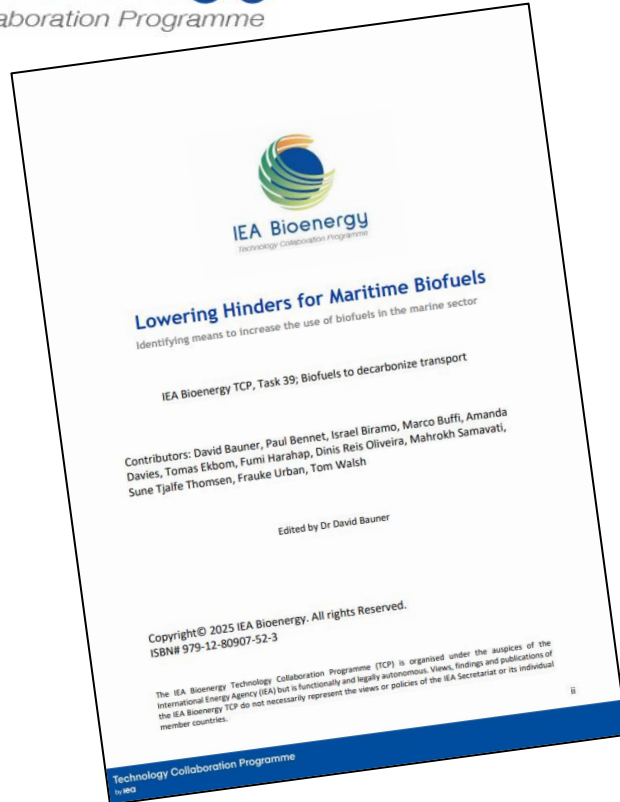
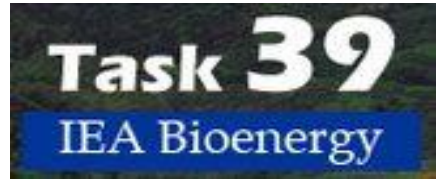




IEA Bioenergy
Technology Collaboration Programme



Lowering Hinders for Maritime Biofuels – identifying means to increase the use of biofuels in the marine sector

Zero Emission Shipping – November 2025

Task 39 - Biofuels to Decarbonize Transport

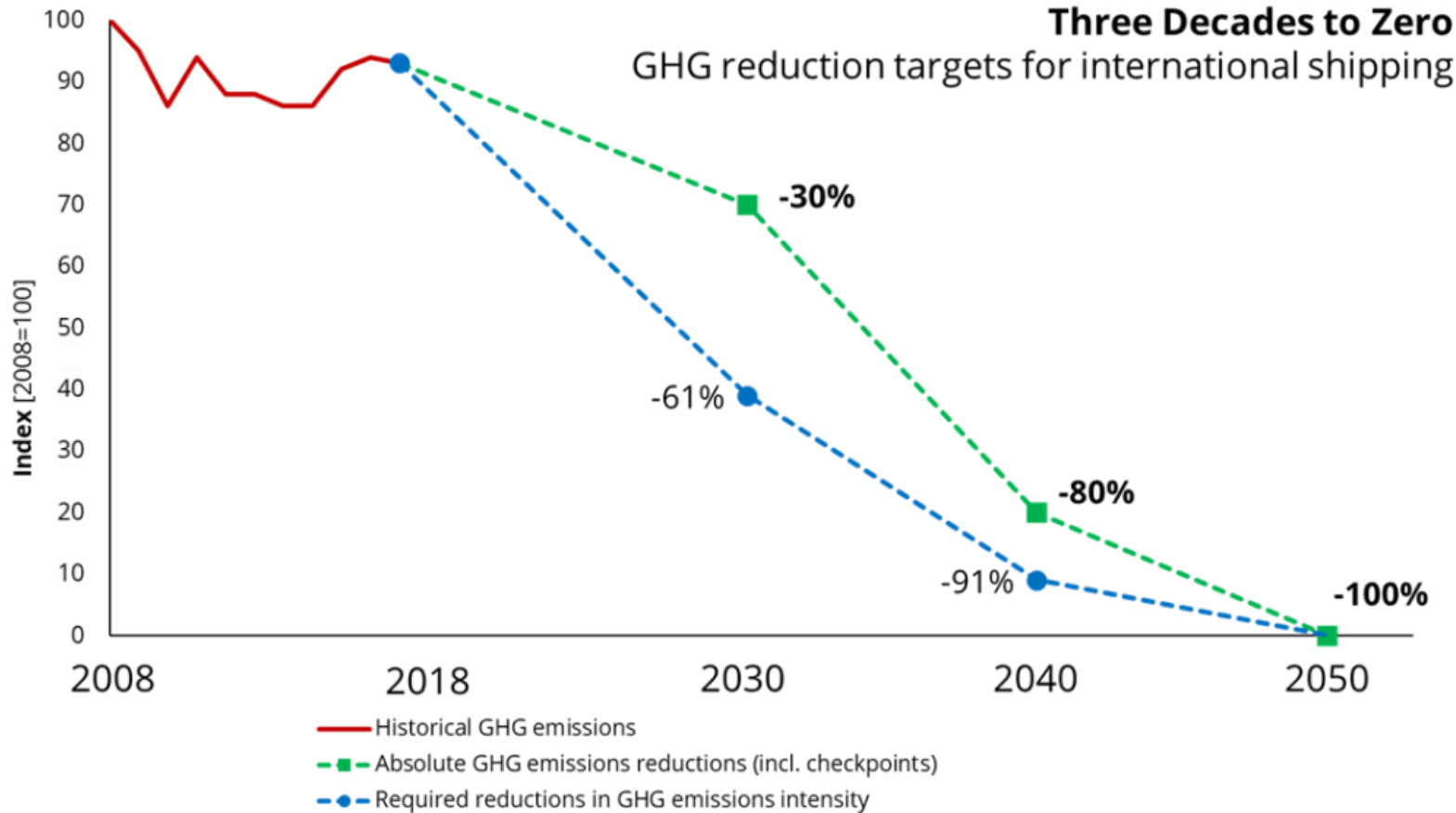
Tom Walsh CEO, NTL Renetech Bioresources Ltd, Ireland

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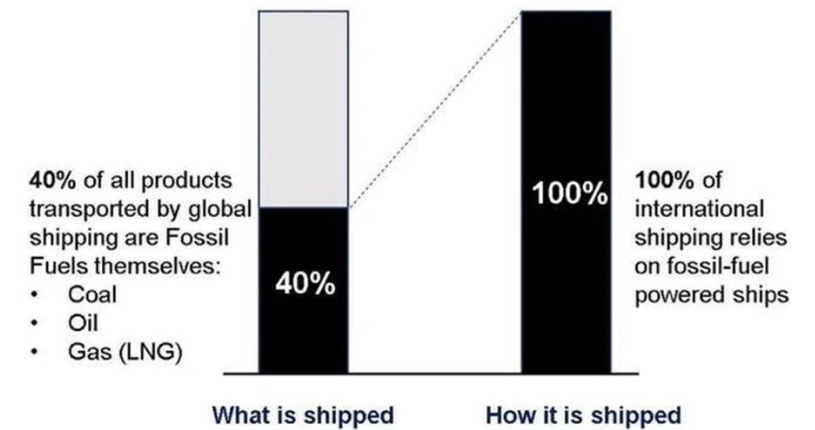
Agenda

- Background
- 2024-2025 Report highlights
 - Outline
 - Reference group
 - Biomass Sourcing
 - System level scenario outlook
 - Innovation
 - Maritime Fuel qualities
 - IMO and EU regulations
 - Market development and Investment
- Conclusion

Background



Global shipping has a big fossil fuels problem

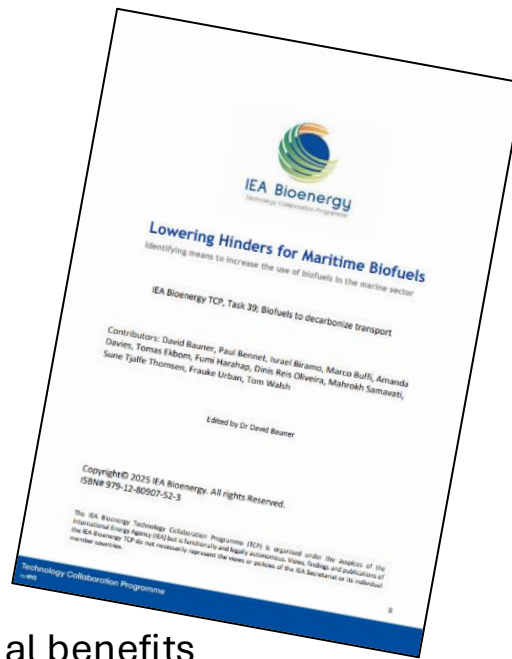


Source: UNCTAD (2019), Degnarain (2020)

A new climate deal for shipping: Three decades to zero. (2023, June 13). World Bank Blogs. <https://blogs.worldbank.org/transport/new-climate-deal-shipping-three-decades-zero>

2025 Report outline

- 1 Background**
 - 1.1 Introduction – IEA and task 39
 - 1.2 Objectives, Goals, Methodology
 - 1.3 Shipping industry history
 - 1.4 Marine fuel use today
 - 1.5 Maritime biofuels and its potential benefits
- 2 Developing the market for sustainable marine fuels (state of the art)**
 - 2.1 Introduction
 - 2.2 Biomass sourcing
 - 2.3 Biofuel production
 - 2.4 Distribution and bunkering
 - 2.5 Fuel use
 - 2.6 Energy efficiency
 - 2.7 Conclusion

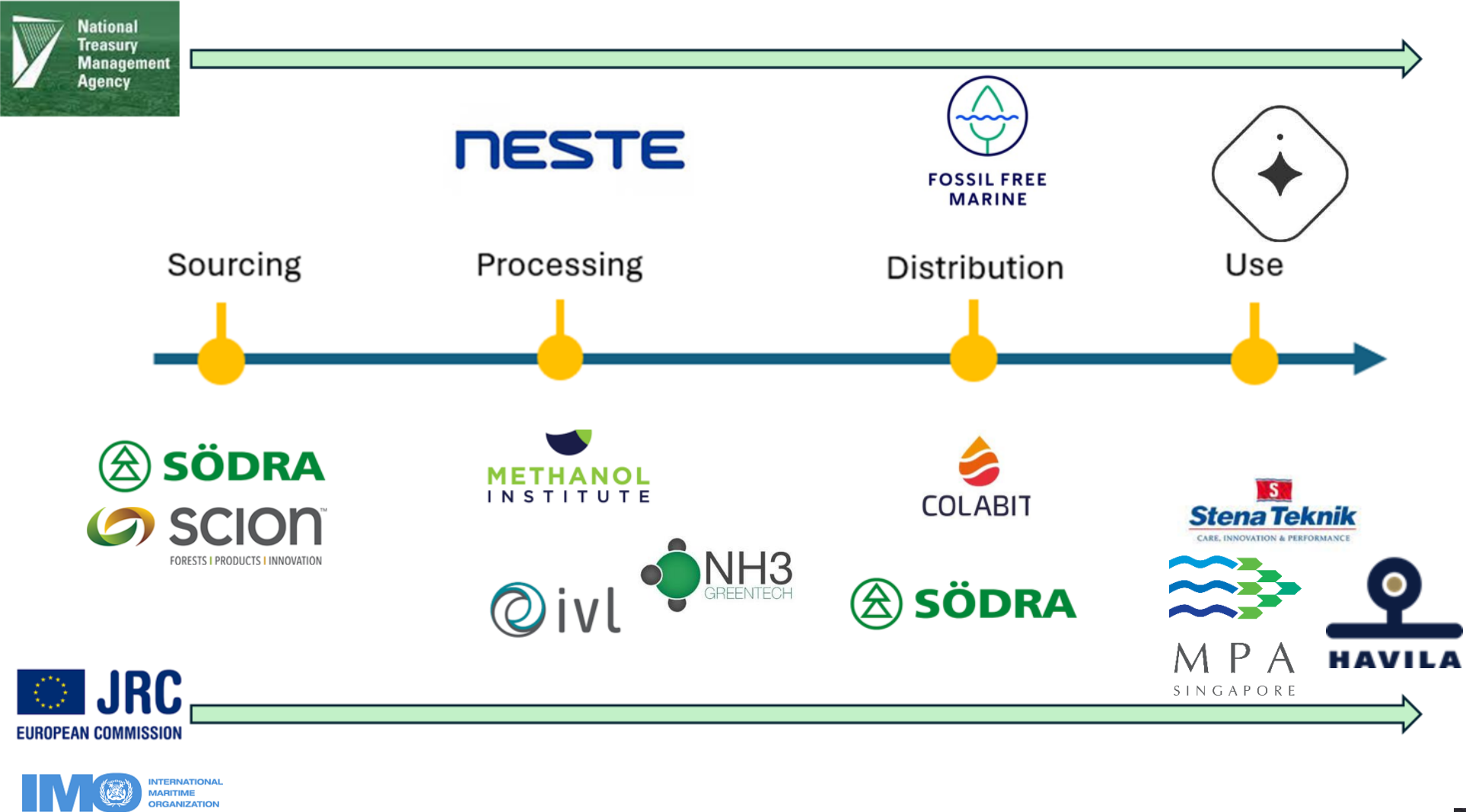


Report link

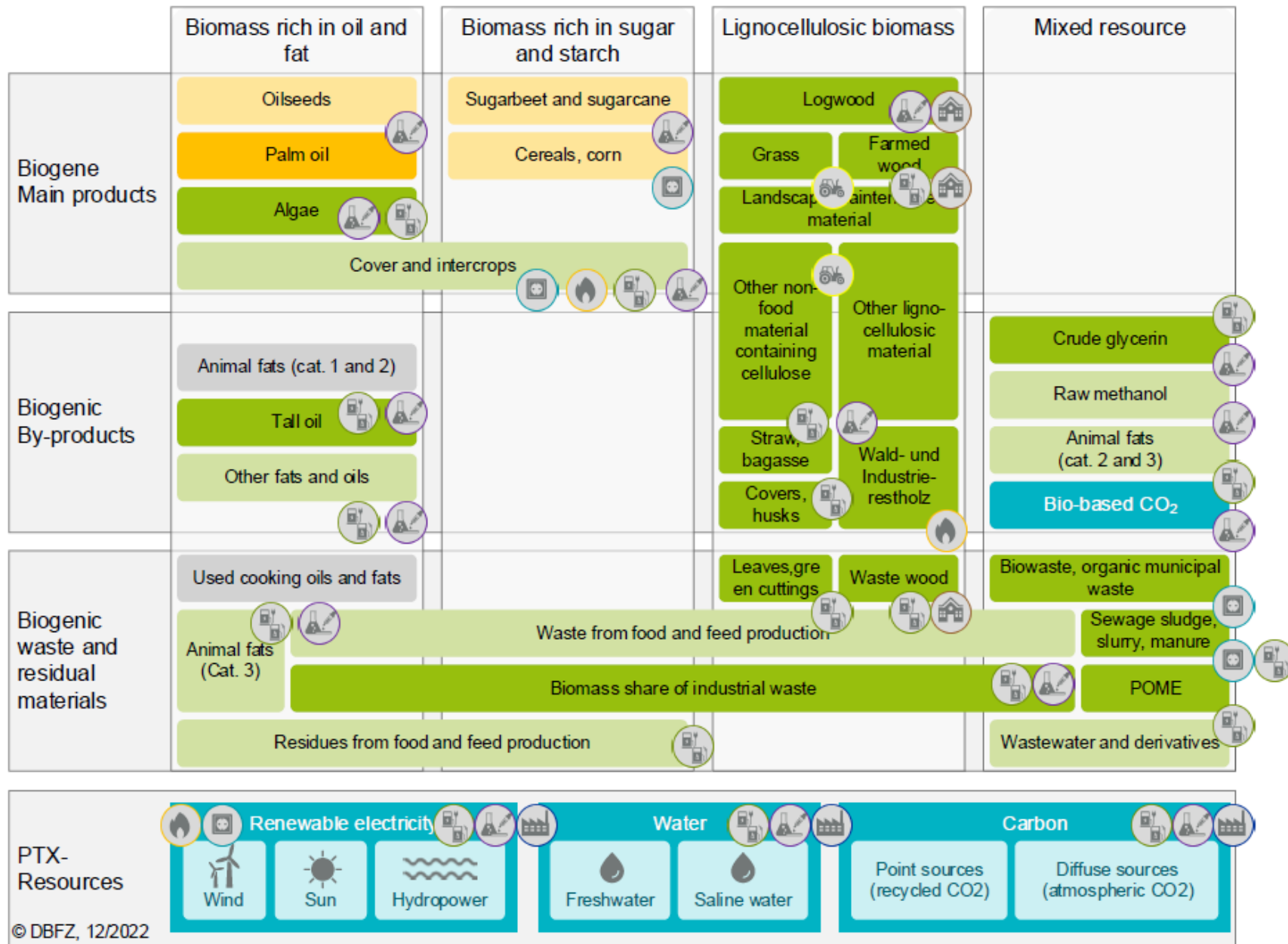
<https://www.ieabioenergy.com/wp-content/uploads/2025/04/IEA-Bioenergy-TCP-Task-39-T3-Maritime-Biofuel-Hinders-Report-revised.pdf>

- 3 Overcoming barriers for biofuels (prospective)**
 - 3.1 Introduction
 - 3.2 System level scenario outlook
 - 3.3 The role of regulation
 - 3.4 Developing biofuel production
 - 3.5 Distribution and use of biofuels
 - 3.6 Energy efficiency measures to enable biofuels
 - 3.7 The need for investment
 - 3.8 Case study: Marine Fuels from Pyrolysis of Biomass – A Solution For New Zealand?
 - 3.9 Case Study: Interview with MPA, Singapore
- 4 Analysis and summary**
 - 4.1 IMO and DNV roadmaps to 2050
 - 4.2 Discussion

Reference group and interviewees



Biomass sourcing



© DBFZ, 12/2022

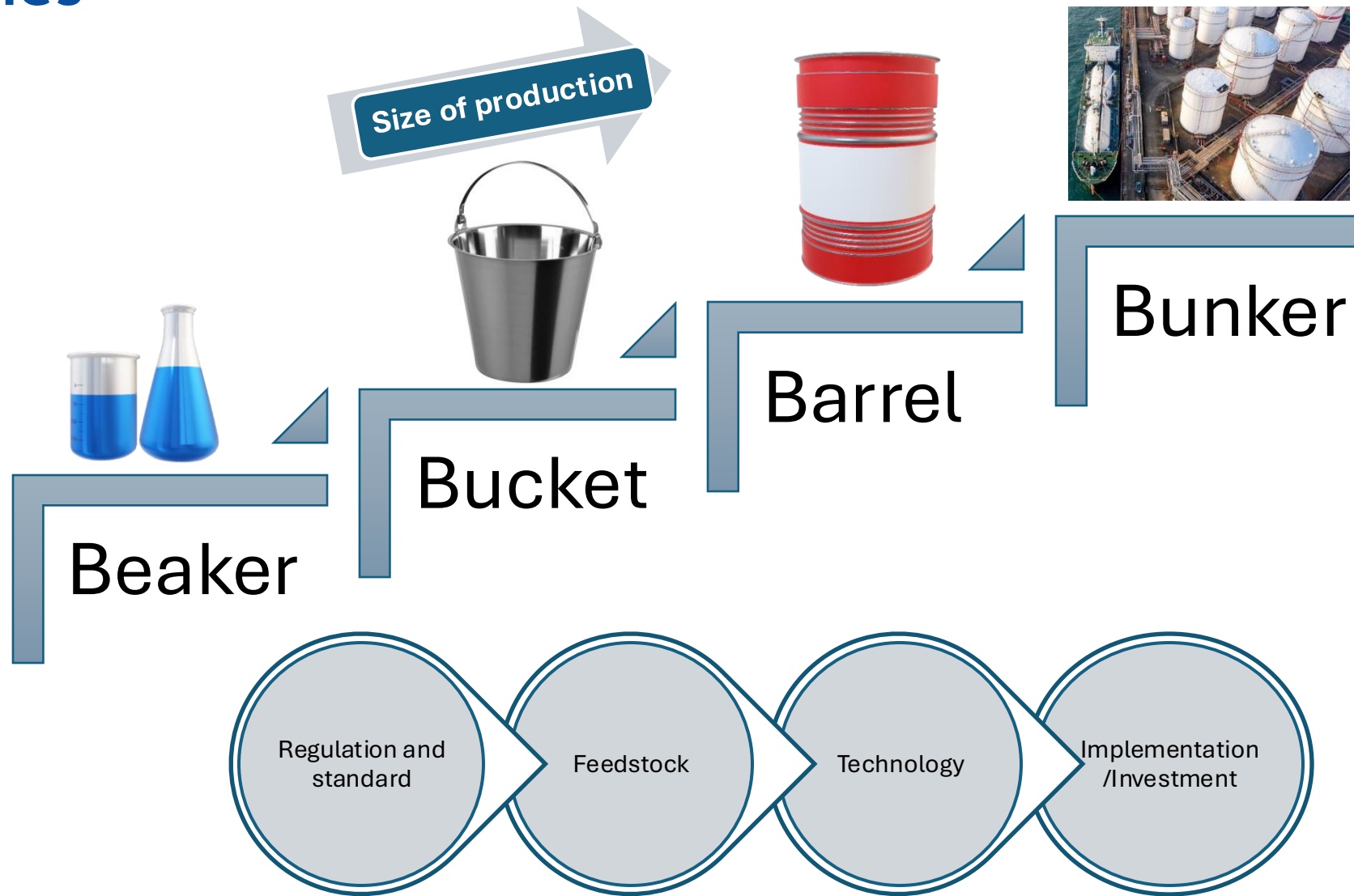
Systems level scenario outlook

Economic growth	International trade	Climate policy	Carbon price	Fossil fuel use	Increased use of biofuels	GHG emissions
High	High	Strong	High	Medium	Medium to high	Medium
		Medium	Medium	High to medium	Medium to low	Medium
		Weak	Low	High	Low	High
Medium	Medium	Strong	High	Medium	Medium	Medium
		Medium	Medium	Medium	Medium	Medium
		Weak	Low	High	Low	High
Low	Low	Strong	High	Low to medium	High to medium	Low to medium
		Medium	Medium	Medium	Medium	Medium
		Weak	Low	High to medium	Low to medium	Medium

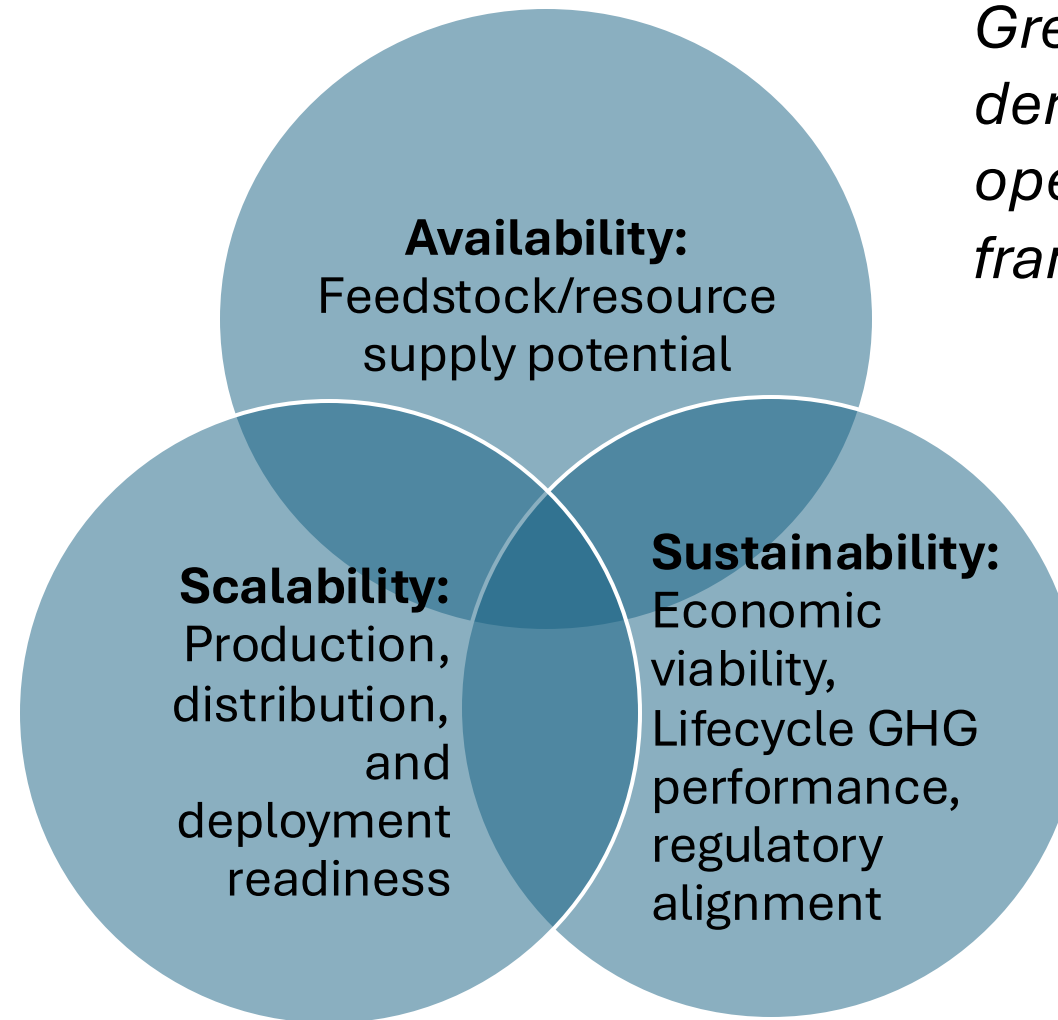
Source: Frauke Urban (KTH, Sweden), Mahrokh Samavati (Ramböll), Fumi Harahap (Ramböll)



Innovation ladder - from lab scale to commercial fuel use in engines

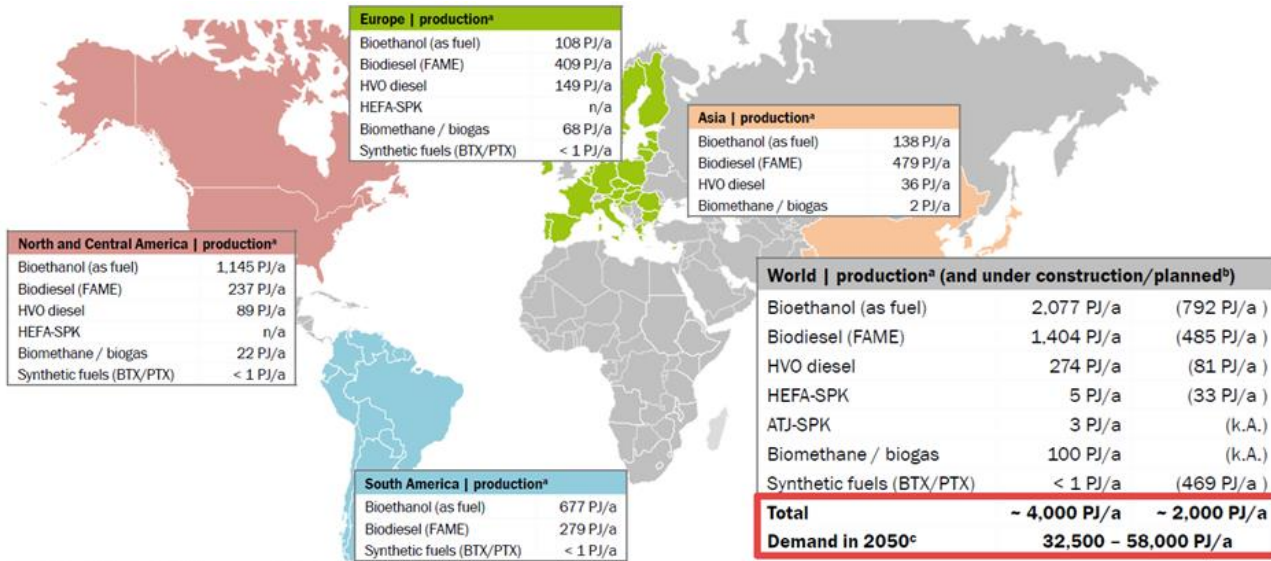


Sustainability-Availability-Scalability Framework for Marine Biofuels Evaluation

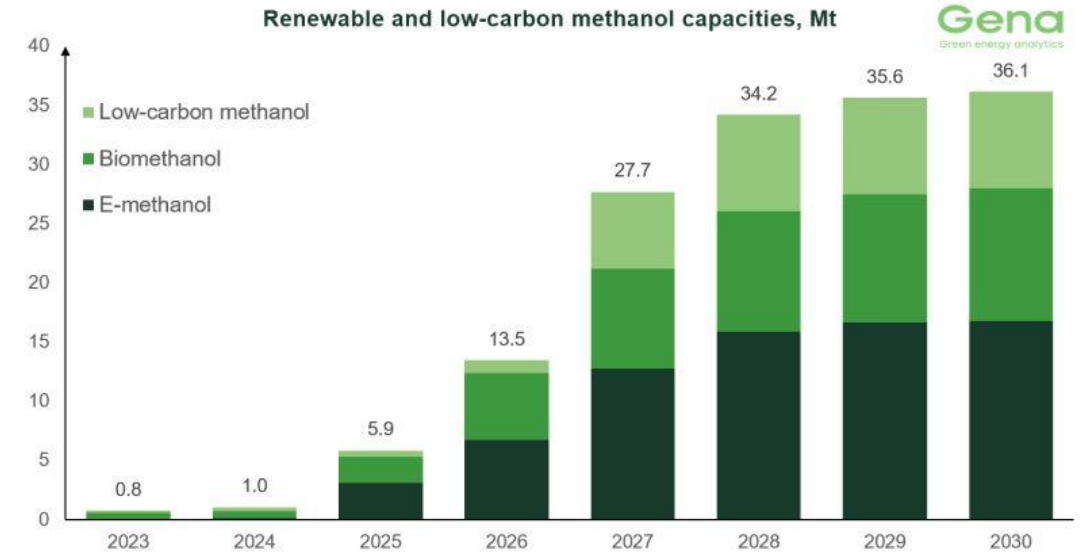


Green Corridors serve as demonstration platform to operationalize this framework

Renewable fuel in the international market



© DBFZ 10/2023 based on [Schröder, Naumann 2023], without claim of completeness
^a production in 2021 and biomethane capacities in 2019; ^b planned capacity; ^c demand according to IEA World Energy Outlook 2022 und IRENA Global Energy Transformation 2018

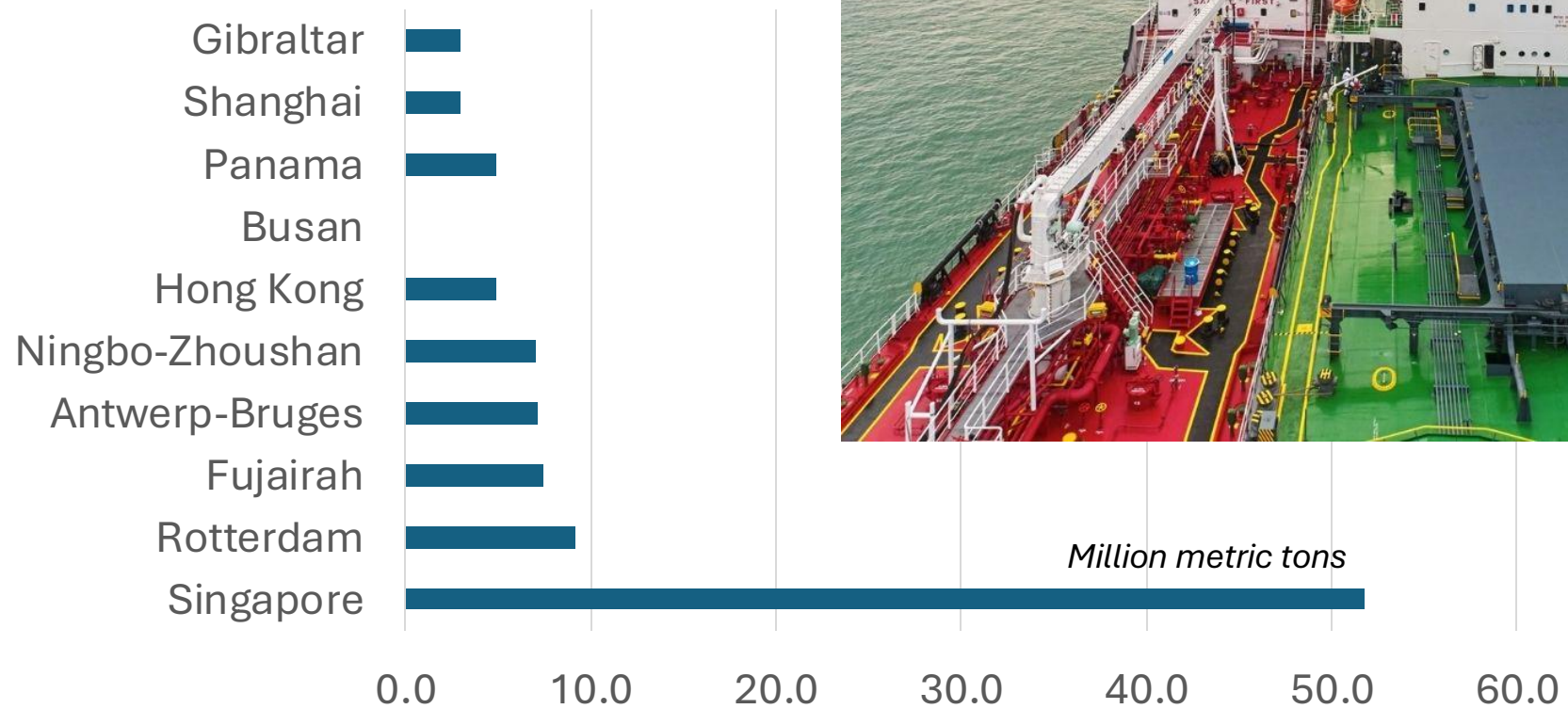


Source: GENA Solutions, www.genasolutions.com. Note: As of August 2024. Based on announced startup dates.

Renewable fuel in the international market projected upto 2050 (Source DBFZ (2023))

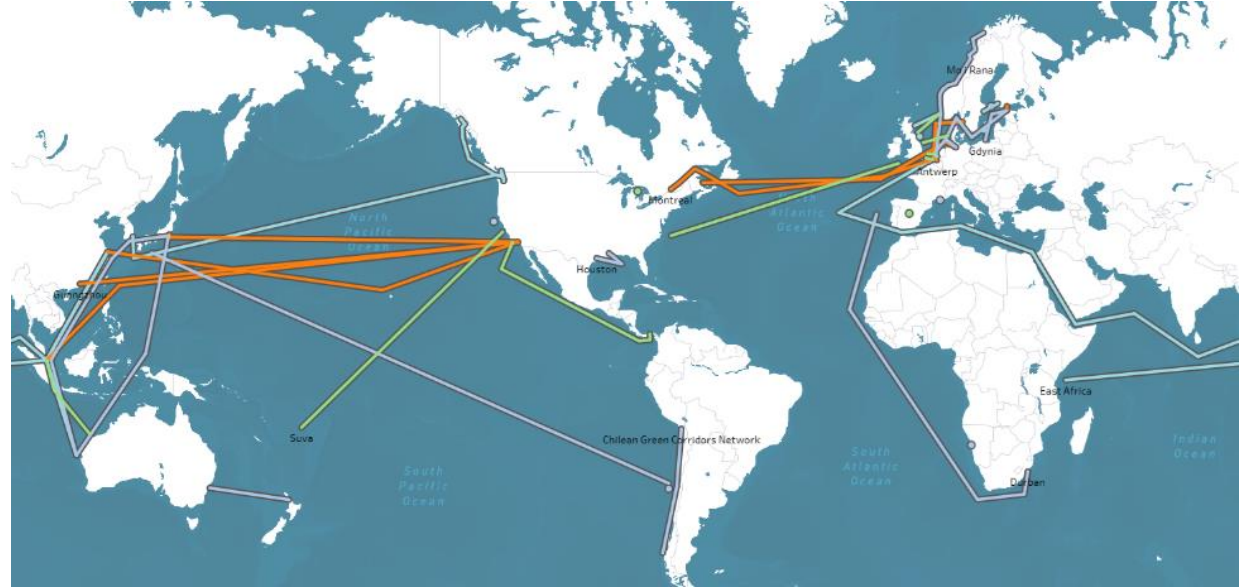
Coming green methanol pipeline globally as of August (MI, 2024)

World's largest bunkering ports 2023



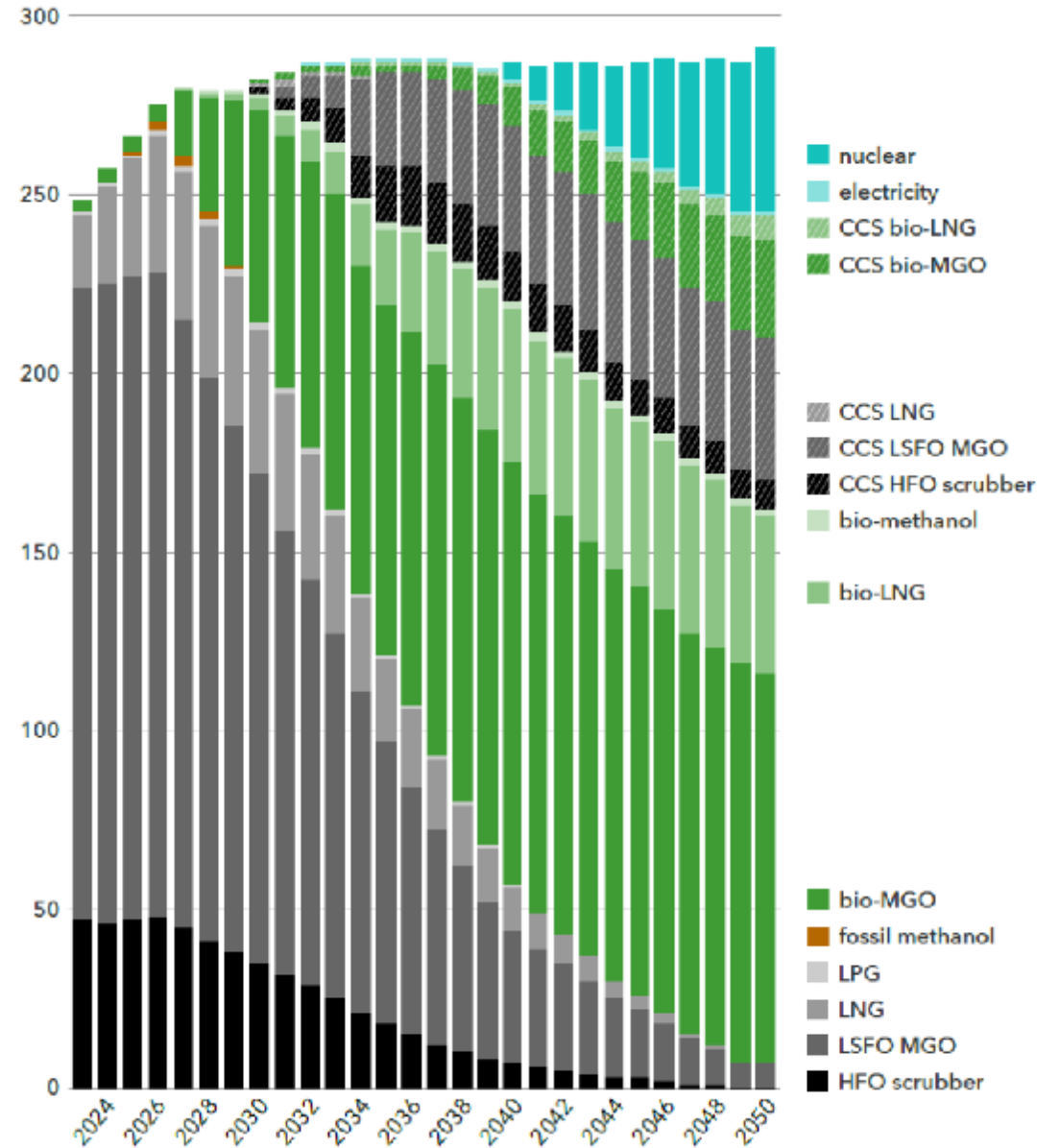
Green Corridors: Operationalizing Biofuel Transitions

- Analyse full value chains in real-world shipping
- De-risk adoption: Port-to-port fuel certainty
- Align standards, investments, and policy incentives
- Coordinate market stakeholders (port, fuel, engine, operator)
- Serve as models for broader scale-up
- Support policy: EU ETS, FuelEU Maritime, IMO GHG rules



DNV biofuel scenario (2024-08)

- Bio-methanol and bio-MGO dominate
- Rapid phase-out of fossil methanol
- Slow phase-out of (fossil) LNG
- Nuclear for near-shore
- BECCS for bio-LNG and bio-MGO as feasible
- CCS for LNG, MGO and HFO as feasible



Biomethane (2025): Drop-In Renewable Gas for Marine Use

- Availability: Municipal, Industrial & agricultural waste; proven digester technology
- Scalability Barriers: Liquefaction capability, Feedstock aggregation, methane slip, small-medium scale
- Sustainability: Cost competitiveness, high GHG reduction if methane capture is optimized
- Infrastructure Synergy: Compatible with LNG vessels & port systems
- Green Corridor Example: Viking Line Group-LBG trial, Rotterdam-Singapore Green and Digital Shipping Corridor (GDSC) initiative.
- Technology Examples: Havila Voyages methane-electric hybrid cruise ships, Wasaline transition to 2030 in agreement with Gasum.
- Next Steps: Policy credits for avoided emissions; methane slip reduction



Bio-Ethanol (2026): Liquid Biofuel with Global Supply Potential

- Availability: Abundant 1G & 2G feedstocks (corn, sugarcane, residues)
- Scalability Barriers: Engine compatibility, safety codes (IGF), cost
- Sustainability: Must avoid food vs. fuel conflict; **RED II certified**
- Infrastructure Synergy: Uses existing tanks, pipelines, barges
- Industry Activity: [Wärtsilä-Raízen trials](#)
- Mitigation: Incentivize dual-fuel retrofits; fast-track IMO code adoption



E-Methanol (2027): Synthetic Fuel for Last Mile Decarbonization Efforts

- Availability: Tied to renewable electricity & captured CO₂
- Scalability Barriers: Electrolyzer cost, CO₂ sourcing, CAPEX intensity
- Sustainability: Zero-carbon pathway if powered by green inputs
- Infrastructure Synergy: Ambient liquid- fits existing bunkering
- Market Signal: European Energy e-methanol plant, Maersk's methanol ships - EU FuelEU regulation support
- Mitigation: Targeted green corridors - LCOF + MAC metrics to assess cost-effectiveness



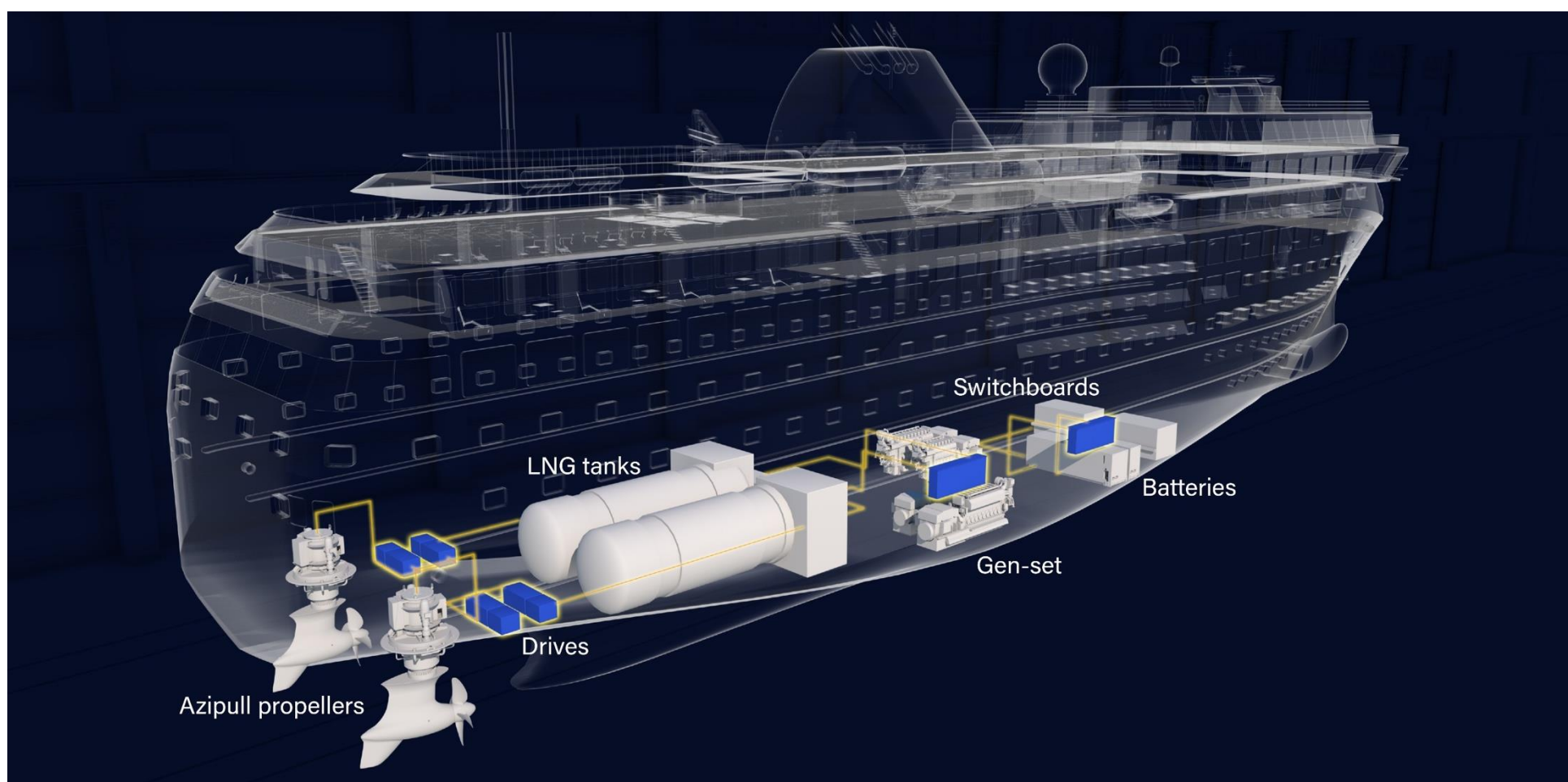
Maersk invests in dual fuel methanol vessels and Green Methanol production



- Maersk has taken delivery of 18 new dual-fuel vessels with a total of over 300 000 TEU
- Maersk has agreed with Japanese energy company ENEOS and A.P. Moller Holding to jointly invest \$100 million in green methanol project developer C2X, primarily to fund the final development phase of the Beaver Lake Renewable Energy (BLRE) plant in Louisiana, with a planned production of 500,000 metric tons of green methanol per year.

Plug-in hybrid - LNG/LBG & battery

Havila Voyages, Norway - existing ship



Wind-assisted Propulsion Systems under implementation for 2024-2025 - EU supported projects



7-10% reduction of fuel consumption for one wing on a RO-RO vessel is possible



52 seagoing ships now in operation and 97 newbuilds with WAPS ordered (as of January 2025)
DNV, 2025

Key recommendations

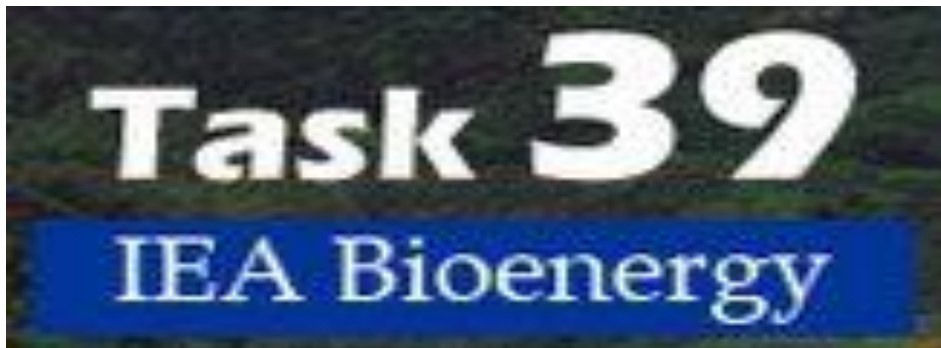
- **Availability, Scaleability and Sustainability** should be the framework for analysis and implementation across each biofuel value chain from feedstock to production technology to biofuel use. **Green Corridors** is an integrated means to test and demonstrate.
- **Research, innovation and commercialisation policy** should focus on the **bucket to barrel** sector if it is to have an impact in terms of availability by 2030.
- **Risk Mitigation:** Electric, Biofuels and Efficiency measures go hand in hand. The combustion engine will not go away quietly. Scenario planning - what if the lights are switched off?

Thank you!

Tom Walsh

tom.walsh@renetech.net

Contributors: David Bauner, Paul Bennet, Israel Biramo, Marco Buffi, Amanda Davies, Tomas Ekbohm, Fumi Harahap, Dinis Reis Oliveira, Mahrokh Samavati, Sune Tjalfe Thomsen, Frauke Urban, Tom Walsh



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