



Green Fuels Transition for International Shipping

- **What the IMO is doing to accelerate the transition to green fuels?**
- **What is the current state of green transition for International Shipping?**

Green Fuels Transition for International Shipping Workshop

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What the IMO is doing to accelerate the transition to green fuels?- IMO's 2050 climate strategy

2030 Checkpoint - GHG emissions should be reduced by 20% but striving for 30 %. (Compared to 2008). Also, at least 5%, striving for 10%, uptake of zero or near-zero GHG emission fuels and a 40% reduction of CO₂ emissions per transport work, as an average across international shipping, compared to 2008; (*GHG emissions to include carbon dioxide (CO₂), nitrous oxide (N₂O), and methane (CH₄), and are calculated as CO₂-equivalents (CO₂eq).*)

2040 Target – 70% reduction in GHG, but to strive for 80%.

2050 Target – To peak GHG as soon as possible and strive for Net-zero GHG emissions by or around 2050.

How is International Shipping going to Achieve these Targets ?



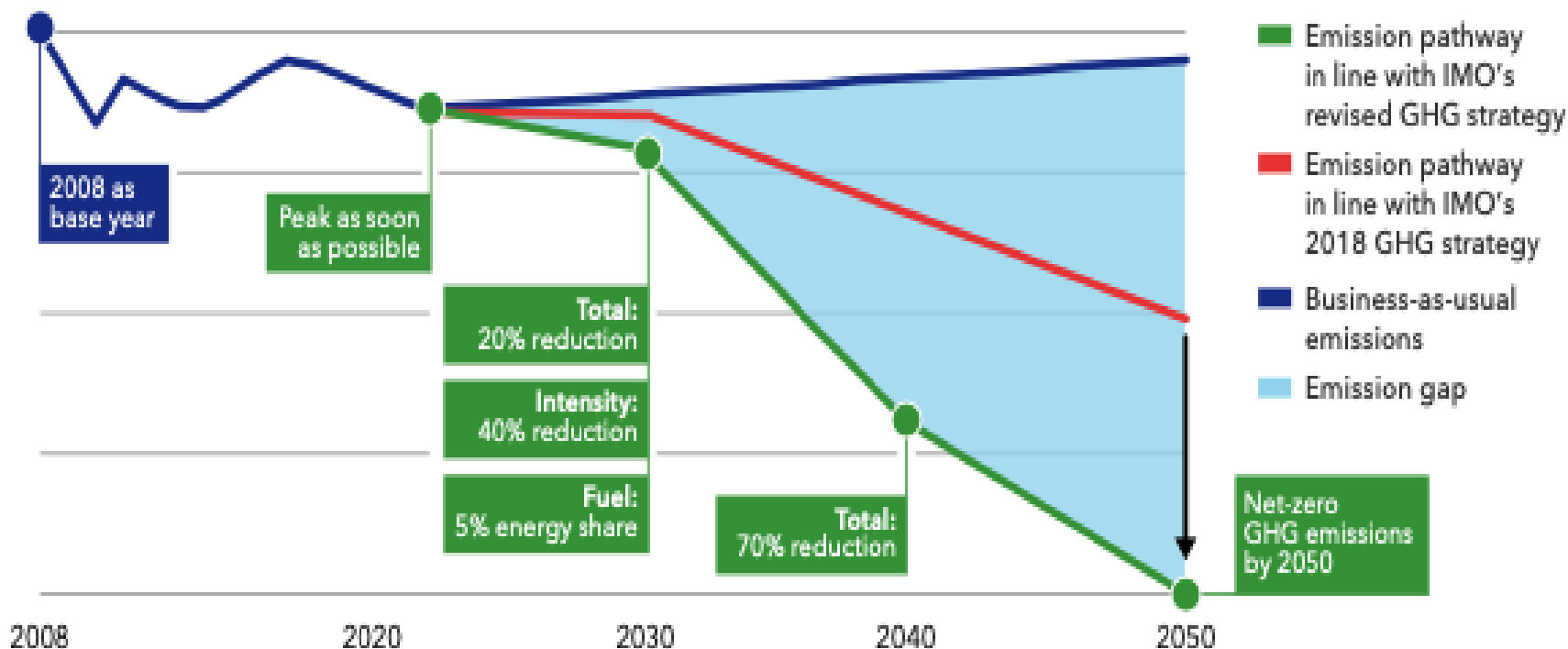
What the IMO is doing to accelerate the transition to green fuels? -

New IMO GHG Strategy Checkpoints to reach Net Zero by 2050

FIGURE 3-2

Outline of ambitions and minimum indicative checkpoints in the revised IMO GHG strategy

Units: GHG emissions



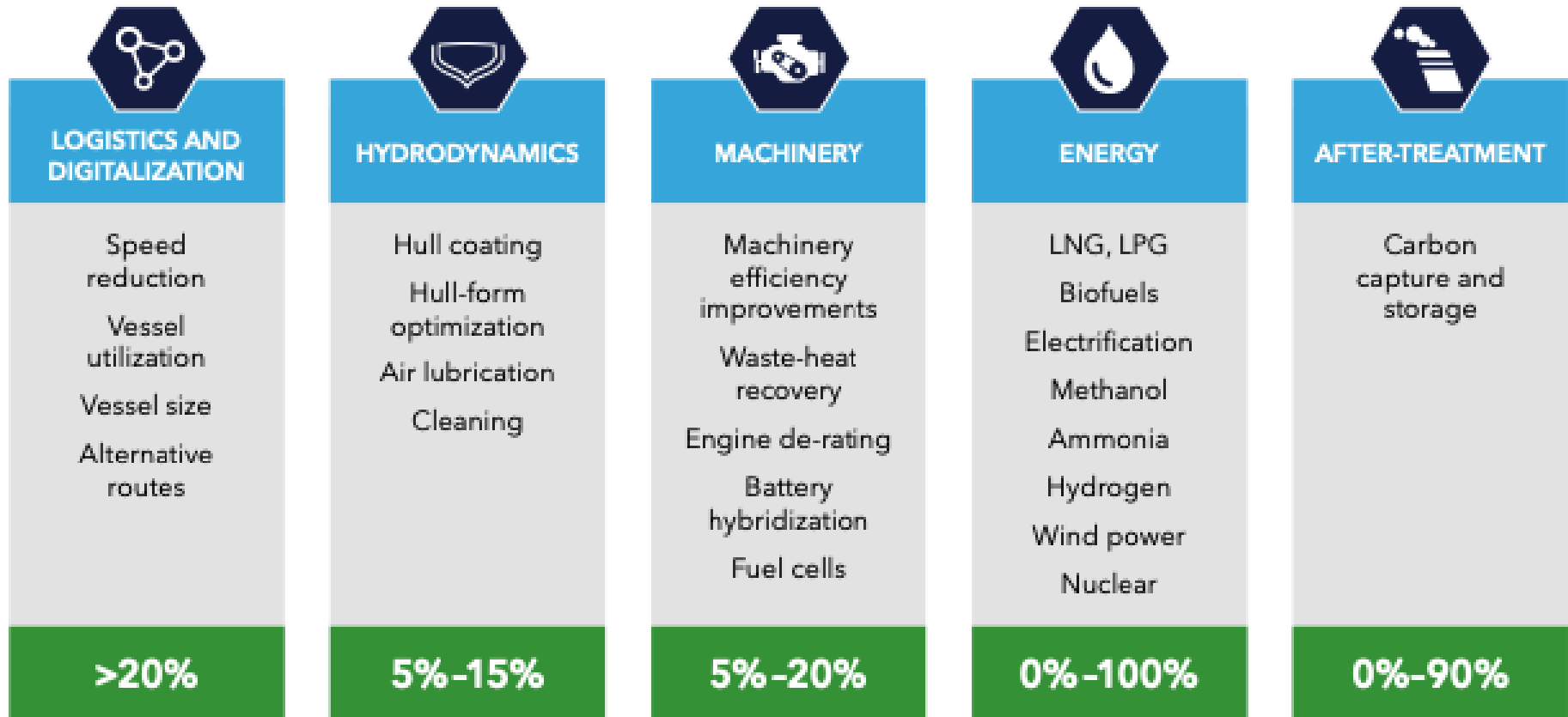
Total: Well-to-wake GHG emissions; Intensity: CO₂ emitted per transport work; Fuel: Uptake of zero or near-zero GHG technologies, fuels and/or energy sources

What the IMO is doing to accelerate the transition to green fuels? Using Bio and LNG fuels + efficiency measures could be enough to achieve the 2030 IMO goals. But to achieve the 2040 IMO Goals requires huge supply of zero emission fuels.



FIGURE 4-1

Solutions that can contribute to decarbonize shipping, and their GHG reduction potential





What the IMO is doing to accelerate the transition to green fuels 2023?

The Mid Term Market Based Measures - MBM's

All systems based on Fund and Reward system

1. A Levy system - fixed for 5yr periods
2. Global Fuel Index, GFI system – graduated known increases

The IMO's objective at MEPC83 is to create a system through consensus that incentivises ships to switch to low/zero emission fuels.

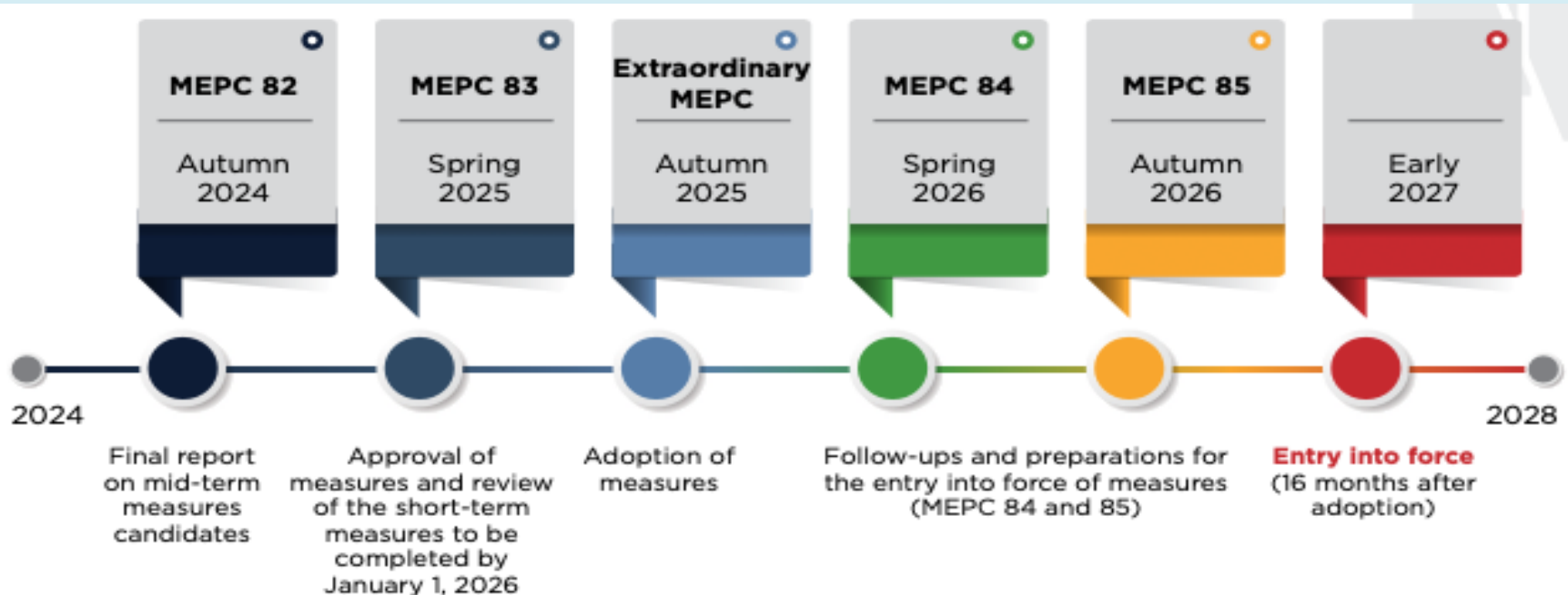








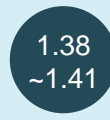





Figure 1.1: Timeline for the development of IMO mid-term measures.



What the IMO is doing to accelerate the transition to green fuels? - What are Green Fuels ? Are they safe to use?

Characteristics of alternative fuels

Fuel	HFO	LNG	LPG (Propane and Butane)	Methanol	Ammonia	Hydrogen
CO ₂ emissions per unit of heat (HFO = 1)	1 	0.74 	0.84 ~ 0.86 	0.90 	0 	0 
Liquid fuel volume per unit of heat (HFO = 1)	1 	1.65 	1.38 ~1.41 	2.39 	2.72 	4.46 
Flammability (LEL)	-	○ (5.0 vol%)	○ (2.1 vol%)	○ (6.0 vol%)	△ (15.0 vol%)	○ (4.0 vol%)
Toxicity (TLV-TWA)	-	-	-	○ (200 ppm)	○ (25 ppm)	-
Cryogenic	-	○	△	-	△	○
Other safety consideration	-	-	Heavier than air ○	Corrosivity	Corrosivity	Embrittlement Permeability



What is the current state of transition for International Shipping?

2023 ABS Graph shows the estimated Low and Zero Fuel Mix from 2023 to 2050 for all main ship types.

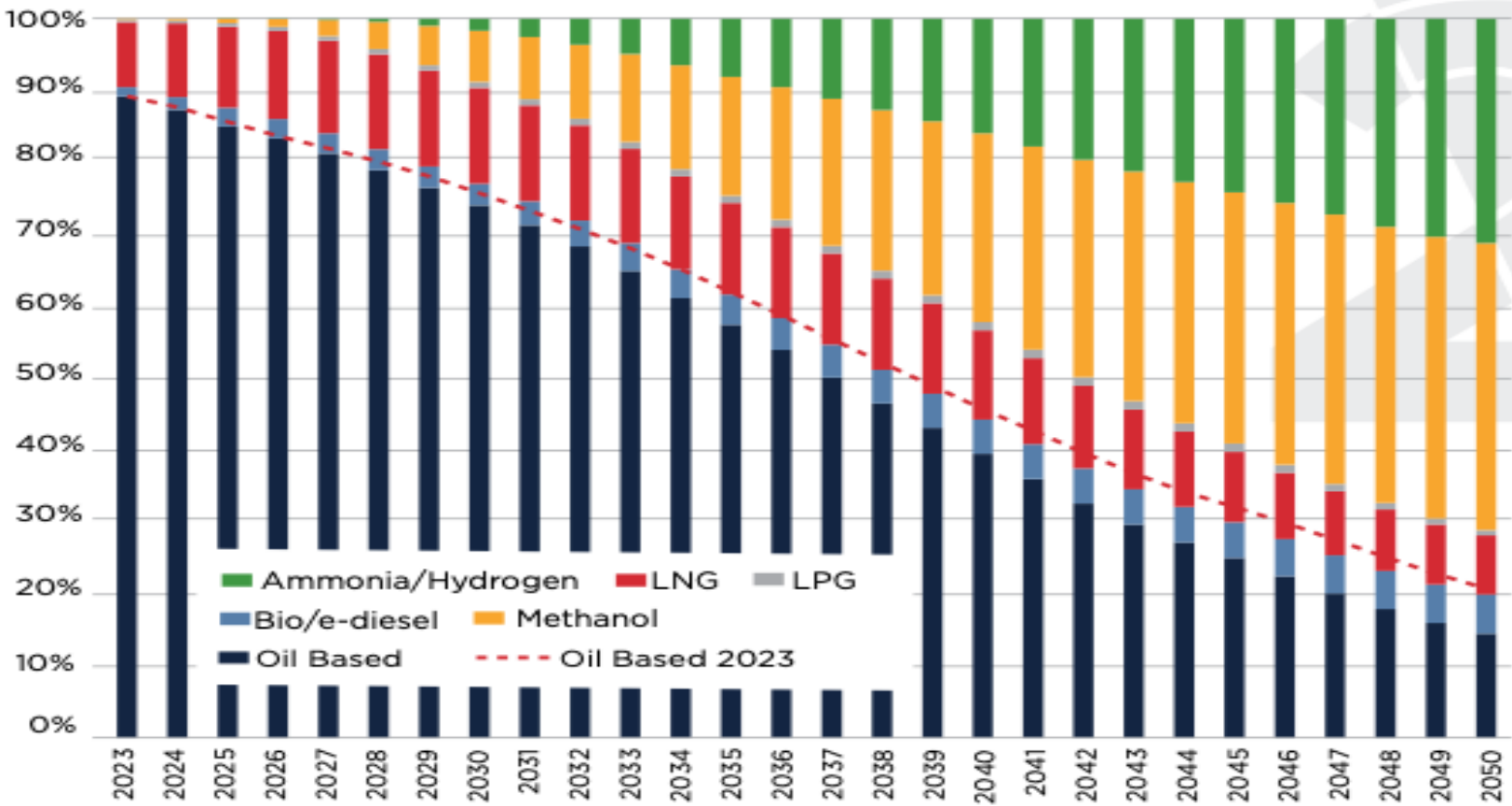


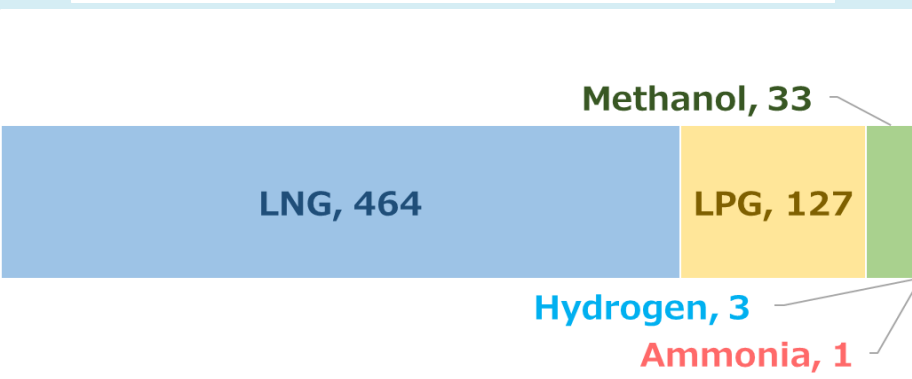
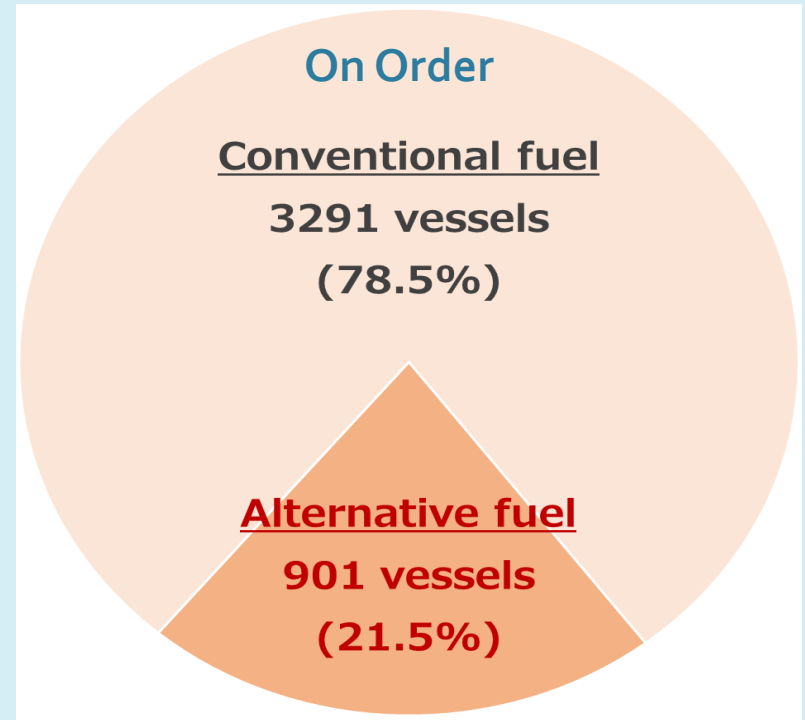
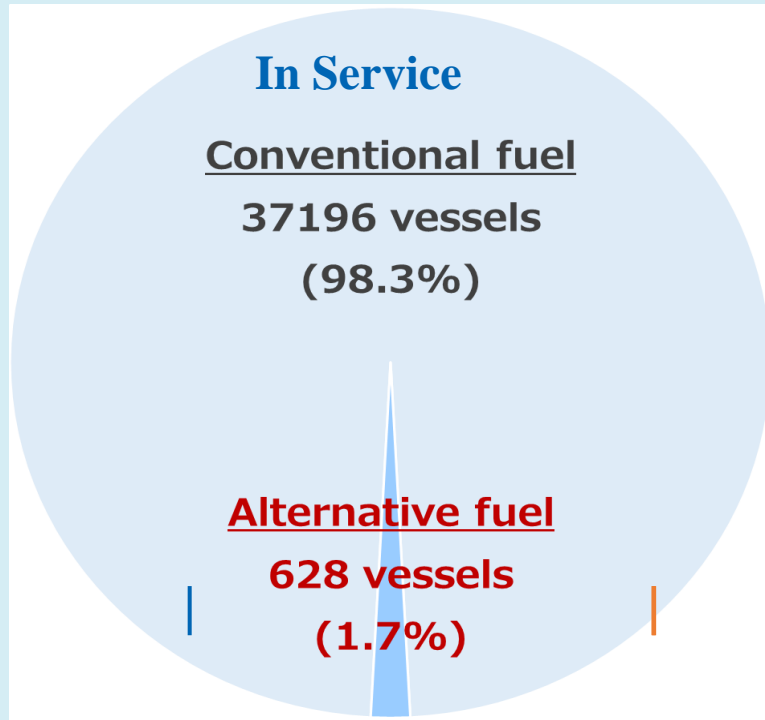
Figure 2.34: Fuel mix (HFO equivalent).

Ship types included: oil and chemical tankers, dry bulk carriers, containerships, LPG, LNG, car carriers, general cargo, ro/ro, ro/pax and cruise.

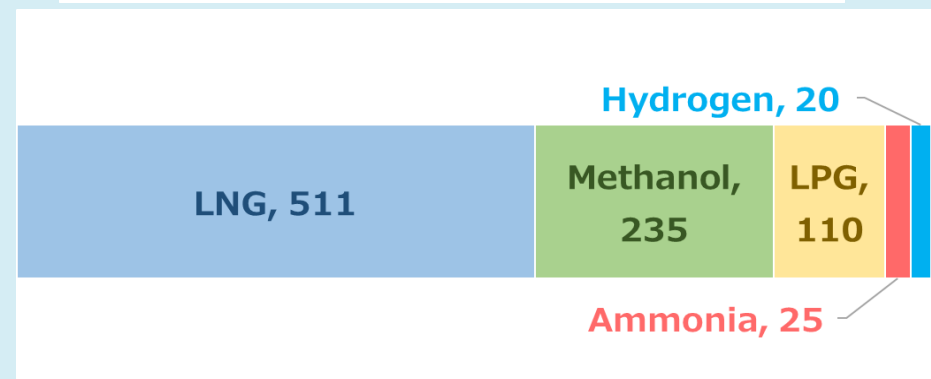
What is the current state of green transition for International Shipping? Alternative fuel ships -30 June 2024



In Service - 628 ships, 1.7% of 37,196 ships. On Order - 901 ships, 21.5% of 3291. (> 5000grt excludes LNG gas carriers and Alternate ready ships)



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What is the current state of green transition for International Shipping?

A Snapshot of the State of Energy Transition in Int. Shipping 30 June 2024

(Ships > 5000grt, excludes LNG gas carriers and Alternate ready ships)



Demand side

Supply side

Other sectors

In service:

37,800 ships*1

Conventional fuel ships
36,500 ships (97%)

Alternative fuel ships*2
1,300 ships (3%)


A transition of 36,500 ships to alternative fuels is necessary. (Alternative fuel ships can use zero-emission fuels.)

*1 5,000 gross tonnage and above (as of the end of June 2024, adjusted for fractions)
*2 LNG-fueled LNG carriers are included.

Shipyard

Newbuildings:

1,300 ships*5





Conventional fuel ships
1,100 ships (85%)

Alternative fuel ships
200 ships (15%)



*5 5,000 gross tonnage and above (2023, adjusted for fractions)

- ✓ **Methanol**
Chemical, etc.
- ✓ **Ammonia**
Electricity, Agriculture, Chemical, etc.
- ✓ **Hydrogen**
Electricity, Automobile, Steel, etc.



Fuel consumption:

216 mil. tons/year*3

Conventional fuel oil
200 mil. tons (93%)

Alternative fuel
16 mil. tons*4 (7%)


The required amount for a full transition to zero-emission fuels would be...

For methanol	440 mil. tons/year
For ammonia	470 mil. tons/year
For methane/LNG	180 mil. tons/year
For hydrogen	70 mil. tons/year

*3 The annual fuel consumption for ships engaged in international voyages with 5,000 gross tonnage and above (abt. 30,000 ships subject to IMO DCS) in 2023 (conventional fuel oil equivalent)
*4 Conventional fuel oil equivalent (of which 98% is LNG fuel.)

Green fuel producers

- ✓ **Methanol** 0.5 mil. tons/year*6
- ✓ **Ammonia** 4.6 mil. tons/year*6
- ✓ **Methane** 0.01 mil. tons/year*6
- ✓ **Hydrogen** 1.5 mil. tons/year*6



*6 Operational, construction, FID (for all sectors)

Much of the green fuels and green chemicals produced are expected to be directed towards demand from other sectors.

While biofuels contribute to GHG emission reductions, there are constraints on the resource availability of biomass, which serves as their raw material. Moreover, demand for biomass competes across sectors.