WHEN TRUST MATTERS

Challenges in the maritime industry

Group Research and Development

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Energy transition in full swing

Future ship fuels

Ensure safe ship operations

Highlights from DNV ETO 2021

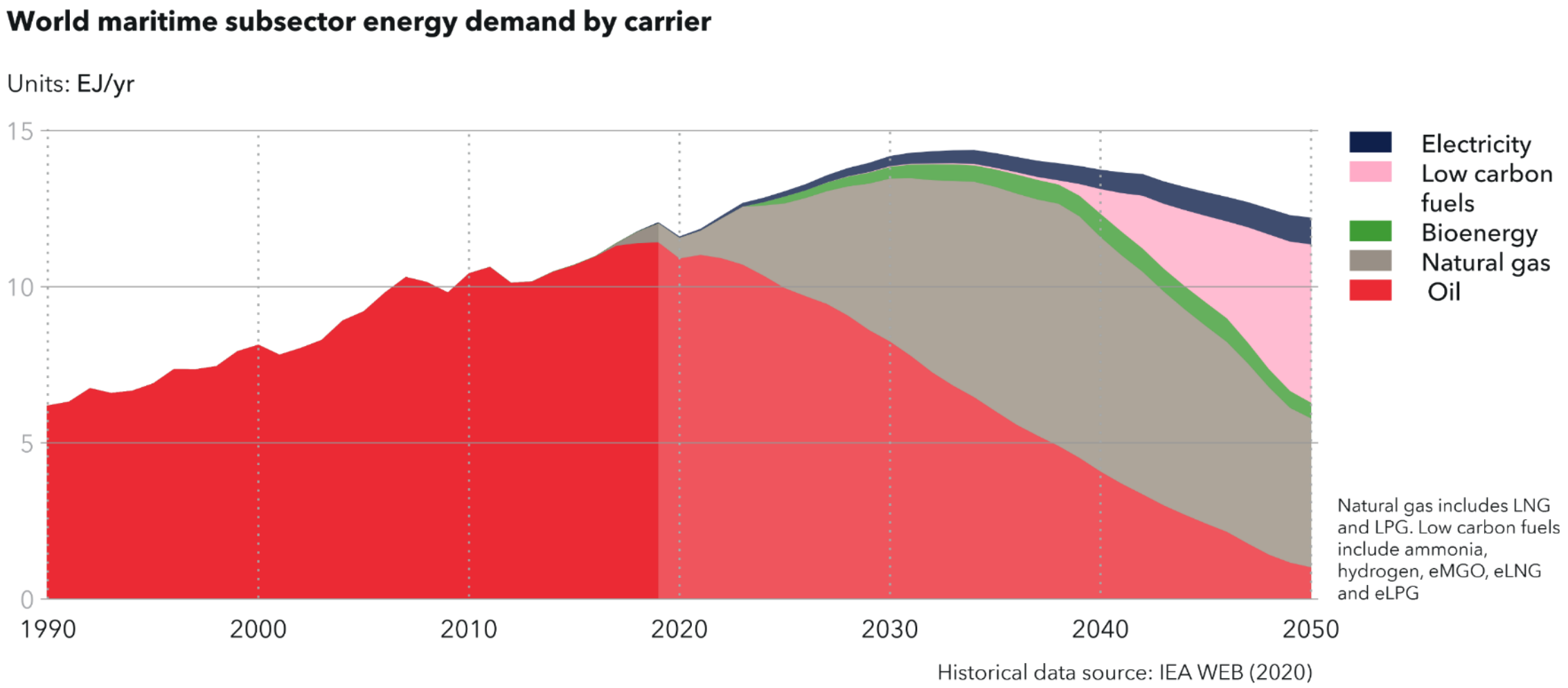
COVID-19 recovery spending is a lost opportunity.
We are far from achieving Paris Agreement ambitions

Electrification is surging ahead.
Variability and low prices are not roadblocks to solar and wind dominance

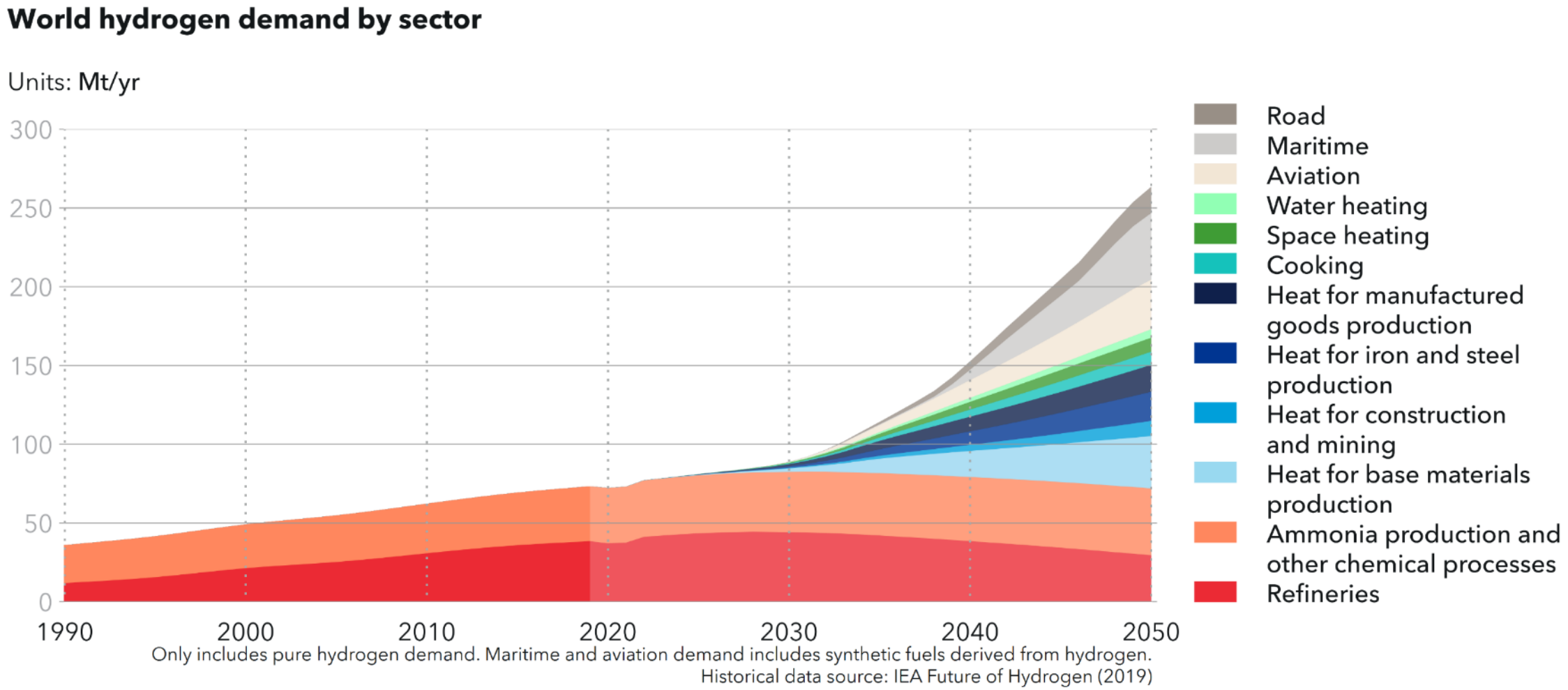
Fossil fuels slowly losing position.
Decarbonization of gas and deployment of CCS are slow

Much more H_2 and e-fuels needed in hard-to-abate sectors.
Most H_2 to come from dedicated renewables

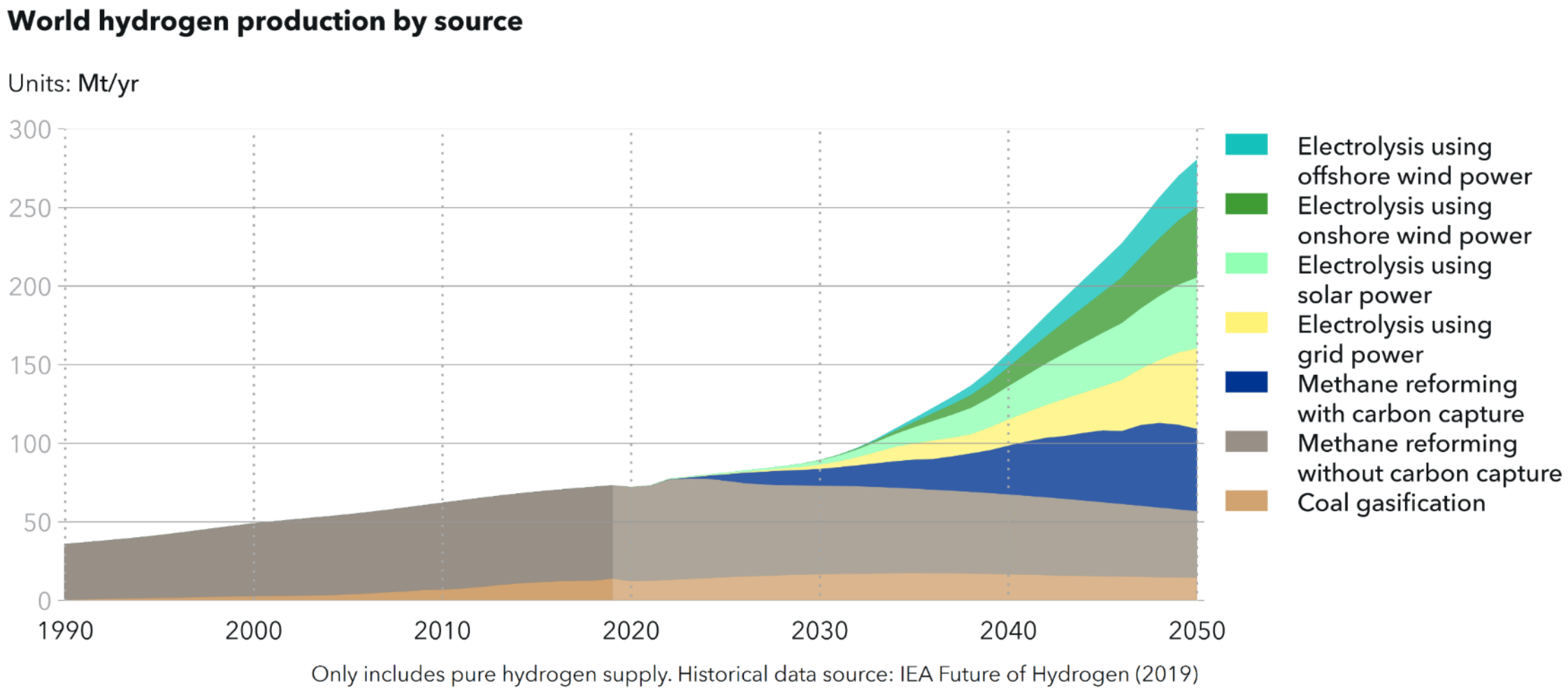
The maritime fuel mix will change dramatically



Hydrogen - late but strong growth: 5% of global energy demand in 2050



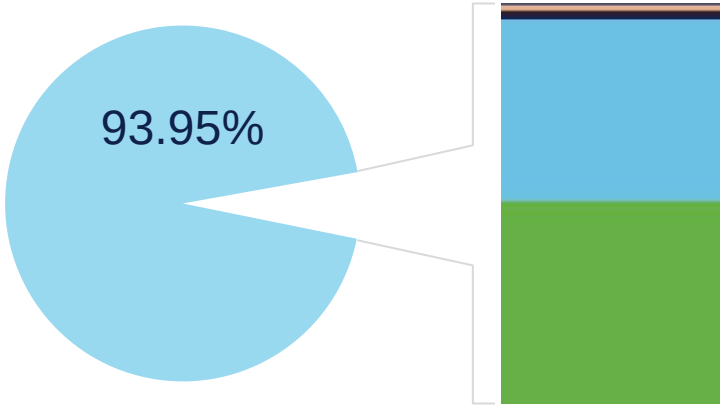
Hydrogen production dominated by electrolysis from dedicated renewables



The fuel transition in shipping has started and is gaining momentum

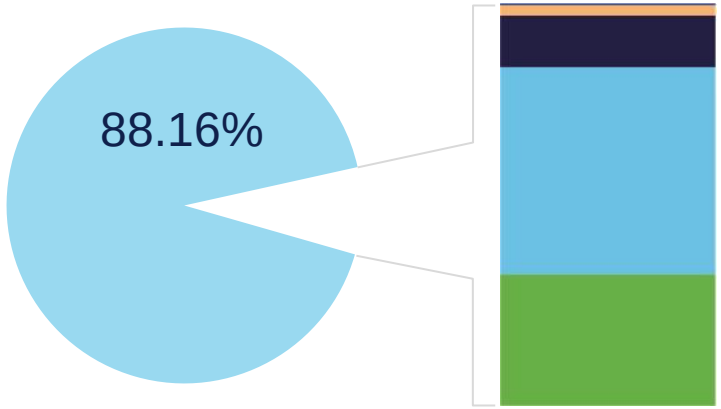
Ships on order, alternative fuel uptake in number of ships

2019



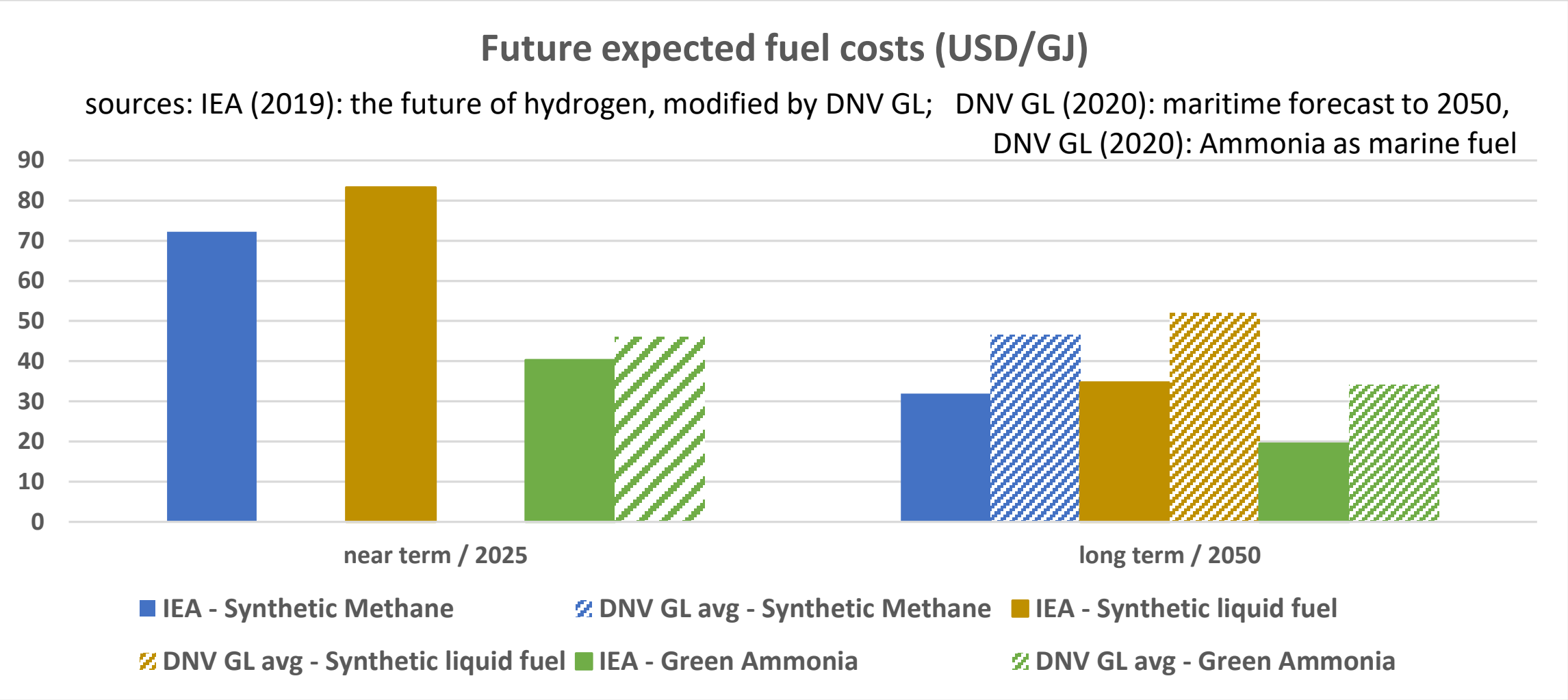
Hydrogen	0.04%
Methanol	0.08%
LPG	0.13%
LNG	2.73%
Battery	3.07%
Total	**6.05%**

2021



Ammonia	0.02%
Hydrogen	0.06%
Methanol	0.30%
LPG	1.51%
LNG	6.10%
Battery	3.85%
Total	**11.84%**

Several zero-carbon and carbon-neutral fuels will compete



10 $/GJ are equivalent to 426 $/t MGO or 10.5 $/mmBTU CH4, based on LHV

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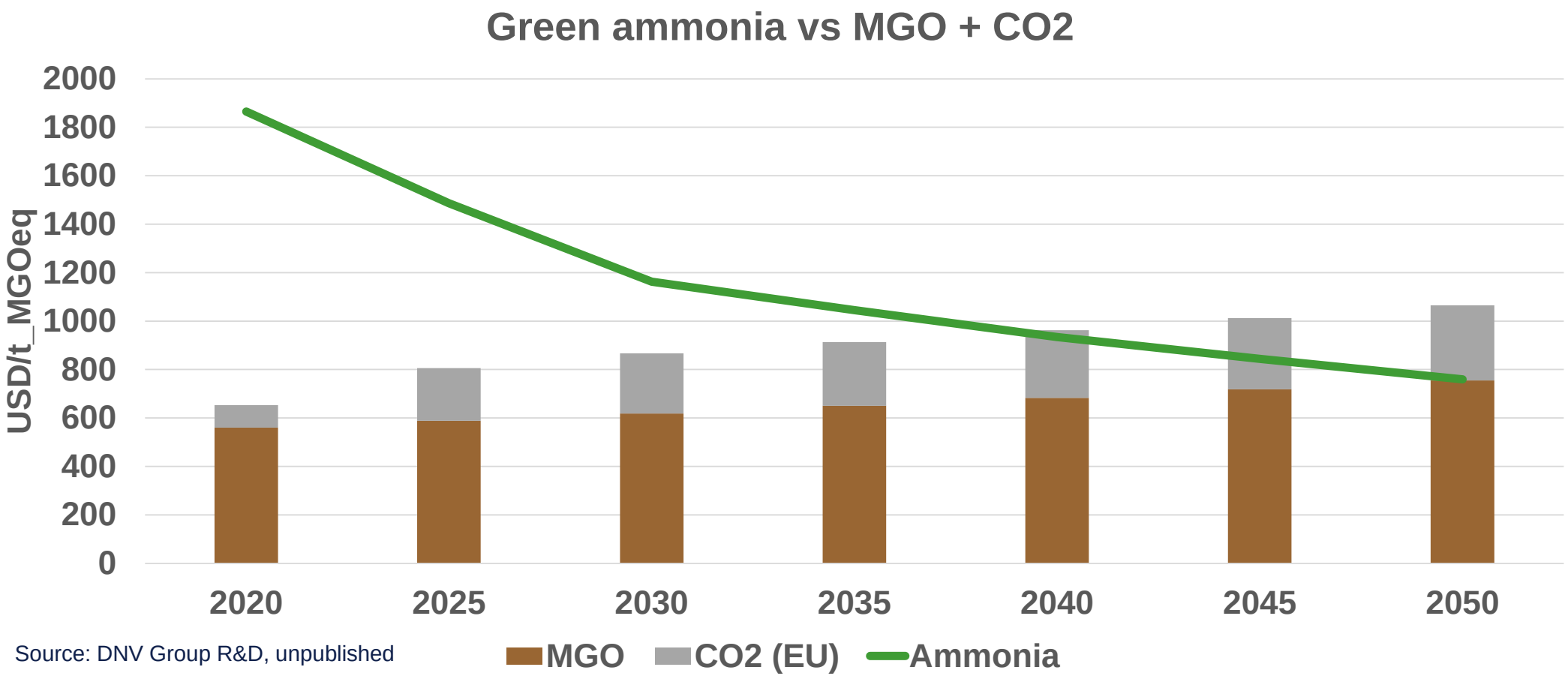
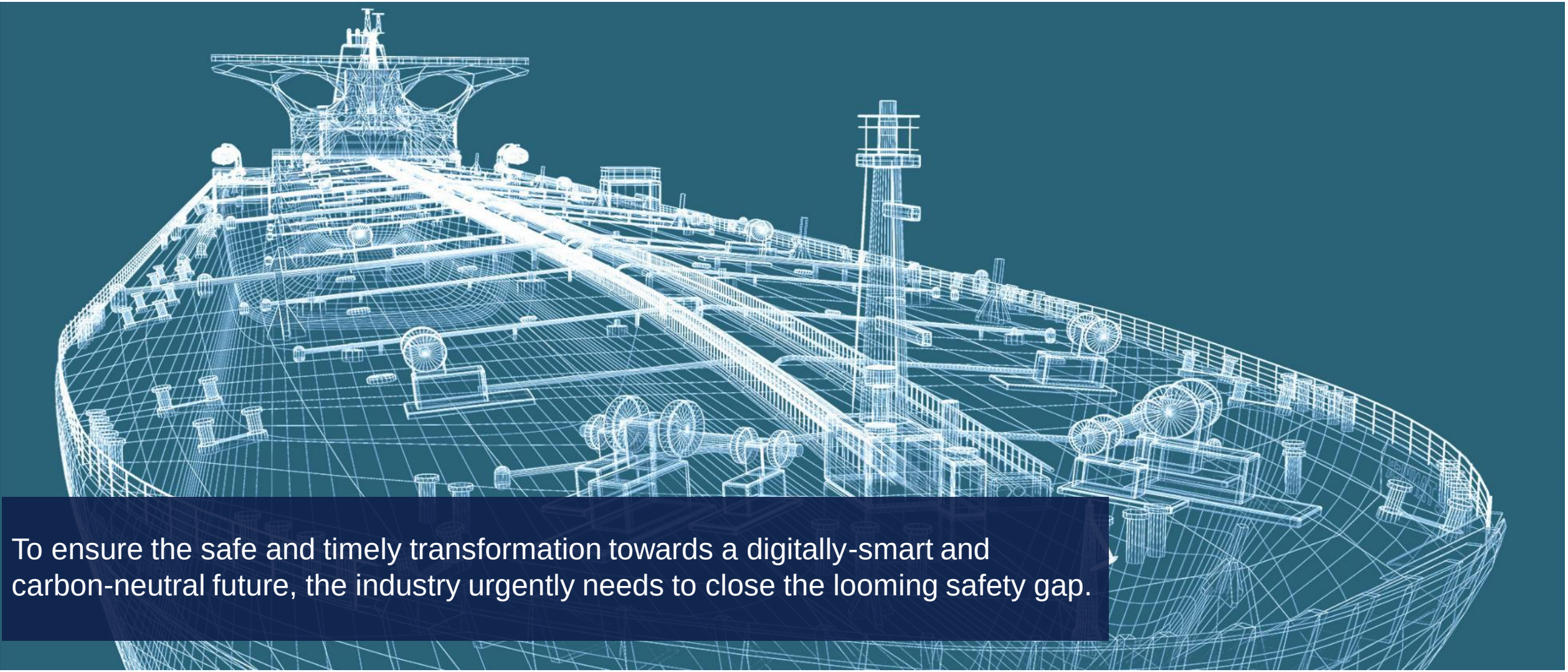
Green ammonia could become competitive by 2040*



Source: DNV Group R&D, unpublished

*) MGO assumed to increase by 1% py, CO2 costs follow DNV ETO 2021 for region EU, carbon factor 3.1

With all eyes focused on digitalization and decarbonization, the industry must continue to meet its commitment to safety



To ensure the safe and timely transformation towards a digitally-smart and carbon-neutral future, the industry urgently needs to close the looming safety gap.

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Digitalization – recommendation on system complexity

! Traditional **risk-management methods** will be insufficient

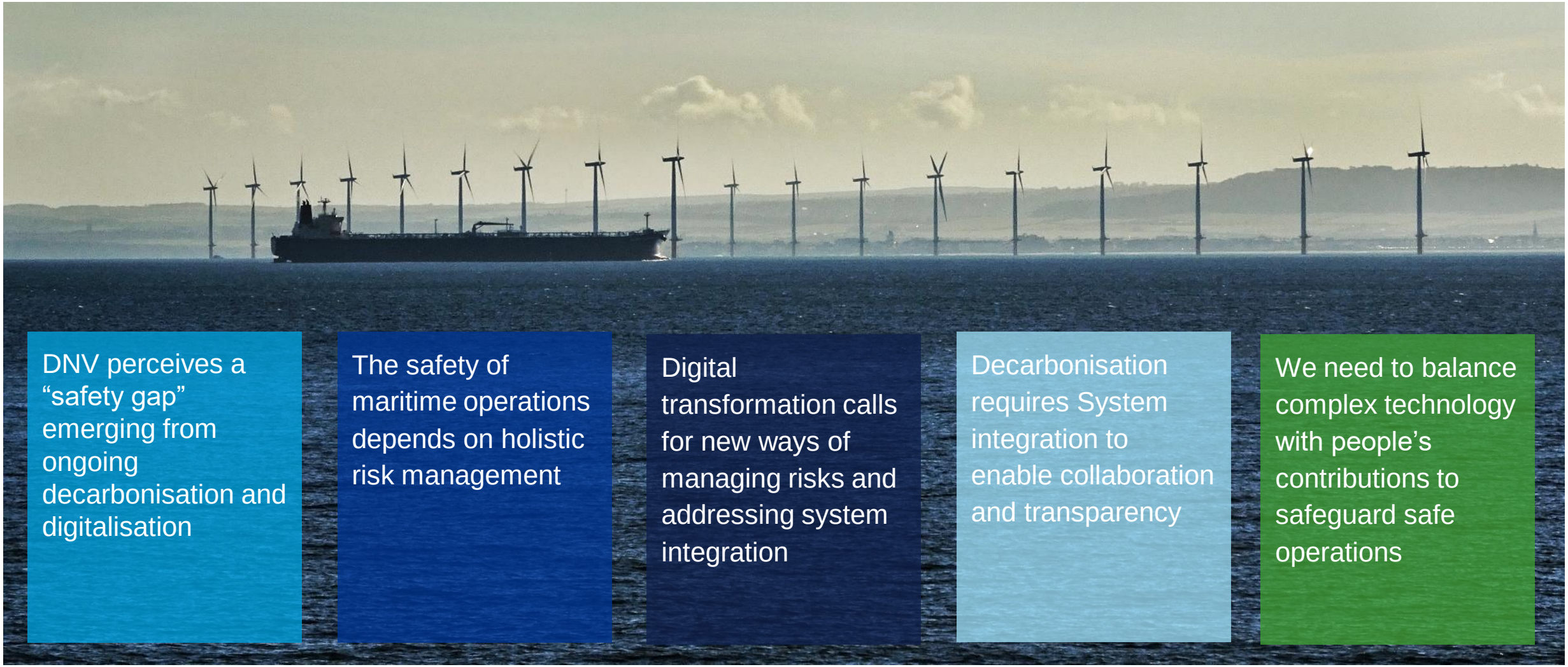
Focus on **system performance** rather than component reliability to manage increasingly complex ship systems

Decarbonization – recommendation on alternative fuels

! Stakeholders work in **silos** focused on subsystems

System integration to enable **collaboration and transparency**

Ensure safe future maritime operations



DNV perceives a “safety gap” emerging from ongoing decarbonisation and digitalisation

The safety of maritime operations depends on holistic risk management

Digital transformation calls for new ways of managing risks and addressing system integration

Decarbonisation requires System integration to enable collaboration and transparency

We need to balance complex technology with people’s contributions to safeguard safe operations

Thank you for your kind attention.

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