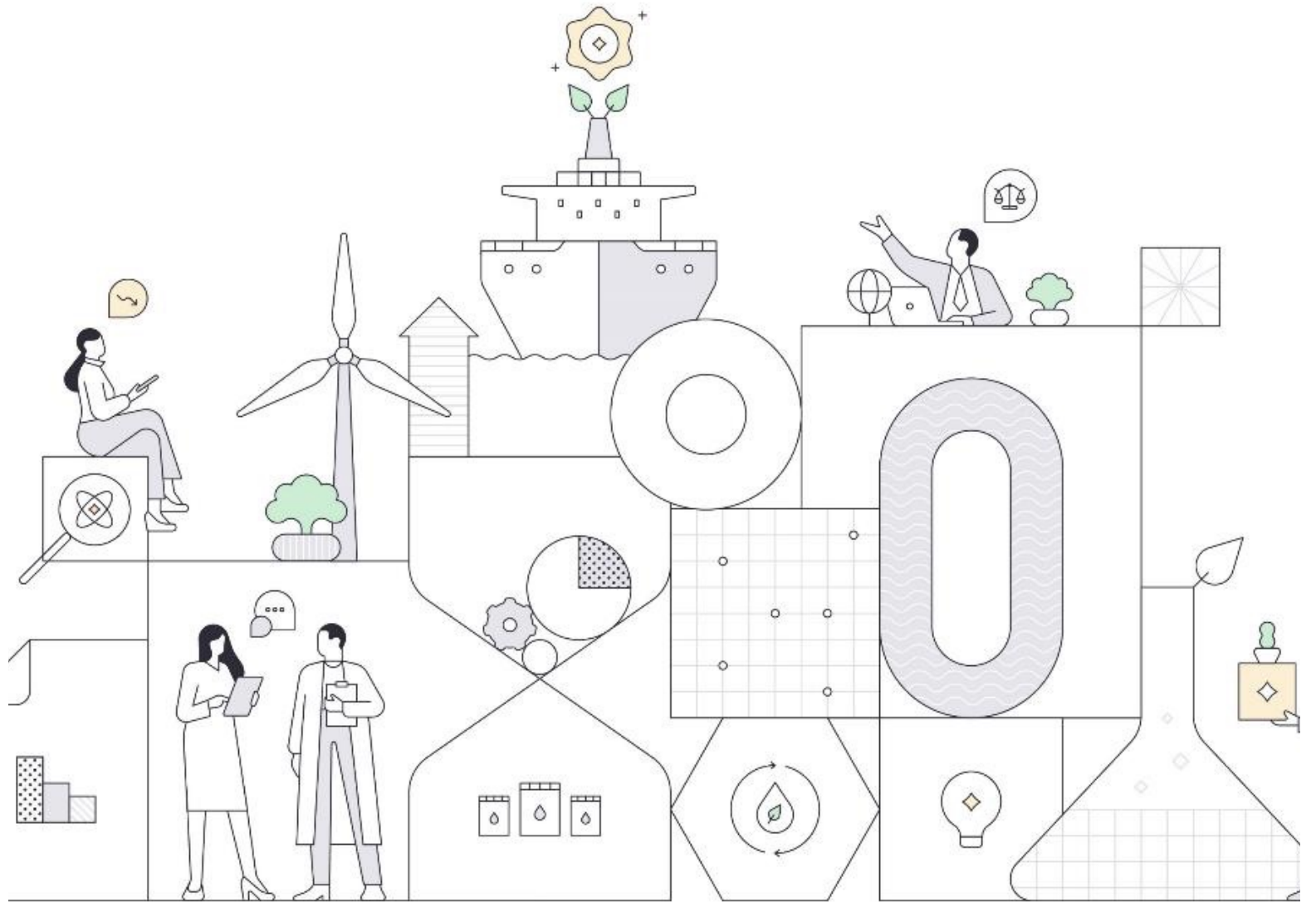


Biomethane and the Shipping Industry



Roberta Cenni,
WBA Members Meeting, June 14, 2022

Mærsk Mc-Kinney Møller Center
for Zero Carbon Shipping

Shipping in numbers:

~100,000 commercial vessels

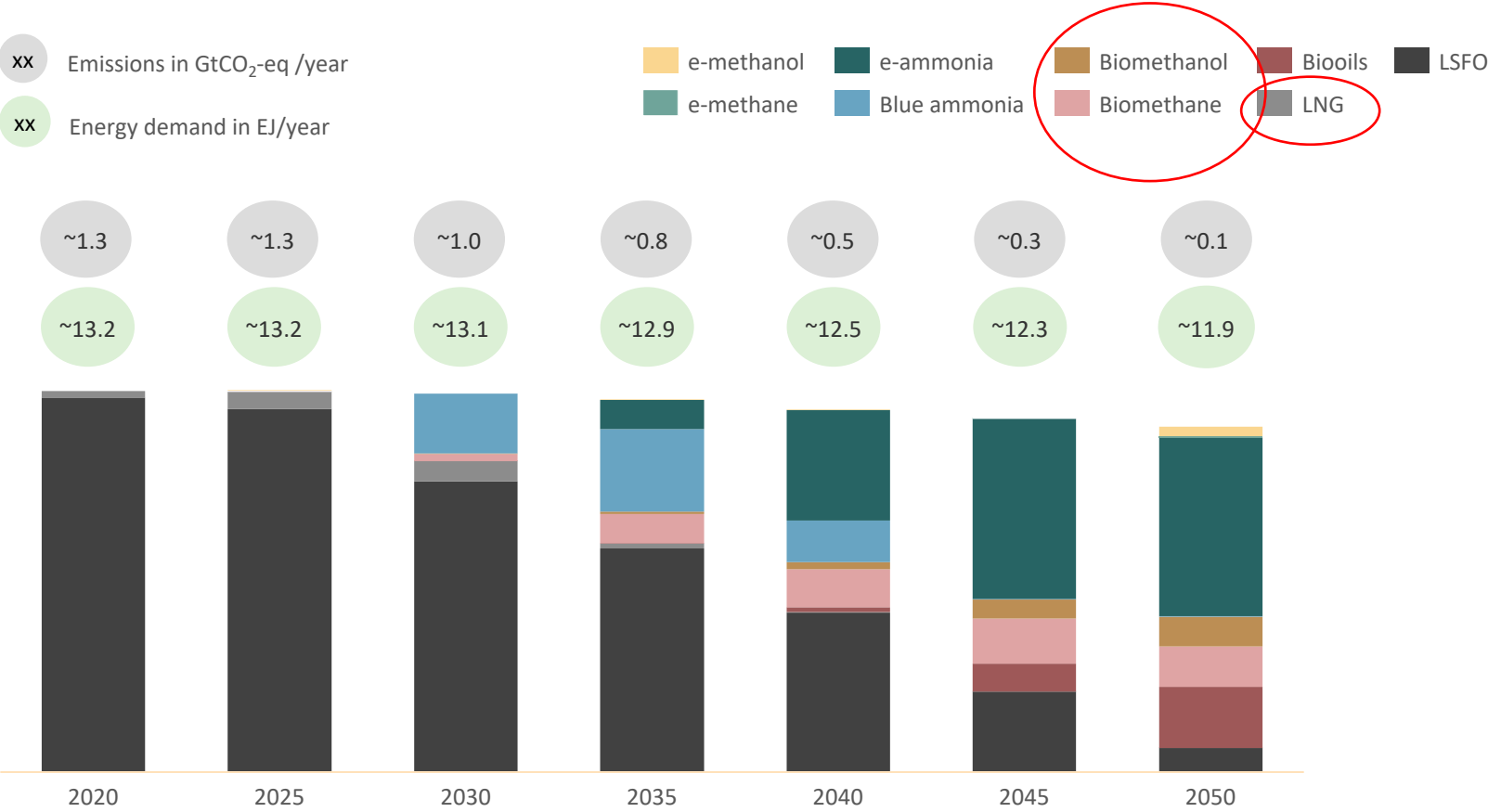
~300 mtons / y fuel (~13 EJ / y)

~3% global CO₂ emissions



According to current scenarios, Biomethanol and Biomethane will not play a significant role before 2035

Scenario: Activating all critical levers and introducing a flat global carbon levy of USD 230/tCO₂-eq



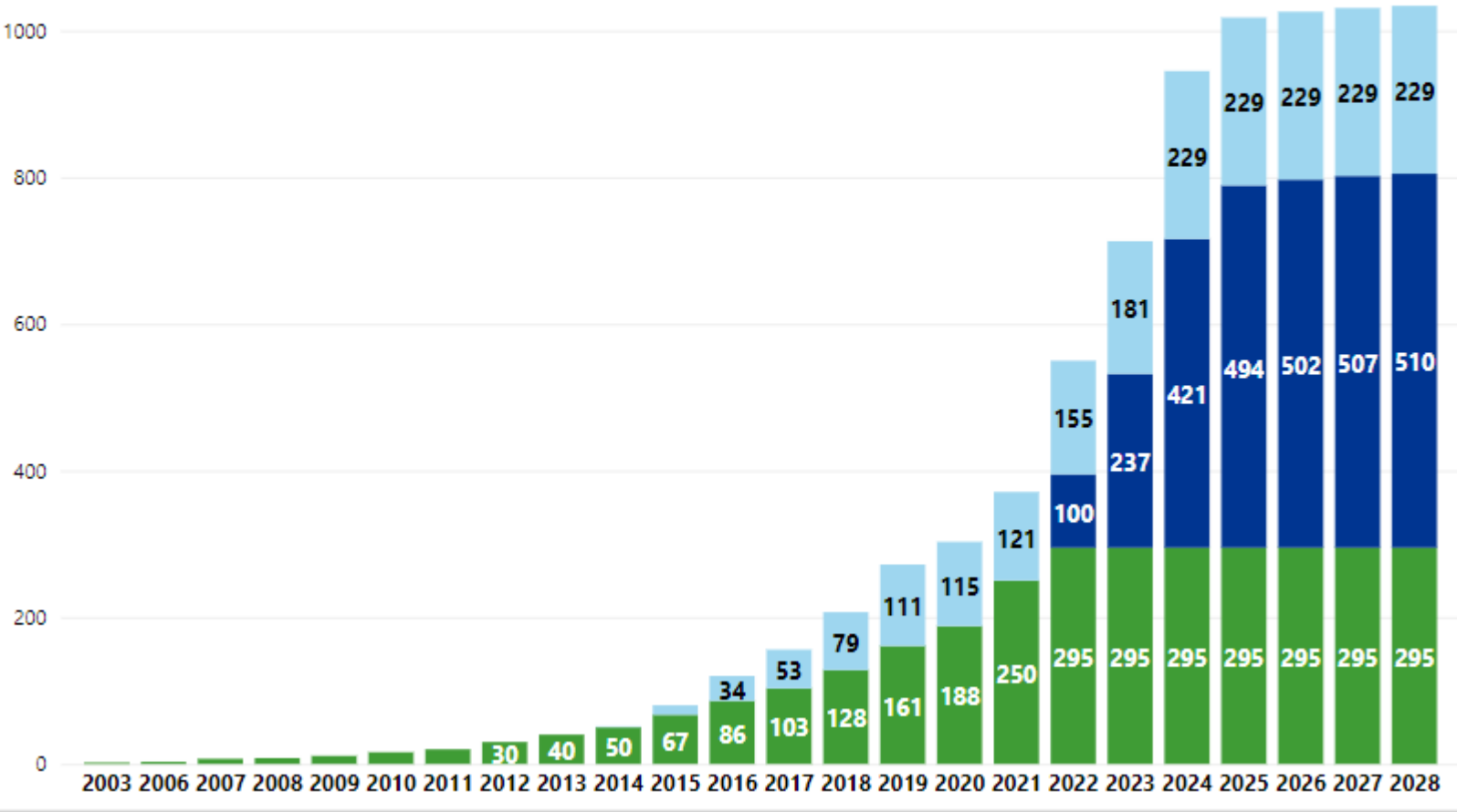
Ammonia may play a central role in meeting the maritime industry’s overall energy demand during the transition on a Path to Zero. Ammonia’s share in the fuel composition could steadily increase from ~16% in 2030 to just more than half in 2050. This has two main reasons – firstly, ammonia may be the cheapest e-fuel (fuel cost and vessel TCO) and secondly, ammonia may be the only relevant blue fuel.

Biofuels likely play a role as their production throughput, technological maturation and supply chains reach necessary scale: bio-methane with a primary role from 2030s, and bio-methanol and bio-oils impacting the fleet mix from 2040s. Lastly, other e-fuels (e.g., e-methanol) may not play a significant role in early years of transition, because of lack of cost-competitiveness¹

Source: NavigaTE
1 Read more about ammonia cost assumptions in Appendix A4.

Yearly development of LNG fuelled fleet

● In operation ● On order ● LNG ready



Methane as the fuel of the transition is a reality:
~400 ships fuelled by LNG are In operation or On order today

But is this the right way to go?

LNG as bunker fuel

- The bank shocked many with the publication of a maritime decarbonisation report in which it specifically recommended that countries pull back from investing in further LNG bunkering infrastructure
- MMMCZCS assesses that marine engines may emit up to 7% methane (engine slip and fugitive)

Bunkering Environment Regulatory

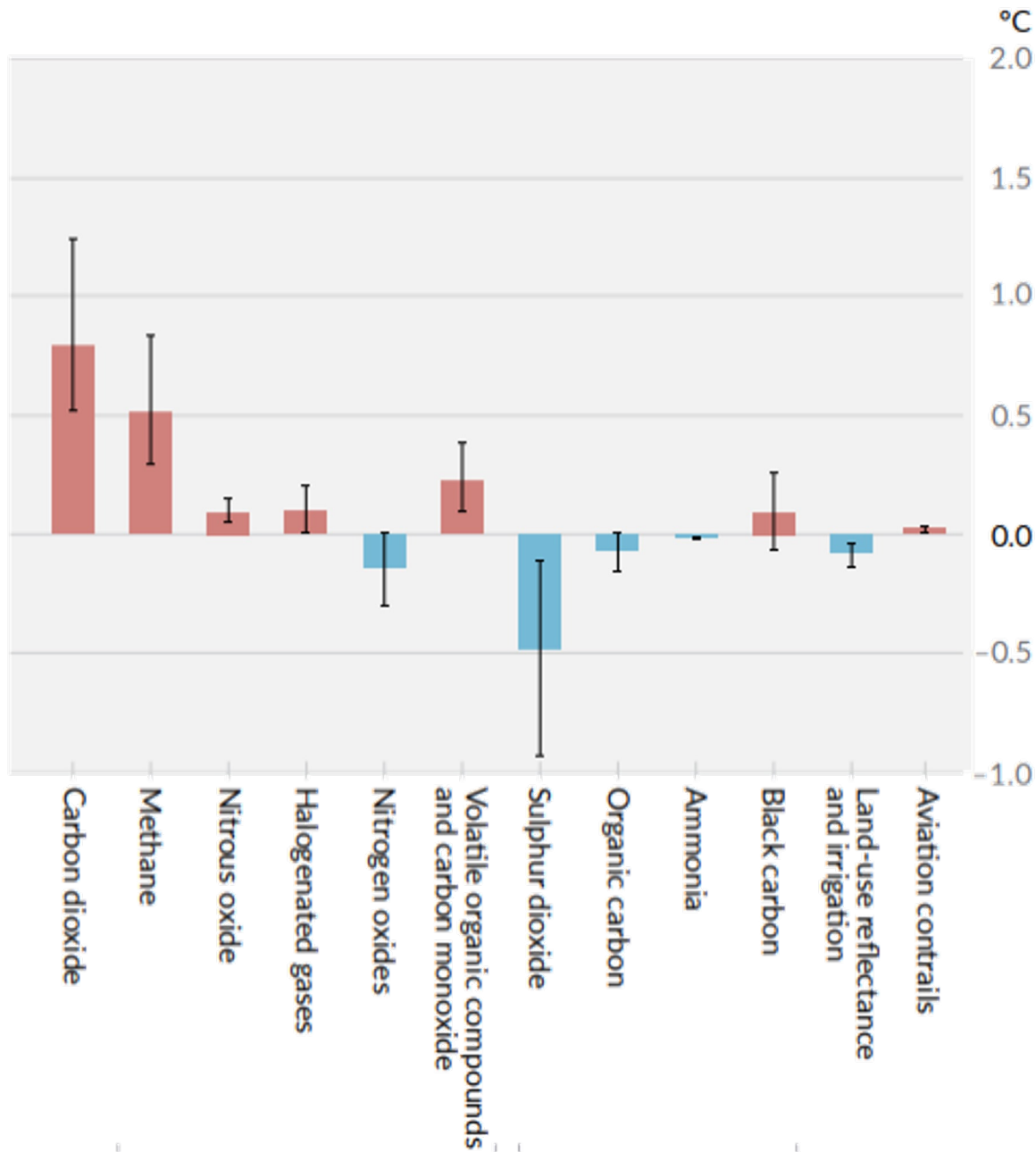
World Bank takes its anti-LNG stance to the IMO



Sam Chambers · September 30, 2021

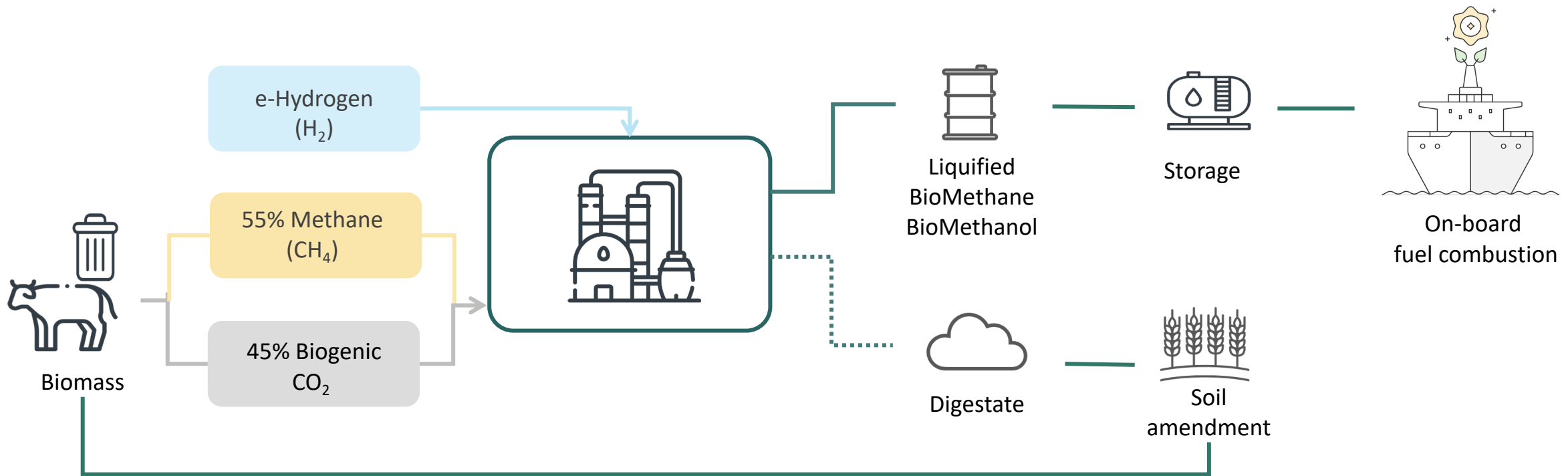
1 7,287 3 minutes read



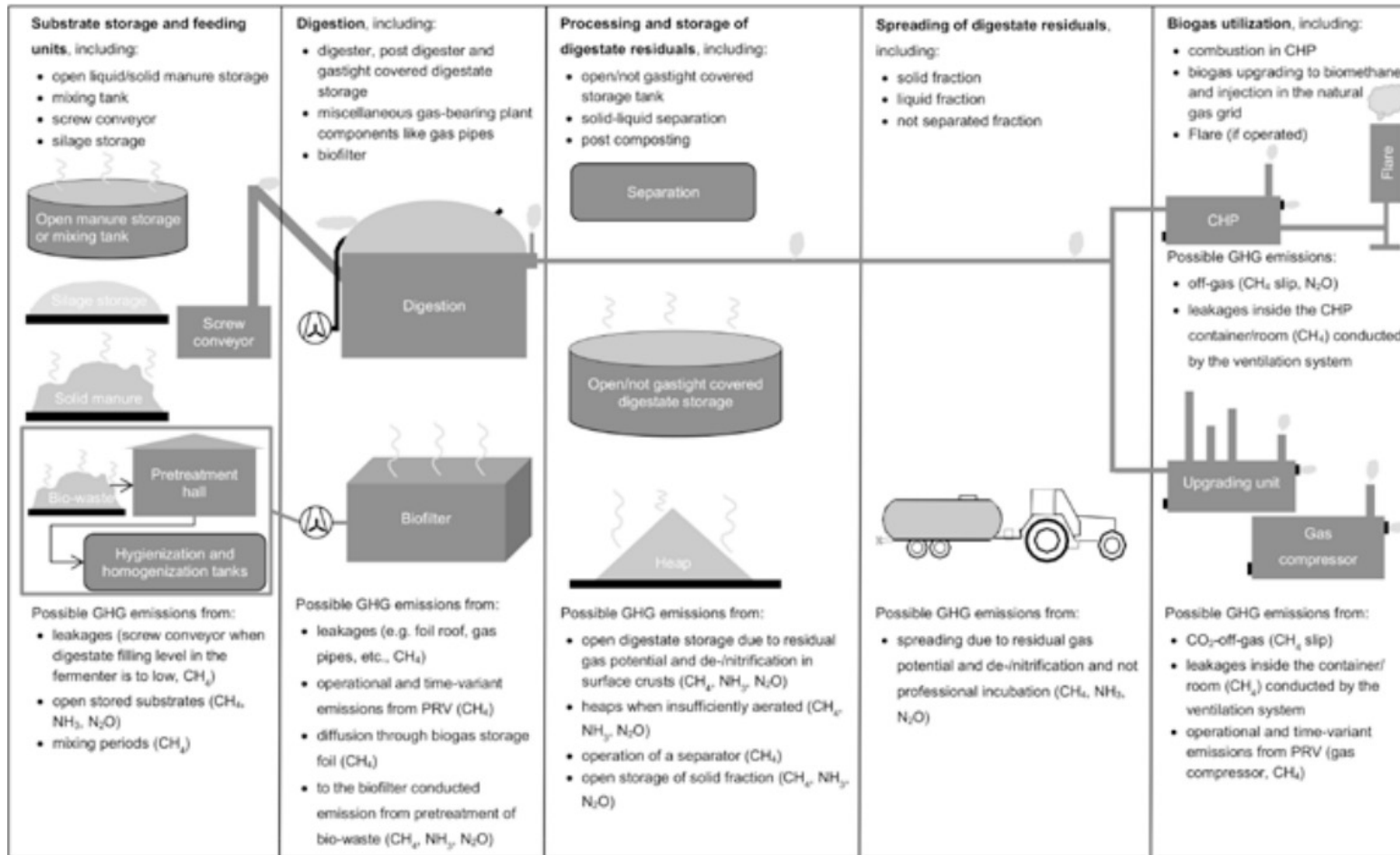


Anthropogenic methane emissions have contributed to ~30% of observed global warming to date

Biogas is an excellent vehicle of chemical building blocks



... but uncontrolled emissions may be everywhere



There may be more:

Barn operations

- Deep litter management
- Aeration

Insufficient technical solutions

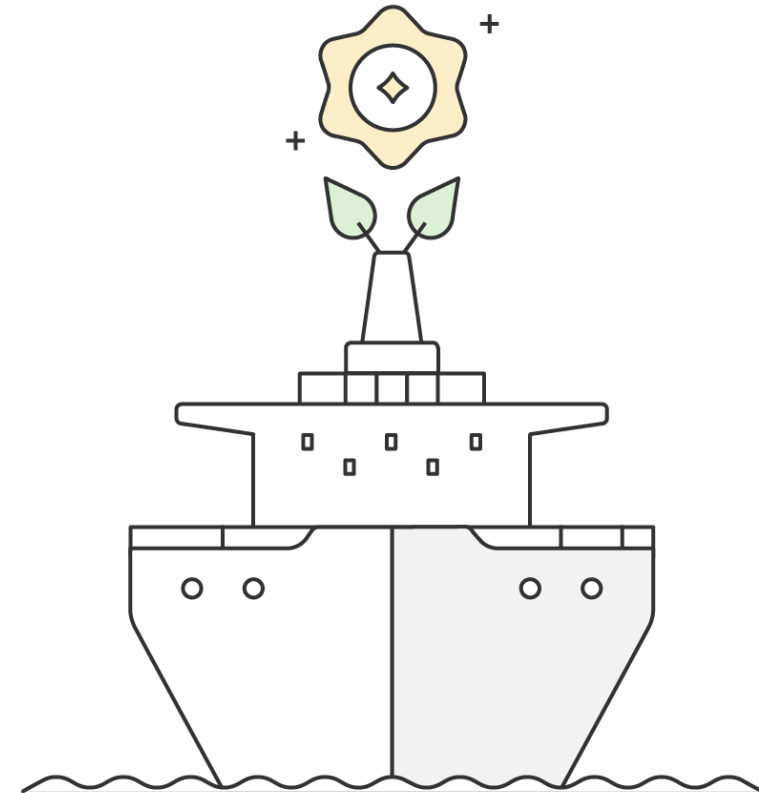
- Lack of temporary storage for rejected gas



Biogas pathways are a no-go
if fugitive emissions are not
eliminated

Our purpose here today

- Understanding the industry and the supply chain
 - Are emissions an individual responsibility ?
 - Measurement methods – accuracy, reliability, affordability. Are they forward looking?
- Remedies and best practices. How good are the best in class?
- Is there more we need to consider?

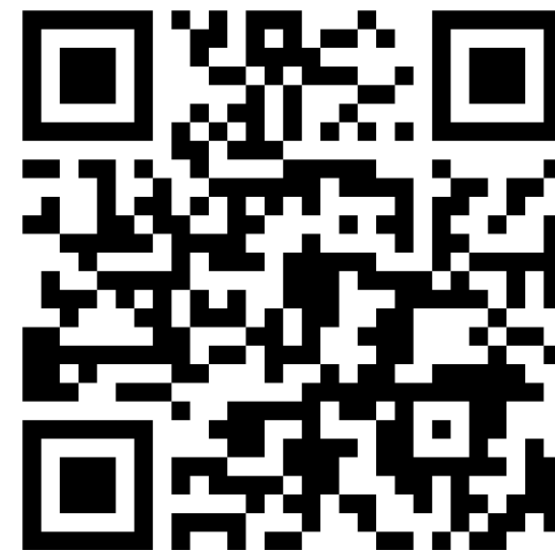


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