



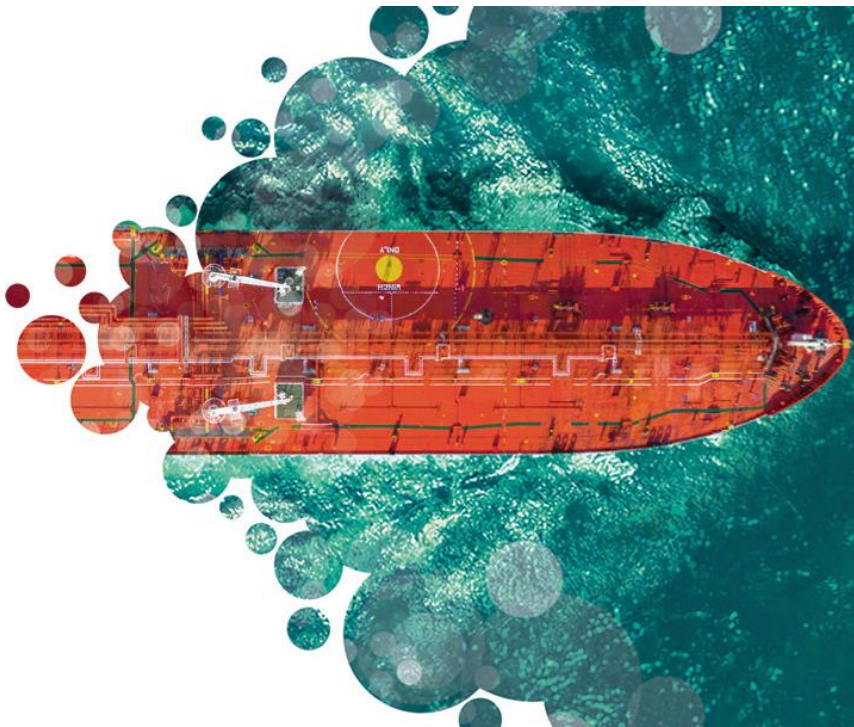
WHEN TRUST MATTERS

# Energy Transition Outlook

## Maritime Fuels

Christos Chryssakis, Business Development Manager

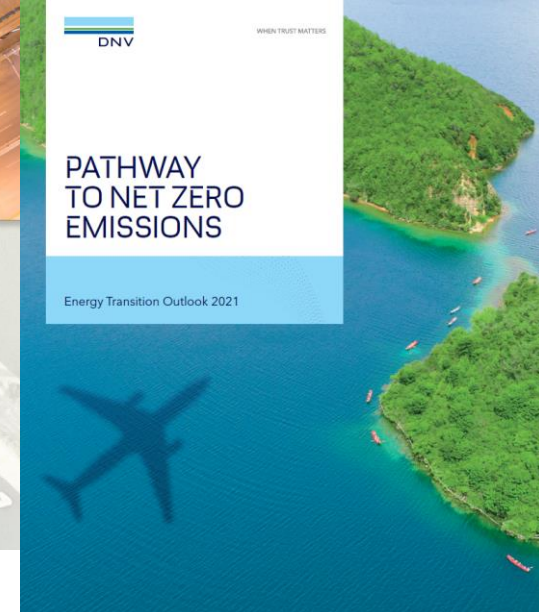
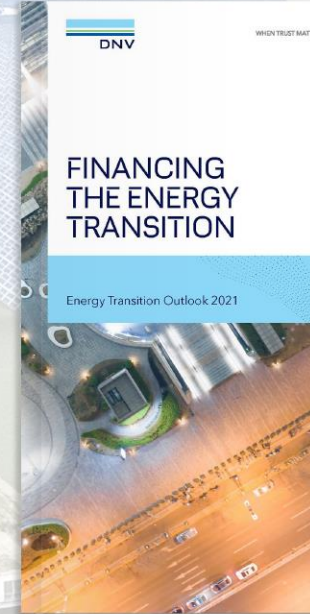
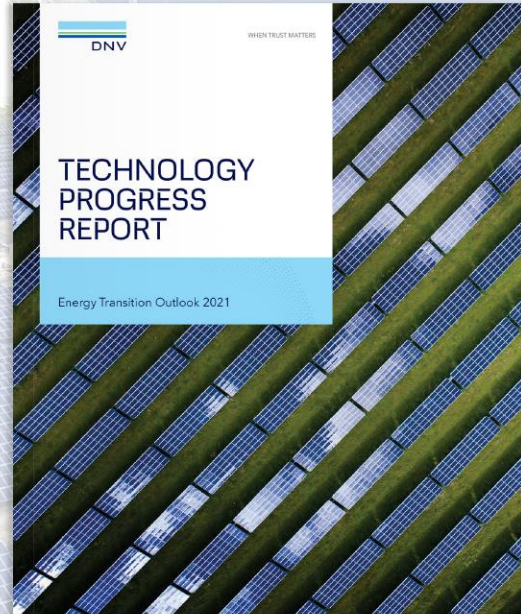
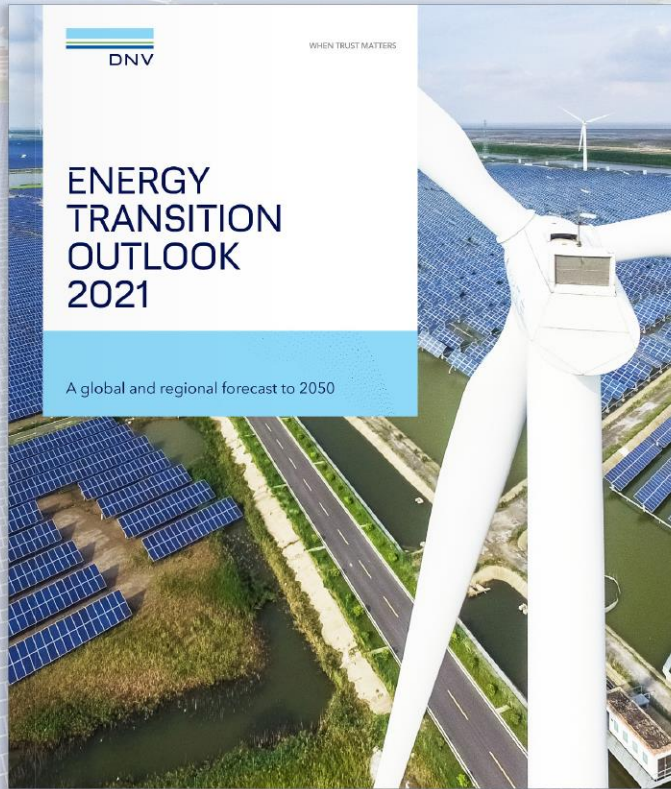
01 December 2021



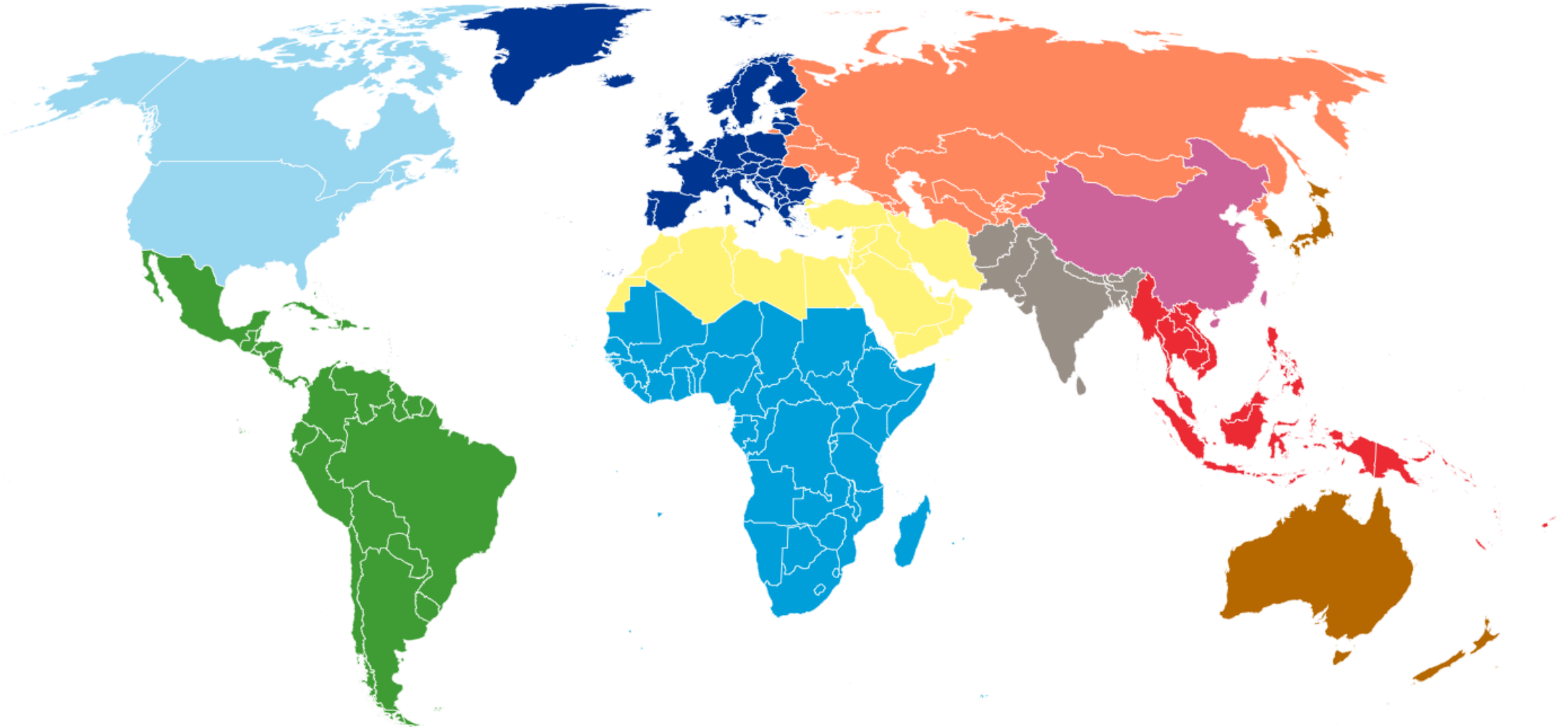


# DNV Energy Transition Outlook – ETO -

<https://eto.dnv.com/2021>



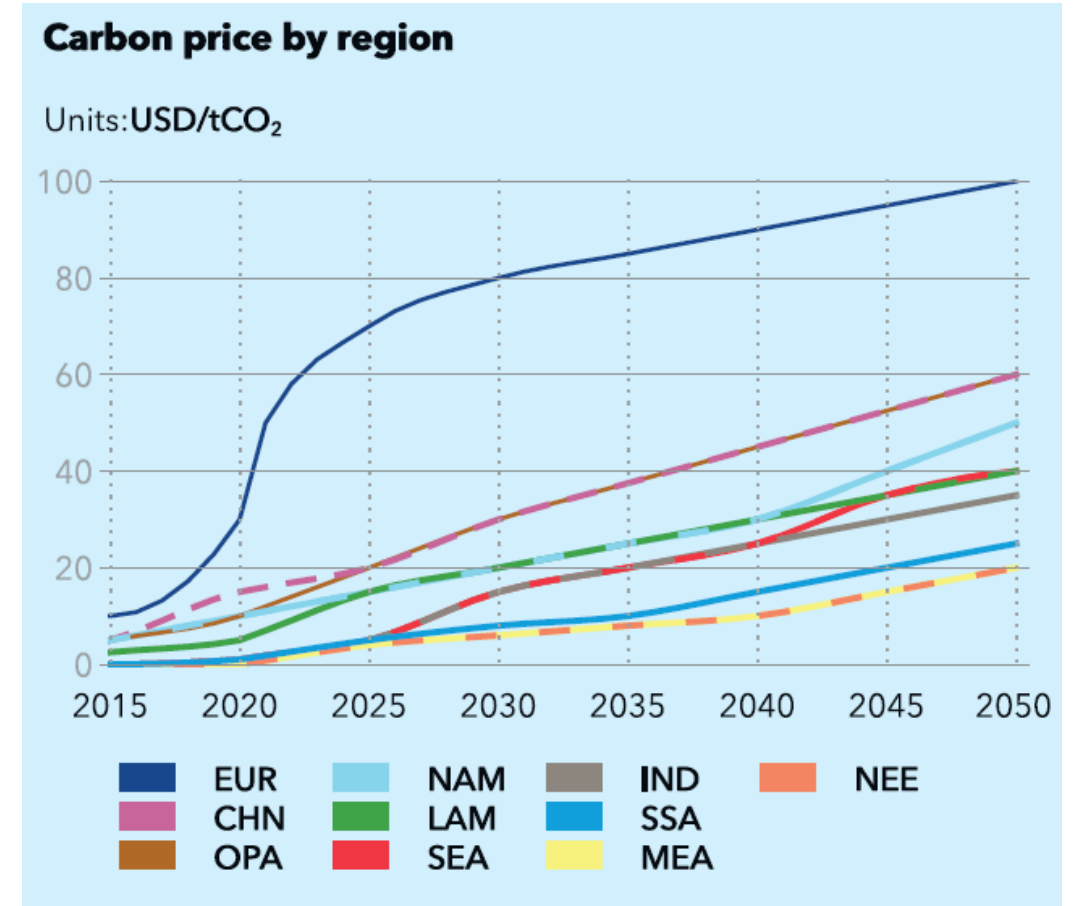
# A global and regional forecast





# Policy – Carbon price

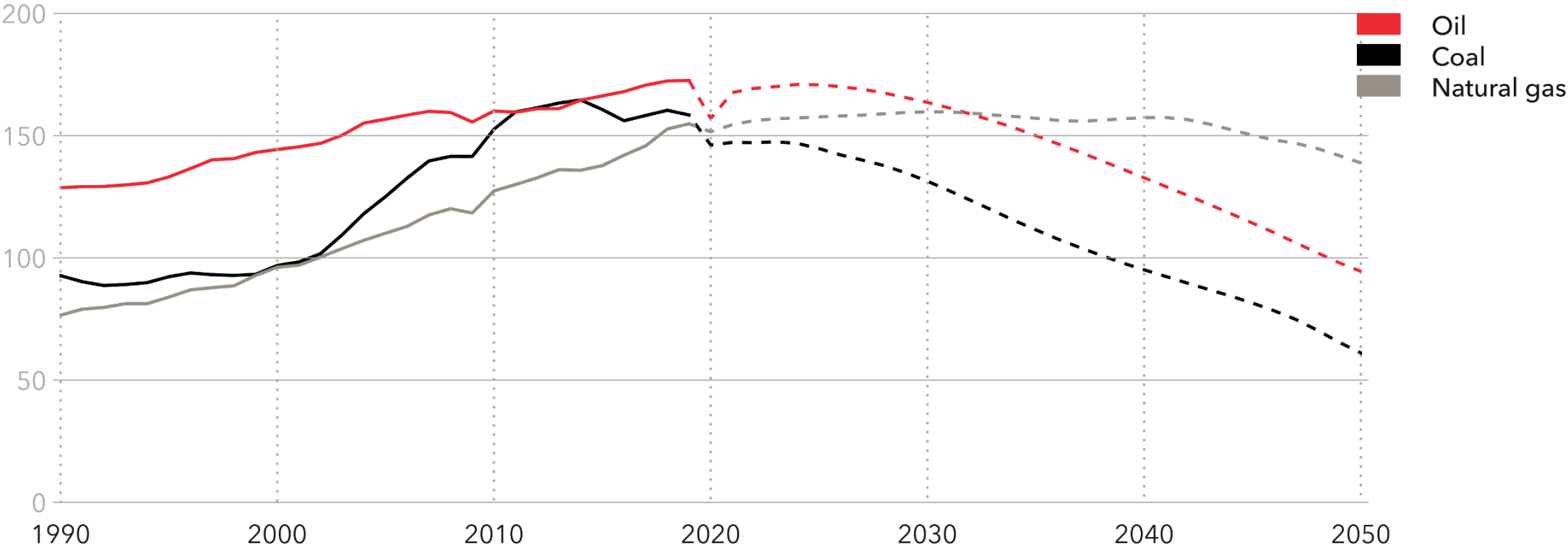
- Regional variations expected
- EU ETS
  - Front runner in carbon pricing
- China's ETS following
  - Expected to trail Europe, starting from a lower level
  - OECD Pacific will be pulled by China, with prospects of linking Asian ETS schemes



# Gas maintains production, while oil use almost half

World primary fossil fuel supply by source

Units: EJ/yr

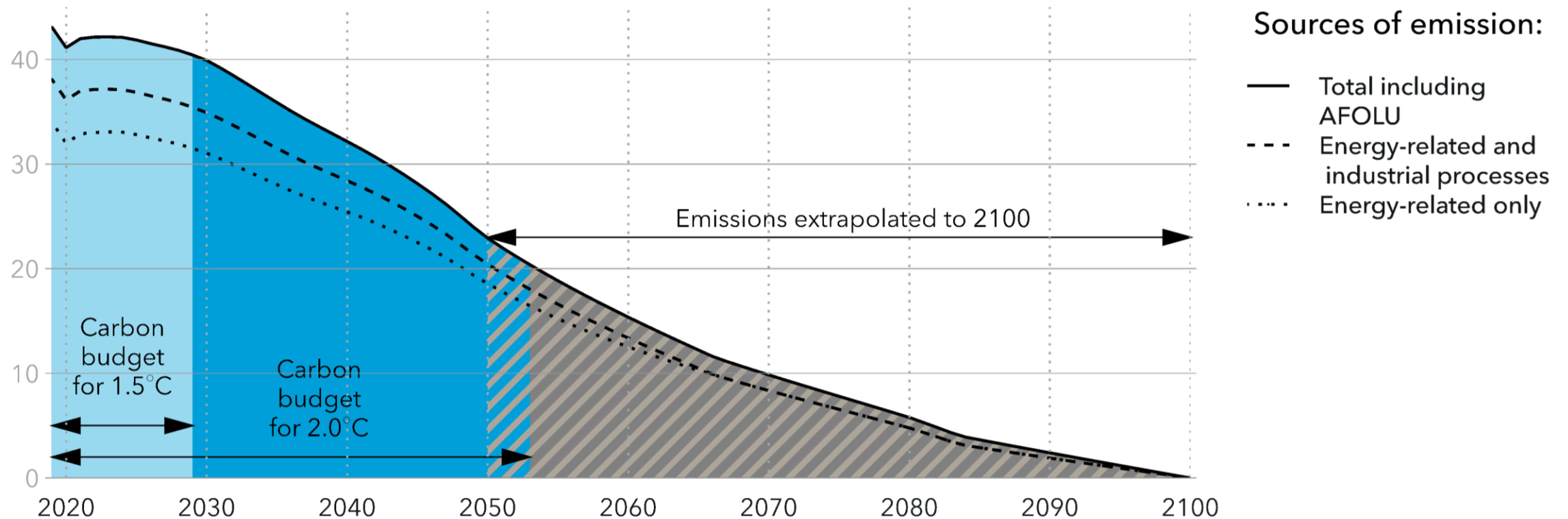


Historical data source: IEA WEB (2020)

# Cumulative emissions exhaust 1.5D budget in 2029, 2D budget in 2053 and indicate 2.3 D global warming by end of the century

## Carbon emissions and carbon budget

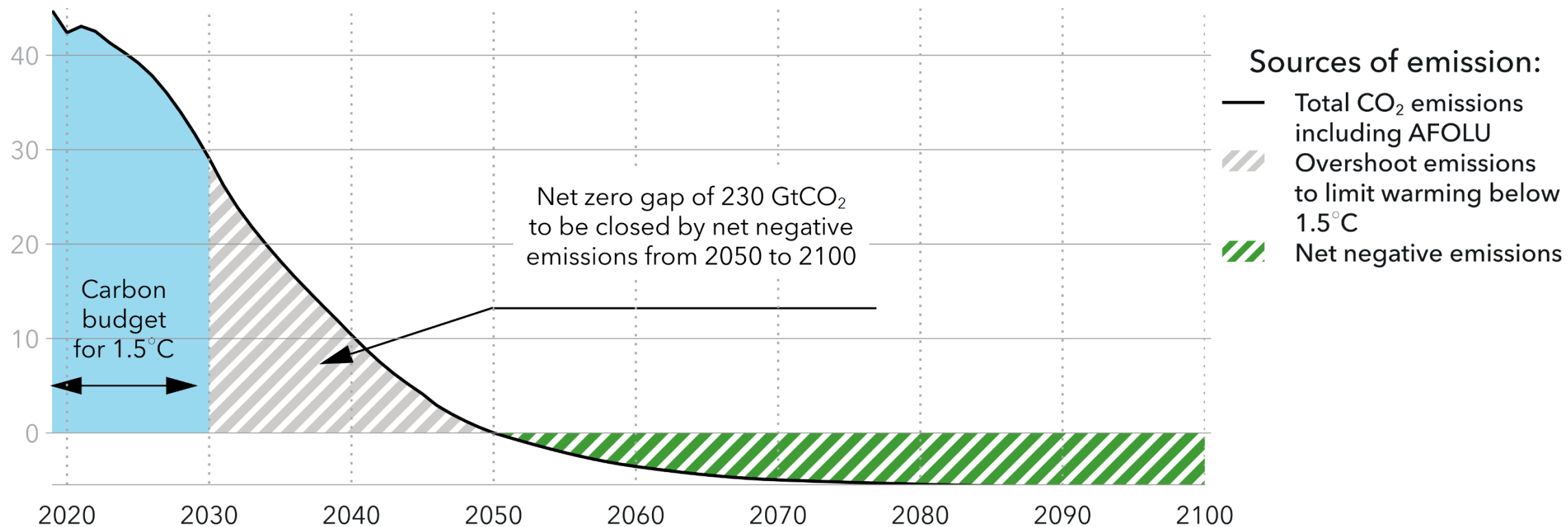
Units: GtCO<sub>2</sub>/yr



# World CO<sub>2</sub> emissions including land use

## Closing the overshoot gap in the pathway to net zero emissions

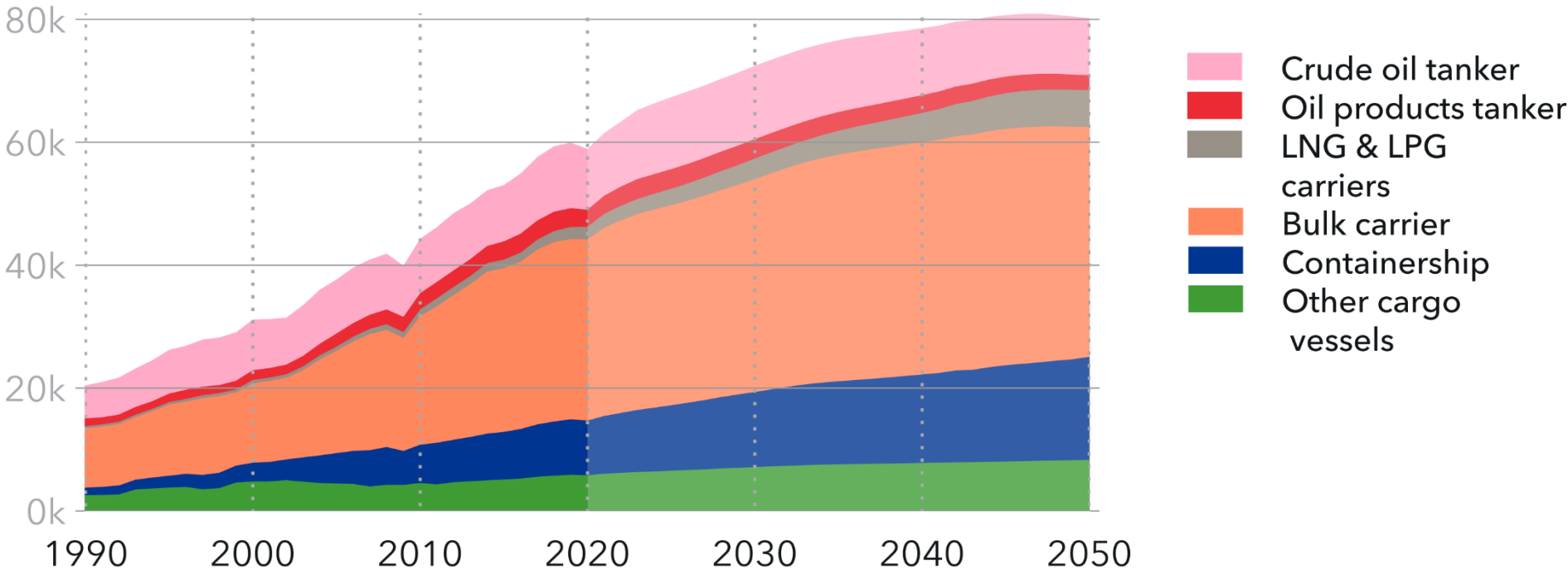
Units: GtCO<sub>2</sub>/yr



# Maritime seaborne trade grows 30% until 2035

## World seaborne trade in tonne-miles by vessel type

Units: Gt-nm/yr

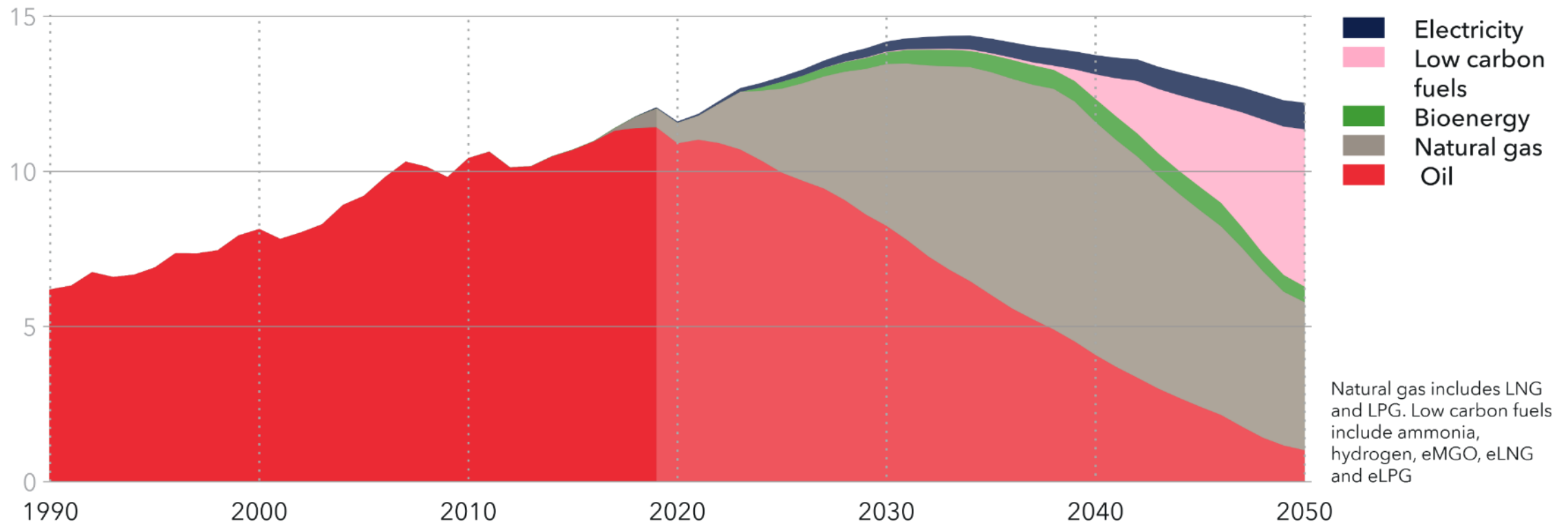




# The maritime fuel mix will change dramatically

## World maritime subsector energy demand by carrier

Units: EJ/yr



Historical data source: IEA WEB (2020)

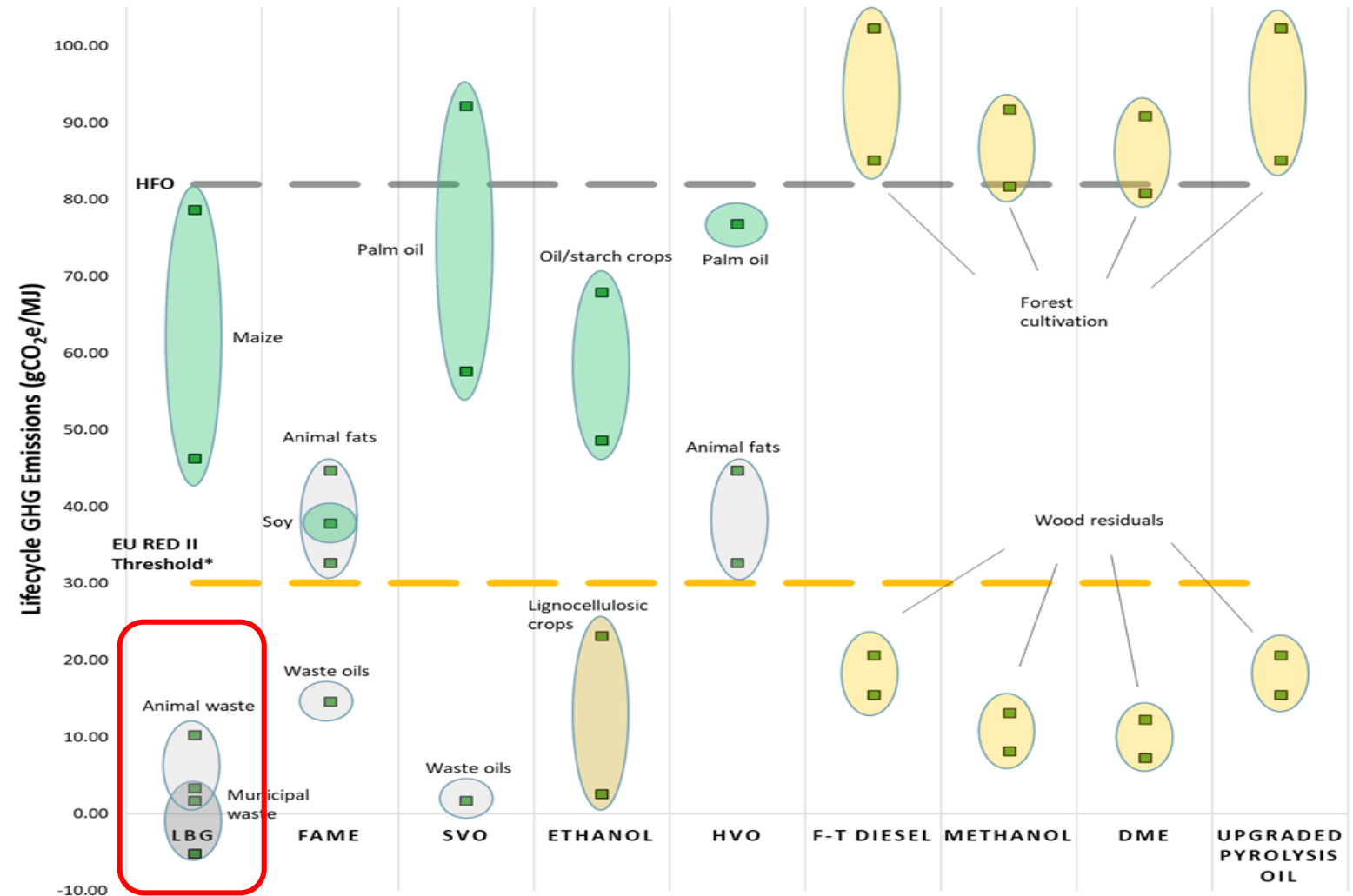
# What is the best fuel option?

	Availability	Infrastructure & Storage	Maturity of technology	Energy density	Price	Green credentials
VLSFO/MGO						
LNG						
LPG						
Methanol						
Bio-/e-fuels						
Hydrogen						
Ammonia						

# Certification & reporting requirements for low carbon fuels

GHG emissions  
depend on source  
of biomass

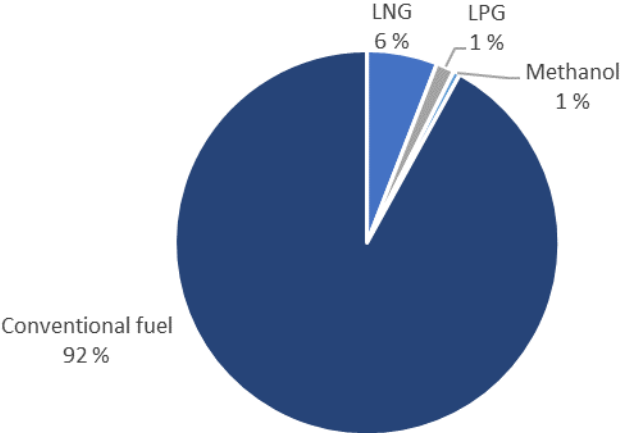
*Advanced biofuels  
have lower  
emissions than  
conventional*



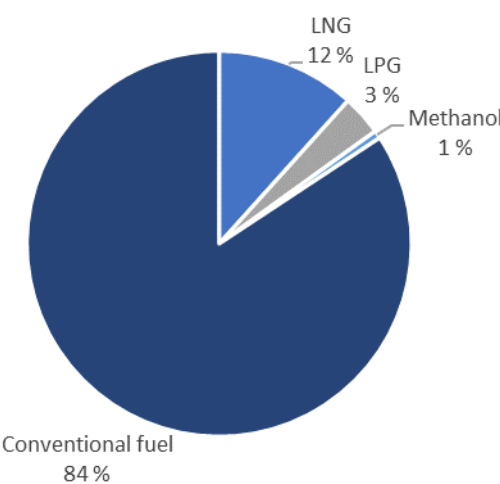
Based on data from various sources

# Newbuilding orders with alternative fuels

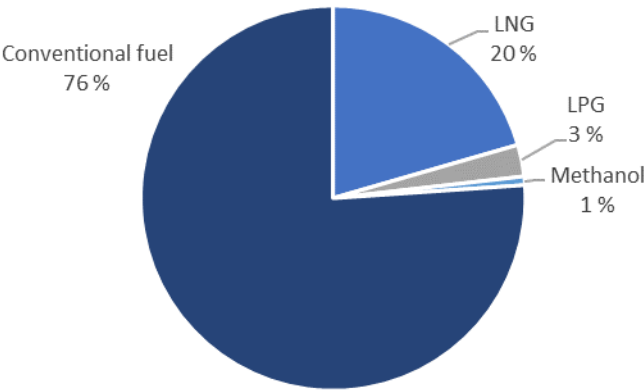
2020 - Number of vessels



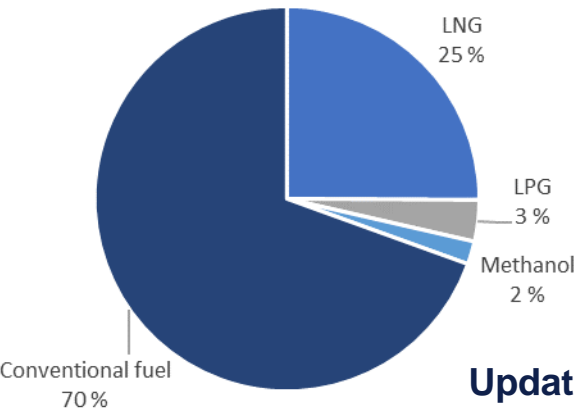
2021 - Number of vessels



2020 - GT



2021 - GT

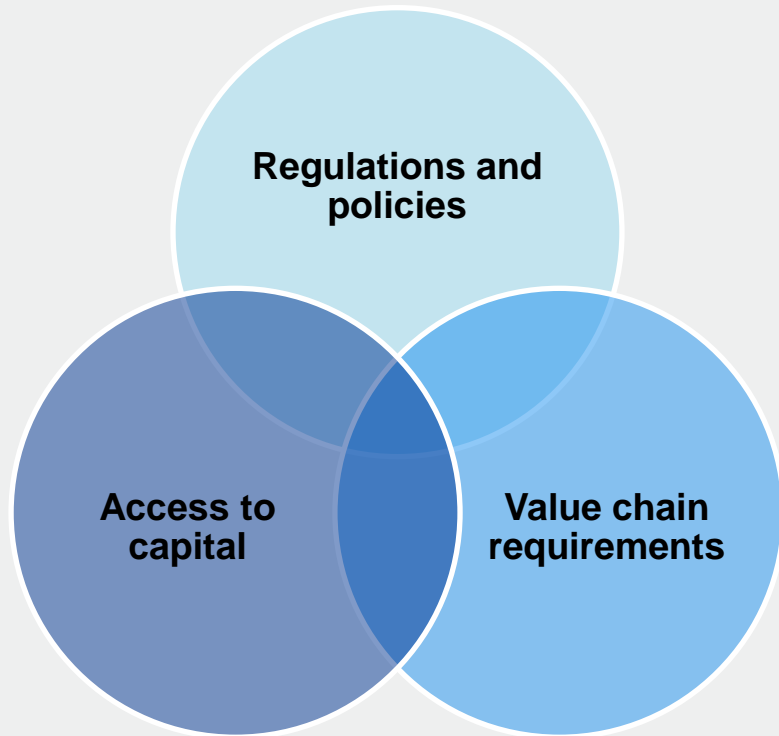


Updated: November 2021



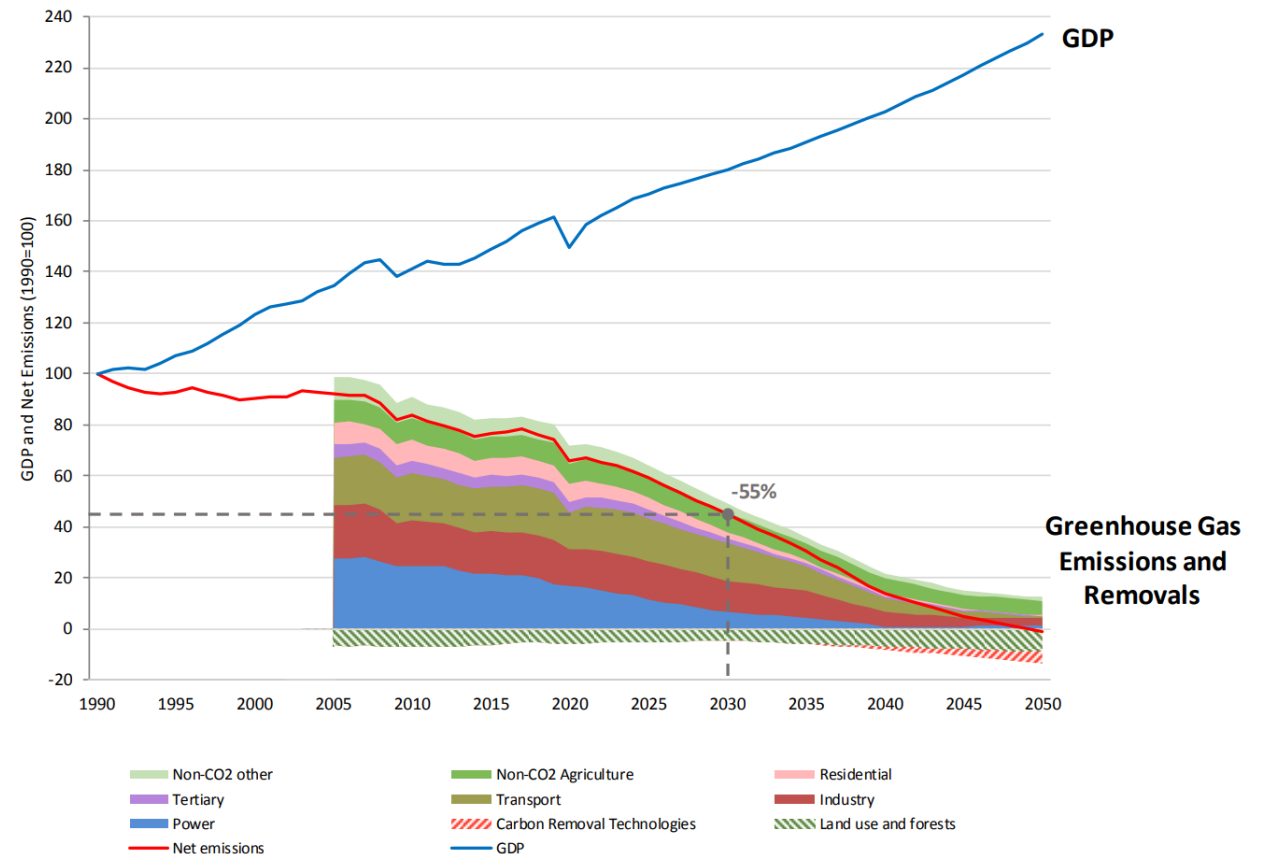
# Regional regulators, financiers and charterers push for faster progress on decarbonization

## Key drivers of maritime decarbonization:



# EU Green Deal – a climate neutral Europe by 2050

- Estimated **90% reduction in maritime transport emissions** relative to 1990 needed by 2050
- Fit for 55 package proposed by Commission on 14 July 2021. Key elements for shipping:
  - Inclusion of shipping in the **European Trading System**
  - **Fuel EU Maritime:** requirements on lifecycle GHG intensity of energy
  - Revision of **Alternative Fuels Infrastructure Regulation:** Shore side electricity and LNG in TEN-T core network ports by 2030 (electricity) and 2025 (LNG)
  - Revision of **Energy Taxation Directive:** Ending tax exemptions for marine fuels within EEA

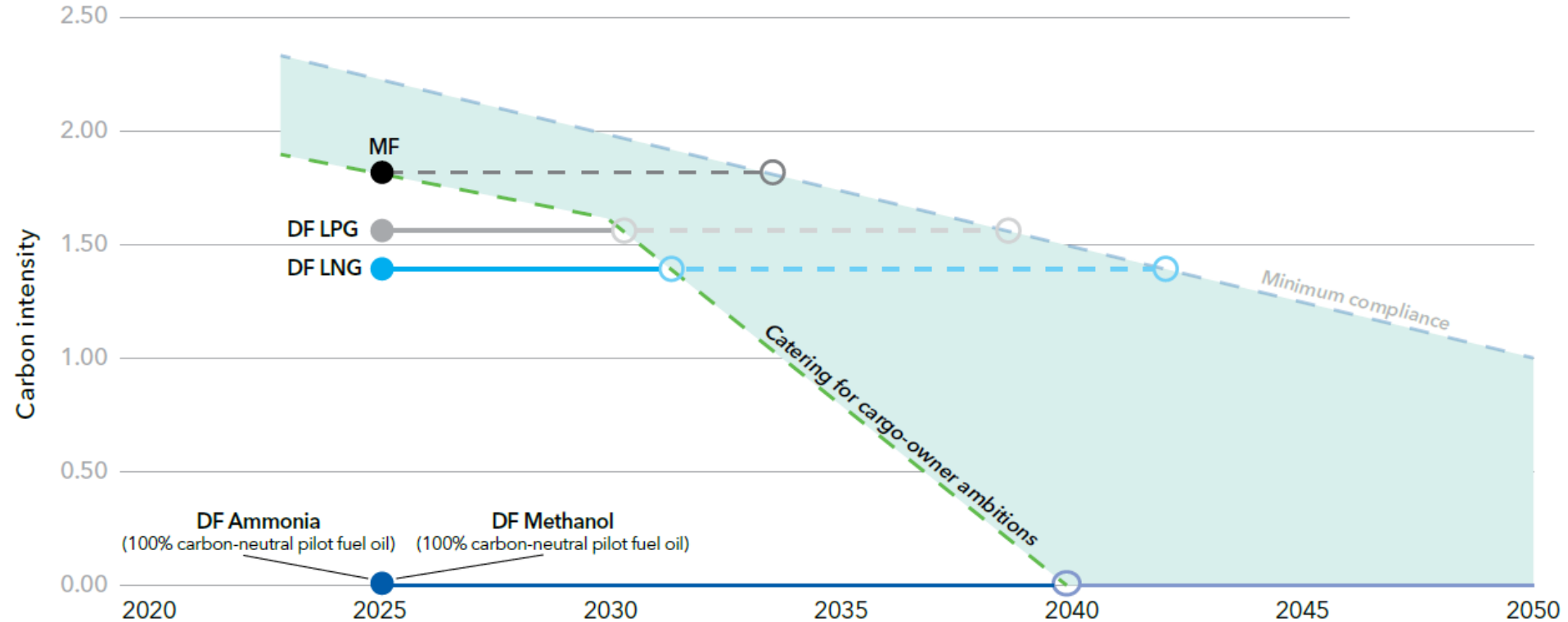


Source: EU Commission, COM(2020) 562 final

# Future proofing newbuilds

## ...Possible decarbonization pathways

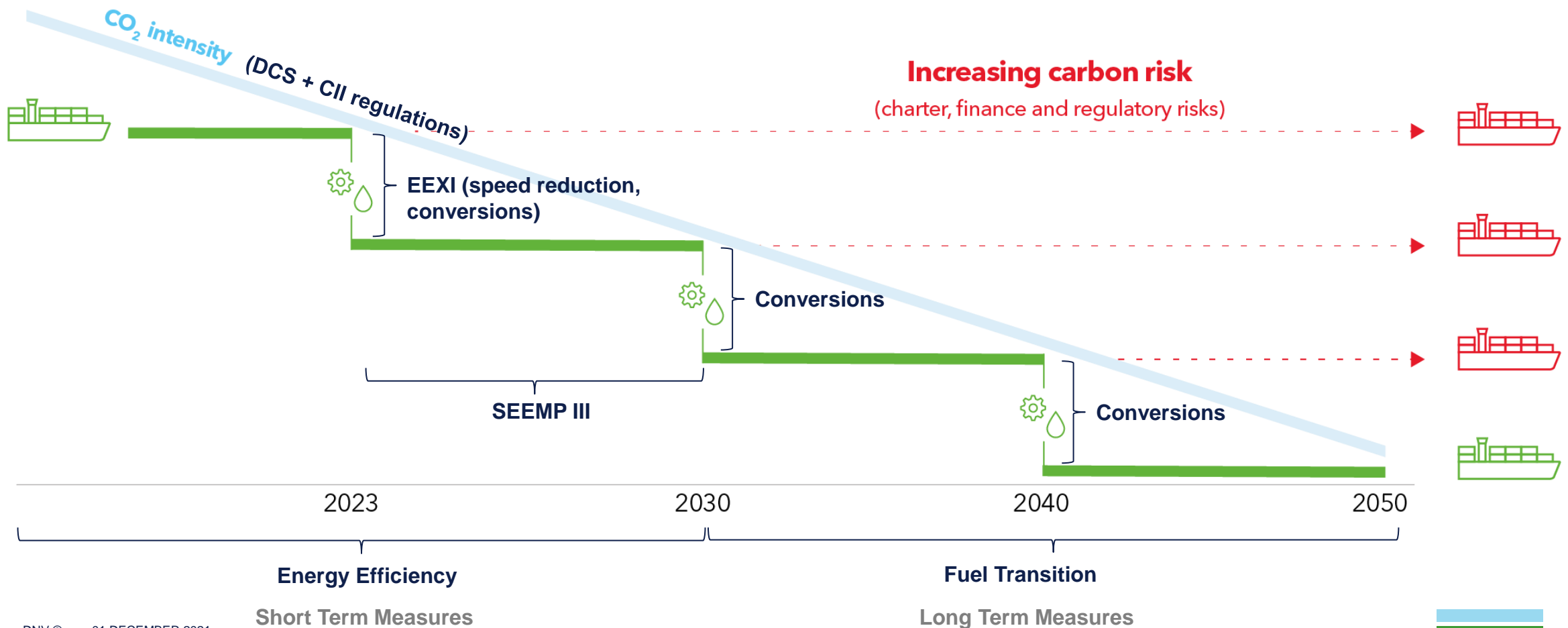
Units: grams CO<sub>2</sub>/dwt-mile



Key: Dual-fuel (DF); liquefied natural gas (LNG); liquefied petroleum gas (LPG); mono-fuel (MF); very low sulphur fuel oil (VLSFO)

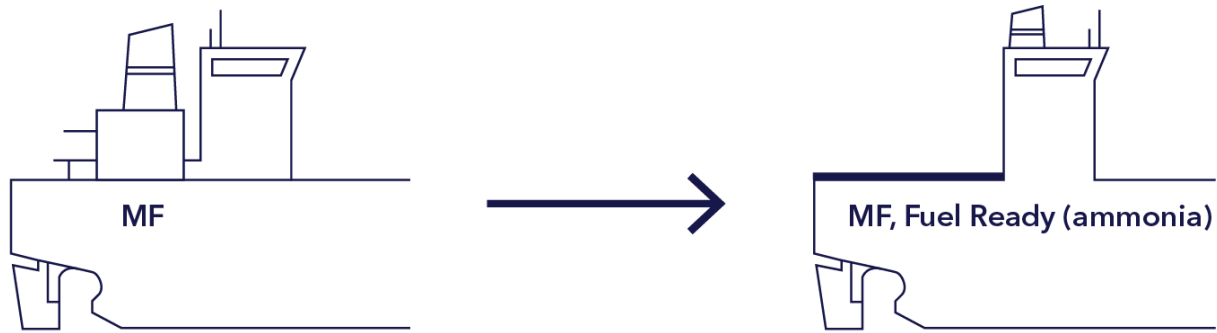
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# Owners must identify their own "*decarbonization stairway*" to manage carbon risk



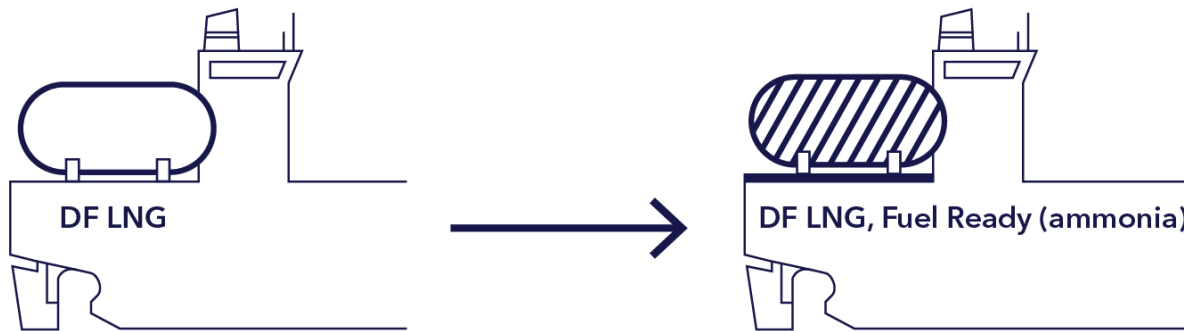


# Incorporating basic measures at newbuild stage is key to accommodate fuel flexibility



## Preparations for **MF, Fuel Ready (ammonia)**:

- Ensure feasibility in design including toxic zones
- Structural preparations
- Trim and stability
- Engines suitable for conversion



## Preparations for **DF LNG, Fuel Ready (ammonia)**:

- LNG tanks suitable for ammonia
- Toxic zones
- Structural preparations
- Trim and stability
- Engines suitable for conversion

Dual-fuel (DF); mono-fuel (MF)

# Key takeaways

## More diversified fuel mix:

- Strong growth in LNG
- Experimentation with LPG, Methanol, biofuels – early developments in H<sub>2</sub>, ammonia

## Fuel & technology cost: main deciding factor

## Focus on energy efficiency

## Build your options for the future – prepare for uncertainty

# Thank you!

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