



Høgskulen
på Vestlandet

Green propulsion - Lessons learned from ‘*Viking*’ shipping?

Bergen Energy Lab, 14.02.2023

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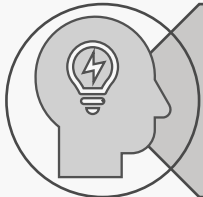


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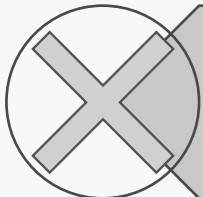
Some words upfront



A subjective approach to a wide topic based on publicly available data



Conclusions based on the presented data / information are made at your own risk.
(NB: Please see listed literature and references)



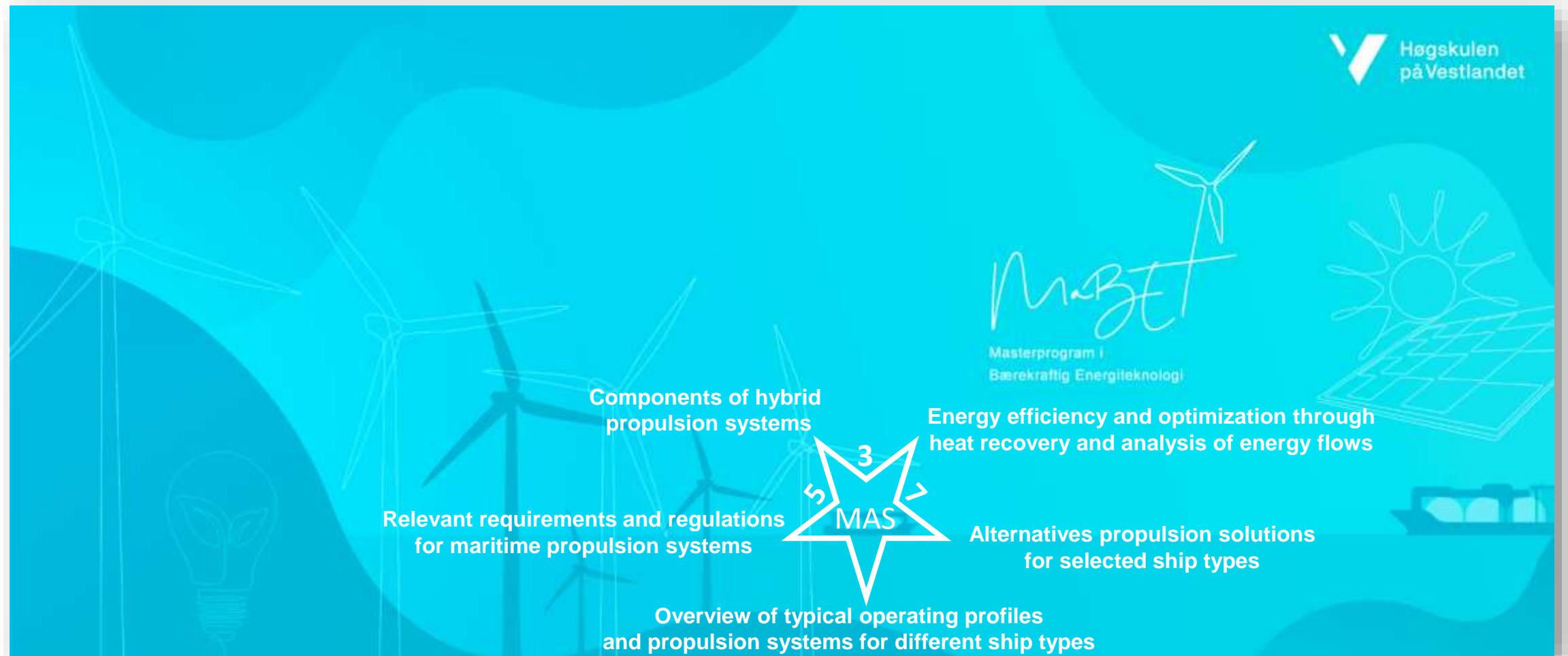
No professional or commercial connection to / cooperation with mentioned entities



Questions, feedback and criticism can be send to pek@hvl.no



Master in sustainable energy technologies (MaBET)



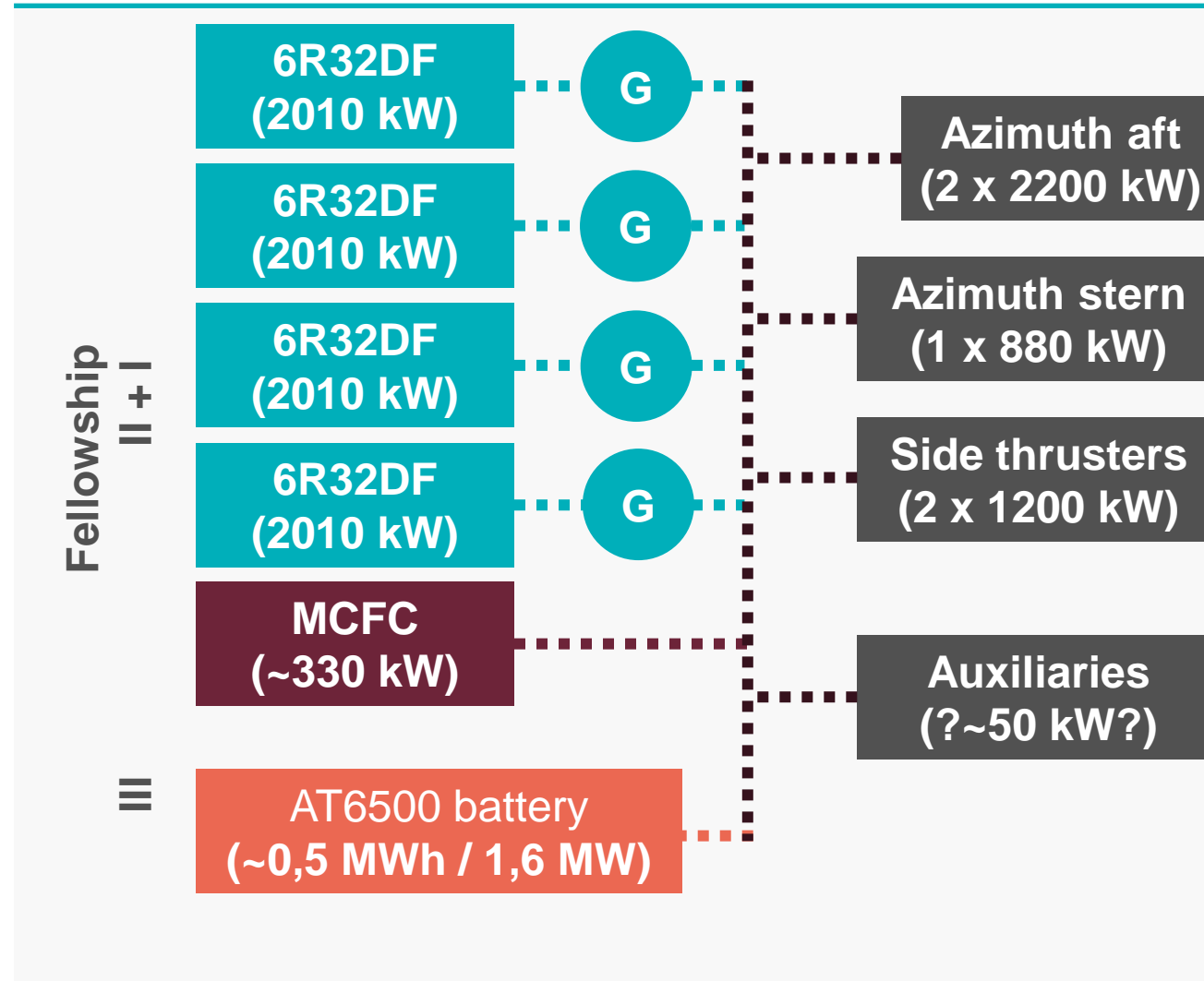
“Getting hooked”

Erratum / correction

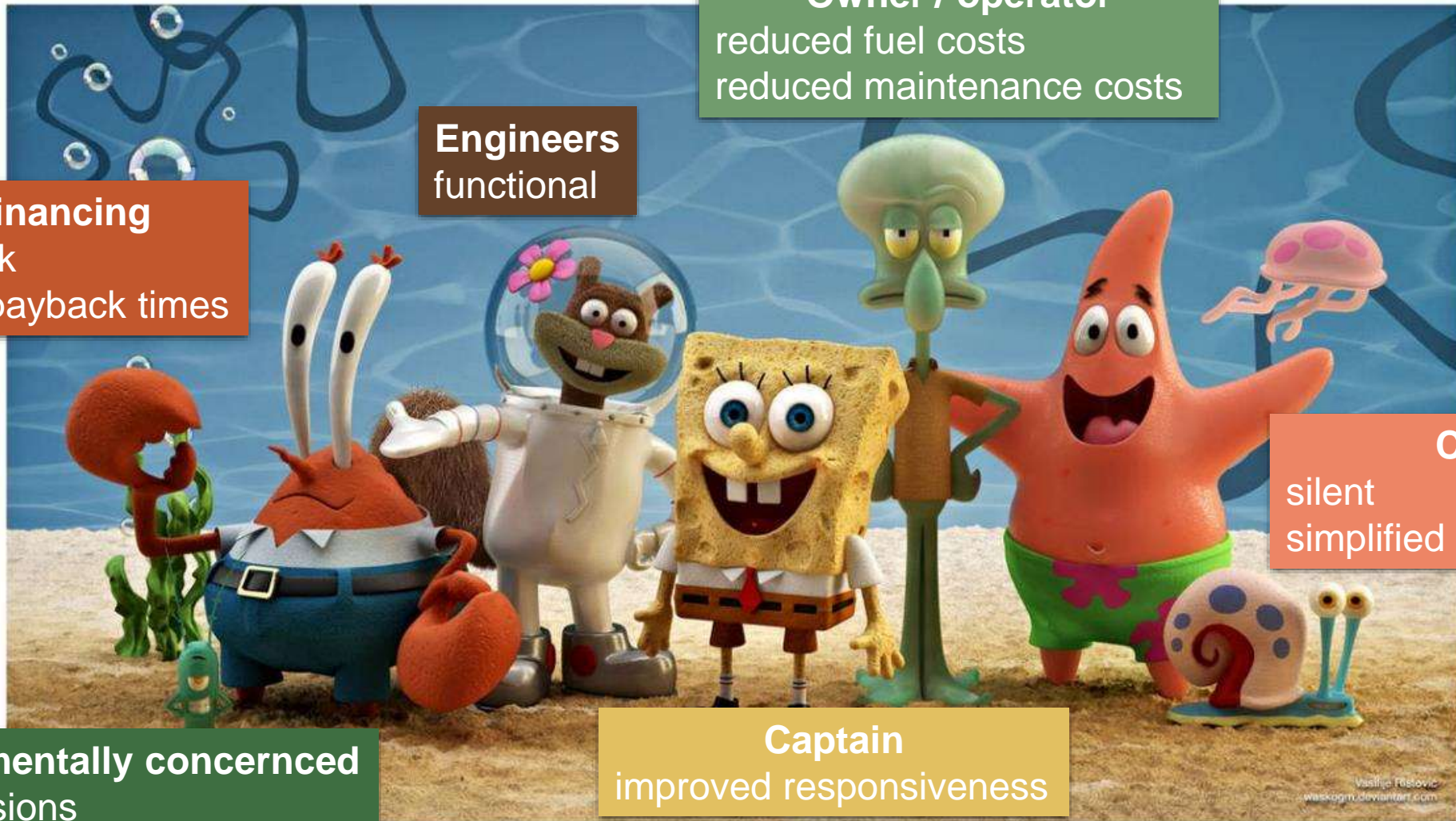
“After 15 years of extensive research, project partners Eidesvik Offshore, Wärtsilä Norway and DNV GL have recently announced the **closure of the FellowSHIP project**. It aimed to explore the use of battery, hybrid and fuel cell technology in the maritime industry.”



“Getting hooked, even more?”



“A five-letter word for happiness...money.”



Financing
low risk
short payback times

Engineers
functional

Owner / operator
reduced fuel costs
reduced maintenance costs


Crew
silent
simplified maintenance

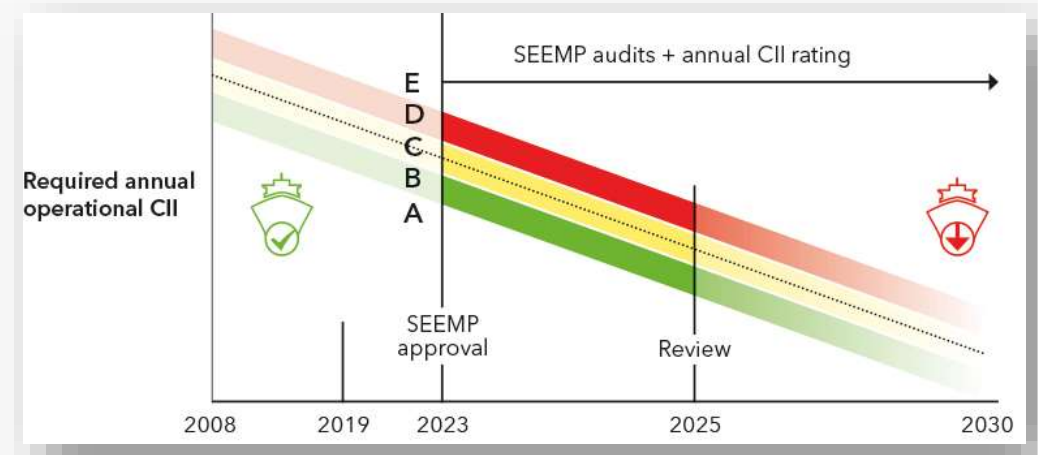
The environmentally concerned
reduced emissions

Captain
improved responsiveness



The 4th dimension (macro)

- 2004** • Norway's proposal for NG fuelled ship regulation
- 2009** • MSC.285(86) interim guidelines
- 2015** • MSC 95 IGF code (NG) adopted
- 2017** • IGF code enters into force
- 2023** • EEXI and CII rating 
- 2030** • Reduction of carbon intensity by 40% for all ships
- 2050** • Decarbonization level 100%-X



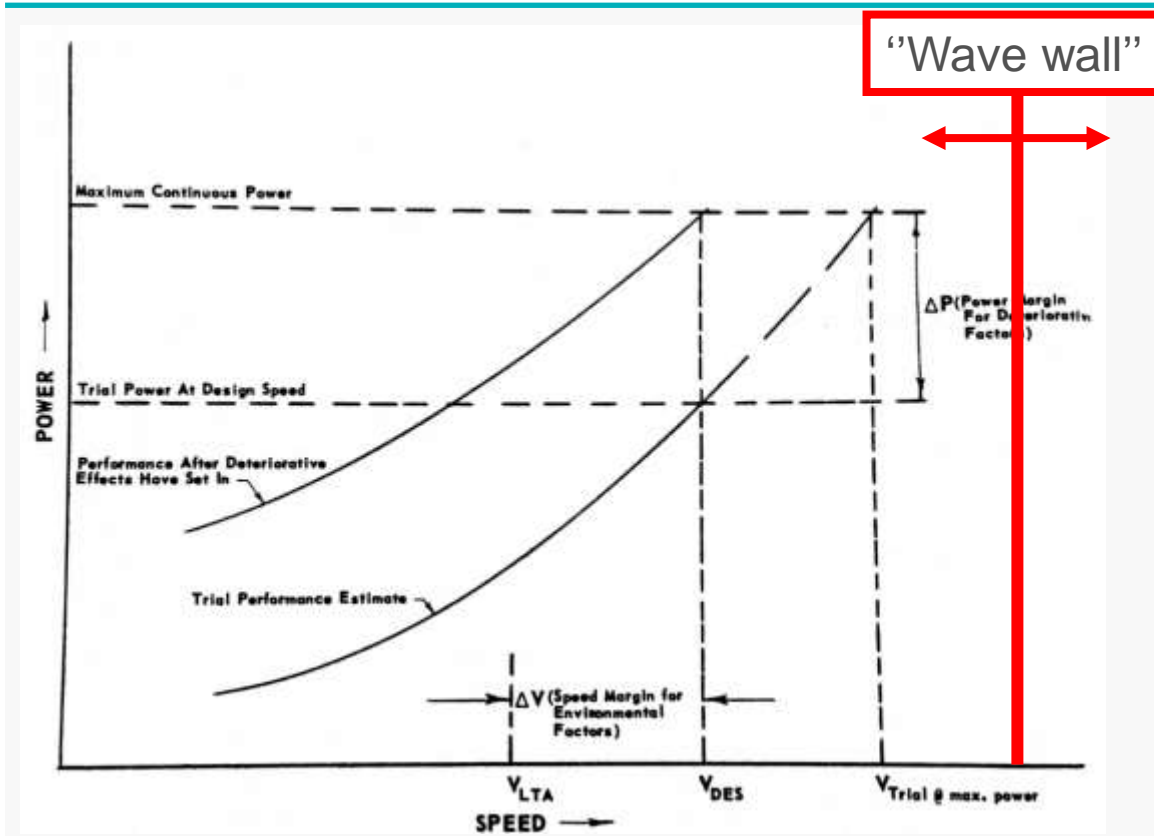
Development & Engineering ~1 year (T - 2)

Construction ~1 year (T - 1)

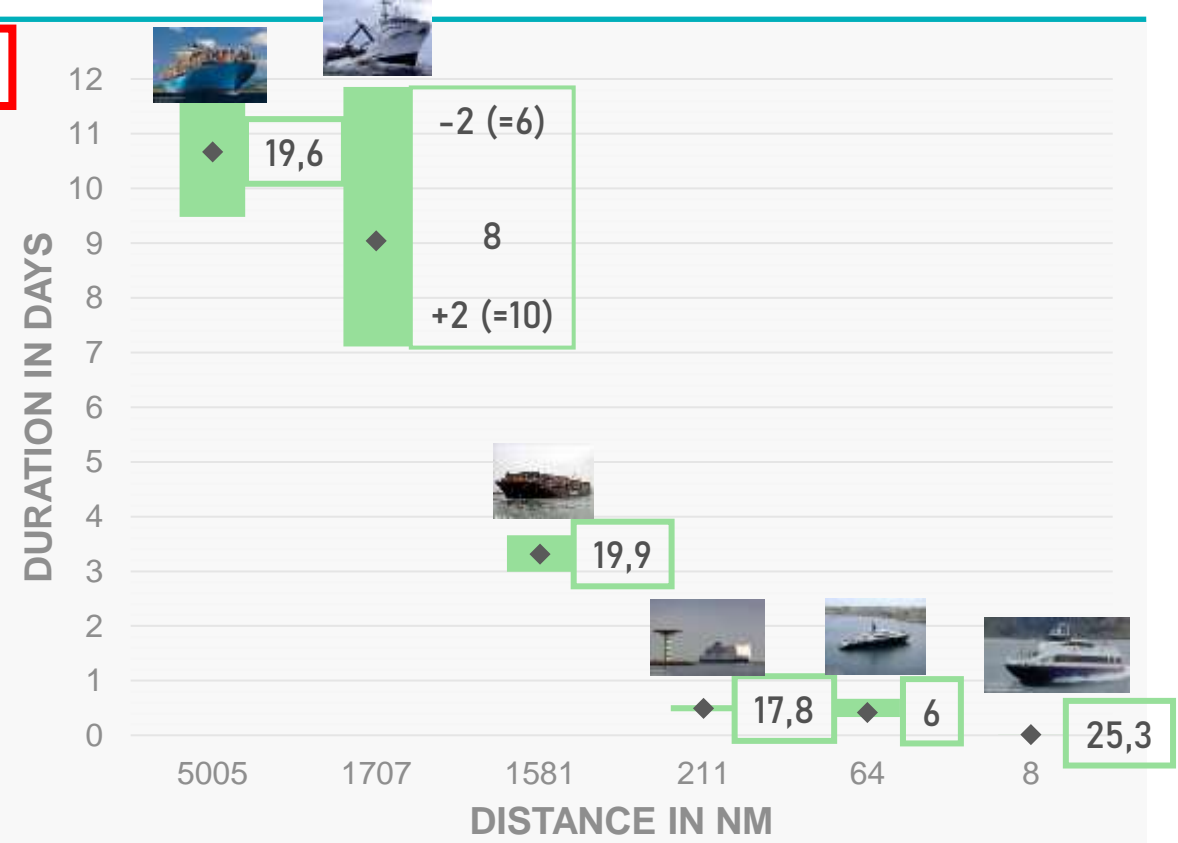
Operation up to 25 years (T + 25)



The 4th dimension (micro)



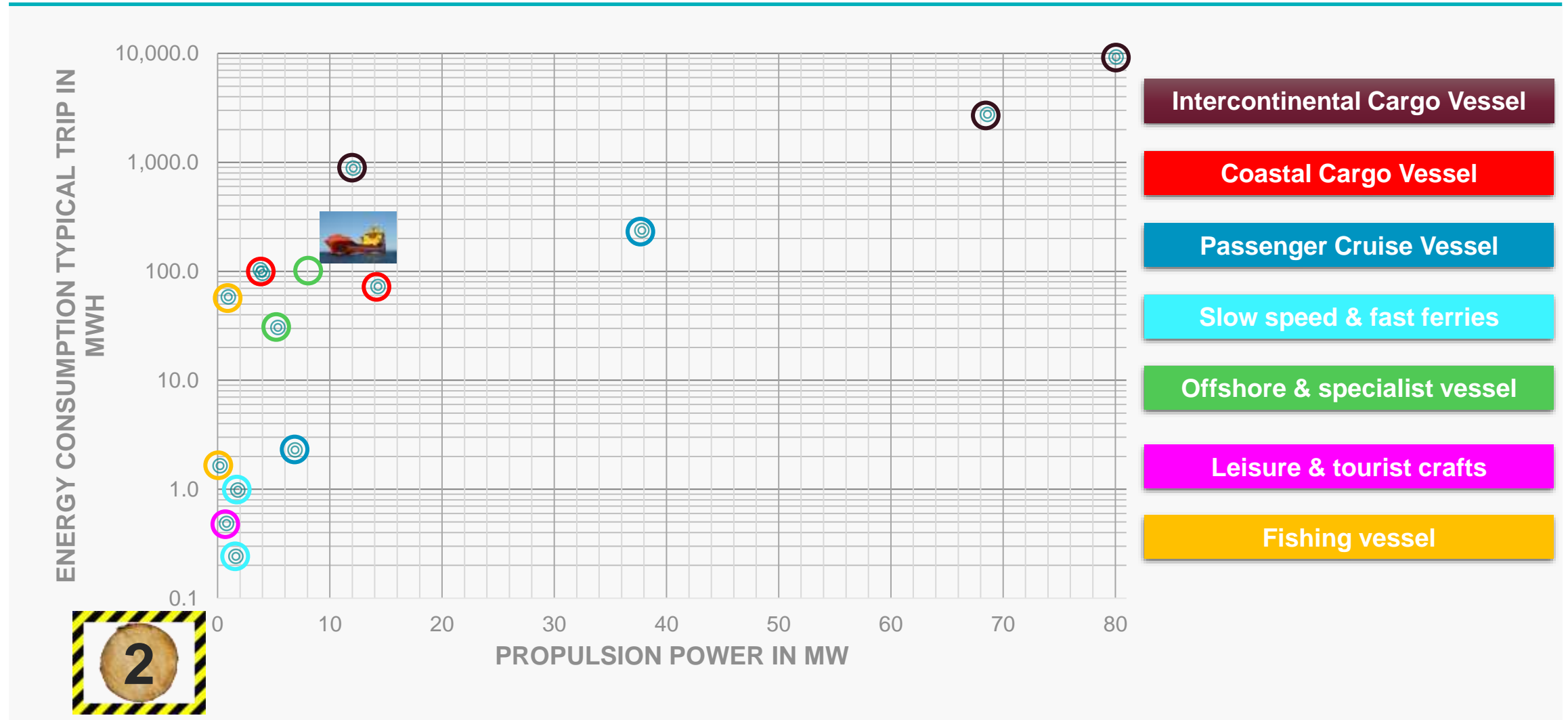
“The difference between the long-term average speed V_{LTA} and the design speed V_{DES} can be considered as a speed margin to maintain performance when operating in the environmental conditions to be expected. Likewise, the difference between maximum continuous power and power required to achieve design speed on trial can be considered as a power margin to maintain performance as the ship ages and deteriorative effects set in.”



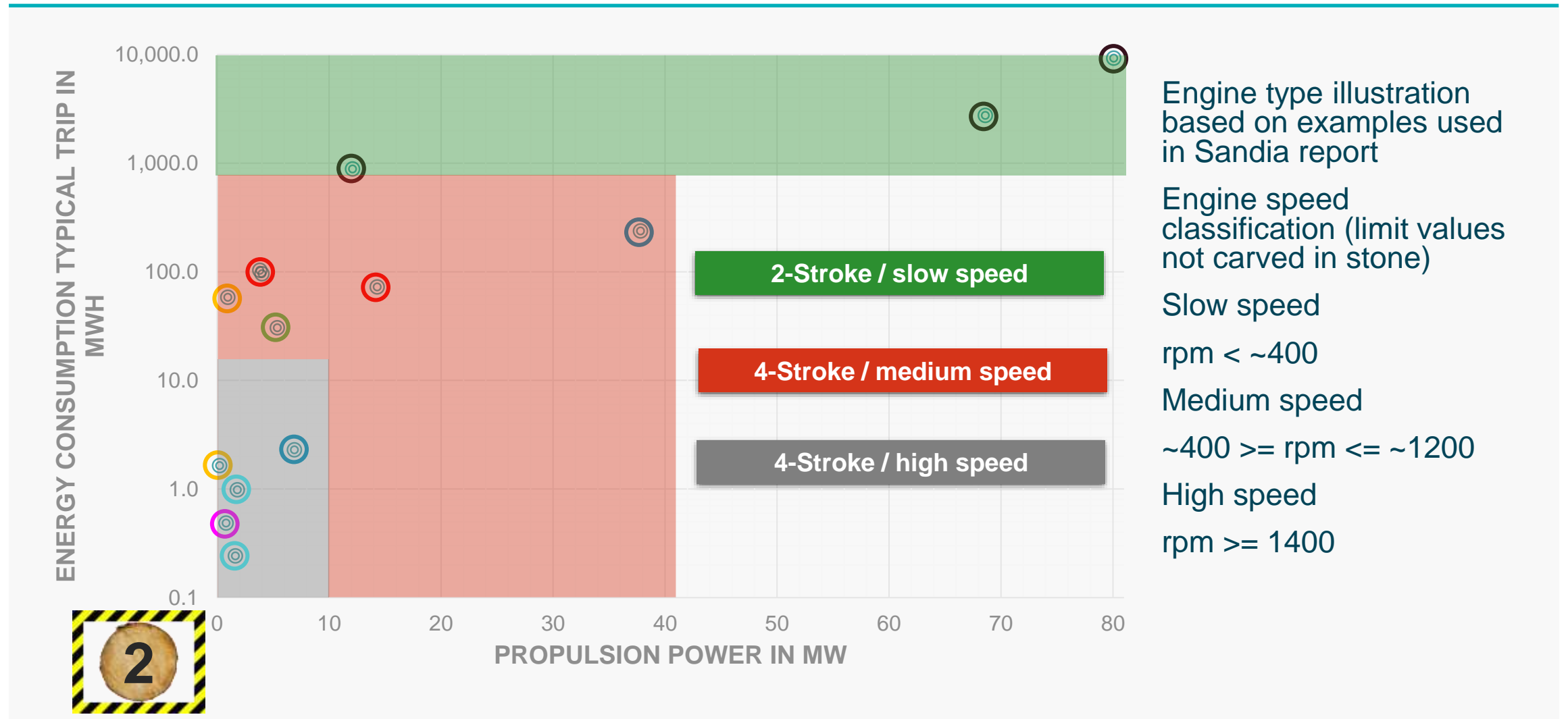
◆ Actual speed in knots (+/- variation by 2)
1 knot = 1 nautical mile (1,852 km) per hour



A closer look ... at all (1)

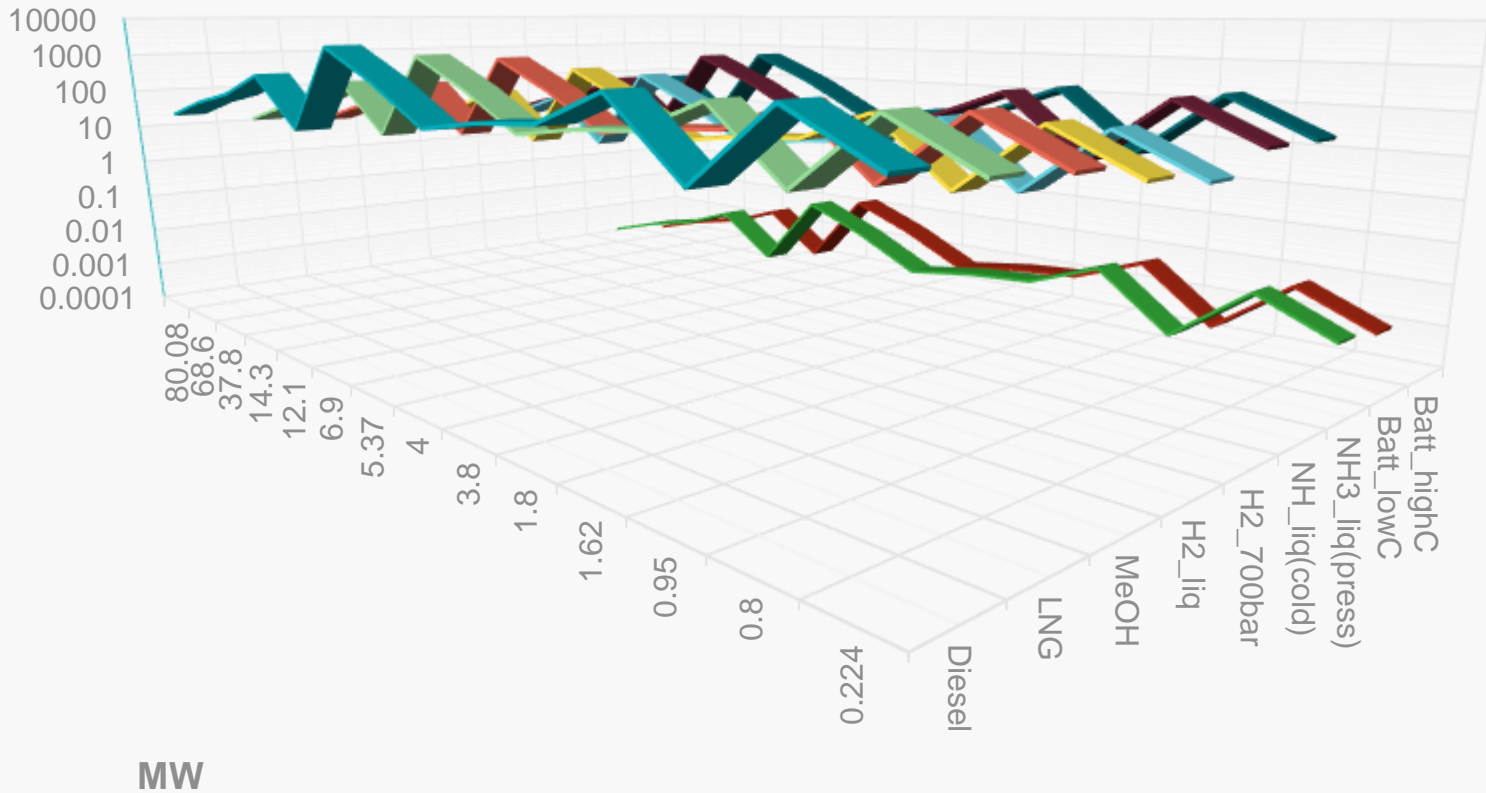


A closer look ... at all (2)



Not too close

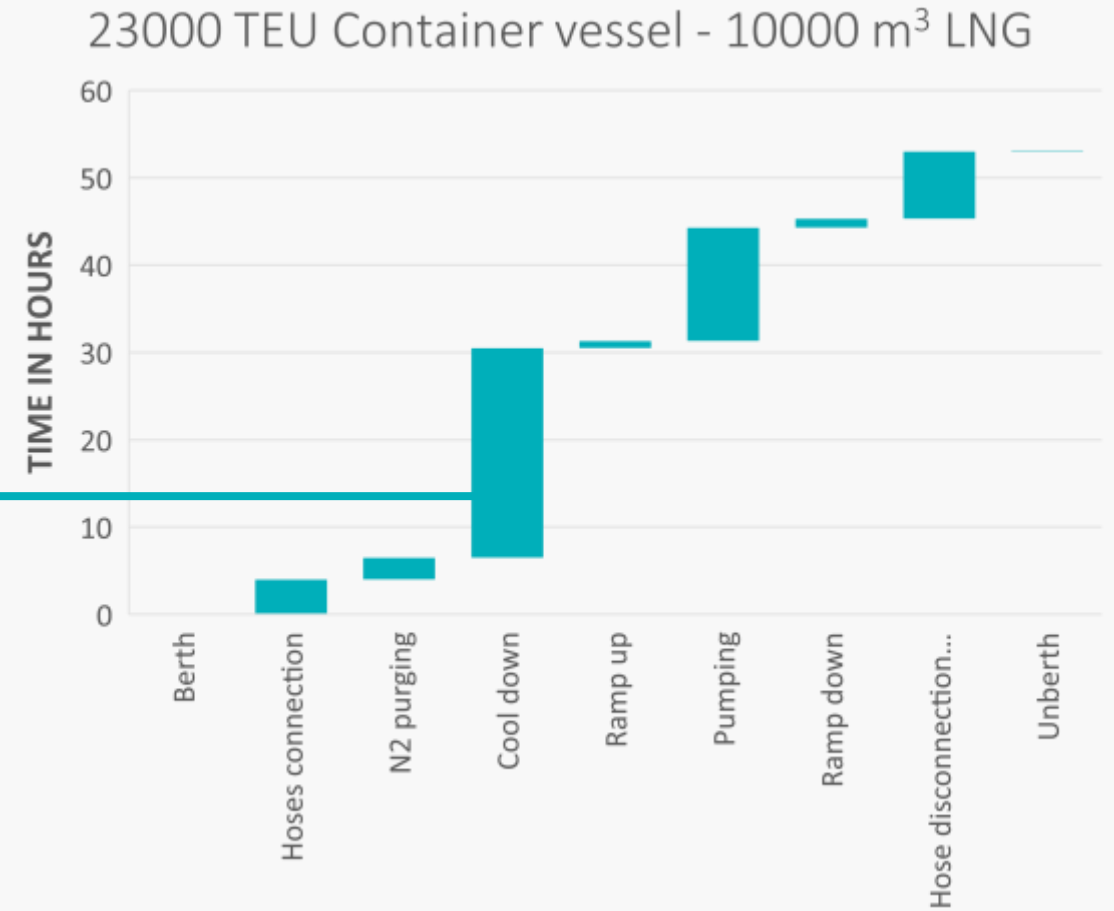
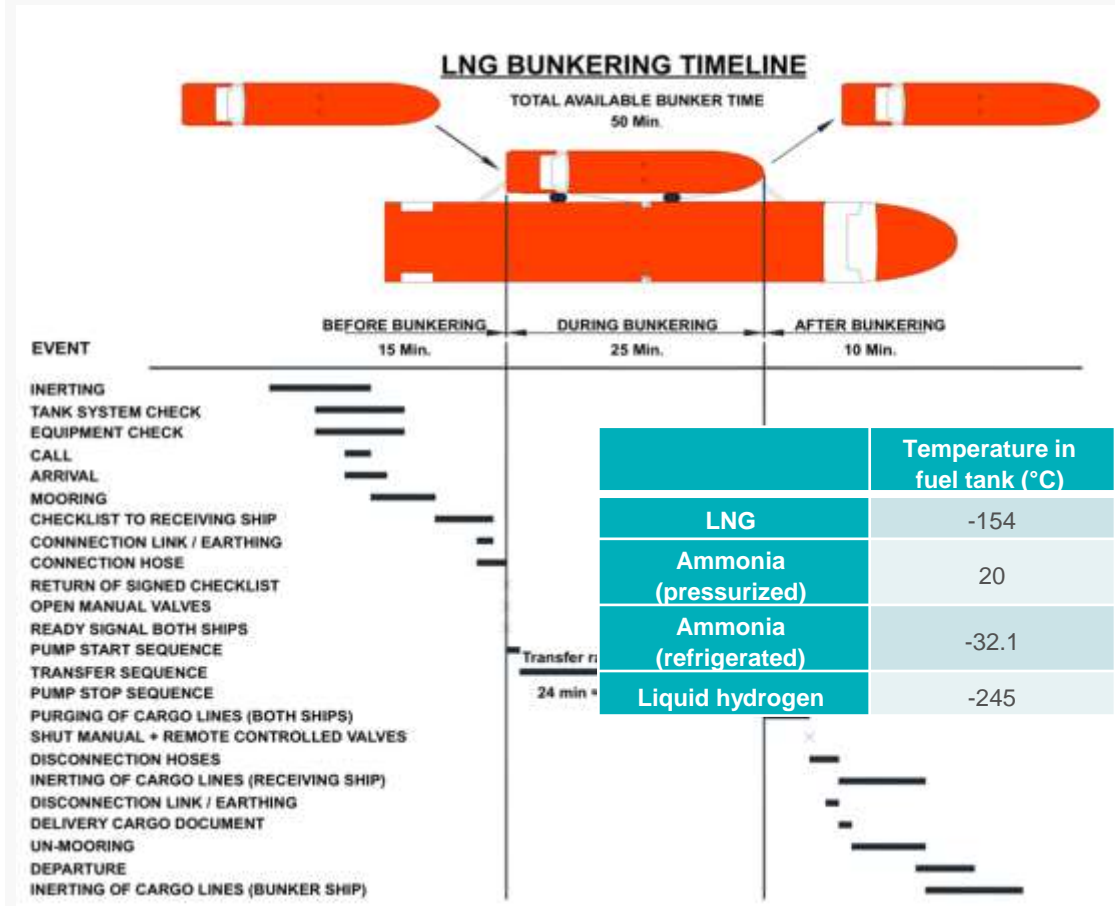
Trips per given tank volume for liquid fossil fuel (ref. Diesel)



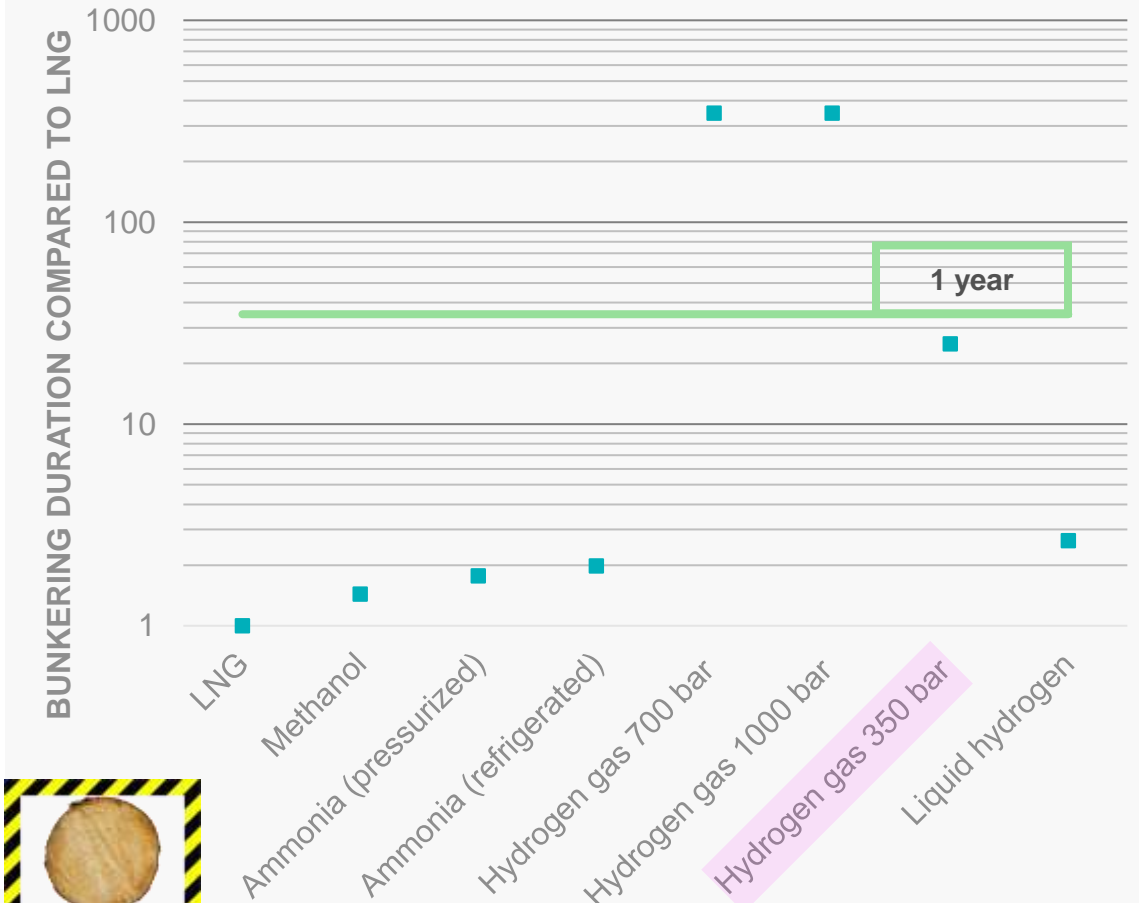
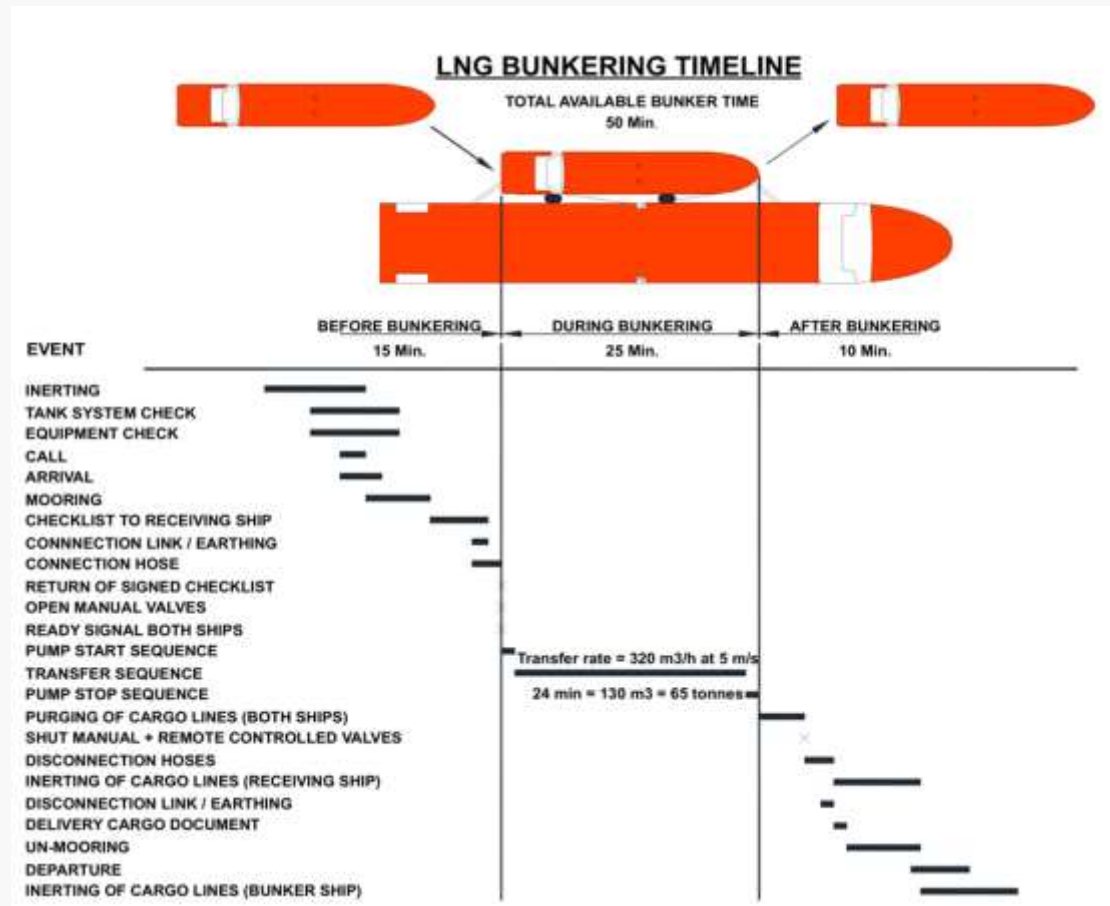
■ Diesel ■ LNG ■ MeOH ■ H2_liq ■ H2_700bar ■ NH_liq(cold) ■ NH3_liq(press) ■ Batt_lowC ■ Batt_highC



The 4th dimension - bunkering (1)



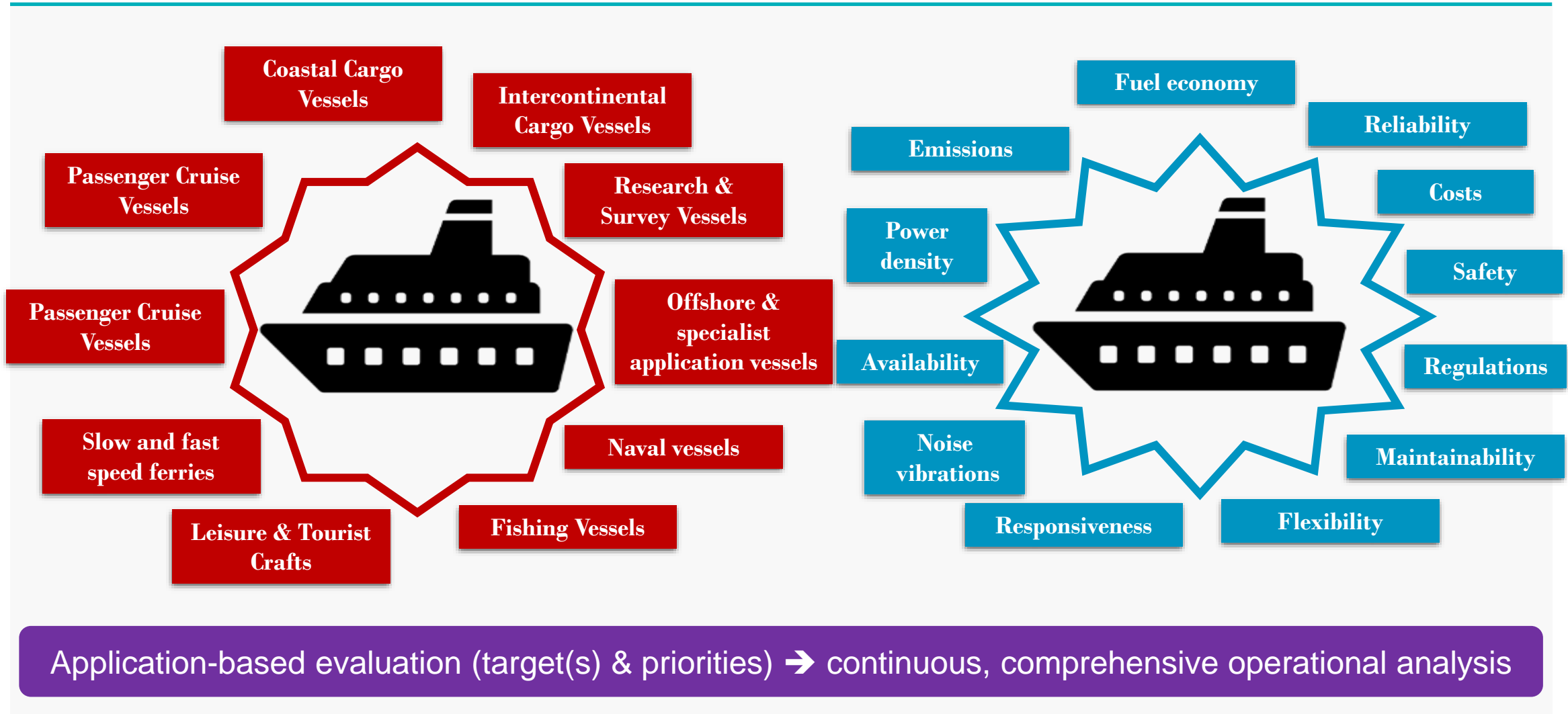
The 4th dimension - bunkering (2)



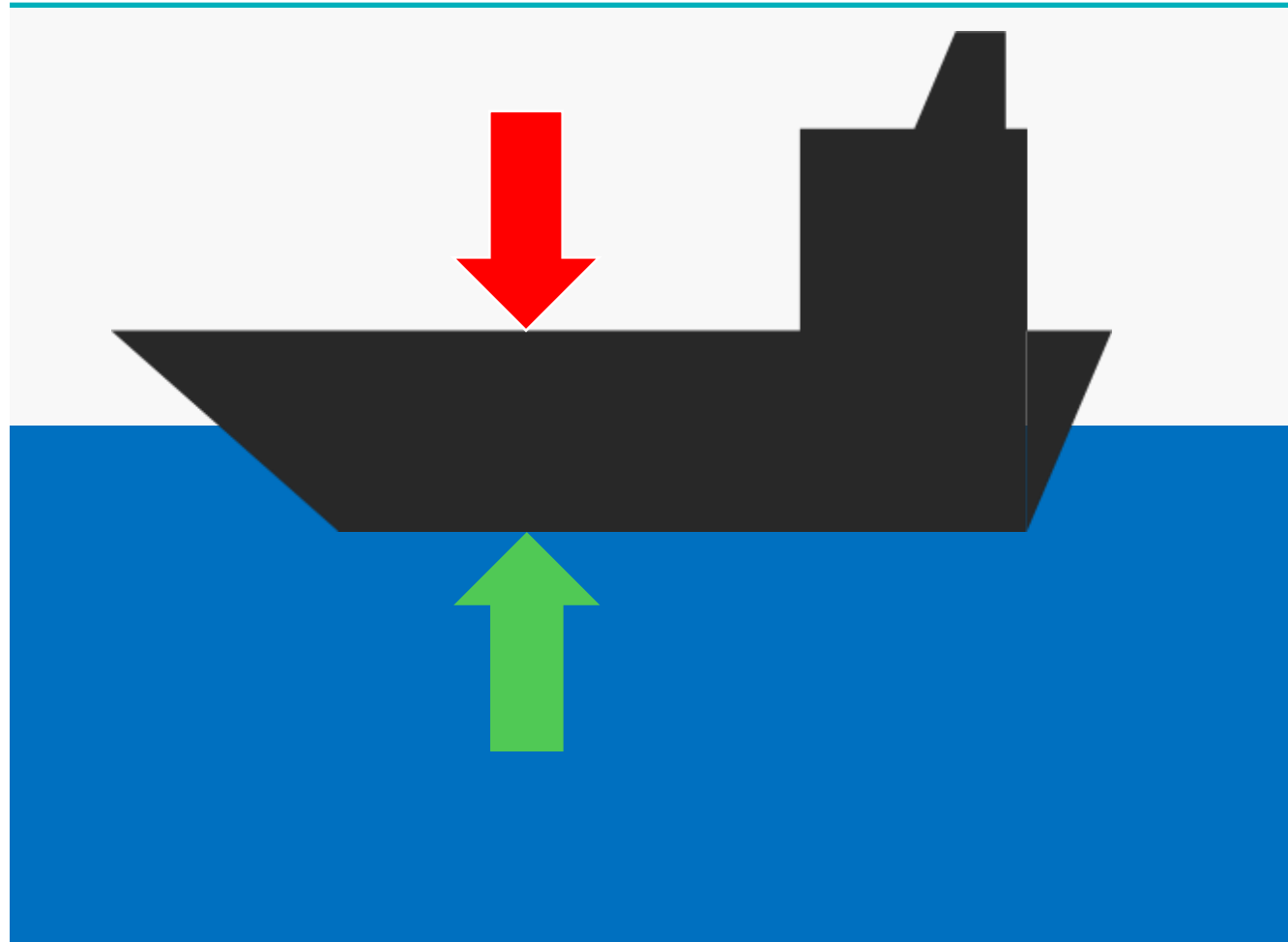
Claim not verified



Squaring the circle



Lessons learned – all about buoyancy*



$$B * L * D * \rho * g = m * g$$

with:

B

L

D

ρ

m

g

Incentives, finances

Rules & regulation

Logistics & infrastructure

In the right place at the right time

...

Reading recommendations

