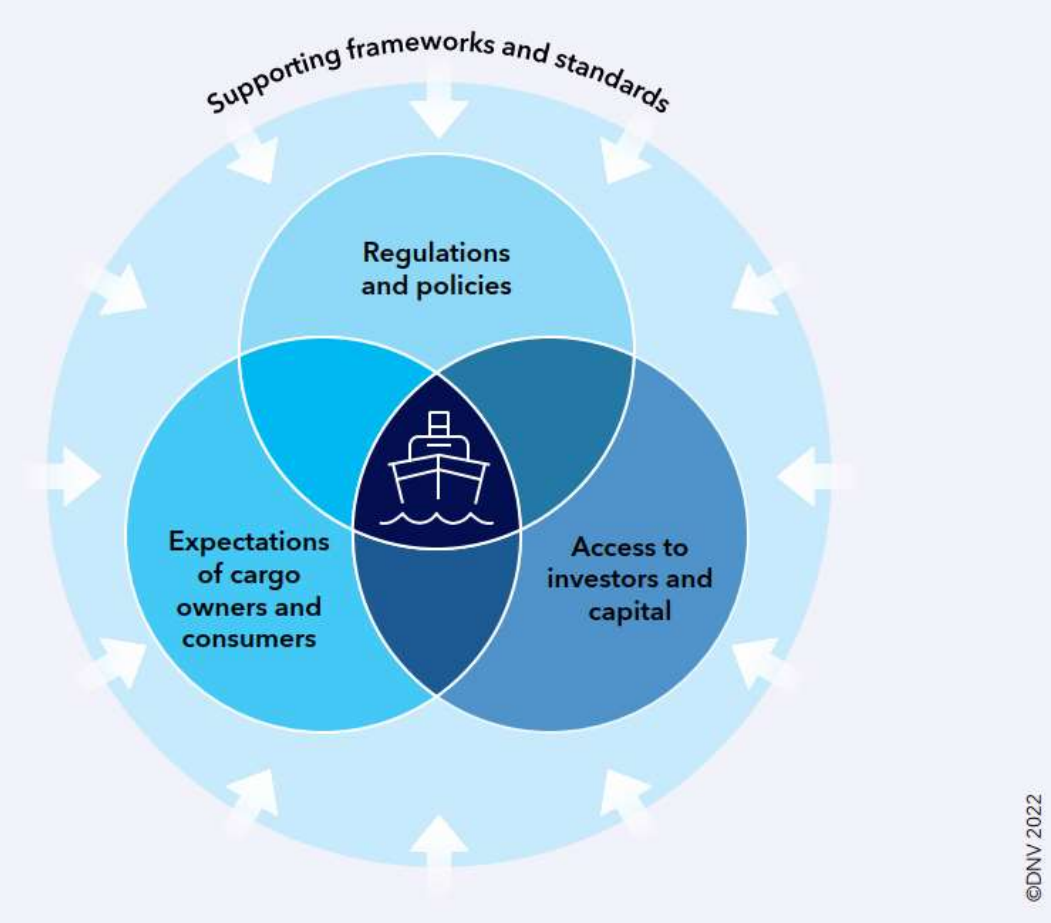
MERILIIKENTEEN ENERGIASIIRTYMÄ

BIOENERGIAPÄIVÄ

27.9.2023

Mats Björkendahl

Suomen Varustamot ry



THE ROLE OF SHIPPING

IN EU

- **In terms of freight volume 75% of EU's foreign trade and 31% of domestic trade is transported by ships**
- EU passenger ships transports annually **400 million passengers**, including 14 million cruise passengers

"Shipping has a vital role in the European transport system and plays a critical role in the European economy"

- **Maritime transport** responsible for **11% of EU's total CO2 emissions in the transport sector** and **3% - 4% of EU's total CO2 emissions**.

"SUOMI ON SAARI"

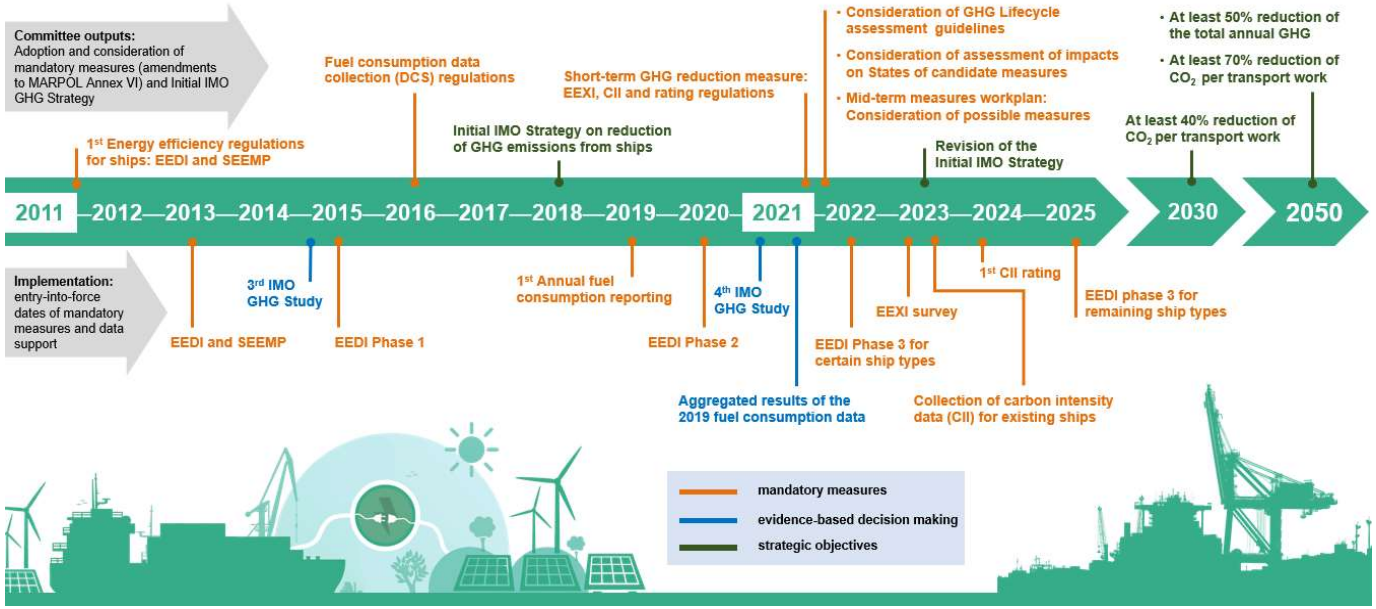
TULLIN TILASTO SUOMESSA 01/2023-06/2023

Merikuljetuksien osuus n 96% ulkomaankaupan kuljetuksista : vienti/tuonti (kg)

IMO 2011-2023 ADDRESSING CLIMATE CHANGE

Addressing climate change

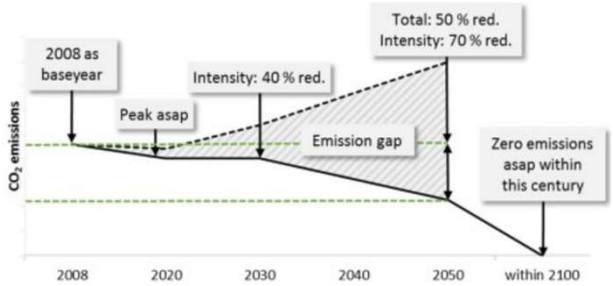
A decade of **regulatory action** to cut GHG emissions from shipping:
towards phasing out GHG emissions from international shipping as soon as possible in this century



IMO adopted MEPC.304(72)
IMO's 2018 initial GHG strategy:

NOW UPDATED in 2023.

Initial IMO Strategy on reduction of GHG emissions: Vision and ambitions



Suomen Varustamot
Rederierna i Finland
Finnish Shipowners' Association

2023 IMO GHG STRATEGY

UPDATE

IMO

In **July 2023** IMO MEPC adopted Resolution MEPC.377(80) which is the revised GHG reduction strategy for global shipping

1. **CARBON INTENSITY of the ship to decline through further improvement of the energy efficiency for new 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. WTW 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, considering 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

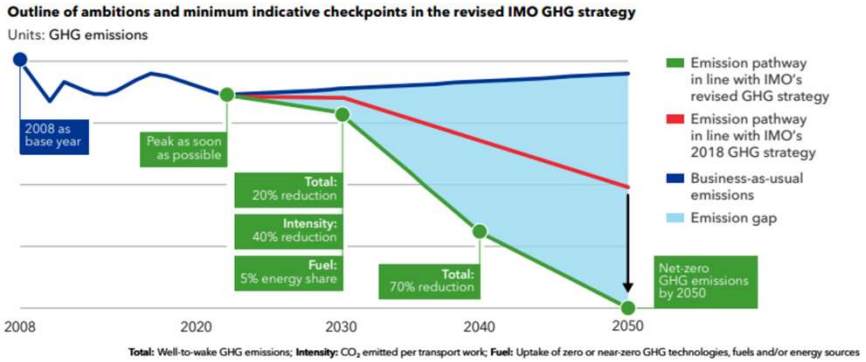


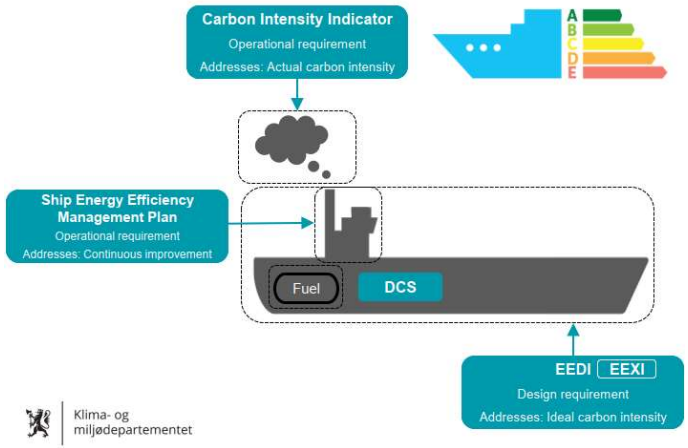
Illustration: DNV Maritime Forecast to 2050 (2023)

ADDITIONALLY two indicative checkpoints to reach net-zero GHG

.1 to reduce the total annual GHG emissions from international shipping by **at least 20%, striving for 30% in 2030**, compared to 2008; and

.2 to reduce the total annual GHG emissions from international shipping by **at least 70%, striving for 80% by 2040**, compared to 2008.

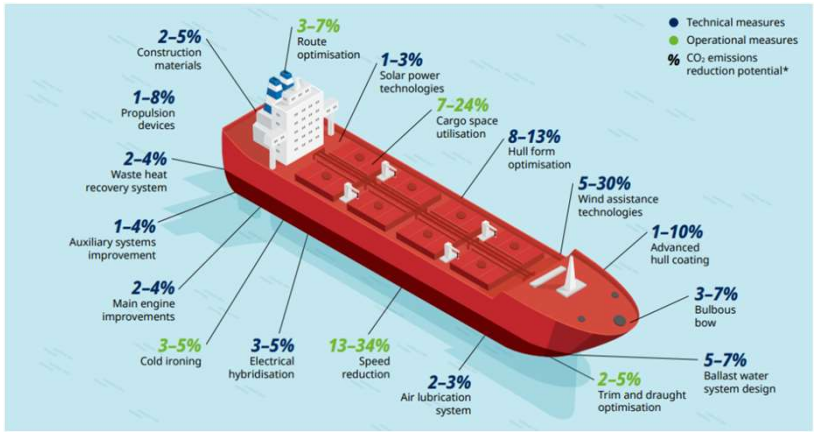
IMO SHORT TERM MEASURE AND REGULATORY FRAMEWORK TO MEET IMO 2030 TARGET



*'IMO has estimated that the operational **carbon intensity of int. shipping has improved 23,6% from 2008 until end of 2019** (target -40% by 2030)'*

MEPC 76 (June 2021)

IMO adopted concreate measures in Marpol Annex VI to safe guard that the 2030, **at least -40%,** carbon intensity target for shipping is met. The hybrid regulation that was approved was a) **EEXI** (Energy Efficiency Existing Ship Index) and b) **Annual Operational CII** (Carbon Intensity Indicator and rating system) a.k.a **the "CII".** EIF 1.11.2022, started 1.1.2023



MIDTERM REDUCTION MEASURES TO MEET 2050 TARGET

IMO 2023 GHG Strategy sets out next steps for the development of a basket of mid-term GHG reduction measures comprising of :

*a **technical element**, namely **a 'goal-based marine fuel standard'** regulating the phased reduction of marine fuel's GHG intensity; and*

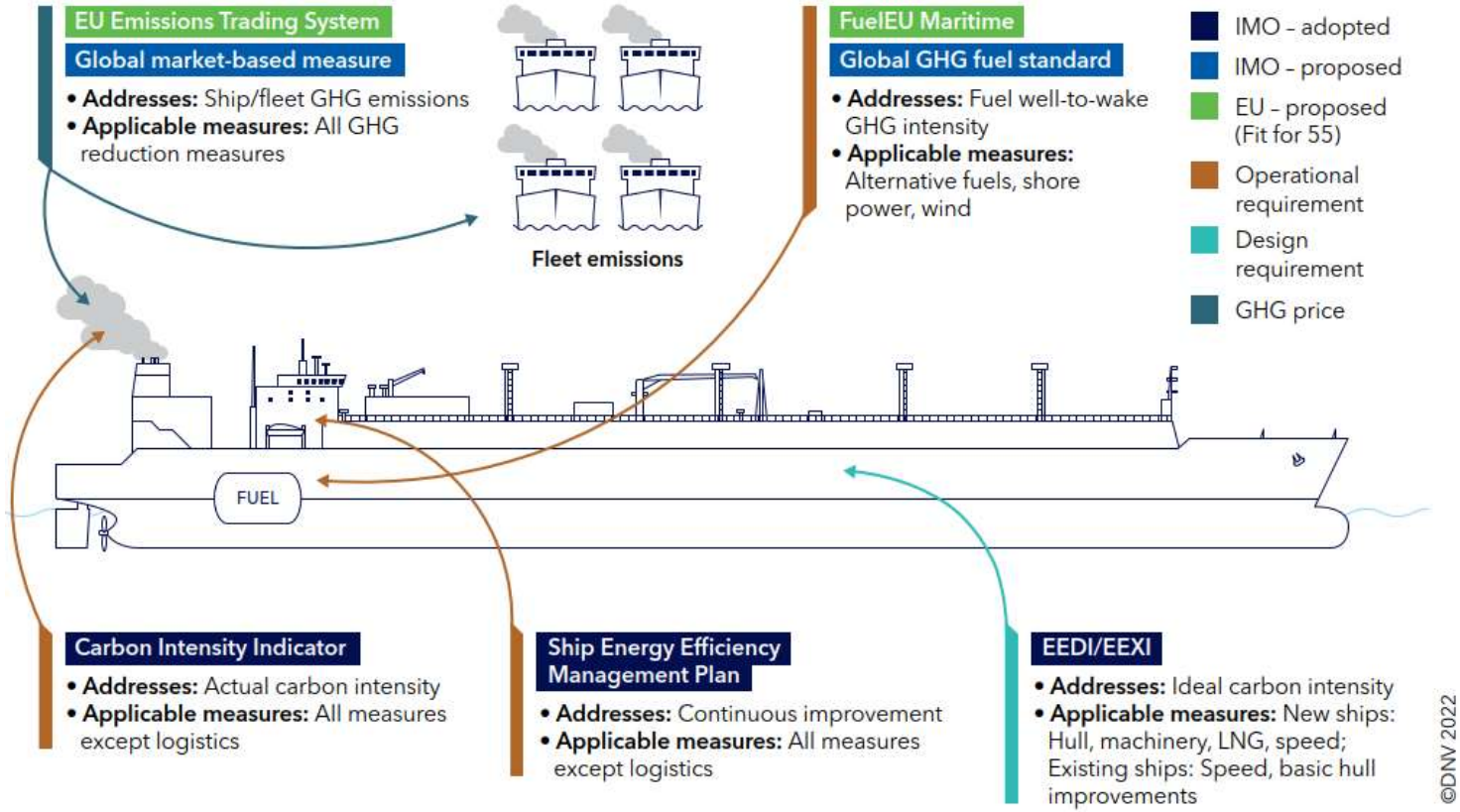
- *an **economic element**, on the basis of **a 'maritime GHG emissions pricing mechanism.***

IMO:s basket of mid-term GHG reduction measures shall be finalized and agreed by the MEPC by 2025 (EIF 2027 !?)

SHIPOWNERS REMAINS COMMITTED TO REACH NET-ZERO GHG EMISSIONS BY 2050

- Shipowners have proposed for IMO a global GHG reduction fund to reward 'first movers' using low emission fuels the so called : IMSF&R (International Maritime Sustainability Fund & Reward - fund
- Fund and reward' system would be financed by mandatory flat rate contribution by ships, per tonne of CO2eq emitted.
- Ships using eligible low/net zero emission fuels would be financially rewarded for the emissions they prevent.
- Measure aims to ensure at least 5% of energy used by shipping globally is produced from alternative zero emission fuels by 2030.
- Shipowners have also proposed to IMO a simplified Global Fuel Standard that would require ships to use fuels with a reduced GHG intensity e.g. 5% less in 2030 than in 2019 and would like to see the concept of pooled compliance is embraced by IMO as sufficient quantities of fuels with required GHG intensity are not available globally when the regulation is implemented

REGULATORY FRAMEWORK FOR GHG REDUCTION IN SHIPPING



(Source : DNV)

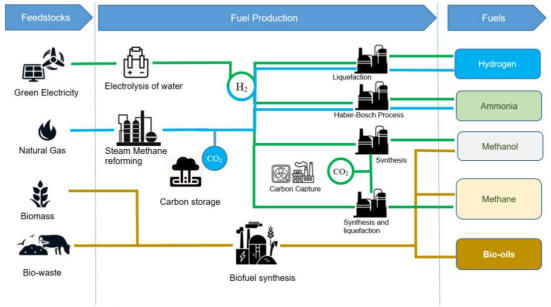
FuelEU Maritime Regulation

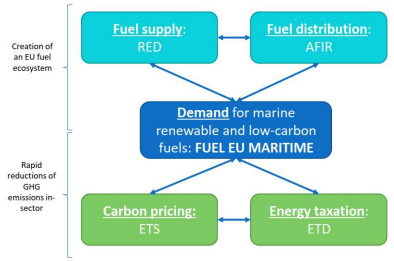
Objective

1. **Reduce GHG intensity of a ship's energy use** by promoting use of renewable and low carbon fuels
2. **Obligation for containers and passengers ships to use OPS or zero-emission technology in TEN-T ports**
3. **Incentivize the production and use of RFNBO's & RCF's in maritime sector through reward factors**

			2025	2030	2035	2040	2045	2050
PROVISIONAL AGREEMENT								
2020 REFERENCE VALUE			FuelEU GHG Intensity Index limit					
			-2 %	-6 %	-14,5 %	-31 %	-62 %	-80 %
91,16			89,3	85,7	77,9	62,9	34,6	18,2

[unit: g CO2ekv per MJ]





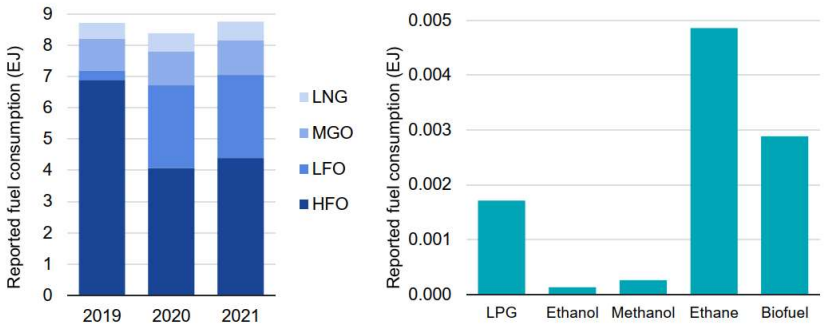
- Complementary with ETS: ETS promotes energy savings while FuelEU addresses fuel technology.
- Complementary with RED and AFIR: FuelEU addresses fuel demand, RED fuel supply and AFIR fuel distribution
- Complementarity with ETD (if approved): taxation levels for renewable and low-carbon fuels and for electricity at berth are consistent with FuelEU goals.

TODAYS SHIPPING FUELS

2020: International Shipping [ships > 5000 GT] *

- **203 million ton of fuel** (99,91% was HFO, LFO, MDO or LNG)
- LNG consumption increased from 10.5 -> 12.0 million ton
- Other fuels e.g. **28 000 ton UCO** ; **2 700 ton bio-oil** and **19 ton LBG** *) MEPC 77/6/1 (20.08.2021)
- **Including ships > 400 GT approx 280 Mtoe of fuel**

Figure 5-1: Reported fuel consumption for conventional fuels and LNG in 2019 to 2021 (left) and for minority fuels in 2021 (right)

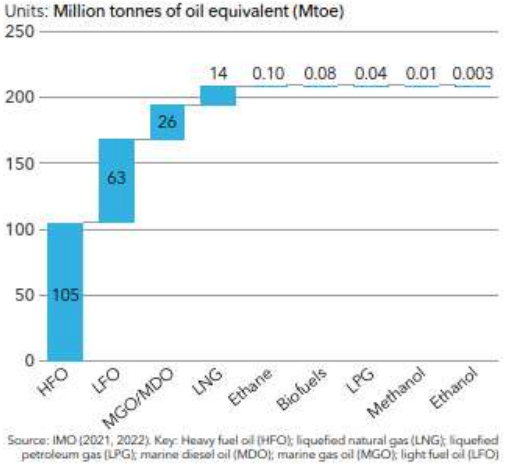


MEPC 80/INF.10 (Ricardo in association with DNV)

2021

FIGURE 5-1

Fuel consumption for ships >5,000 GT based on reported DCS data to IMO (2021) (IMO, 2022)



Source: IMO (2021, 2022). Key: Heavy fuel oil (HFO); liquefied natural gas (LNG); liquefied petroleum gas (LPG); marine diesel oil (MDO); marine gas oil (MGO); light fuel oil (LFO)

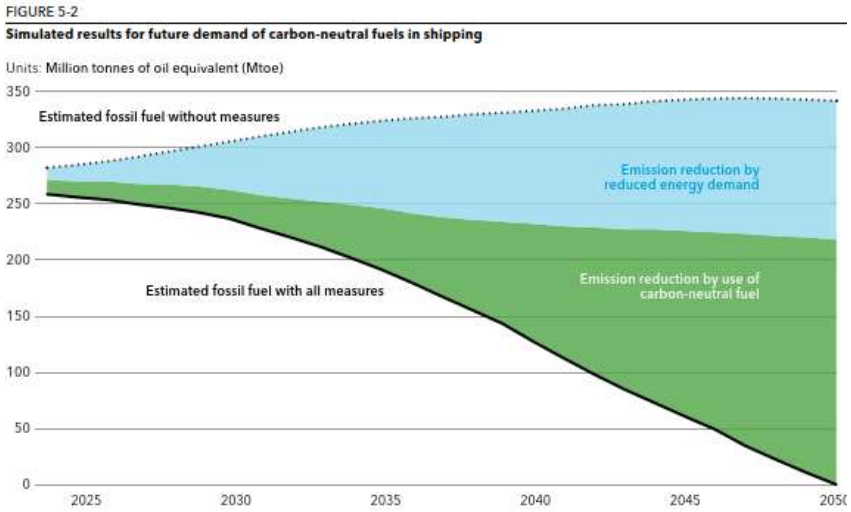
DNV MARI>TIME FORCAST TO 2050 (2023)

Nearly half of bunkering takes place today at major bunkering hubs located along international trade lanes using ship-to-ship transfer: the top ten hubs supplied 44% of total fuel sold, with Singapore contributing over half of this 44%.

In the future a ship may be needed away from refueling being dominated by a small number of bunkering hubs as some carbon neutral fuels have lower energy density, reducing the range of the vessel

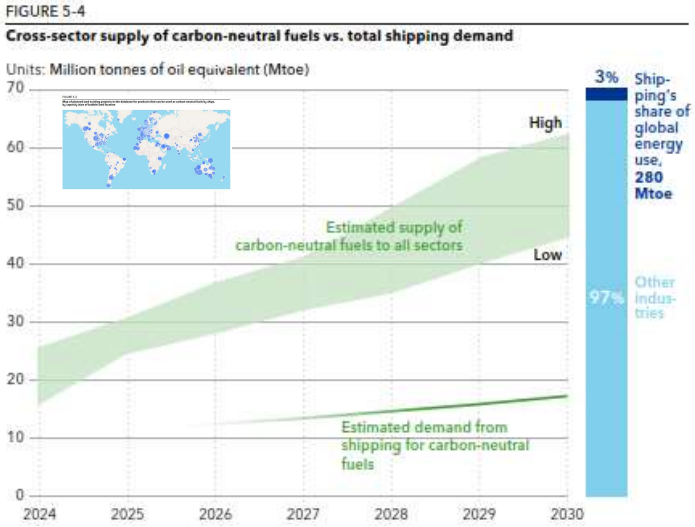
DEMAND FOR NET-ZERO FUELS BY 2030

DEMAND FOR CARBON NEUTRAL FUELS IN SHIPPING



'DNV'S estimated demand for carbon neutral fuels takes into account increase in seaborn trade as well as EE measures and speed reduction'

2030: shipping needs 17 Mtoe of carbon neutral fuel or 30% to 40% of world supply



STATUS OF FUEL TRANSITION IN SHIPPING

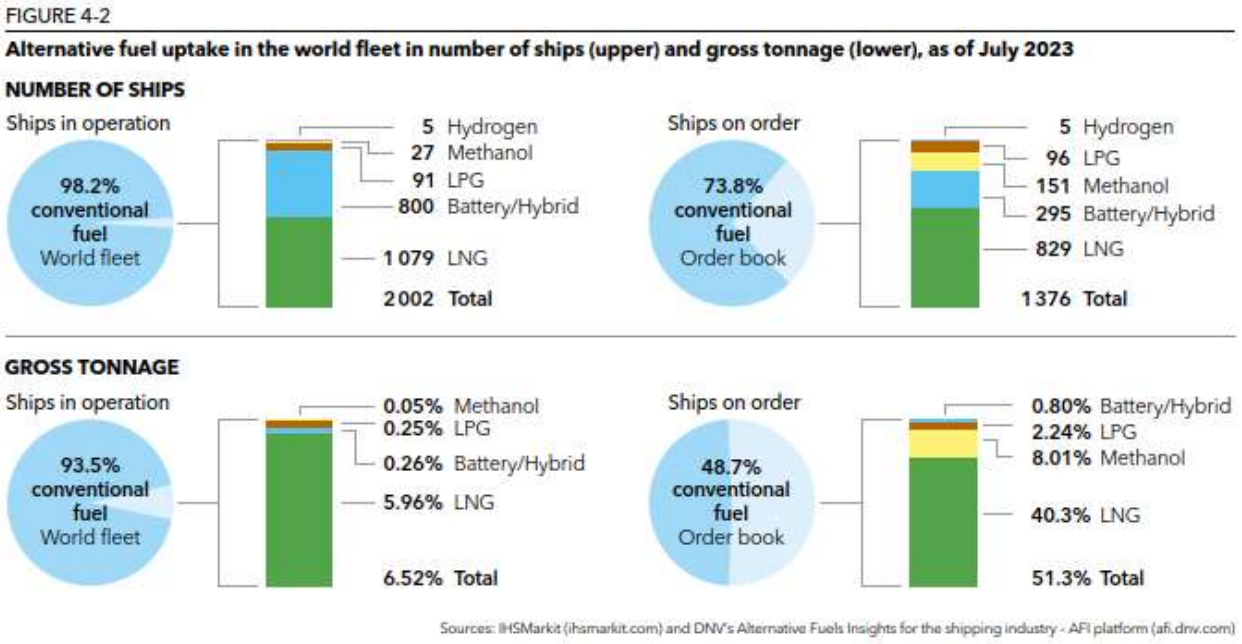
Data from DNV Maritime Forecast 2050

As of June 2022 in gross tonnage

- 5.5% of operational ships using AF
- 33% of ship on order with AF

As of June 2023 in gross tonnage

- 6.5% of operational ships using AF
- 47% of ship on order with AF



"ENERGY TRANSITION IN SHIPPING HAS STARTED"

AVAILABILITY OF CARBON NEUTRAL FUEL

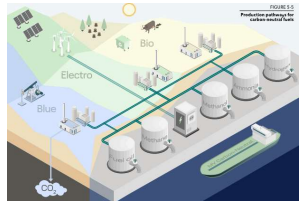
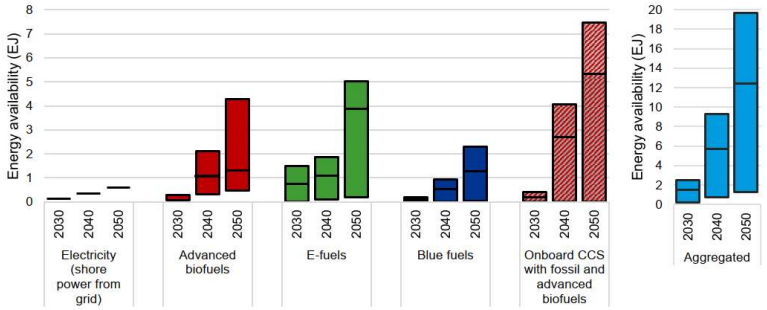
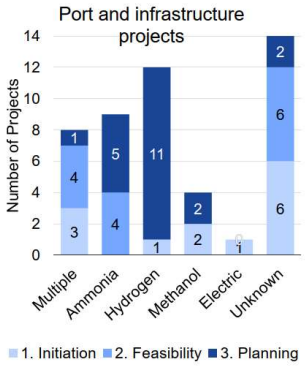


Figure 6-1: Span of estimated availability per candidate fuel (left) and aggregated for all candidate fuels (right) for shipping in 2030, 2040, and 2050.



Bottom range: Confirmed projects / BAU trajectories
Median line: Announced projects / Decarbonisation trajectories, median
Top range: Additional projects / Decarbonisation trajectories, high

Existing orderbook drives demand for bunker facilities
48 candidate fuel production projects identified



Fuel types	Distribution and storage	Bunkering infrastructure
Fuel oils (e-diesel, bio-diesel)	Can use existing distribution and storage facilities for conventional fuel	Can use existing bunkering infrastructure
Gaseous fuels (e-methane, bio-methane)	Can use existing distribution and storage facilities for LNG	Can use existing LNG infrastructure
Methanol (e-methanol, bio-methanol)	Existing storage and distribution infrastructure: methanol terminals, already traded by ships	Successful demonstration bunkering operations, ship-to-ship bunkering possible. Partially developed bunkering infrastructure.
Ammonia (e-ammonia, blue ammonia)	Existing storage and distribution infrastructure: ammonia terminals, already traded by ships	No bunkering infrastructure today, and no bunkering operations demonstrated. Barriers remaining to be solved.
Hydrogen (e-hydrogen, blue hydrogen)	No existing distribution infrastructure	No existing bunkering infrastructure Local bunkering demonstrated. Barriers remaining to be solved.

MEPC 80/INF.10 (Ricardo in association with DNV)

Aggregated availability

- 2030: 0.2 – 2.5 EJ
- 2040: 0.8 – 9.3 EJ
- 2050: 1.3 – 19.7 EJ

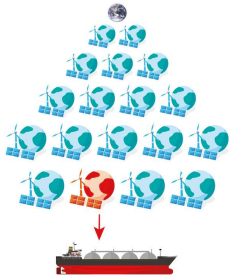
- bio- and e-diesel, and bio- and e-methane will be able to use existing bunkering infrastructure
- orderbook for methanol and hydrogen vessels will drive demand for bunker facilities
- several port and bunkering investment projects planned, including green shipping corridors
- Ammonia and, hydrogen will need new bunkering infrastructure to be built: ammonia will need to build on its existing global network of storage terminals
- methanol already has some refueling infrastructure developed with ship-to-ship bunkering proven e.g in Singapore,

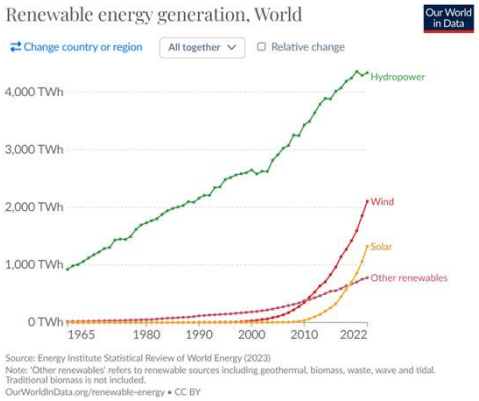
NET ZERO EMISSION

IS THE CHALLENGE UNDERESTIMATED?

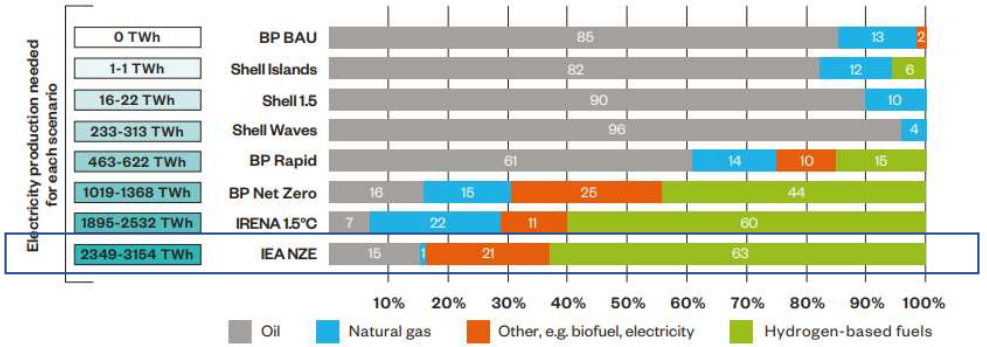
- **IEA** estimates in their **”Net Zero Emission by 2050” scenario ,** global **renewable electricity production must increase 18 times**.
- To achieve **climate neutral shipping by 2050**, **IEA estimates** that approx. **60% of marine fuel must be H2 based electro fuels**. To produce this amount of e-fuel requires approx. 3000 TWh of primary renewable electricity (includes expected energy efficiency)

2022: 3400TWh total renewable electricity production by wind and solar PV combinded (globally).





”NET ZERO EMISSION SHIPPING WOULD ABSORB ALL THE PRIMARY RENEWABLE ELECTRICTY PRODUCTION IN THE WORLD TODAY”



Source: Fuelling the Fourth Propulsion Revolution [ICS]

Various scenarios of fuel mixes for maritime shipping in 2050

Note: Each scenario is explored in detail in the full version of this report

Sources: International Energy Agency (IEA), Shell, BP and International Renewable Energy Agency (IRENA).