debut

Sam Chambers · April 7, 2021

The European innovation project Flagships will deploy the world's first commercial cargo transport vessel operating on hydrogen later this year, plying the river Seine in Paris, gliding passed the Eiffel To…

SHIPPAX

STENA ELEKTRA © Stena Line

Stena´s pathway to decarbonise its shipping operations

The scale of shipping's challenge to transition from fossil-based fuels to renewables must not be underestimated. We are a global industry, and ships must be able to serve all ports. There is still no easy answer on which technology to use and vessels built today could operate for up…

Wind-assisted, LNG-electric containership Trade Wings 2,500 wins BV's AiP

BUSINESS DEVELOPMENTS & PROJECTS

May 17, 2021, by Fatima Bahtić

The 2,500 TEU vessel, which has been designed jointly by VPLP Design, Alwena Shipping, SDARI and AYRO, received an Approval in Principle (AiP) from the classification society Bureau Veritas.

With an overall length of 197 meters and a breadth of 32 meters, Trade Wings 2,500 features six Oceanwings wingsails installed on a vertical sliding mechanism so that they can be retracted partially while the vessel is in port, thus minimising the impact on cargo operations.

Cruise&Ferry

Ulstein develops new concept for zero-emission vessel

Ulstein Thor and Sif will be able to generate clean electricity using a Thorium Molten Salt Reactor

By Alice Chambers
28 April 2022

Ulstein has created a new zero-emission concept vessel, called Ulstein Thor, which will feature a Thorium Molten Salt Reactor (MSR) to generate clean electricity that can be used to power cruise ships.

World's First Zero-Emission Wind and Hydrogen Power Cargo Ship

Concept design for the zero-emmission buler (Egil Ulvan Rederi)

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A Norwegian partnership is moving forward with the development of what they are calling the world's first zero-emission cargo ship. After a six-month competition, with more than 31 ship owners bidding on the project, the contract for the construction has been awarded. The team expected to complete the design this year so that the vessel can enter service by 2024.

ANALYSIS OF 2 FERRIES WITH DIFFERENT ENERGY SYSTEM

Figure 1. Ferry line route map

sustainability MDPI

Article

Decarbonizing City Water Traffic: Case of Comparing Electric and Diesel Powered Ferries

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Abstract: The maritime sector is aiming to achieve carbon neutrality by 2050. Shipping companies are therefore investigating efficient and optimal ways to minimize their greenhouse gas emissions. One of the measures is using vessels that operate on alternative non-carbon fuels. This study compares greenhouse gas (GHG) emissions of a diesel fuelled catamaran and its fully electric sister vessel that operate on the same line. The study shows that the GHG emissions of the electric vessel are only 25% of its diesel-powered sister vessel. However, this figure is highly dependent on the source of electricity in the operating country. In this case, energy costs of the fully electric vessel were 31 % cheaper than costs of diesel energy. The payback time without possible subsidy for replacing diesel ferry with electric one for the case would be 17 years and 6 months. We also show that even in winter, when there is very low solar energy production, the additional energy from solar panels is sufficient to cover several options of applications or consumers. This study brings more insight to academic literature on decreasing maritime CO_2 emissions of city water traffic. As managerial implications, it can be used when shipping companies evaluate options to reduce their emissions. The results of the study show that using fully electric vessels have major benefits concerning the carbon emissions but also financial advantages.

Keywords: carbon neutrality, GHG emission reduction, full electric ferry, diesel ferry

World's Largest Battery-Electric Ship Launched by Incat

China Zorrila will use the largest battery power system when it enters service in South America (Incat)

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Incat is heralding a milestone in the shipping industry as it floated out the world's largest battery-electric ship which it says is also the largest electric vehicle of its kind ever built. The ferry *China Zorrilla* (approximately 14,000 gross tons) being built for Argentina-based Buquebus was floated from the building dock today at the Incat shipyard in Hobart, Tasmania in Australia.

Officially known as Hull 096 currently, the vessel is 130 meters (426 feet) in length and when completed will carry up to 2,100 passengers and 225 vehicles. It was originally ordered in 2019 and then billed simply as the largest aluminum ship and designed for service on the River Plate running between Argentina and Uruguay.

Discussions began between Incat and the shipowner and in 2023 they reported they were investigating the possibility of replacing the planned LNG powerplant with a battery-electric solution. The original concept called for four dual-fuel engines using LNG and providing a maximum speed of over 40 knots.

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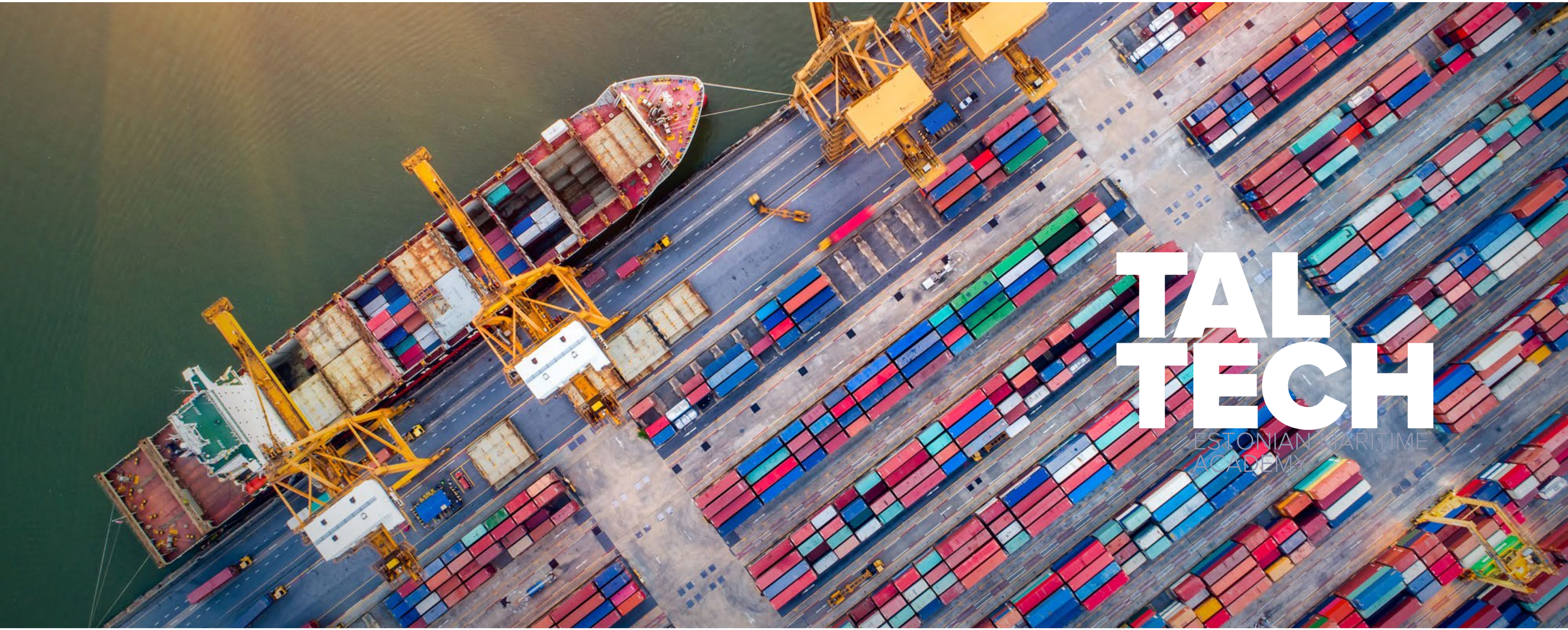
DFDS to Invest EUR 1 billion in battery electric ships for the Channel

FERRY In the future, maritime traffic in the Channel will be electric. DFDS is announcing an expected EUR 1 billion investment in six battery electric ships that will be deployed on the Dunkirk-Dover and Calais-Dover routes to carry passengers and freight between the UK and the European Union.

Vaasa – Umeå Green Shipping Corridor - Wasaline

- First carbon-neutral shipping company in the Baltic Sea
- 2025: Carbon-neutral target achieved (5 years early)
- Partners:
    - Gasum (LBG),
    - Stena Line (FuelEU pooling),
    - DNV (certification)
    - Kvarken Ports (Vasa & Umeå)



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