LNG and Alternate Fuels

Energy Transition Outlook 2019- MARITIME FORECAST TO 2050

PORTCON 2019 LA Long Beach - Annual Update Conference of the Certified Port Executive Program

SAFER, SMARTER, GREENER

Transitions in maritime

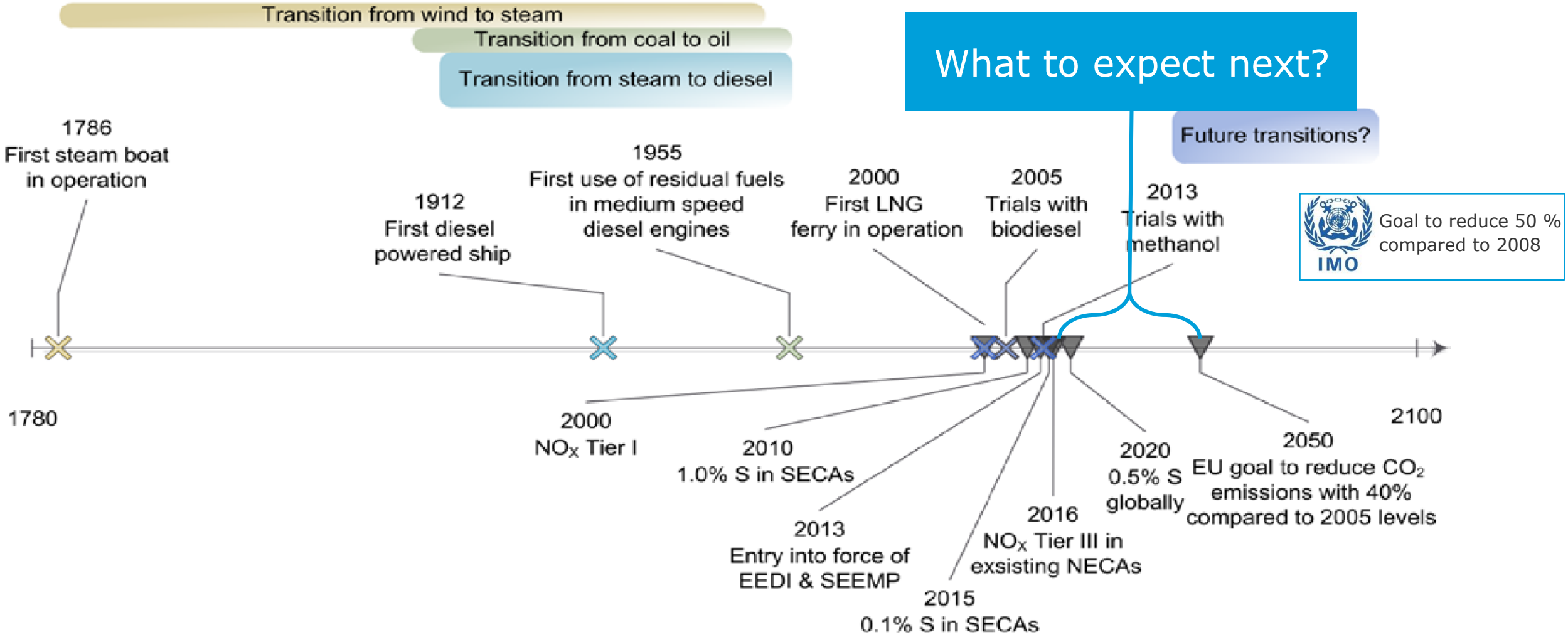
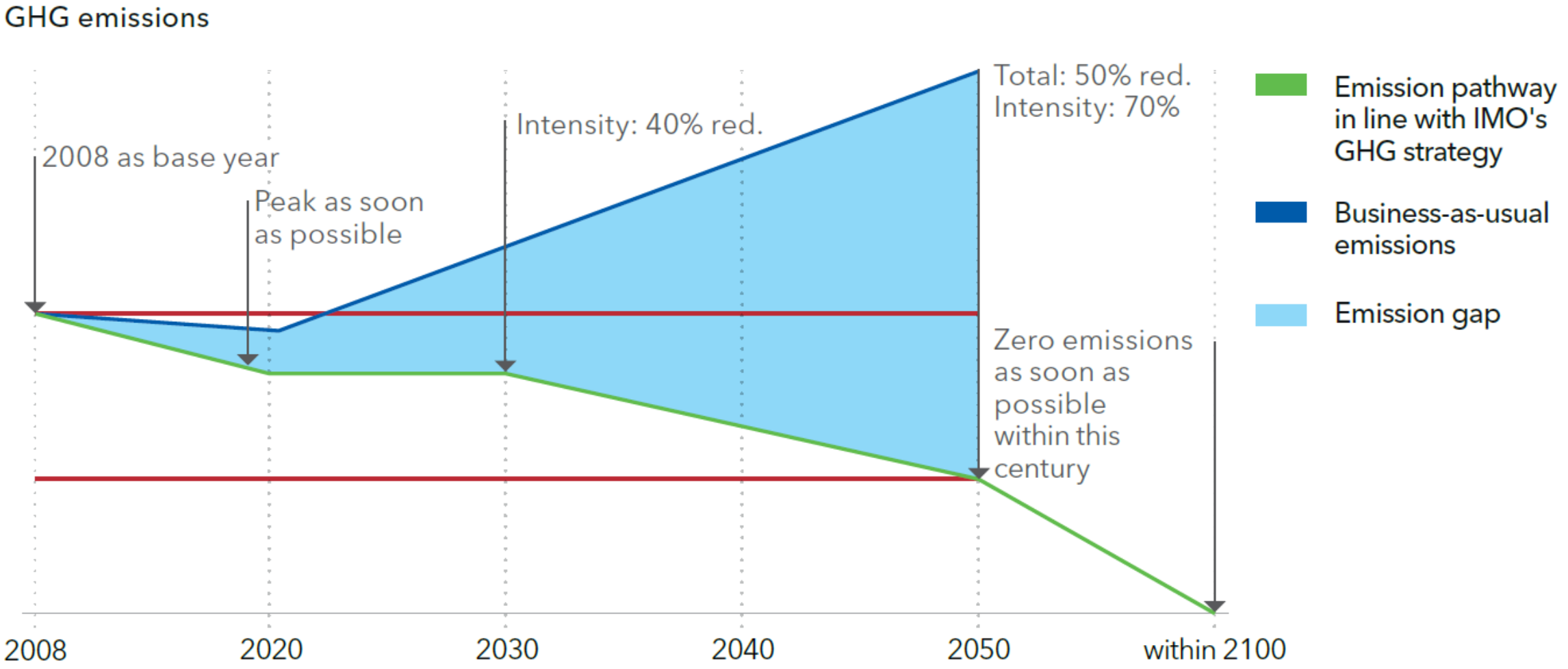


Illustration: Brynolf, S. (2014). Environmental Assessment of Present and Future Marine Fuels. Thesis, Chalmers University of Technology, Sweden.

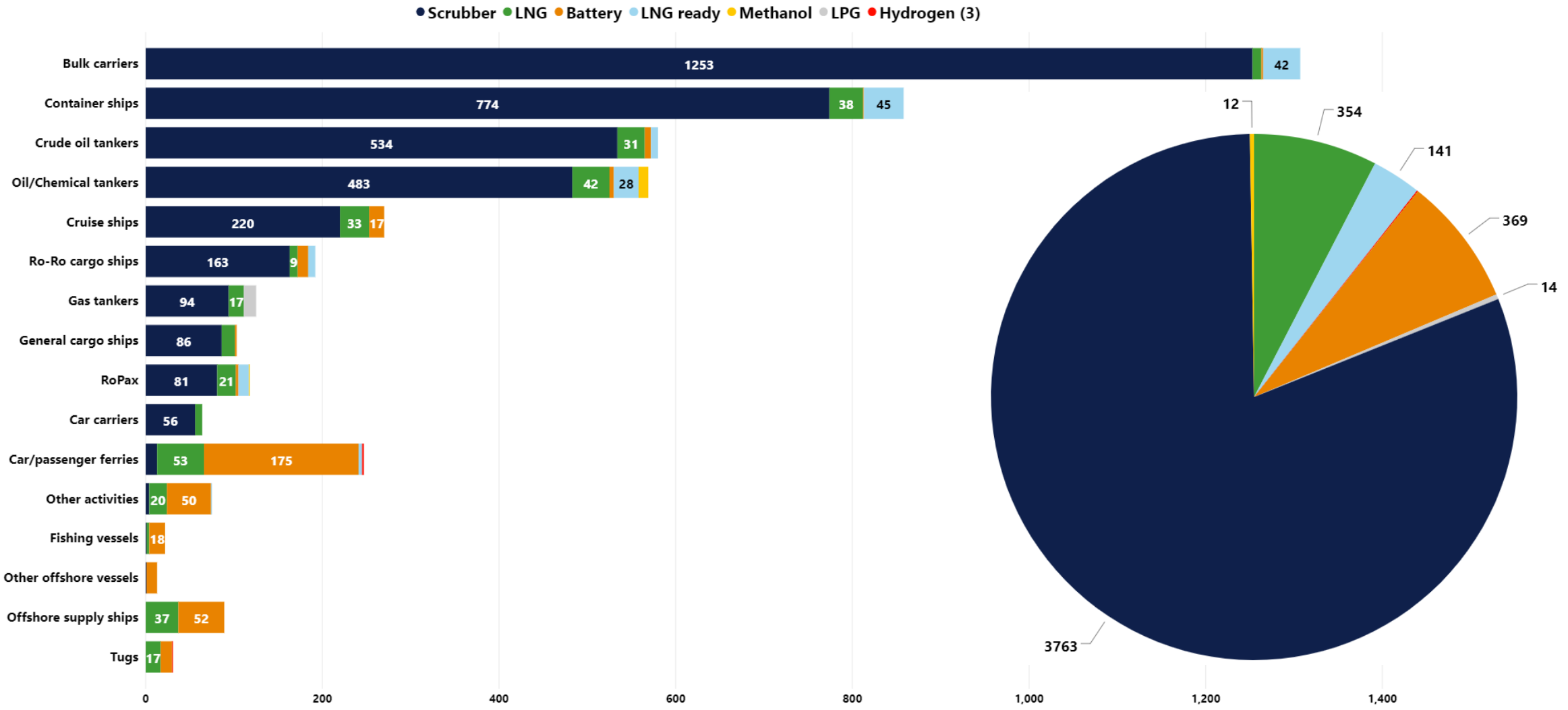
PhD

Greenhouse gases and global warming - a global challenge

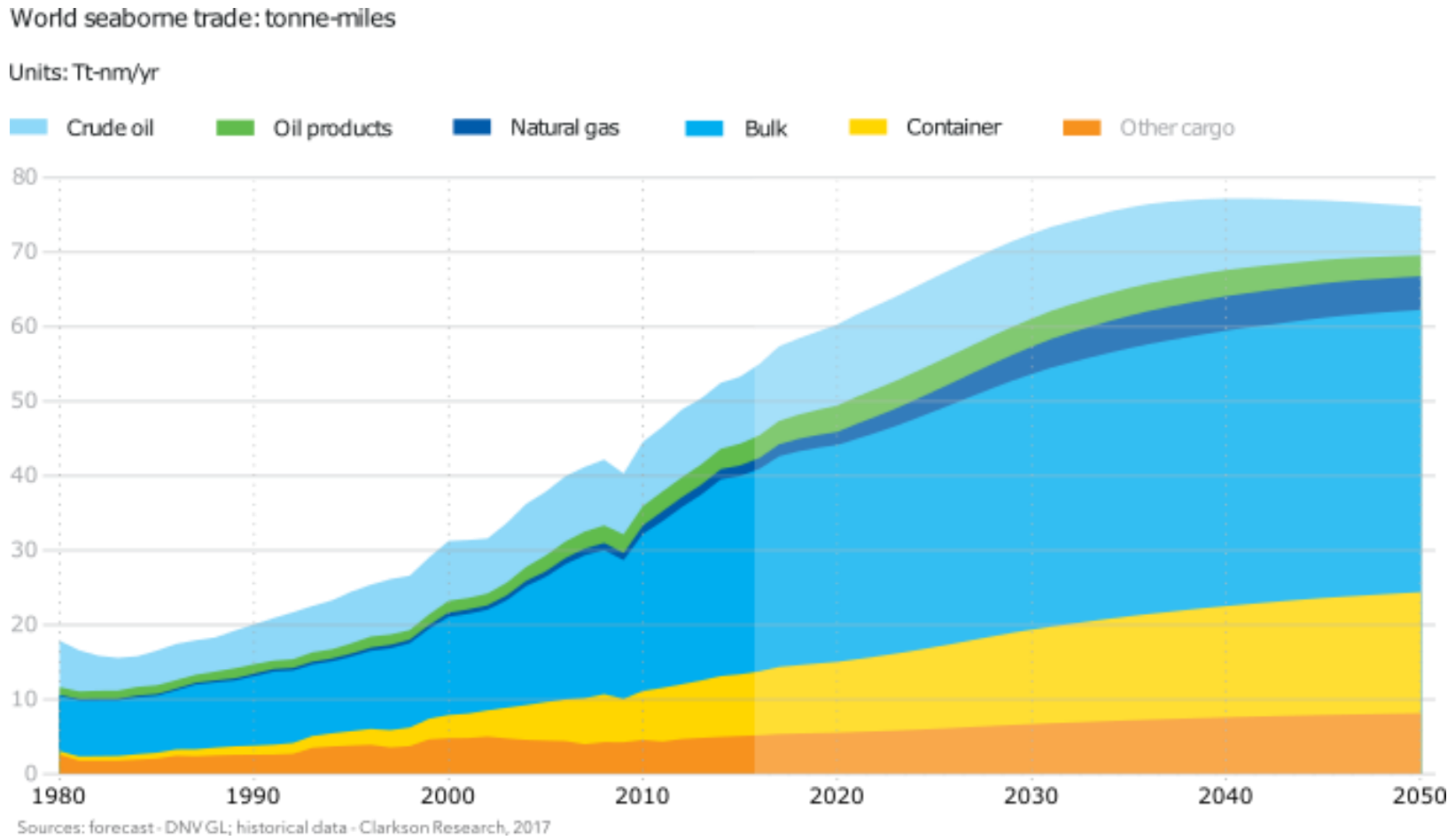


Carbon intensity is measured as CO_2 emission per tonne-mile, while Total is the absolute GHG emission from international shipping.

Adoption of Alternative fuel (Number of ships -in operation and on order)



Demand for seaborne transport will grow 39% by 2050



Average growth of 2.3%/yr to 2030, then 0.3%/yr towards 2050

Source: Maritime Forecast to 2050, DNV GL 2018

Are we really moving in this direction? And at what speed?

Indicators

1. World fleet CO_2 emissions

- Slight increase in CO_2 emissions in recent years

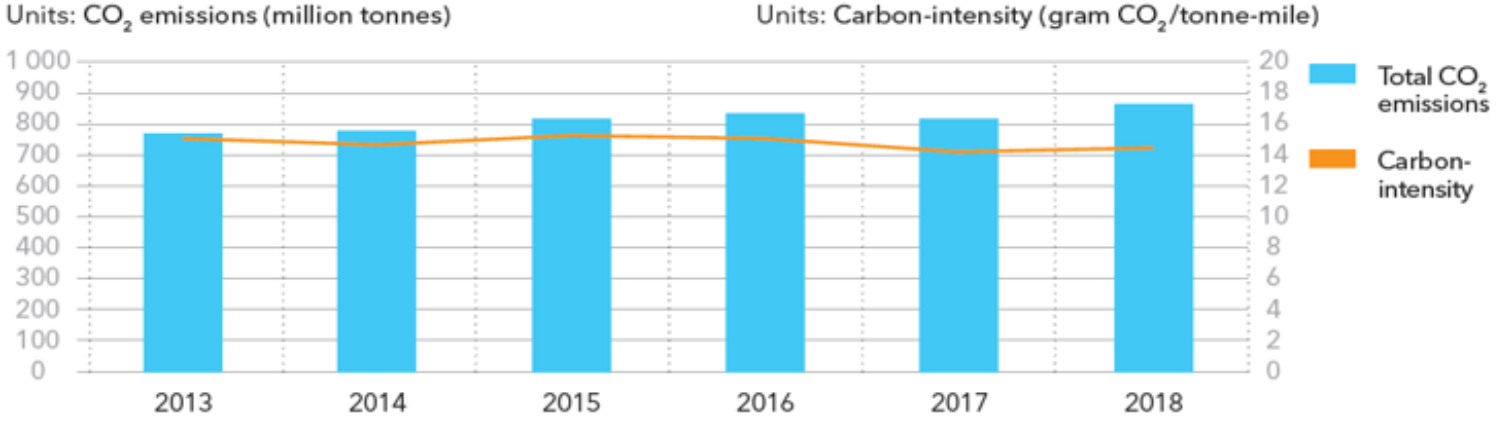
2. Alternative fuels uptake

- 0.3% uptake on ships in operation
- 6% for newbuildings

3. Regulation

- Current policy scenario will not meet the IMO ambitions without further policy

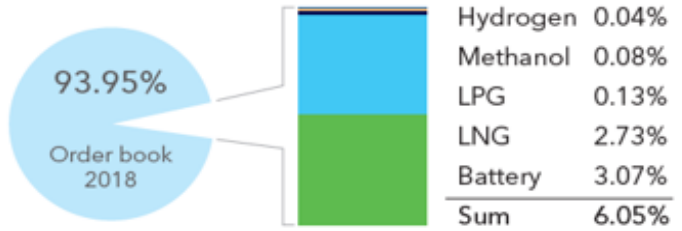
Trend in world fleet CO_2 emissions



Alternative fuel uptake (percentage of ships)[6]

Ships in operation

Ships on order



New 'CO_2 Barometer' signals shipping decarbonization is off course

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The **CO_2 Barometer** provides a high-level decarbonization status in the form of a '**transition pressure level**'

Decarbonization options for shipping

- Significant **GHG reduction** can be achieved by technical and operational measures

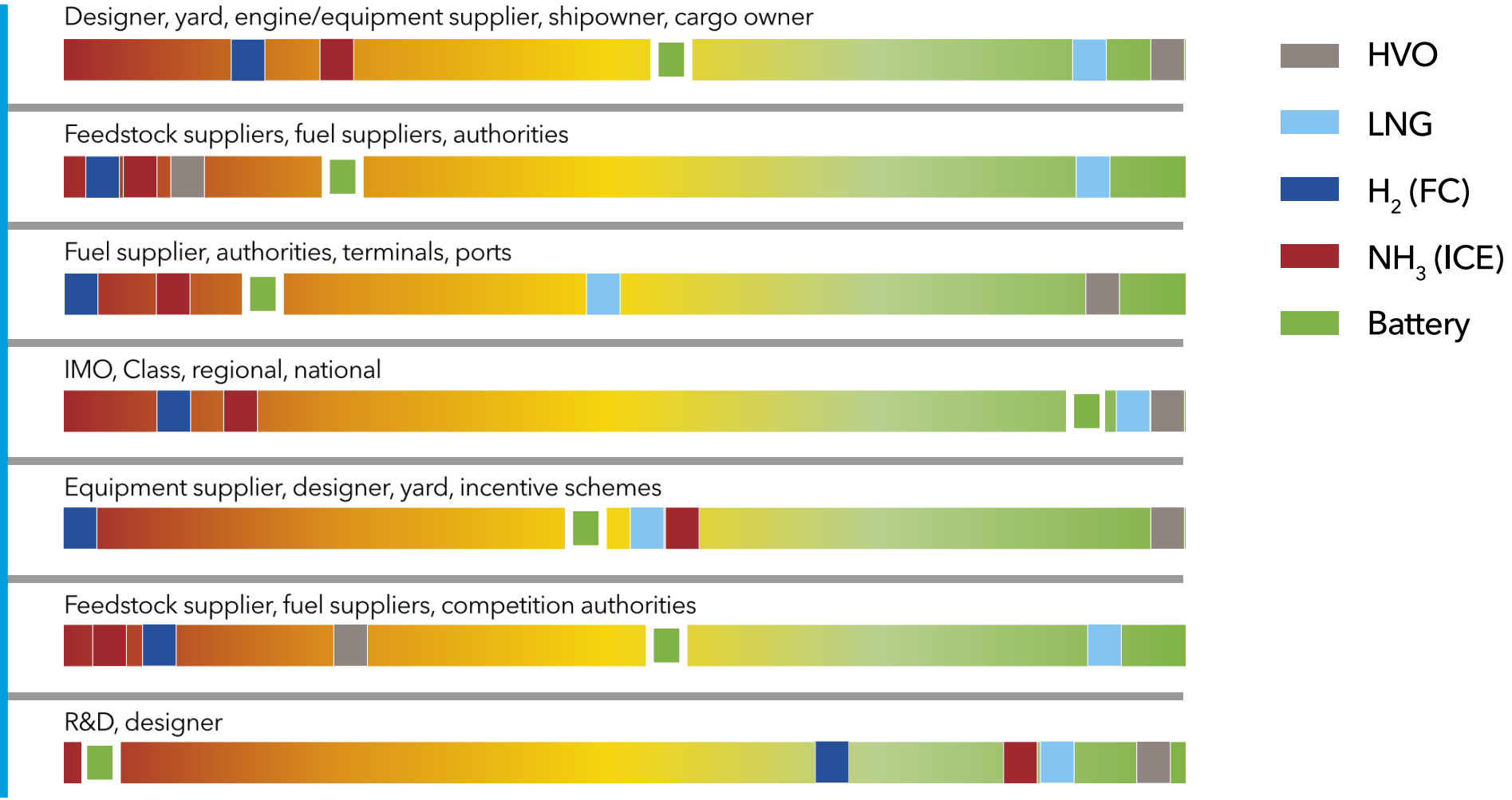
- **Up to 100%** GHG reduction can only be achieved with alternative fuels. Barriers to implementation includes:
  - Cost
  - Availability and infrastructure
  - Onboard storage

The Alternative Fuel Barrier Dashboard: Indicative status of key barriers for selected alternative fuels

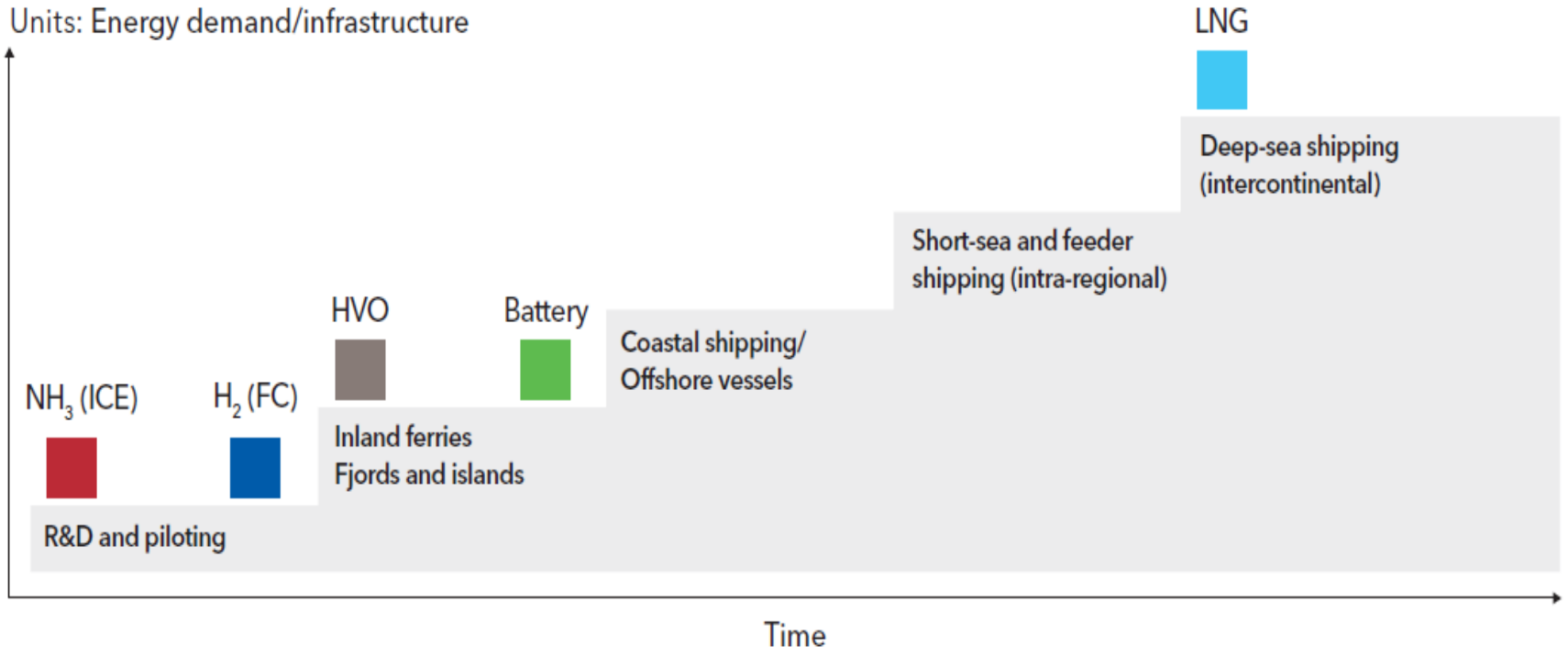
Barriers exists on many levels for different fuels.

Adoption of alternative fuels depend on

- demand from charters/cargo owners,
- proactive regulators,
- procurement policies and
- incentive schemes and international cooperation



Alternative fuels must evolve over time to increase marked penetration



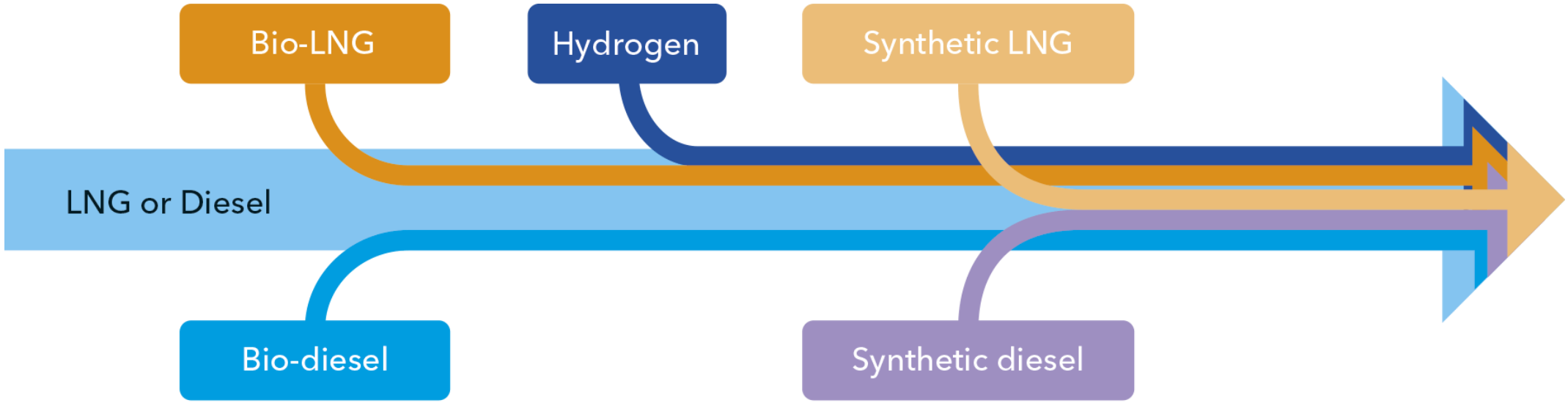
Gradual steps allow for:
- **maturing** of technology
- scaling of supply and **infrastructure**

Not all the options have the potential to reach the deep-sea stage, mainly due to limited energy density

It took LNG around 20 years to climb all steps. To reach the IMO targets, carbon-neutral fuels must mature faster!

Fuel flexibility and bridging technologies – the three pillars

Bridging technologies can facilitate the transition from traditional fuels, via fuels with lower carbon footprints, to carbon-neutral fuels



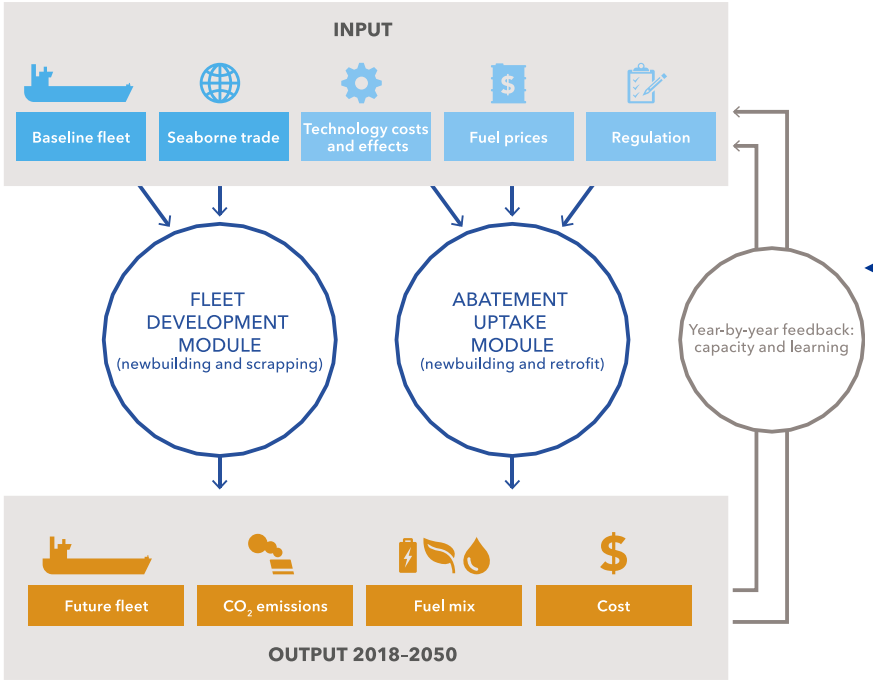
Pathway model: We explore the impact of specific GHG regulations

Regulatory input to the model: Three different policy designs

1 What would happen if **no further decarbonization policies** are put in place?

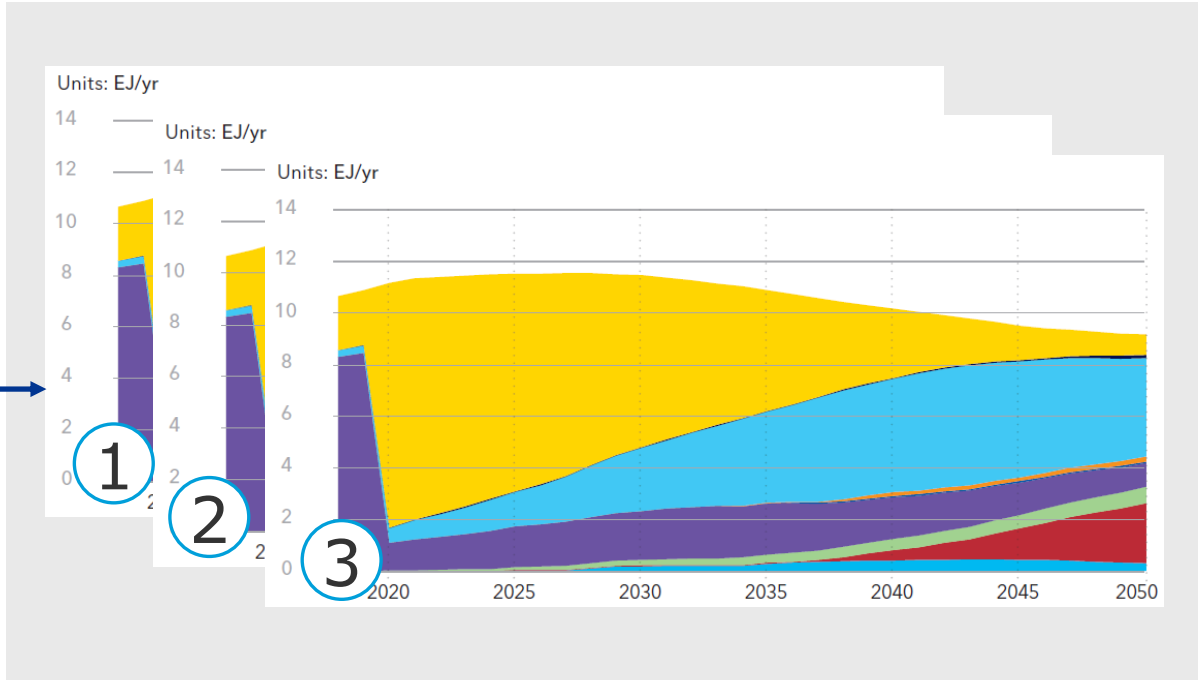
2 What is the effect of stricter **operational requirements?**

3 What if main focus is on stricter **design requirements**?



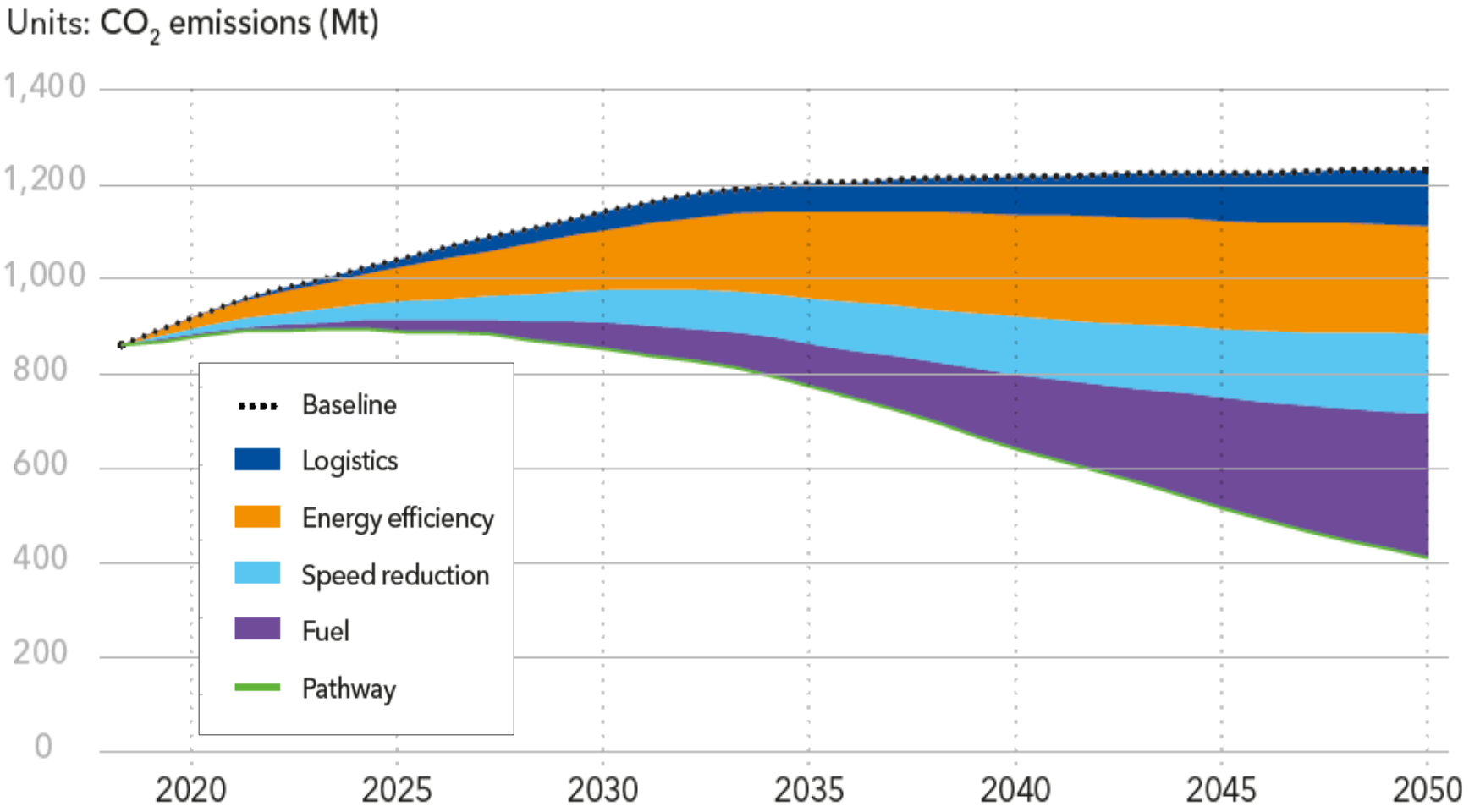
Model

Output

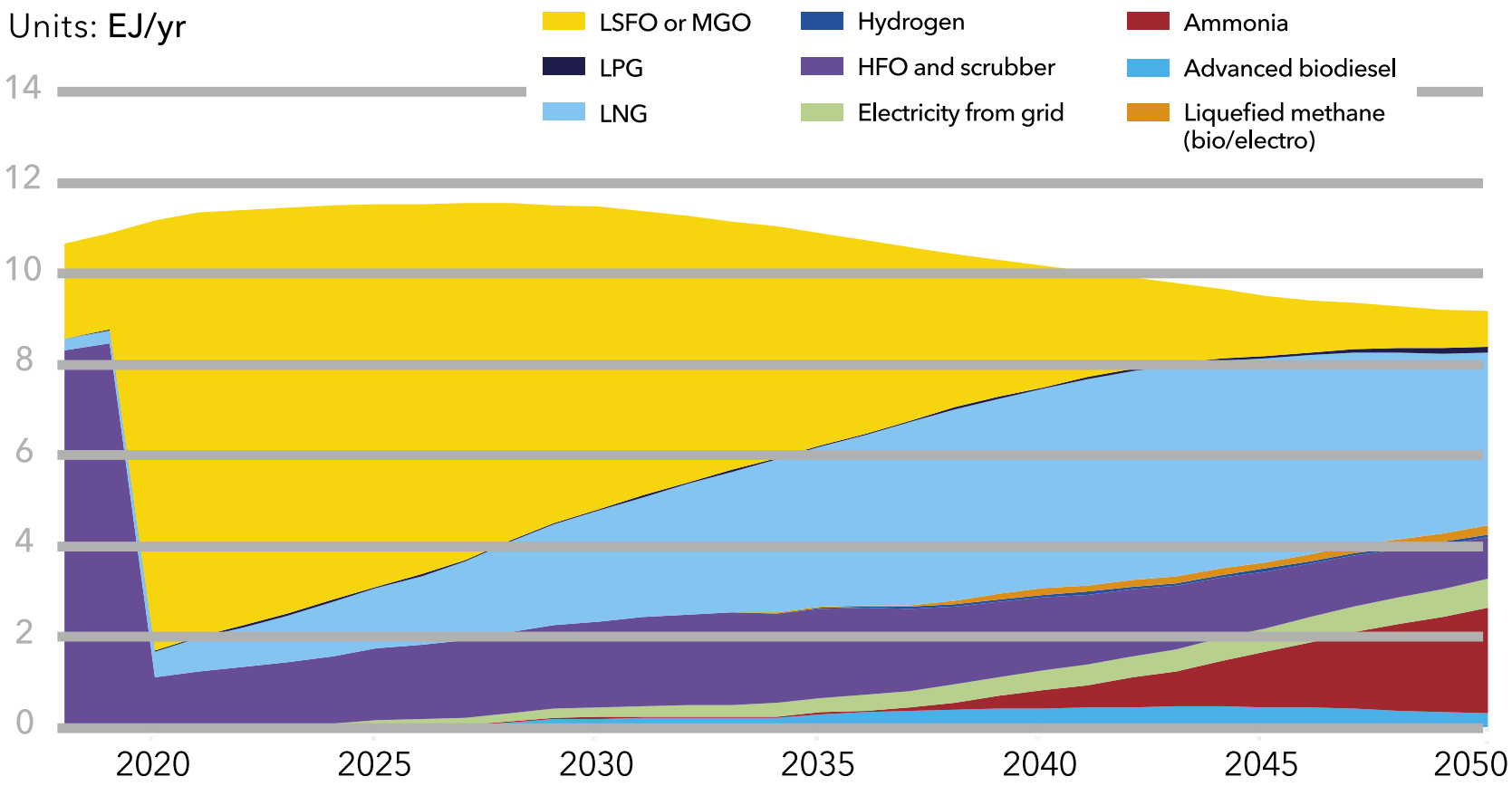


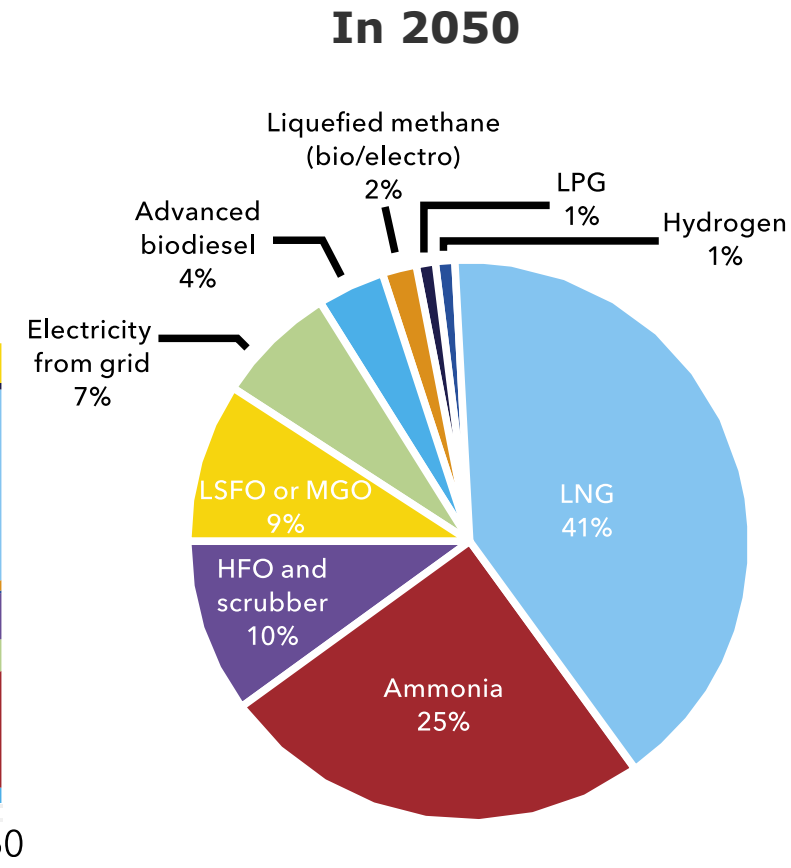
CO_2 emissions towards 2050 in the 'design requirements' pathway

- Both the **design** and **operational** focused regulatory pathways fulfill the IMO ambitions:
  - New fuels, alongside energy efficiency, will play a key role.
  - Carbon-neutral fuels need to supply 30%–40% of the total energy in 2050.
- The "Current policy" pathway **is not** fulfilling the IMO ambitions.



Fuel mix towards 2050 in the 'design requirements' pathway



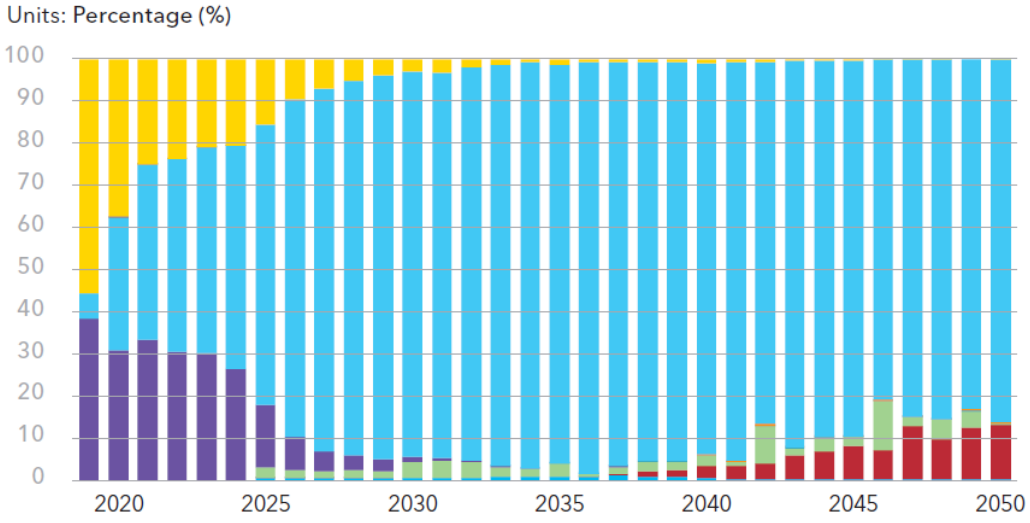


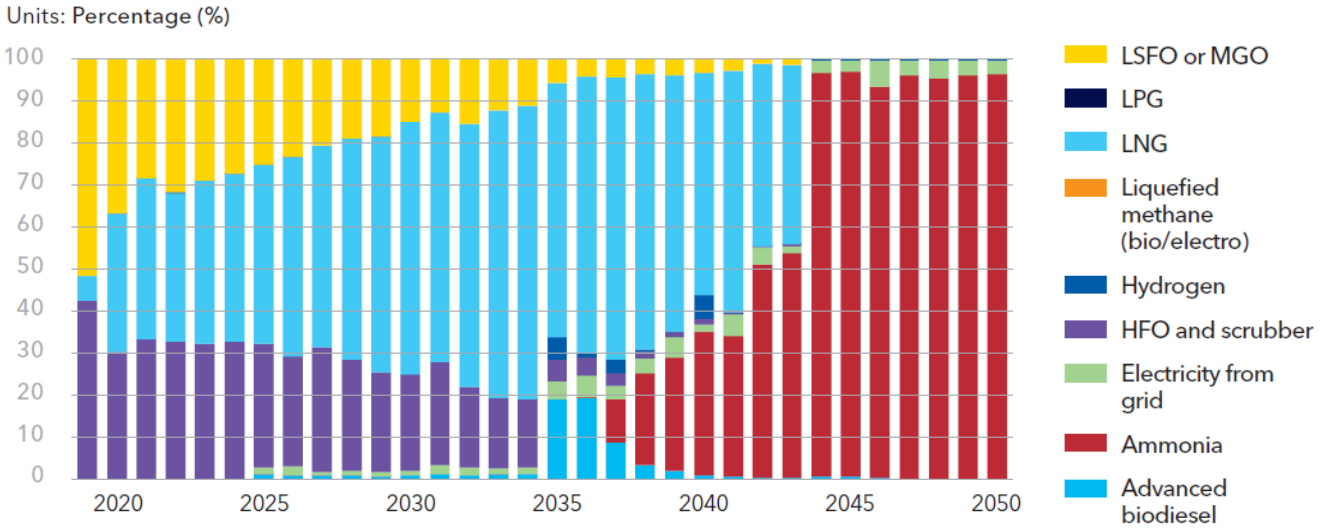
In all three pathways modelled, liquefied methane (both fossil and non-fossil) ends up dominating the fuel mix.

Several ways to meet the IMO targets – Impact on Newbuilding

Focusing on **operational requirements**, the uptake of alternative fuel for newbuildings is more gradual

If main focus is on **design requirements**, the shift in fuel and fuel-converter technology on newbuildings is very abrupt





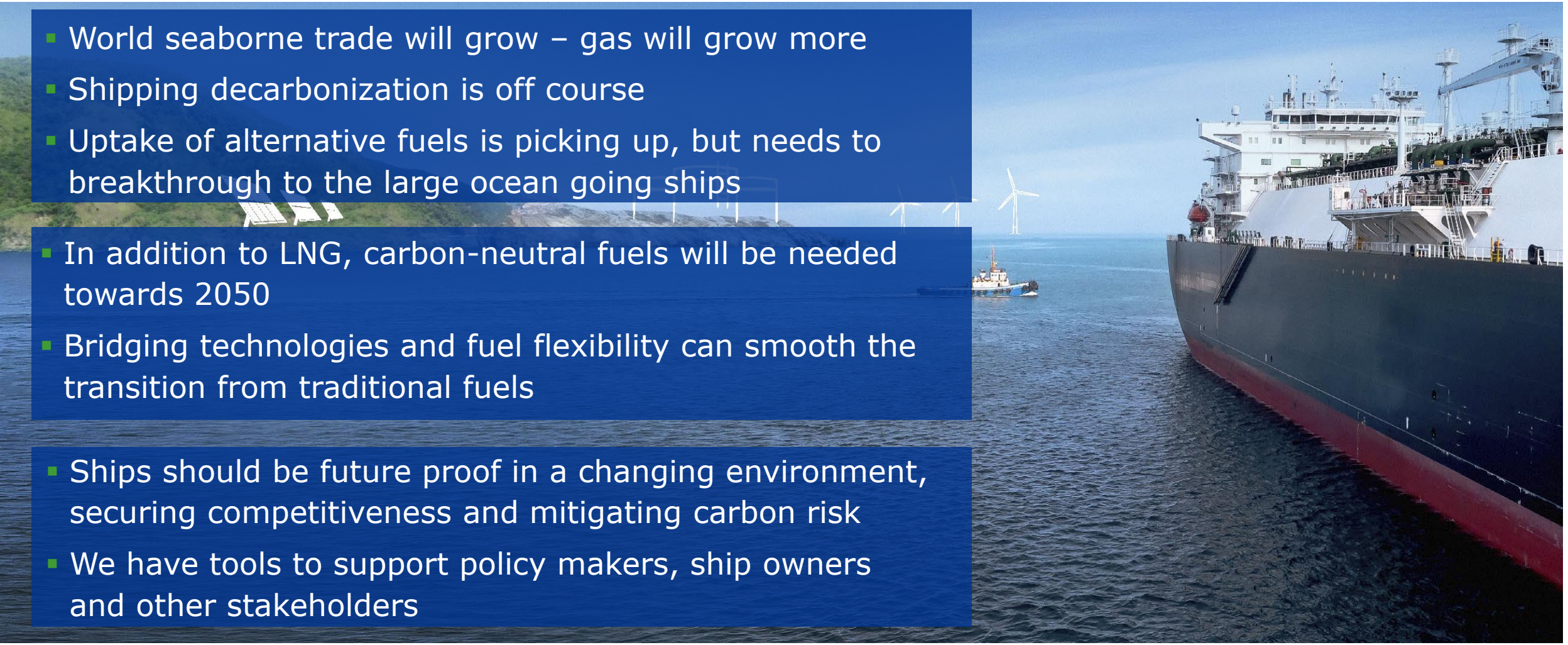
LNG play an important role – transition to carbon neutral fuels will be needed

Key findings

- World seaborne trade will grow – gas will grow more
- Shipping decarbonization is off course
- Uptake of alternative fuels is picking up, but needs to breakthrough to the large ocean going ships

- In addition to LNG, carbon-neutral fuels will be needed towards 2050
- Bridging technologies and fuel flexibility can smooth the transition from traditional fuels

- Ships should be future proof in a changing environment, securing competitiveness and mitigating carbon risk
- We have tools to support policy makers, ship owners and other stakeholders



Thank you for your attention

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Energy Transition Outlook – Report / Premium Analytics

https://eto.dnvgl.com/2019/index.html#ETO2019-top

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