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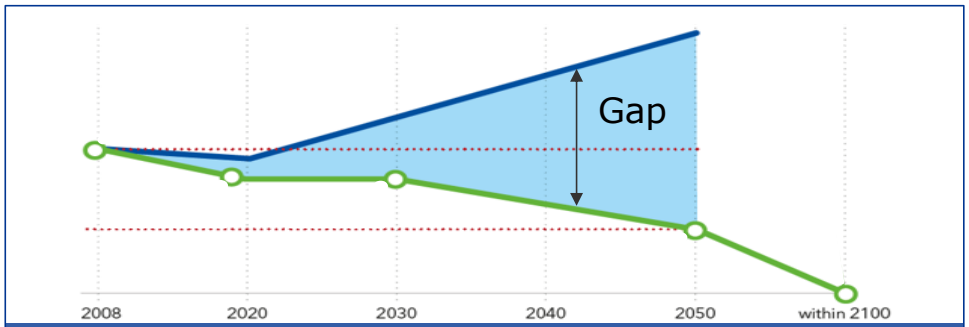
MARITIME FORECAST TO 2050

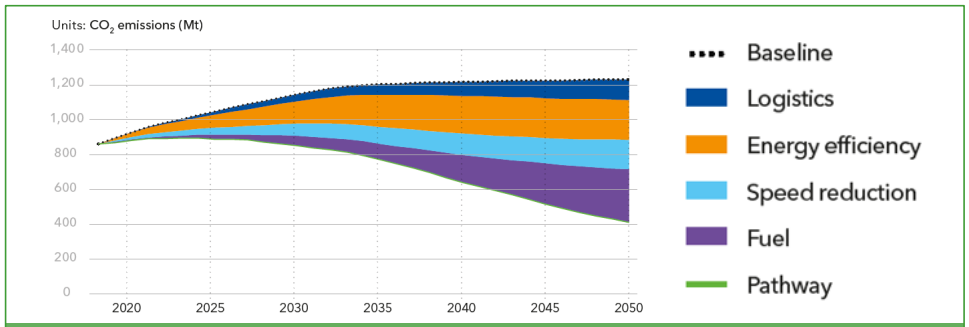
Energy Transition Outlook 2019

SAFER, SMARTER, GREENER

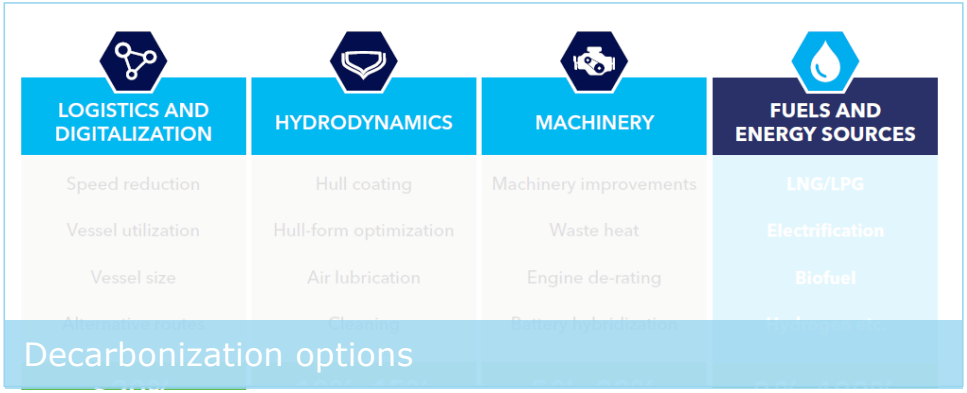
Maritime forecast to 2050 in a nutshell



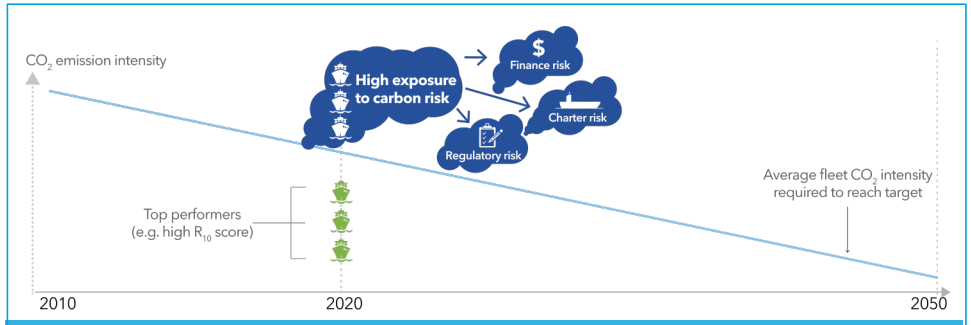
GHG regulation



World fleet CO_2 outlook

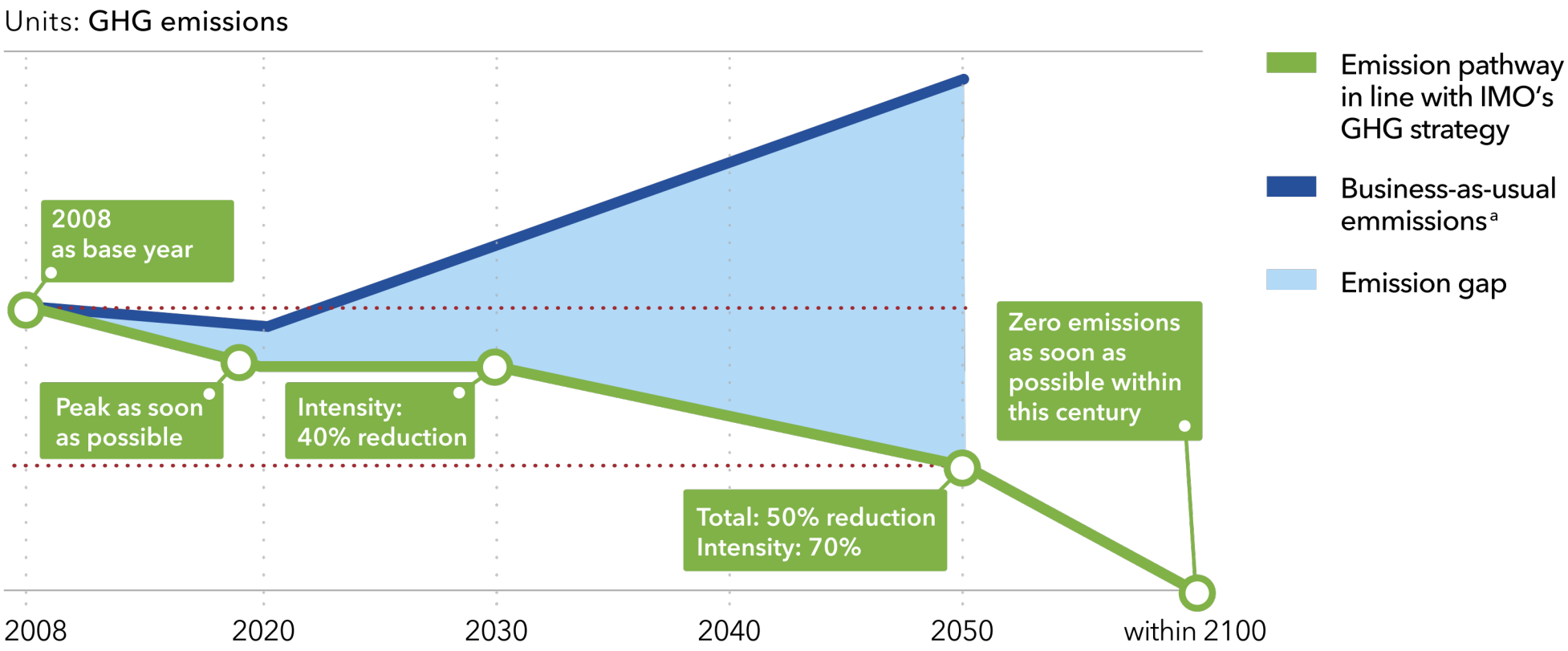


Decarbonization options



Ship design performance

The foundation for the outlook is the IMO GHG strategy



New ‘CO_2 Barometer’ signals shipping decarbonization is off course

Indicators

1. World fleet CO_2 emissions

- Slight increase in CO_2 emissions in recent years

2. Alternative fuels uptake

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

3. Regulation

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

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

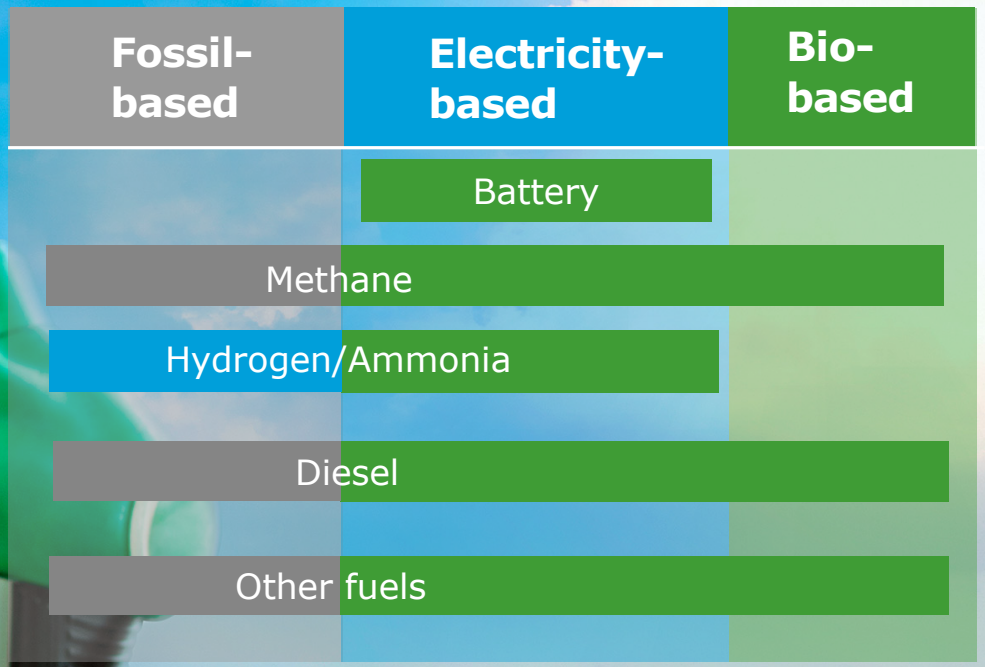
Decarbonization options for shipping

LOGISTICS AND DIGITALIZATION	HYDRODYNAMICS	MACHINERY	FUELS AND ENERGY SOURCES
Speed reduction	Hull coating	Machinery improvements	LNG/LPG
Vessel utilization	Hull-form optimization	Waste heat	Electrification
Vessel size	Air lubrication	Engine de-rating	Biofuel
Alternative routes	Cleaning	Battery hybridization	Hydrogen etc.
>20%	10%-15%	5%-20%	0%-100%

- 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

Decarbonization options for shipping - alternative fuels and energy sources

- **Three** main "family types" of fuels, categorized based on energy source.
  - Similar fuels can originate from different energy sources, but lifecycle emissions and cost vary greatly
  - A given energy converter (e.g. combustion engine) may apply many alternative fuels



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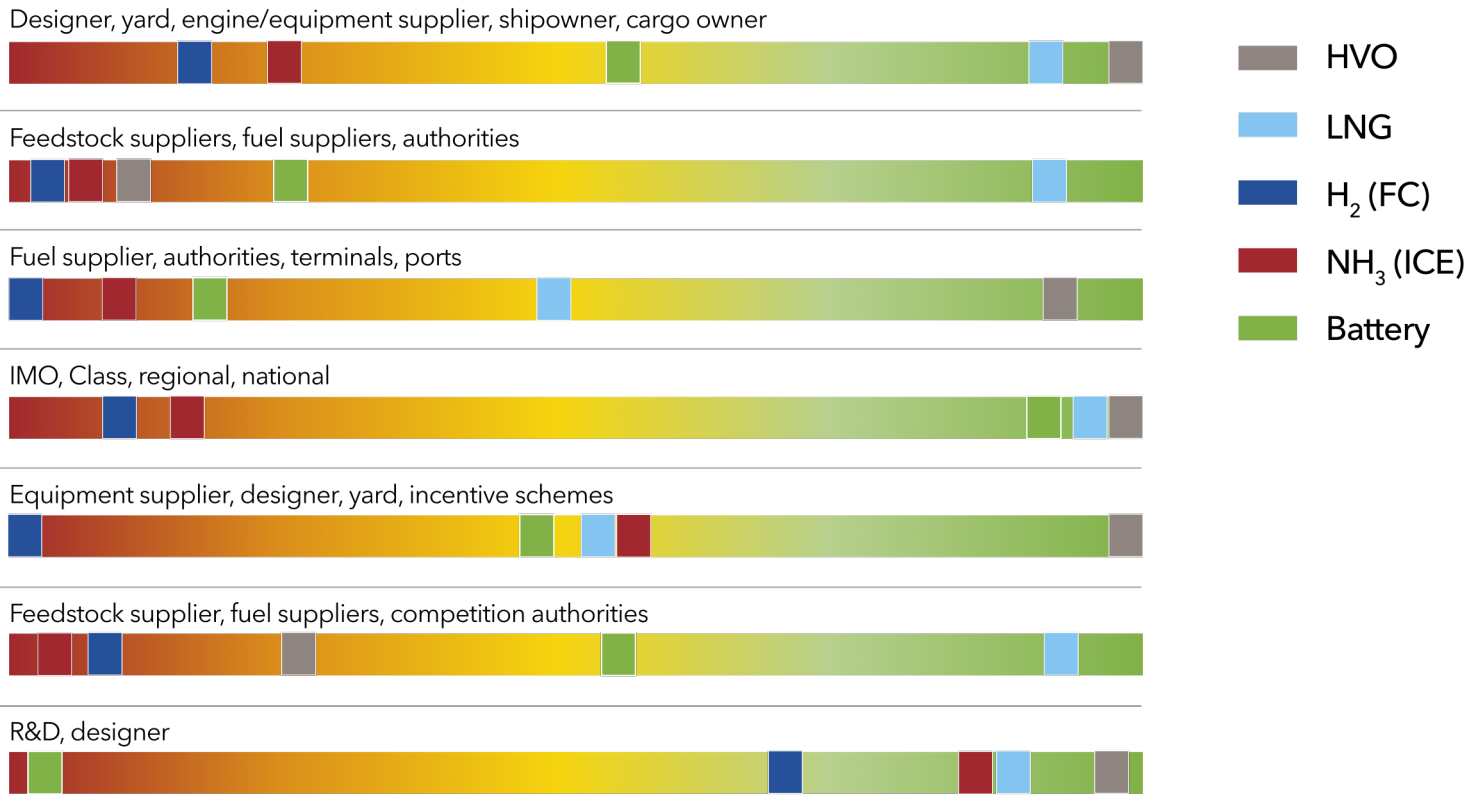
The Alternative Fuel Barrier Dashboard: Indicative status of key barriers for selected alternative fuels

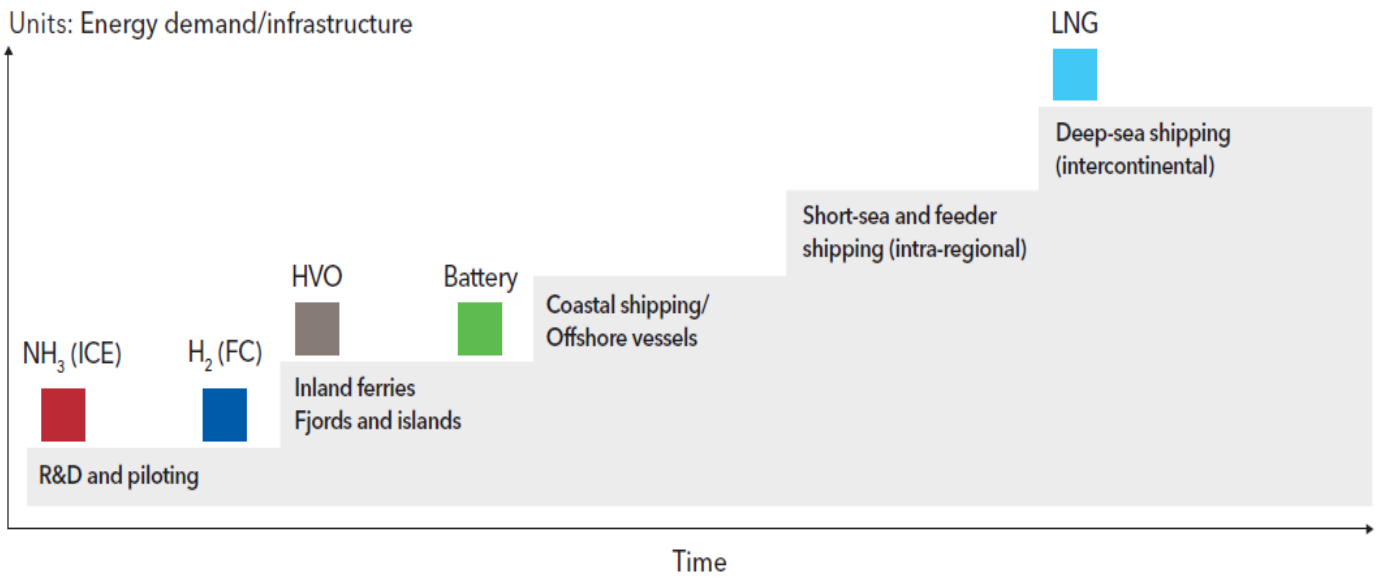
Barriers exists on many levels for different fuels.

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



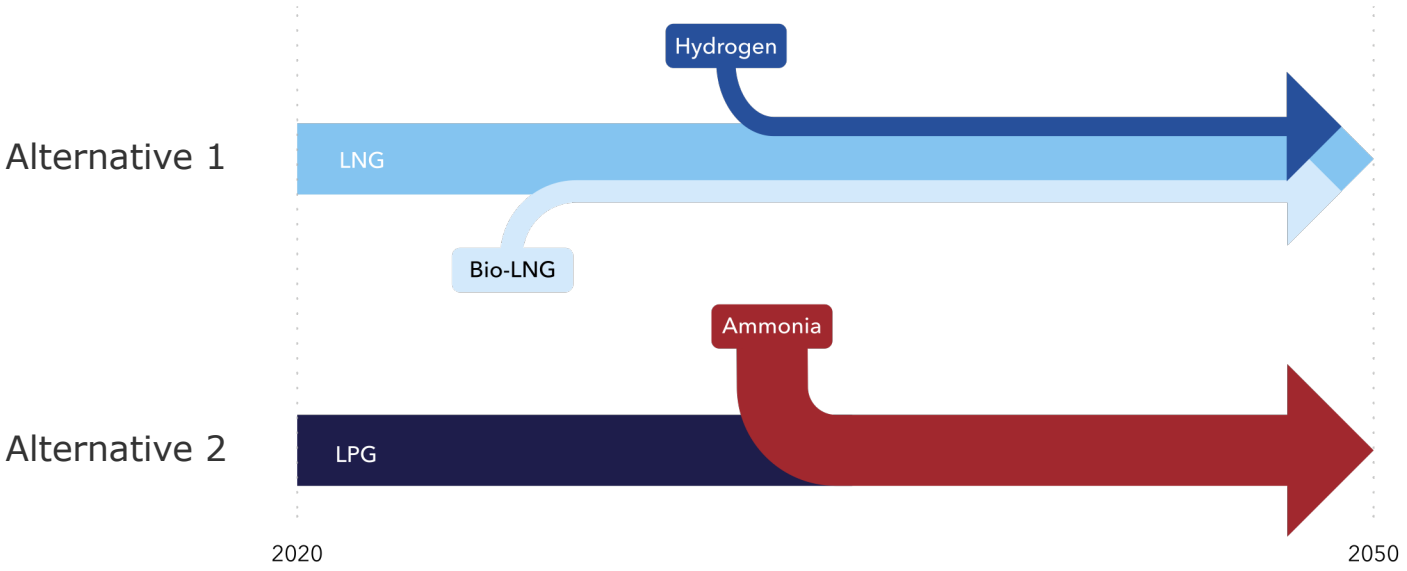
Gradual steps allow for:
- **maturing** of technology
- scaling of supply and **infrastructure**

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

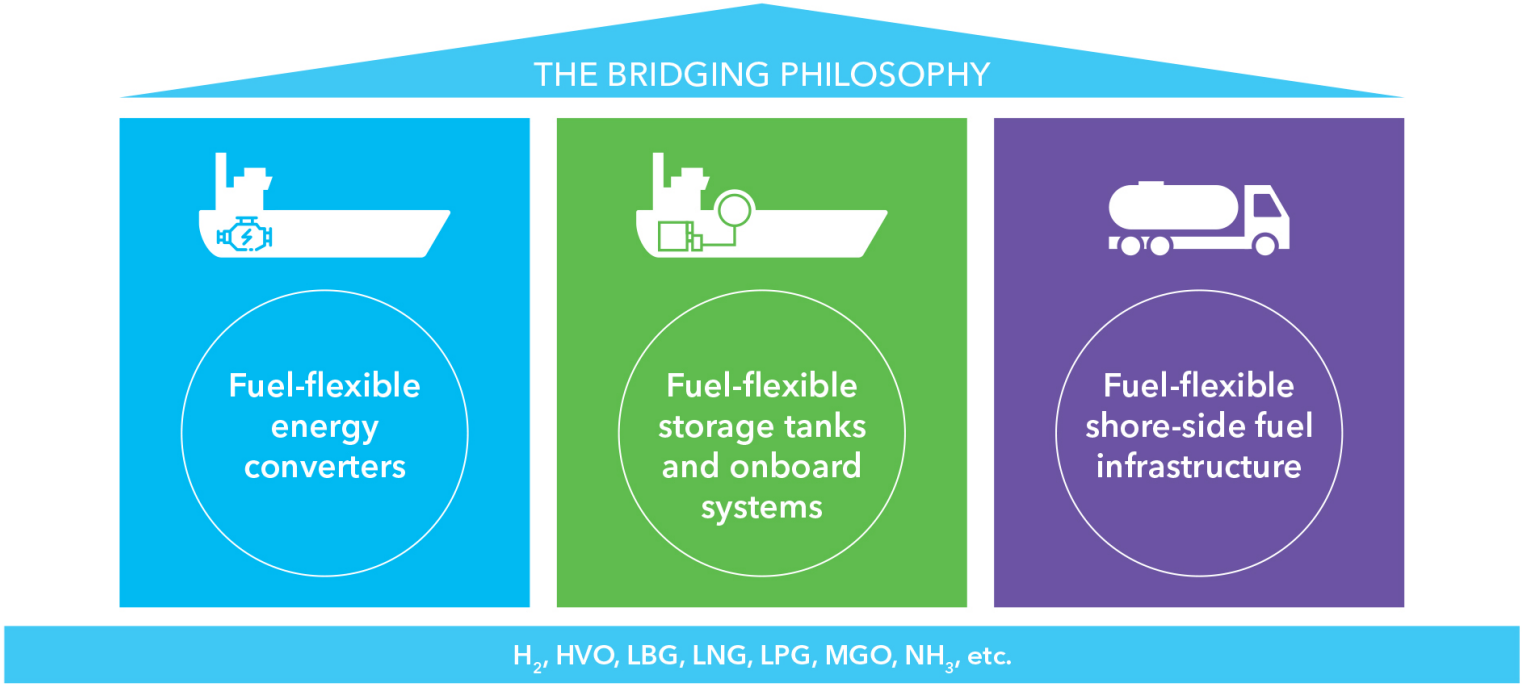
It took LNG around 20 years to climb all steps. To reach the IMO targets, carbon-neutral fuels must mature faster!

Fuel flexibility and bridging technologies

- can facilitate the transition from traditional fuel, via fuels with lower-carbon footprints, to carbon-neutral fuels
- require limited investments and modifications along the way



The three pillars of the bridging philosophy

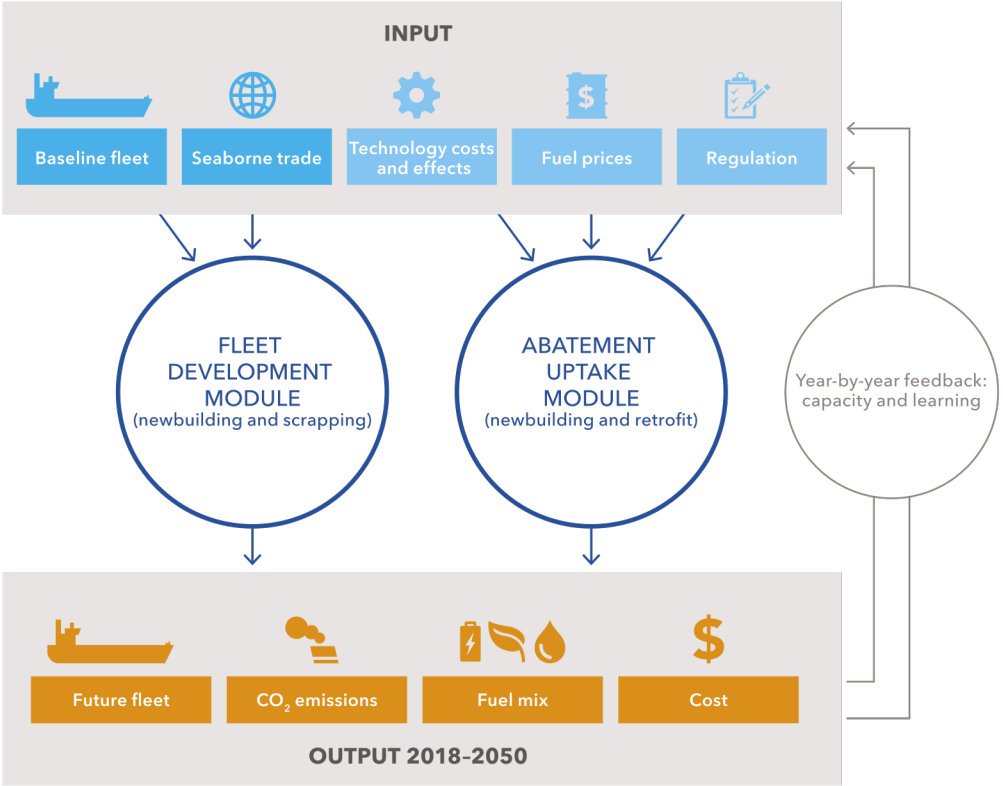


H_2, hydrogen; HVO, hydrotreated vegetable oil; LBG, liquid biogas; LNG, liquefied natural gas
LPG, liquefied petroleum gas; MGO, marine gas oil; NH_3, ammonia

GHG Pathway Model: Ship-by-ship & year-by-year

- Flexible **modelling tool** for assessing alternative futures, handle various scenarios including:
  - regulatory and trade developments
  - fuel-price assumptions
  - energy-efficiency technologies

- The **pathway model** projects the
  - future fleet
  - fuel mix and CO_2 emissions
  - abatement cost.



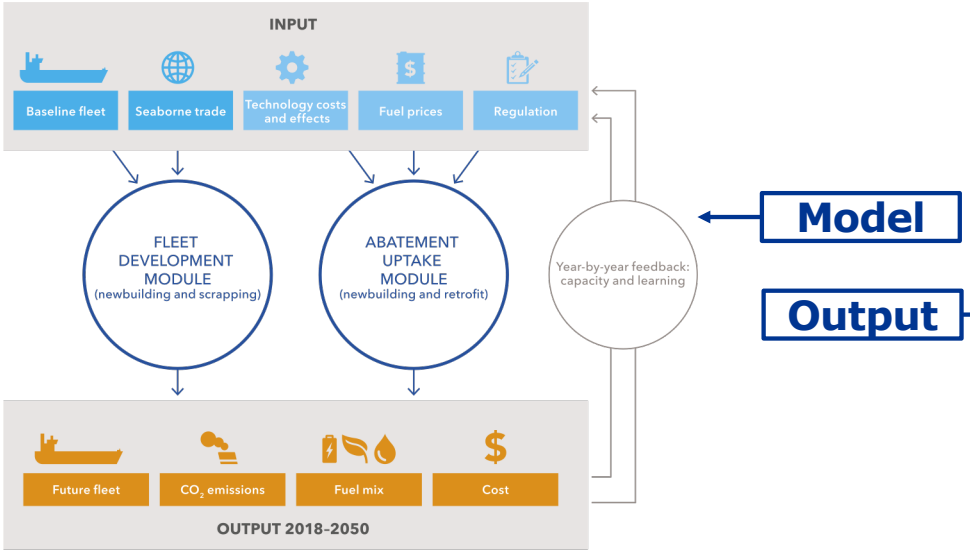
Pathway Model; We explore the impact of specific GHG regulations

Regulatory input to the model: Three different policy designs

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

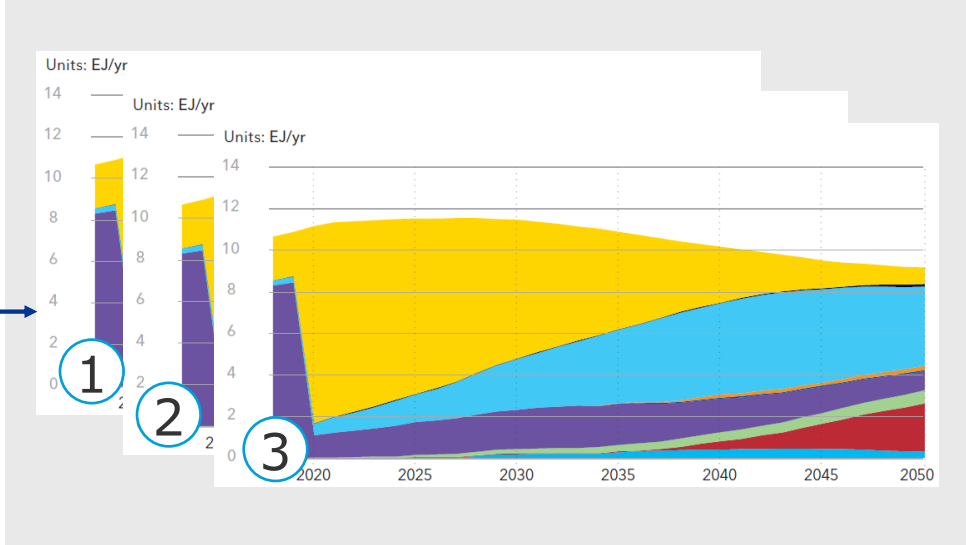
2 What is the effect of stricter **operational requirements?**

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



Model

Output



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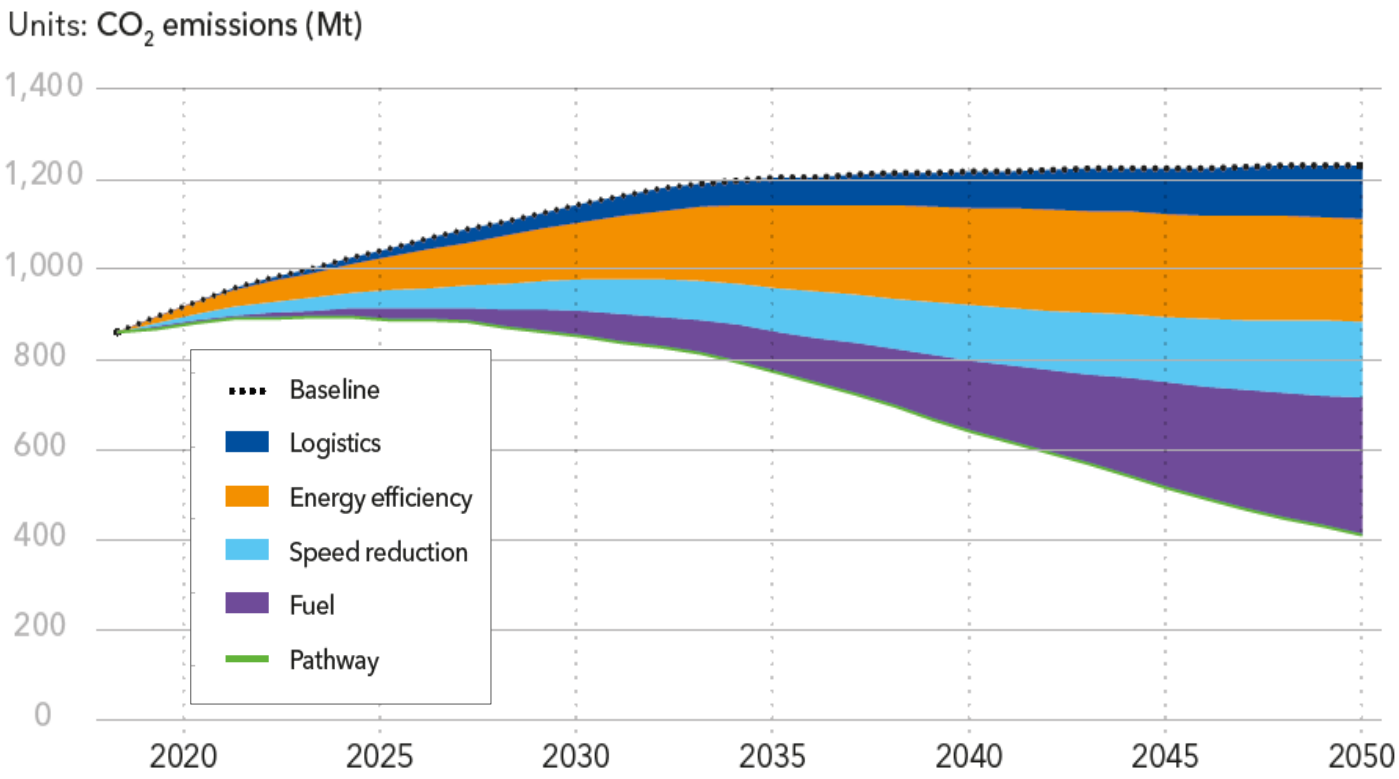
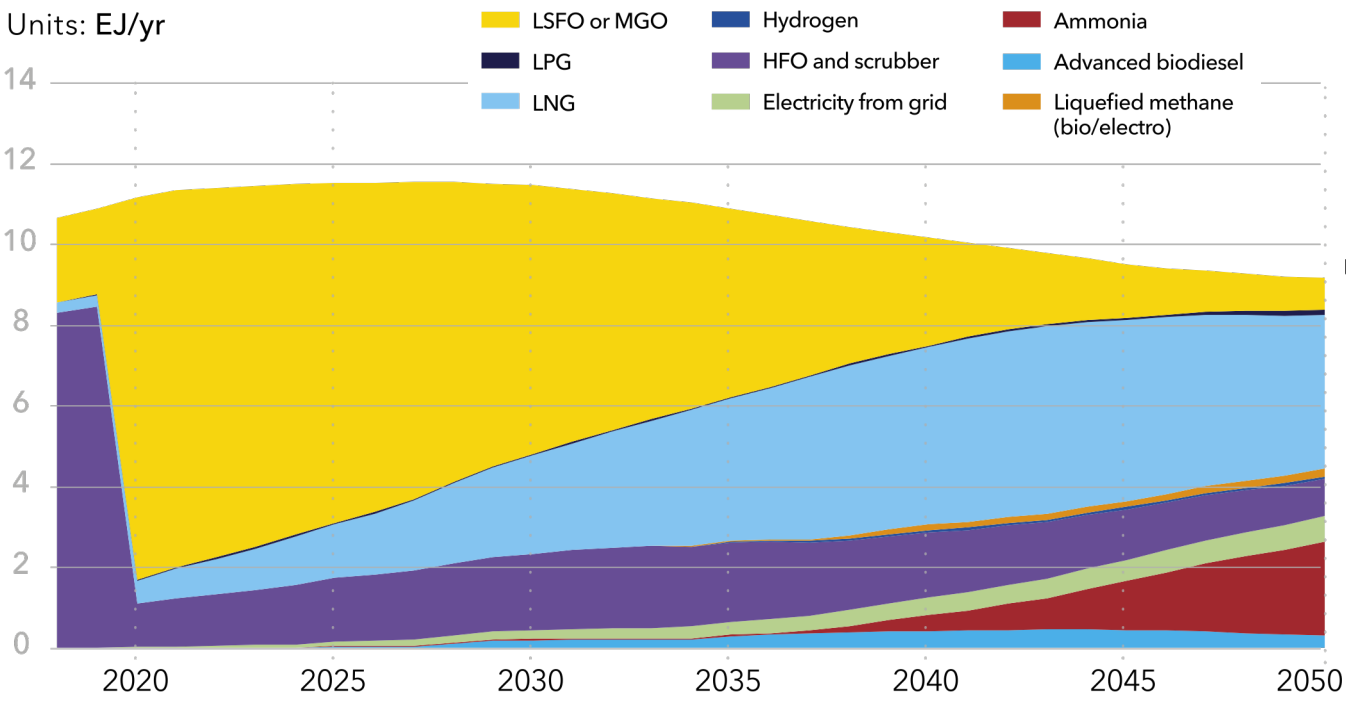
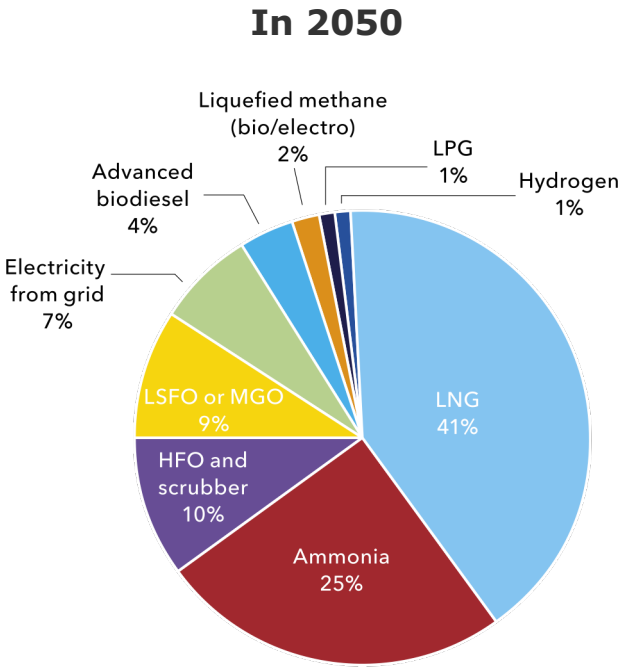
CO_2 emissions towards 2050 in the 'Design requirements' pathway

- 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



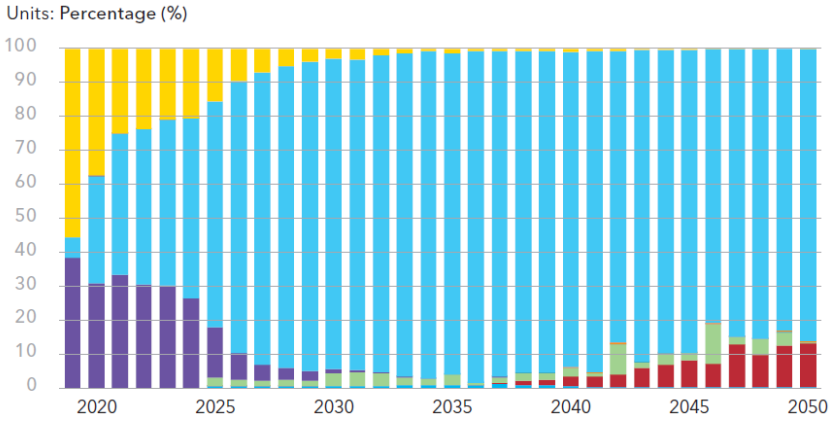


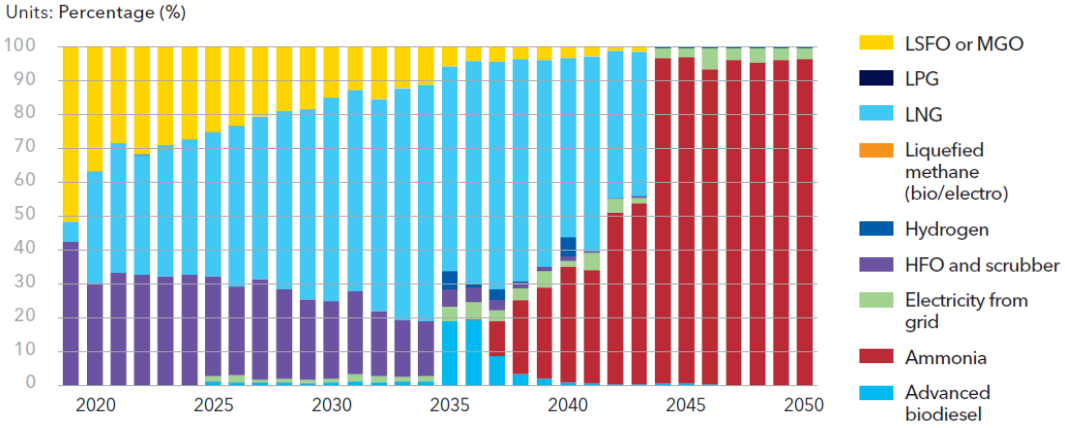
In all three pathways modelled, liquefied methane (both fossil and non-fossil) ends up dominating the fuel mix.

Several ways to meet the IMO targets - policy matters

Focusing on **operational requirements**, the uptake of alternative fuel for newbuilding's 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

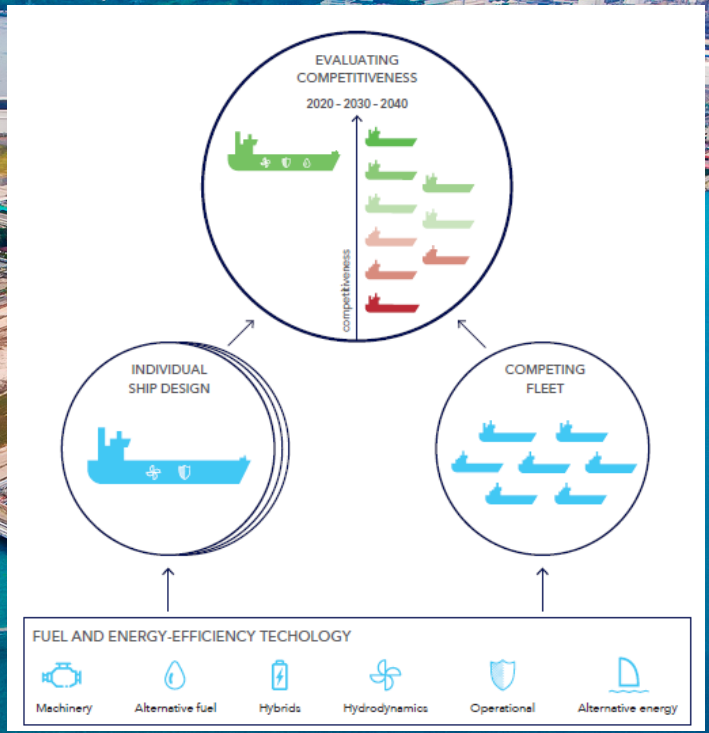
What is the future competitiveness of your ship?

DNV GL has developed a model to test **competitiveness** under different scenarios – taken into account:

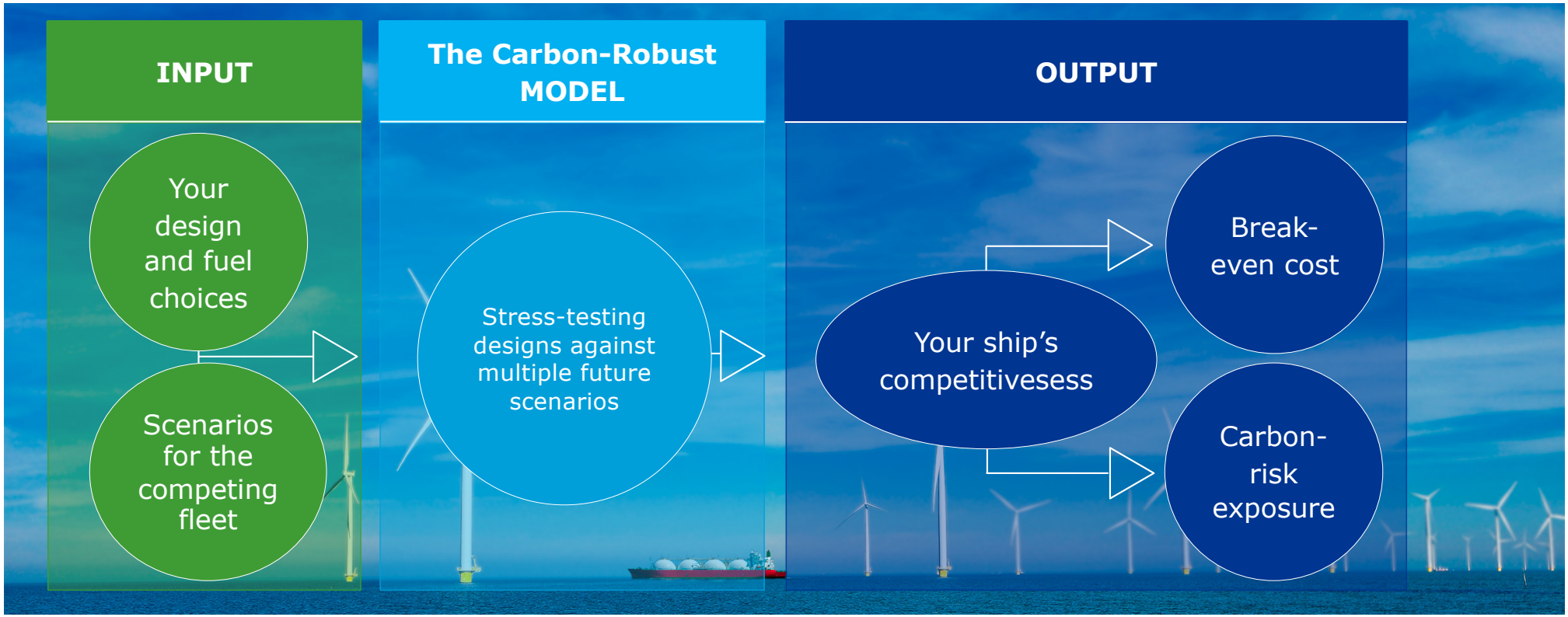
- Fuel & technology
- Regulations
- Risks related to the market

Competitiveness of individual **ship designs** is assessed using:

- Break-even cost
- CO_2 emissions



Stress-testing designs against multiple future scenarios

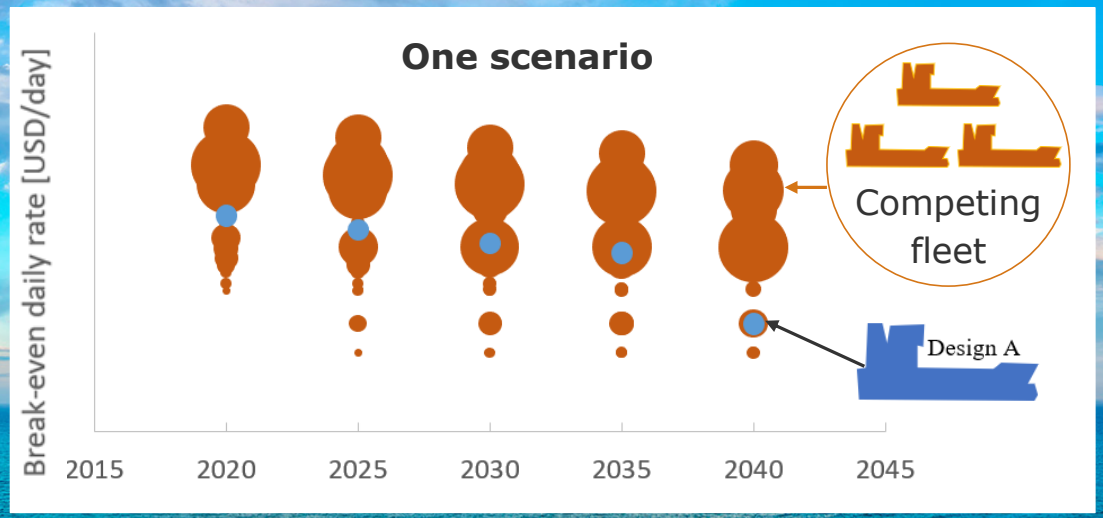


How well is your design performing under different scenarios

The model evaluates the **break-even cost** of a design to that of the competing fleet.

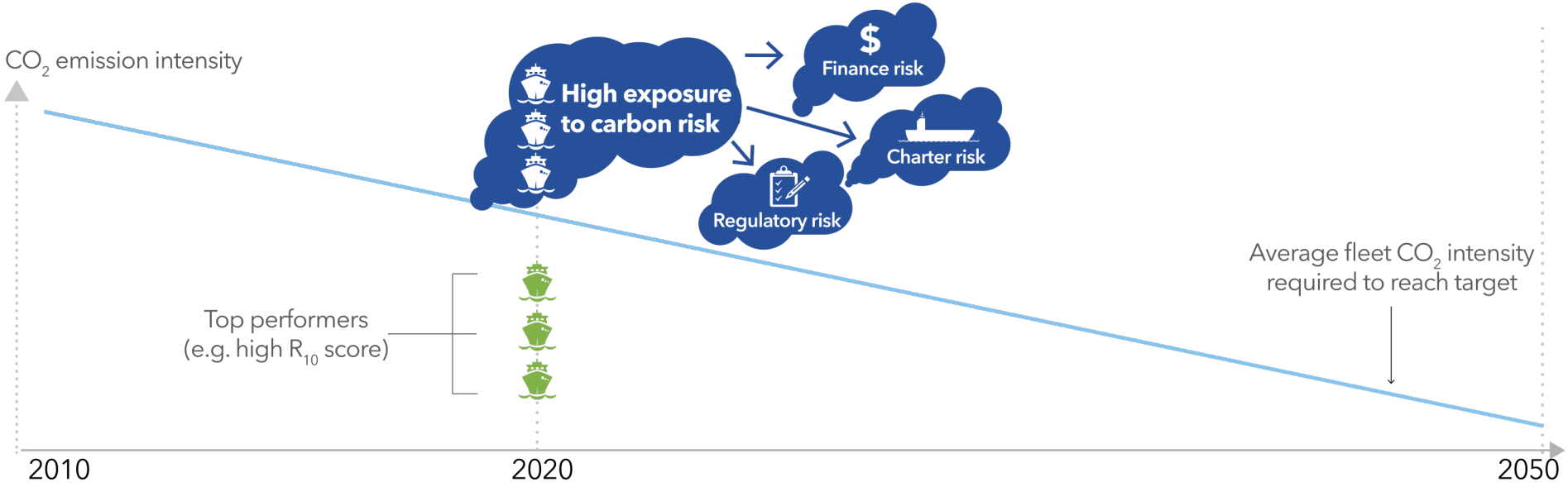
A **multi-scenario** approach is applied, spanning the commercial, regulatory and technology opportunity space.

This will help to build resilience and readiness, and provides input to a **robust** newbuilding strategy.



(The break-even cost is the minimum rate that a ship must secure to cover all costs)

What is the exposure to carbon risk under different scenarios?



The model also evaluates the **CO_2 emissions** of a design to that of the competing fleet.

It is possible to asses the **balance** between short-term cost reduction and long-term carbon-risk exposure.

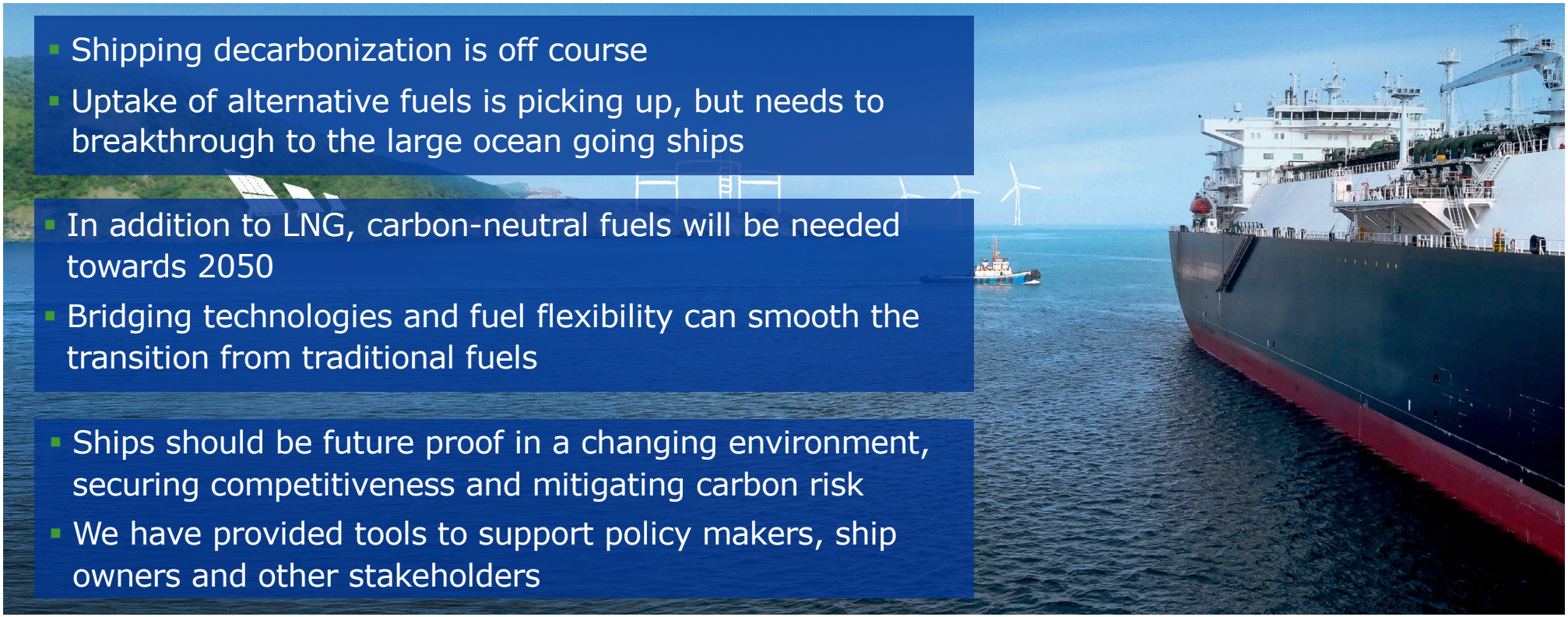
CO_2 emissions could become an additional **differentiator.**

Key findings

- Shipping decarbonization is off course
- Uptake of alternative fuels is picking up, but needs to breakthrough to the large ocean going ships

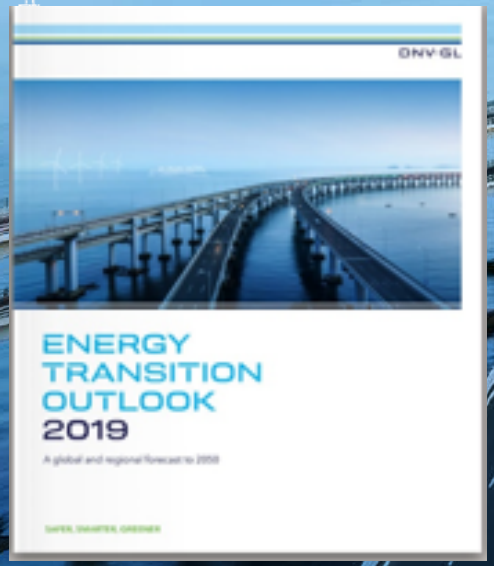
- In addition to LNG, carbon-neutral fuels will be needed towards 2050
- Bridging technologies and fuel flexibility can smooth the transition from traditional fuels

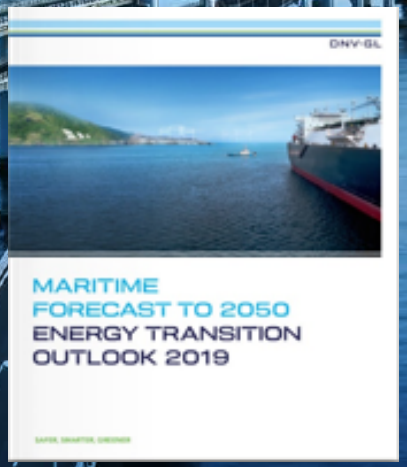
- Ships should be future proof in a changing environment, securing competitiveness and mitigating carbon risk
- We have provided tools to support policy makers, ship owners and other stakeholders

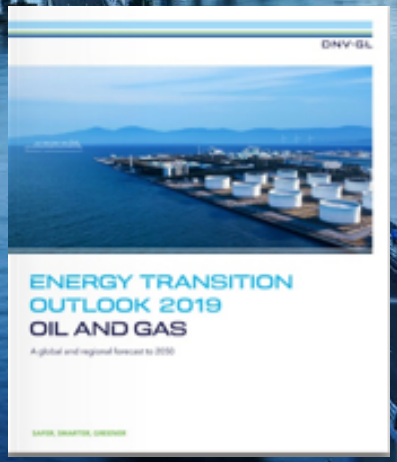


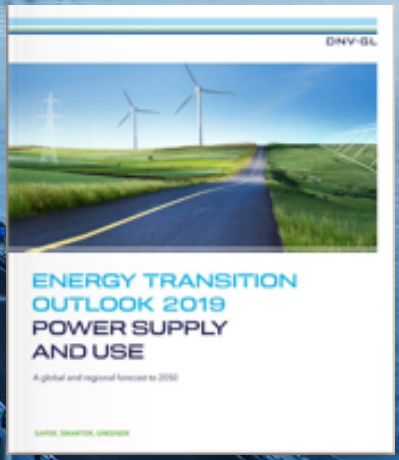
Reports available for download

https://eto.dnvgl.com









Thank you !

Tony Linden
antony.robert.linden@dnvgl.com

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