

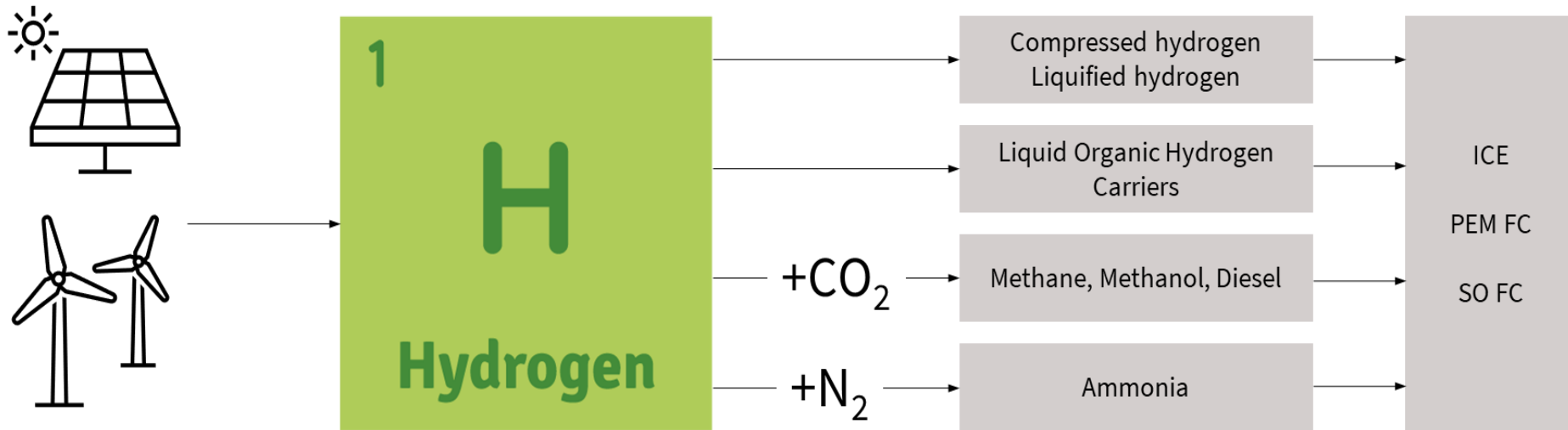
Hydrogen in the maritime sector – The Role Of FuelEU maritime

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Hydrogen based fuels for water transport



*The report excluded battery-based and bio-fuels solution

The trade-off between fuel cost and fuel density

COST OF FUEL



Battery?

Compressed
H₂

Liquid H₂

e-Ammonia

e-LNG

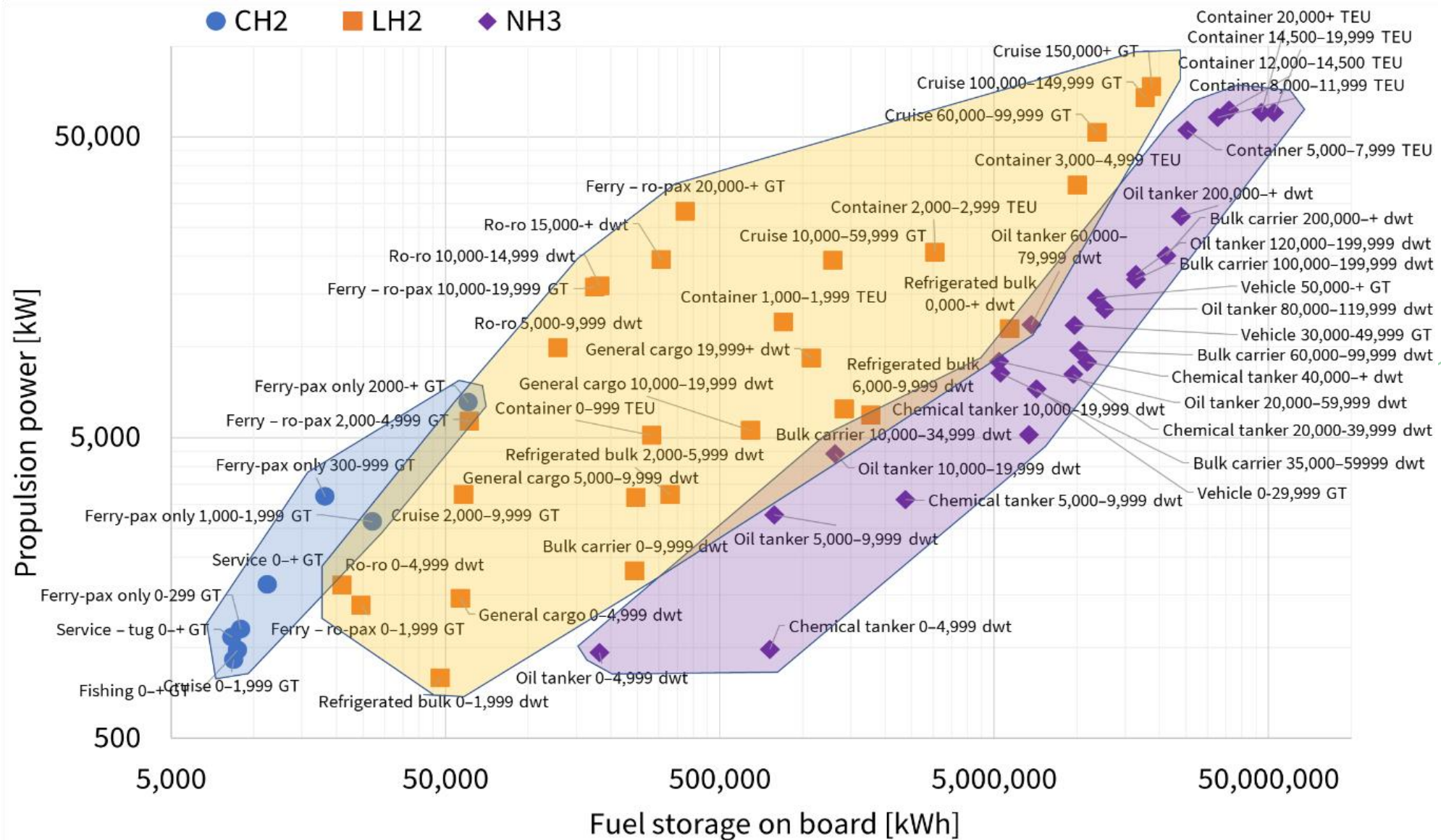
other e-fuels

ENERGY DENSITY

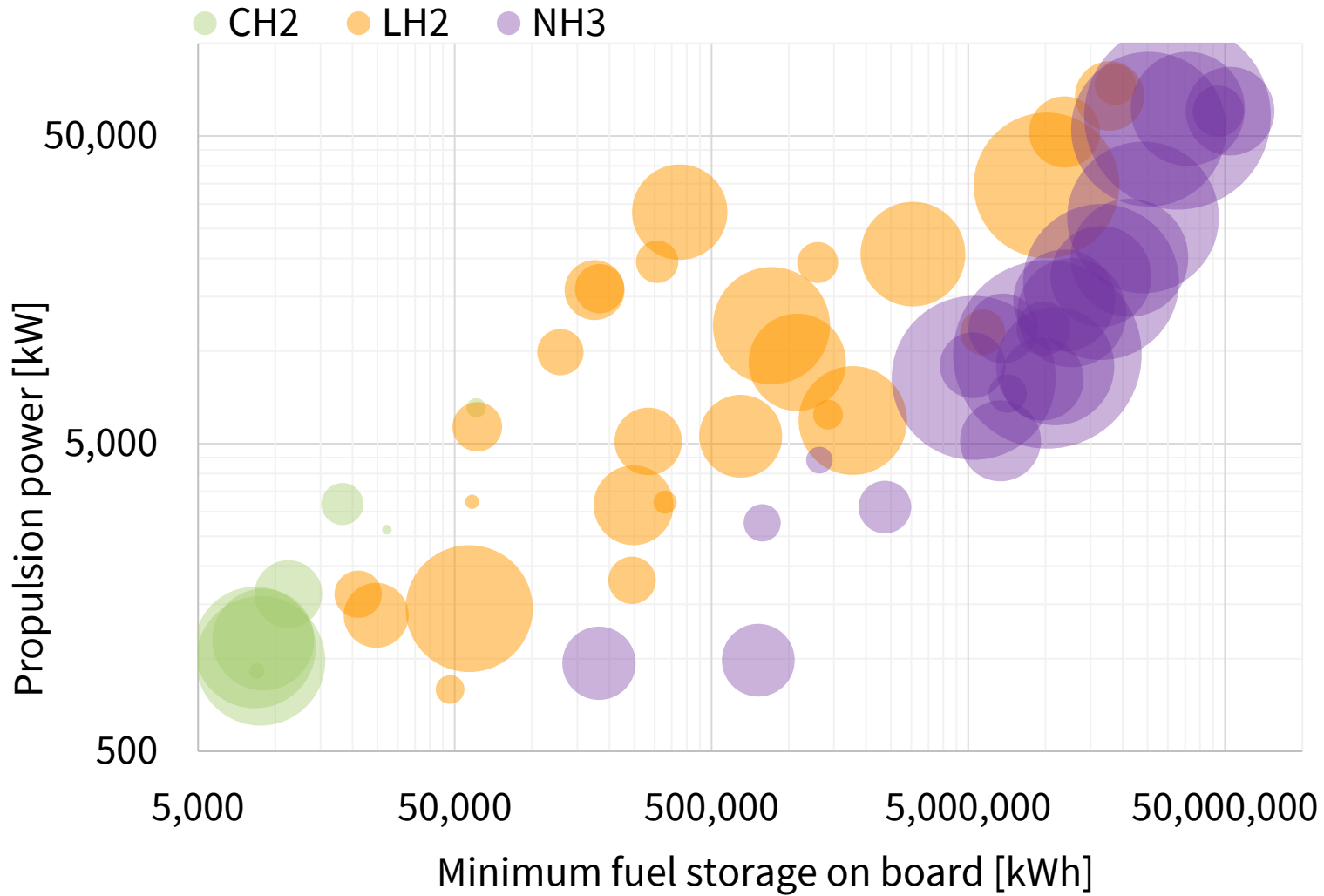


*e-fuels cost are based on CO₂ from Direct Air Capture

Lowest TCO among zero-emission option



Lowest TCO among zero-emission option



Theoretical Market Share

- 90% - e-ammonia
- 9% - Liquefied H₂
- 1% - Compressed H₂

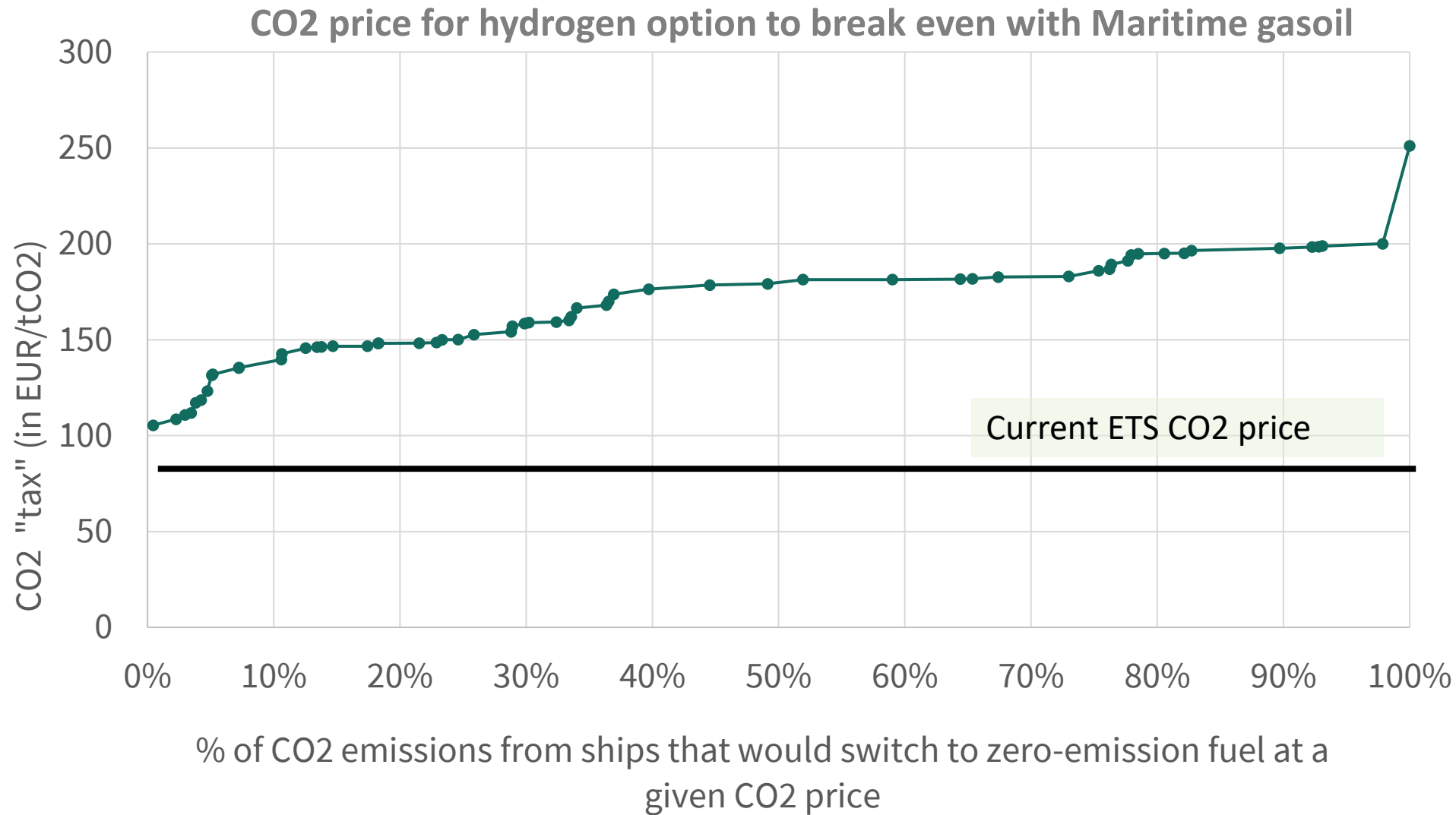
Caveat on the comparison between Ammonia and e-methanol:

- The previous findings hold true if CO₂ is from Direct Air Capture
- But If you use industrial CO₂, the differences between ammonia and methanol are rather small

Choice of Fuels beyond economics:

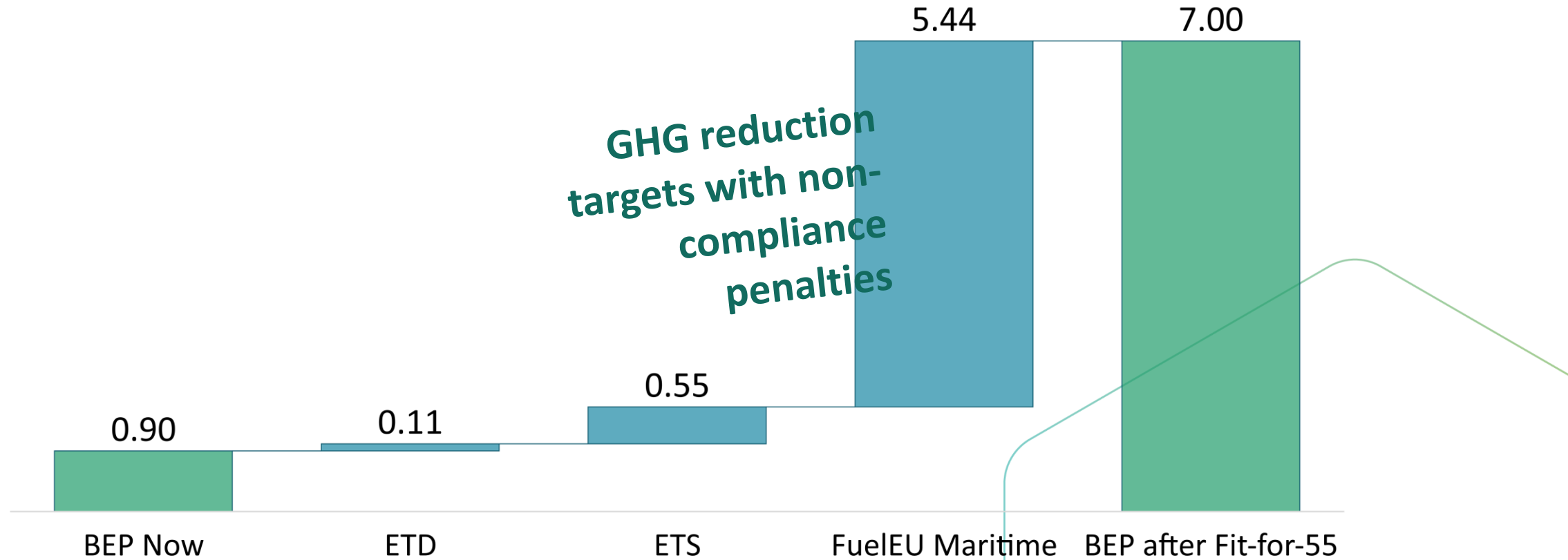
- (1) availability of engines (methanol ones are already in use, ammonia not yet, even if they are coming fast and soon),
- (2) Toxicity of ammonia vs safety of methanol, which make it potentially a better fit – especially for passenger ships
- (3) Slightly higher energy density of methanol,

Including maritime sector in the ETS is important but not enough



The theoretical Impact of Fit 4 55 Policies on the hydrogen business case

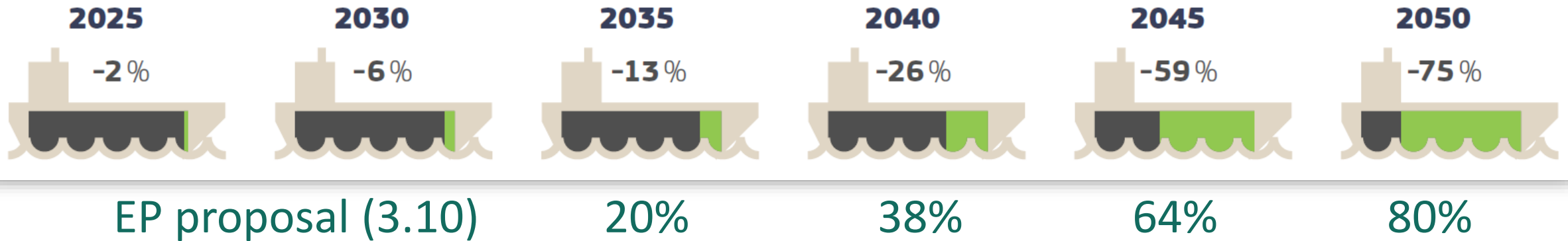
Hydrogen Break-Even Point vs Heavy Fuel Oil (EUR/kg)



BEP – break-even point
ETD – Energy Taxation Directive
ETS – Emission Trading System

... but there are problems

Maritime targets on the limits on greenhouse gas intensity of the energy used on-board compared to 2020



- Generally rather low level of ambition (at least before 2040)
- No specific sub-target for zero emission solutions (like in Aviation)
 - EP proposal: 2%
- Loophole allowing green-washing through the use of Onshore Power Supply (OPS)

1. Increased GHG Ambition

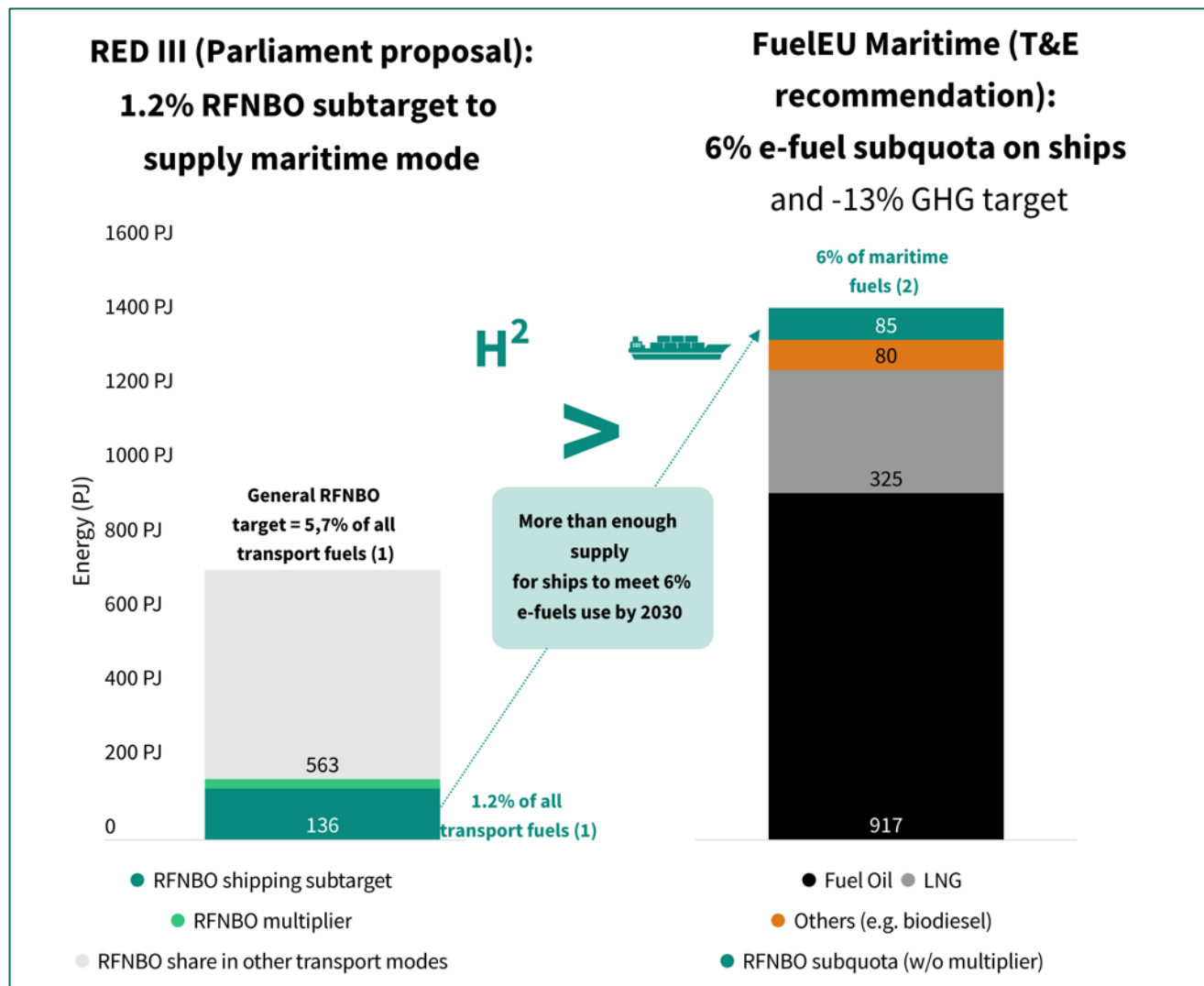
2. An RFNBOs quota

- >6% (Aligned with RED3)
- No exemptions to owners of <=3 vessels

3. High multipliers for RFNBOs

- Decreasing overtime
- Applying above the reached quota

We need a coherent approach for supply and demand of RFNBOs



Thank You



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