WHEN TRUST MATTERS

# Maritime Forecast to 2050

## Energy Transition Outlook 2023

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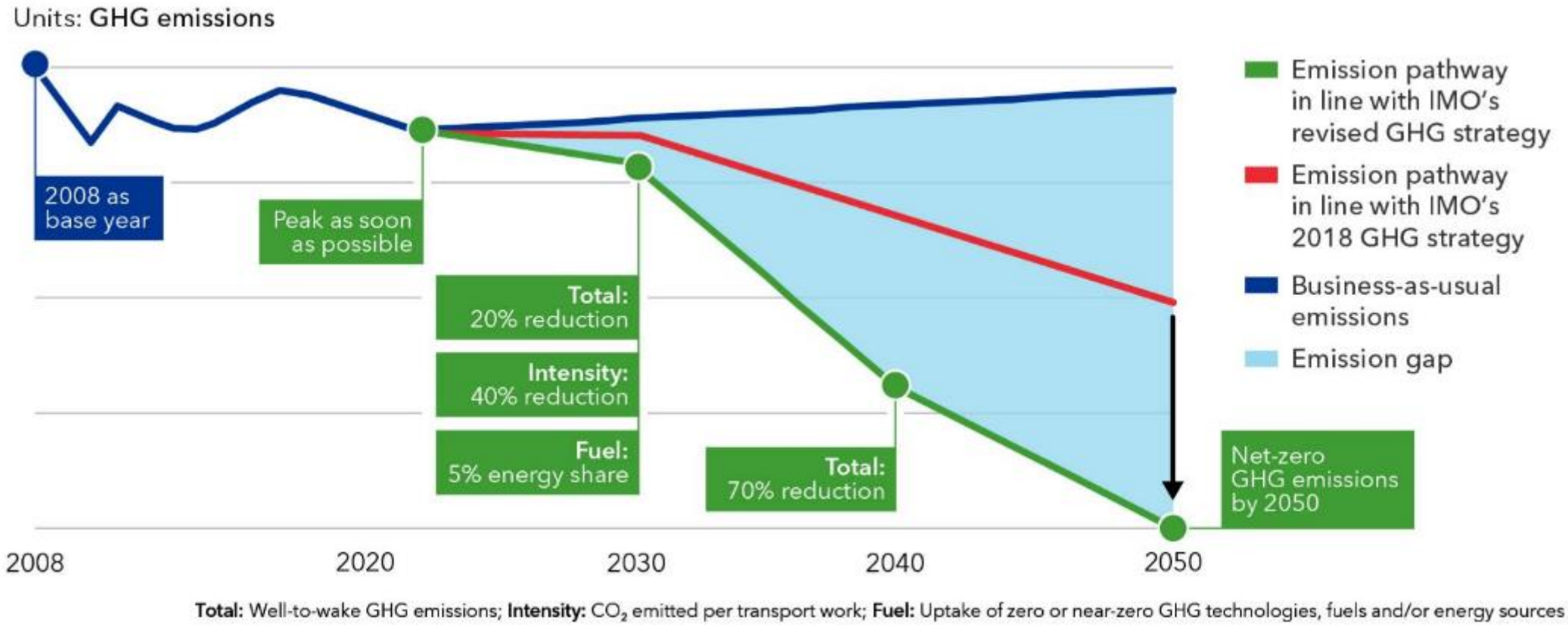
# Regulations, technologies and fuel production are developing, with a large impact on shipping's future


**Drivers**
**Regulations**

**Fuel**
**production**
**and demand**

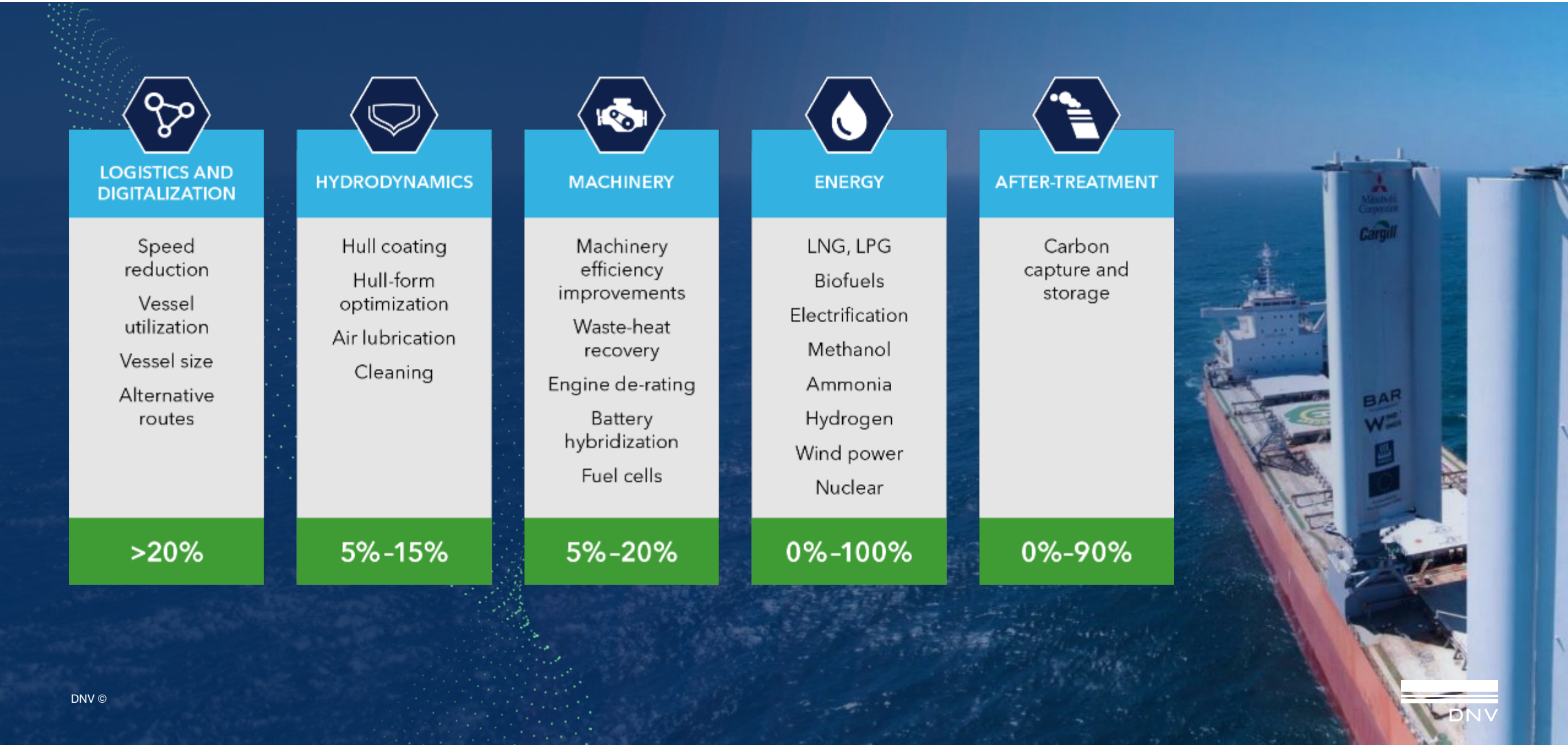
**Technologies**
**Fuels**

# IMO decarbonization ambitions significantly strengthened

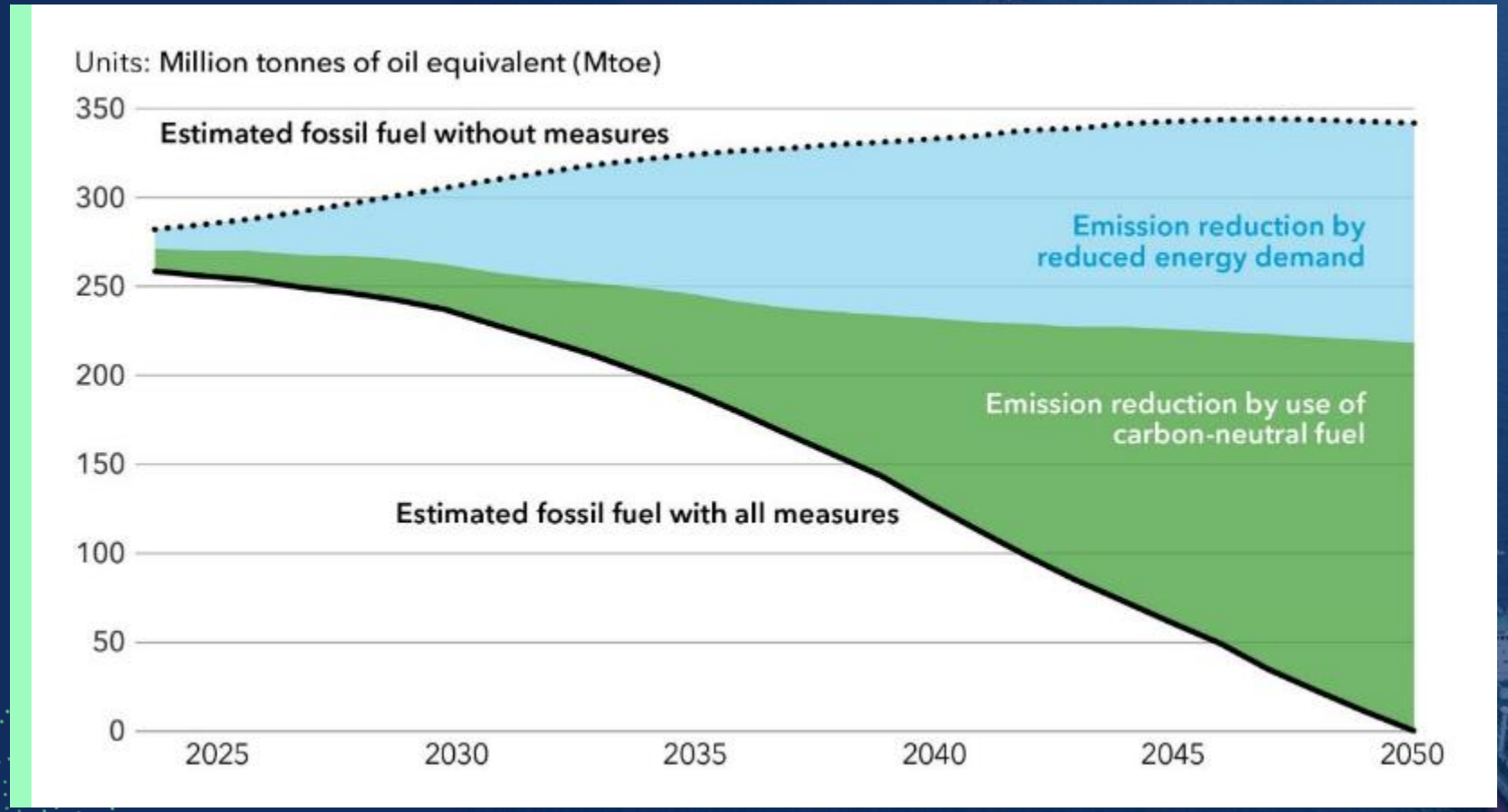


# All decarbonization solutions must be explored

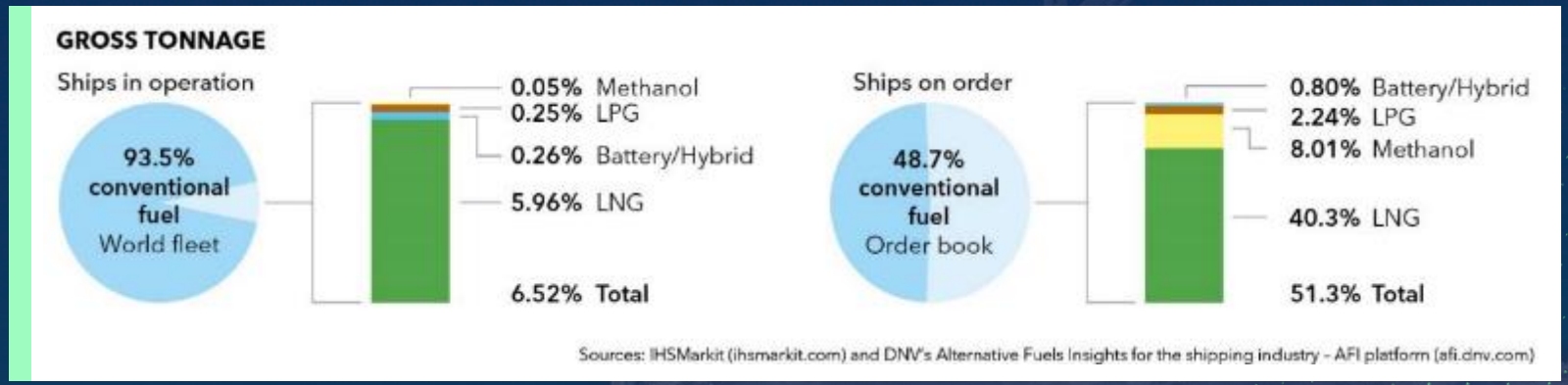
| LOGISTICS AND DIGITALIZATION | HYDRODYNAMICS | MACHINERY | ENERGY | AFTER-TREATMENT |
|---|---|---|---|---|
| Speed reduction | Hull coating | Machinery efficiency improvements | LNG, LPG | Carbon capture and storage |
| Vessel utilization | Hull-form optimization | Waste-heat recovery | Biofuels | |
| Vessel size | Air lubrication | Engine de-rating | Electrification | |
| Alternative routes | Cleaning | Battery hybridization | Methanol | |
| | | Fuel cells | Ammonia | |
| | | | Hydrogen | |
| | | | Wind power | |
| | | | Nuclear | |
| >20% | 5%-15% | 5%-20% | 0%-100% | 0%-90% |

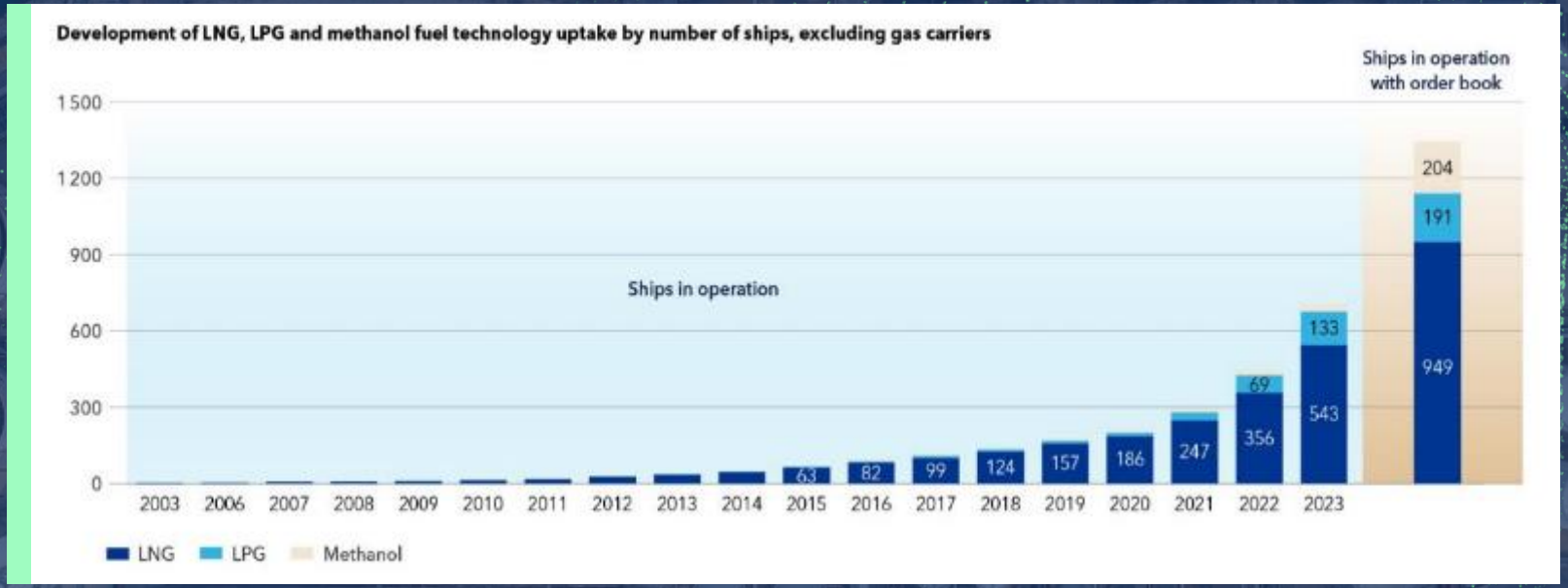


# Reducing energy consumption is critical to reduce emissions and sustain increased energy costs

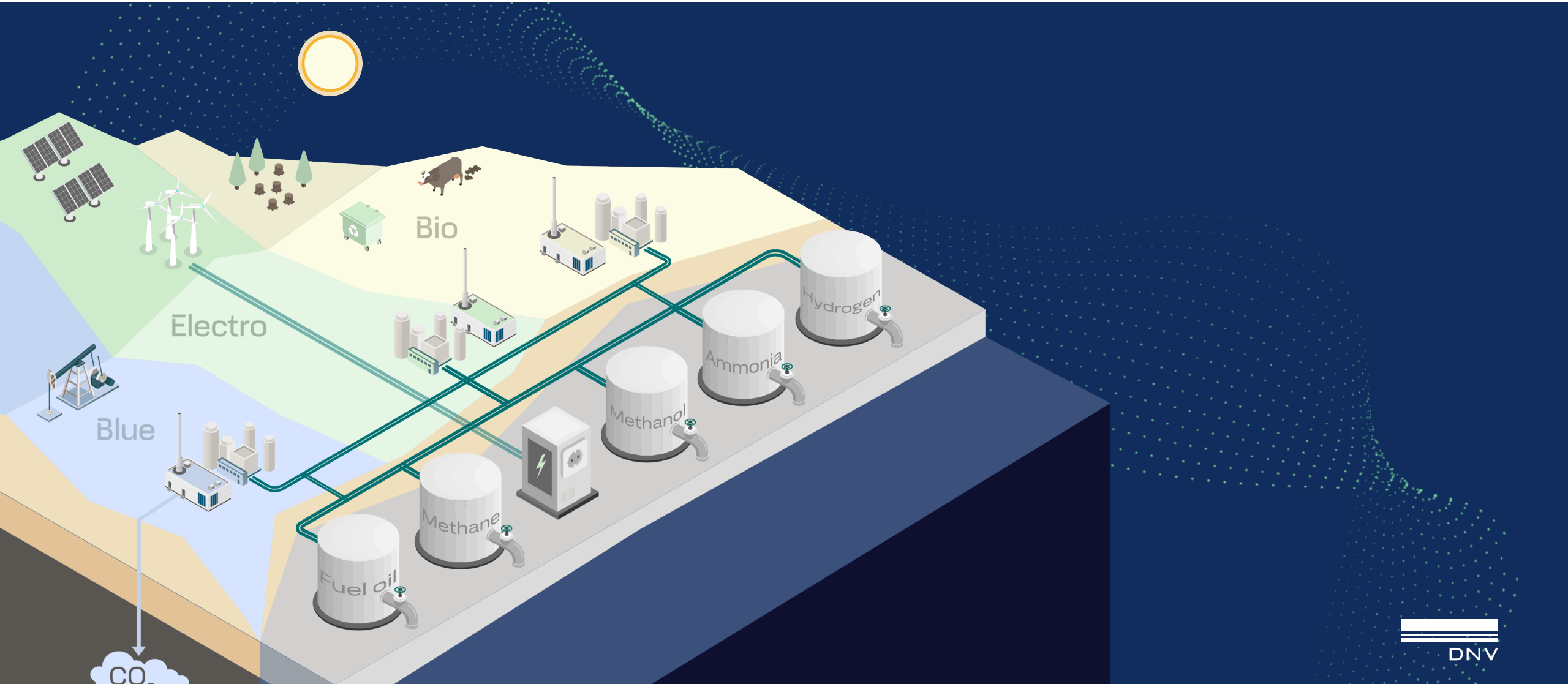


# Shipowners investing in fuel flexibility – half the ordered tonnage can run on alternative fuels

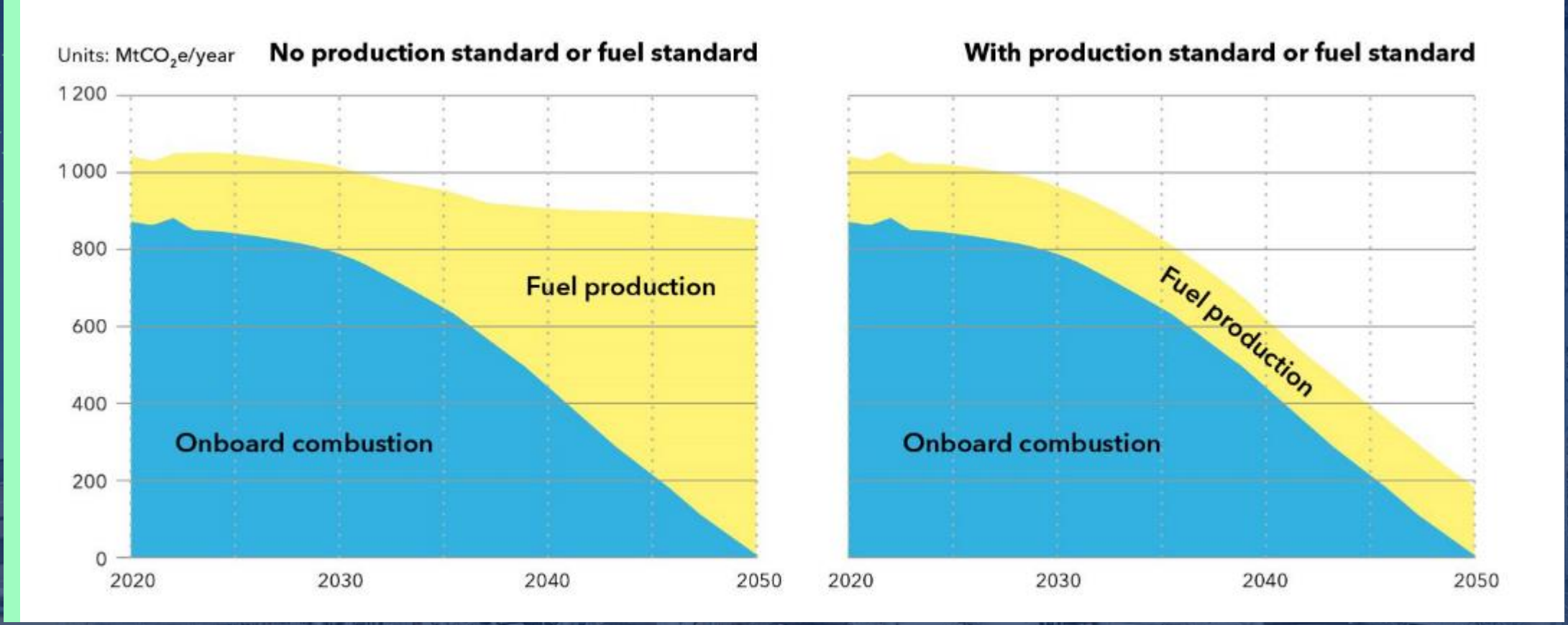


# Emissions from fuel production are part of IMO’s goals



# Regulations are needed to ensure emissions are not moved from ship to shore



# 2,200 carbon-neutral fuel projects identified, most without final investment decision

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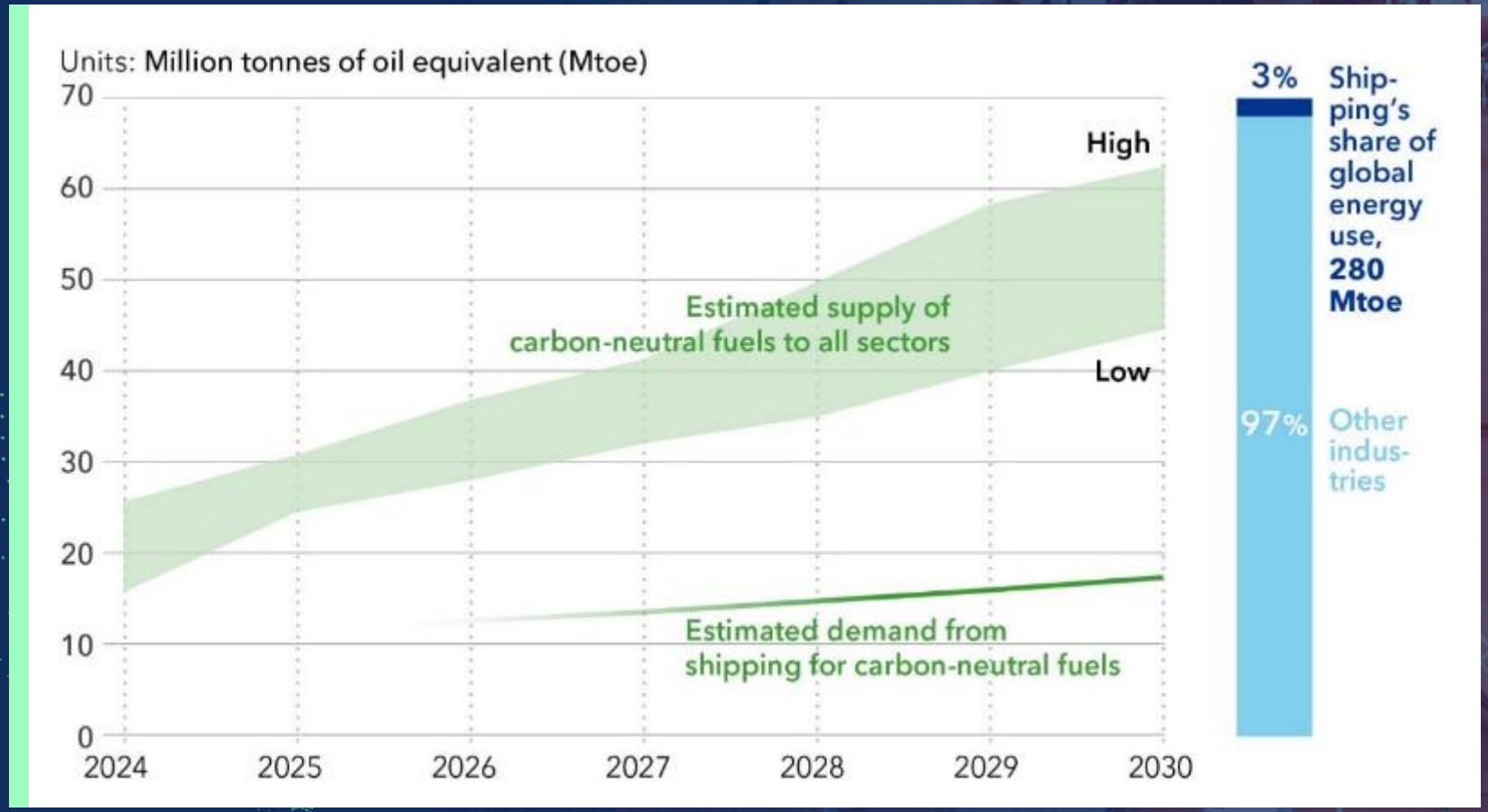
# Shipping requires an estimated 30-40% of global carbon-neutral fuels in 2030



# Onboard carbon capture and storage can reduce the demand for carbon-neutral fuels

- **Avoids competition** for sustainable biomass and renewable electricity
- **Case study** for 15,000 TEU container vessel
- **Capturing 70% of $CO_2$ in 4,000 $m^3$ tanks**



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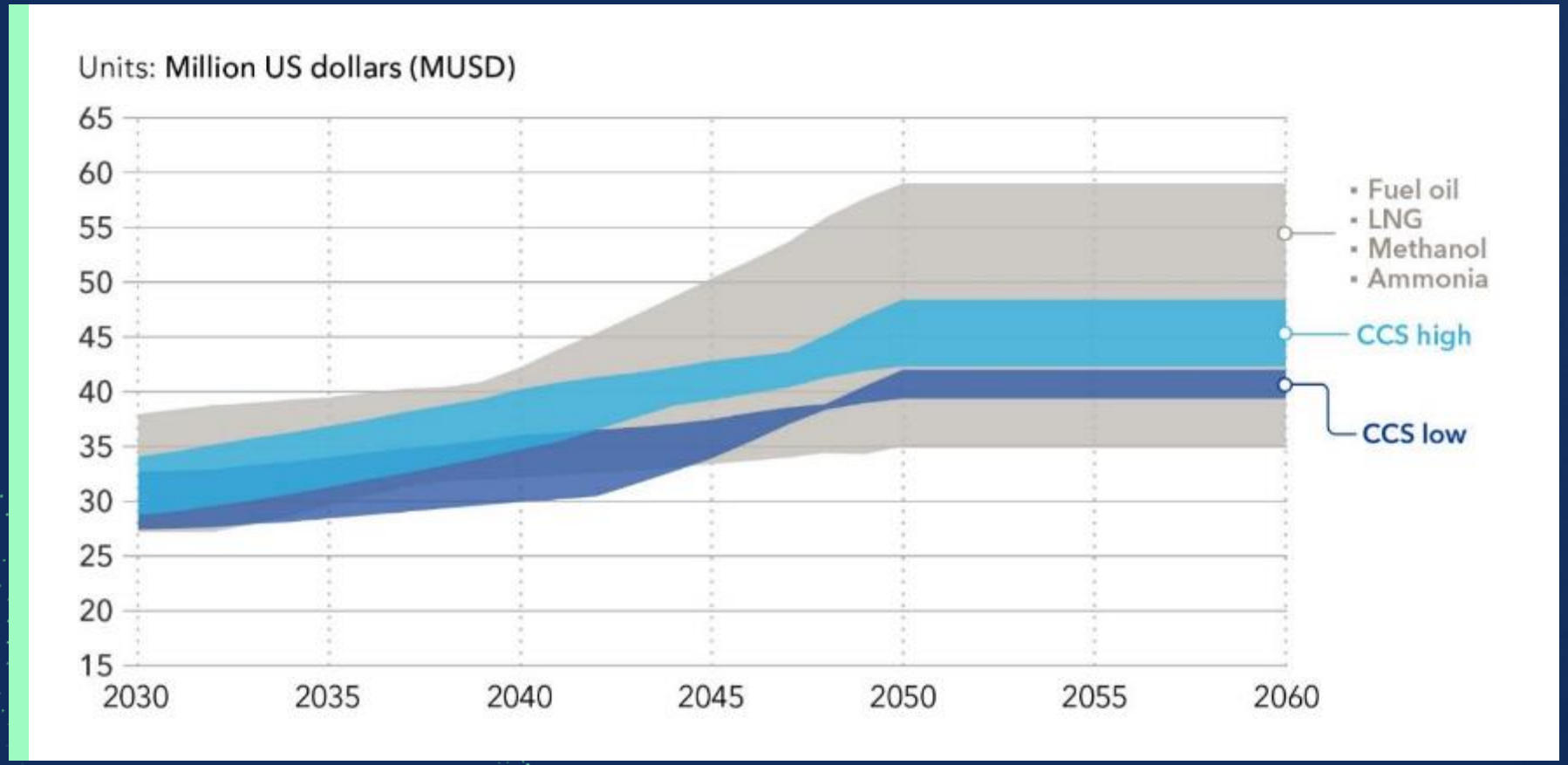
# Case study of 15,000 TEU container vessel shows that onboard carbon capture can compete with other proposed decarbonization solutions




**A high and a low cost scenario**

**CCS high**
- 30% fuel penalty
- 80 USD/ton $CO_2$

**CCS low**
- 15% fuel penalty
- 40 USD/ton $CO_2$



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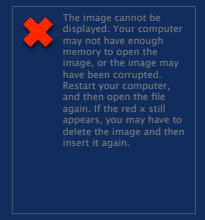
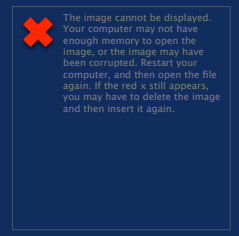
# Maritime Forecast to 2050 – key findings


**Strengthened IMO ambitions** and first international $CO_2$ price in EU, set the decarbonization pathway

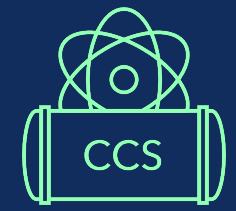

**Shipping will require** an estimated 30-40% of global cross-sector carbon-neutral fuel supply in 2030




**Half the ordered tonnage** can use LNG, LPG or methanol in dual-fuel engines

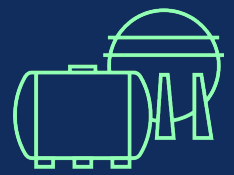



**Global fuel production standards** are needed to meet IMO's net-zero close to 2050 goal




**Onboard carbon capture and nuclear** are technically and economically feasible options

# Maritime Forecast to 2050 – implications

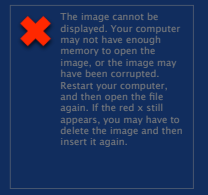


**Fuel producers must accelerate plans**, but need offtake commitments from fuel buyers

**Reducing energy consumption** critical to lowering emissions and softening the impact of increased energy costs

**The fuel and technology shift** will require large scale training of seafarers, no matter which technologies and fuels are the winners

**Further regulatory clarity** and commercialization of new technologies is required




**Cost of decarbonization** must be carried through the maritime value chain by green corridors or similar mechanisms

The 2020s is proving to be **the decisive decade for decarbonization of shipping**



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# Maritime Forecast to 2050 – recommendations

## Shipowners should:

- **Reduce** energy consumption now
- **Consider** all decarbonization options
- **Focus** on fuel flexibility
- **Consider** long-term fuel strategy

*Thank you for your attention!*

# MARITIME FORECAST TO 2050

**Download the report now!**
www.dnv.com/maritime-forecast



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