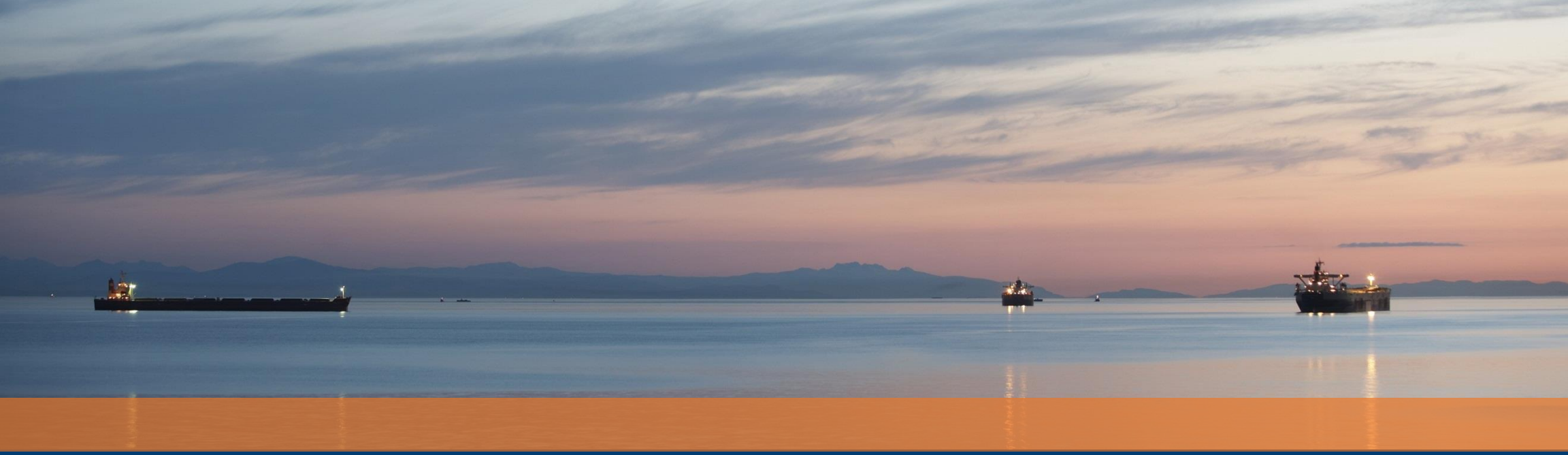

Global Marine Fuel Trends 2030

Shipping in Changing Climates

Katharine Palmer, Environmental Manager

Lloyd's Register Marine

UCL ENERGY INSTITUTE

Working together for a safer world

We have developed a new piece of research

Global Marine Fuel Trends 2030

Which fuel?
Which technology?
CO_2 emissions?

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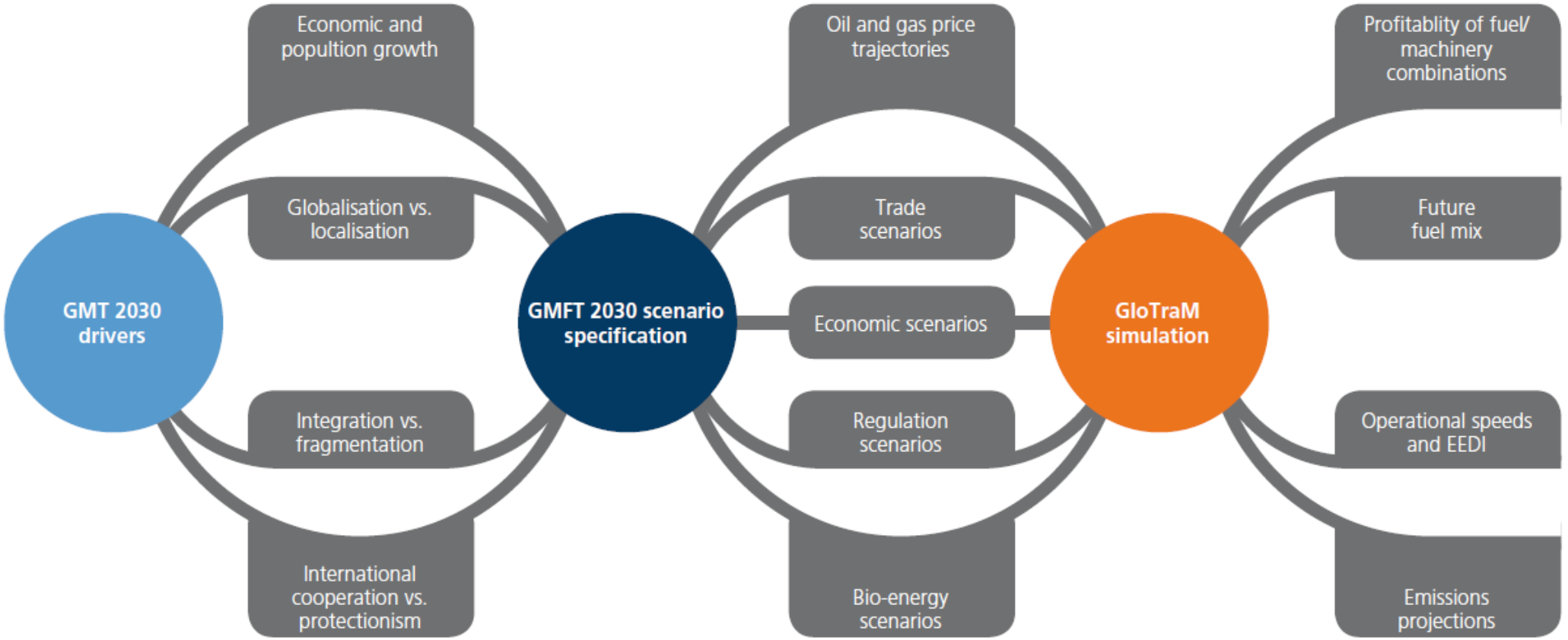
LOW CARBON SHIPPING
A SYSTEMS APPROACH

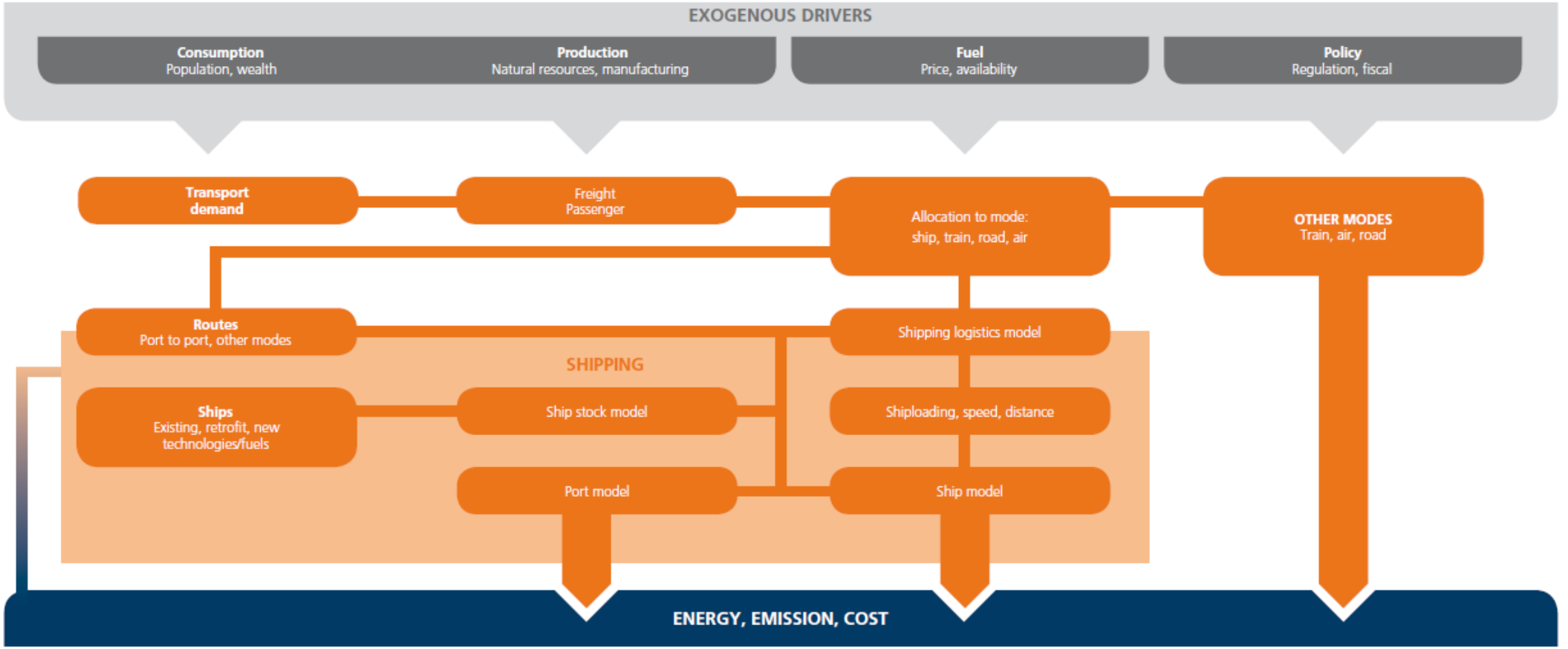
We take our previous research forward



3 scenarios for deep sea shipping

Status Quo	Business as usual
	Short term regulatory solutions
	Economic growth at the current rate
Global Commons	International cooperation and trade agreements
	Emphasis on environment and climate change
	Expansion in globalisation
Competing Nations	Local production and consumption
	Regulatory fragmentation
	Brake in globalisation

Main assumption: maximum profit and regulatory compliance

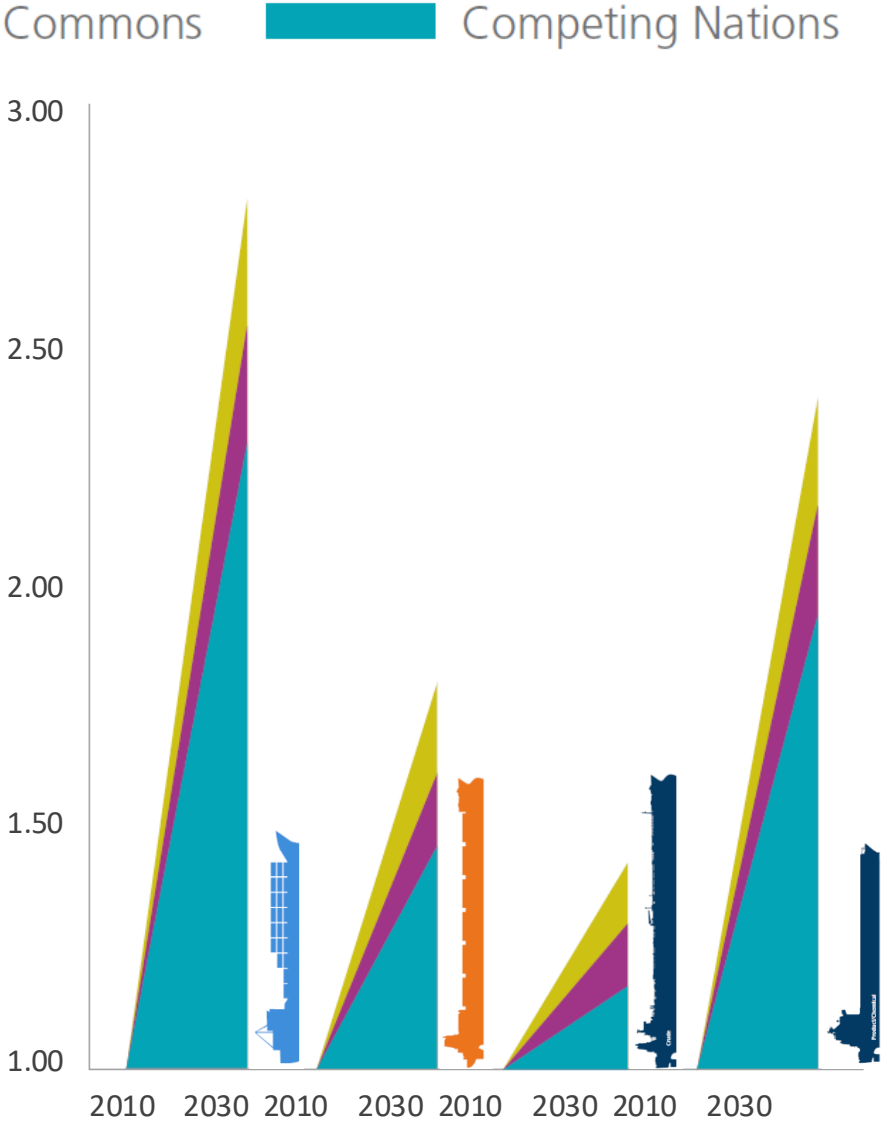


Deep sea shipping trade will grow in all scenarios

Containerships

Bulk carriers/general cargo ships

Tankers (crude/products/chemical)

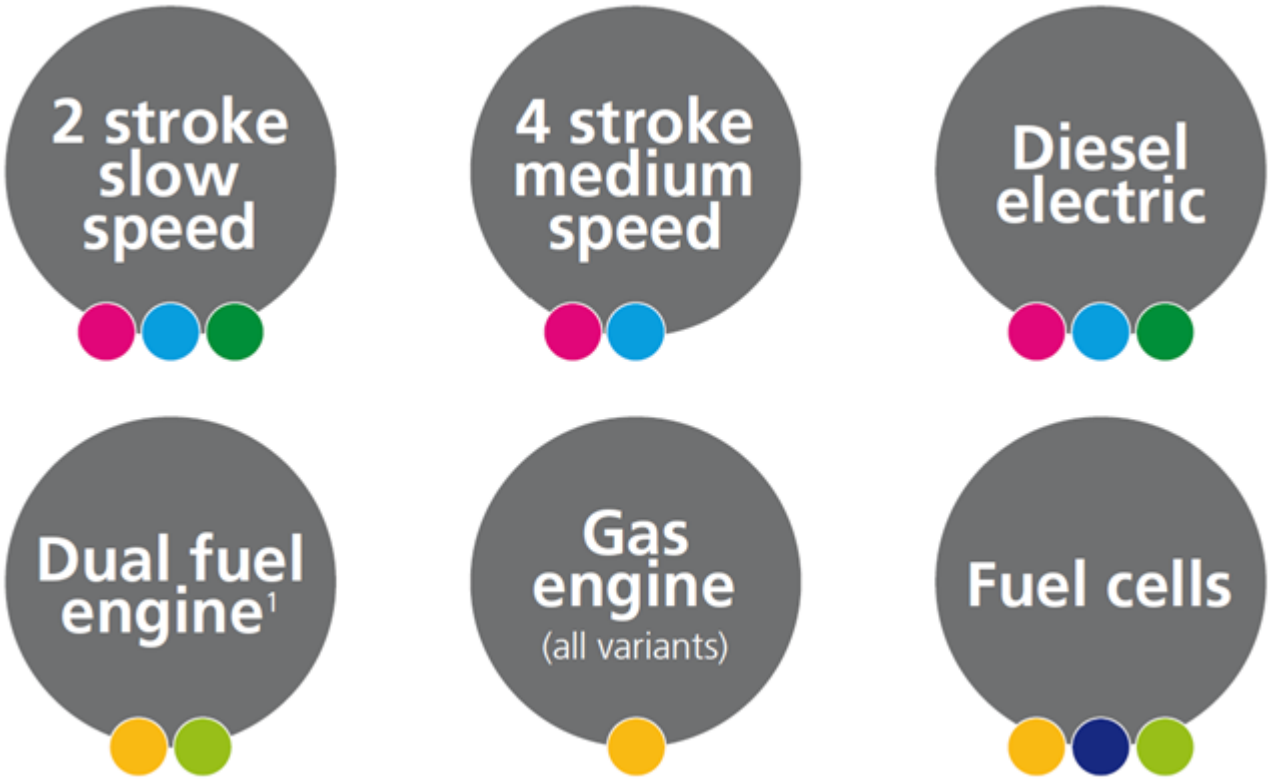


We considered many different options

Marine residual (HFO)	Straight vegetable oil (bio-HFO)	Low sulphur fuel oil (LSHFO)
Straight vegetable oil (bio-LSHFO)	Marine distillate (MDO/MGO)	Biodiesel (1st/2nd gen)
Liquefied natural gas (LNG)	Biogas (bio-LNG)	Hydrogen
Bio-hydrogen	Methanol (MeOH)	Bio-methanol

Technologies to match the fuels

HFO MDO/ MGO LSHFO LNG Hydrogen Methanol



Technology performance parameters

- Capital cost (UPC)
- Through-life cost (TCL)
- Specific fuel consumption (SFC)
- Deadweight loss

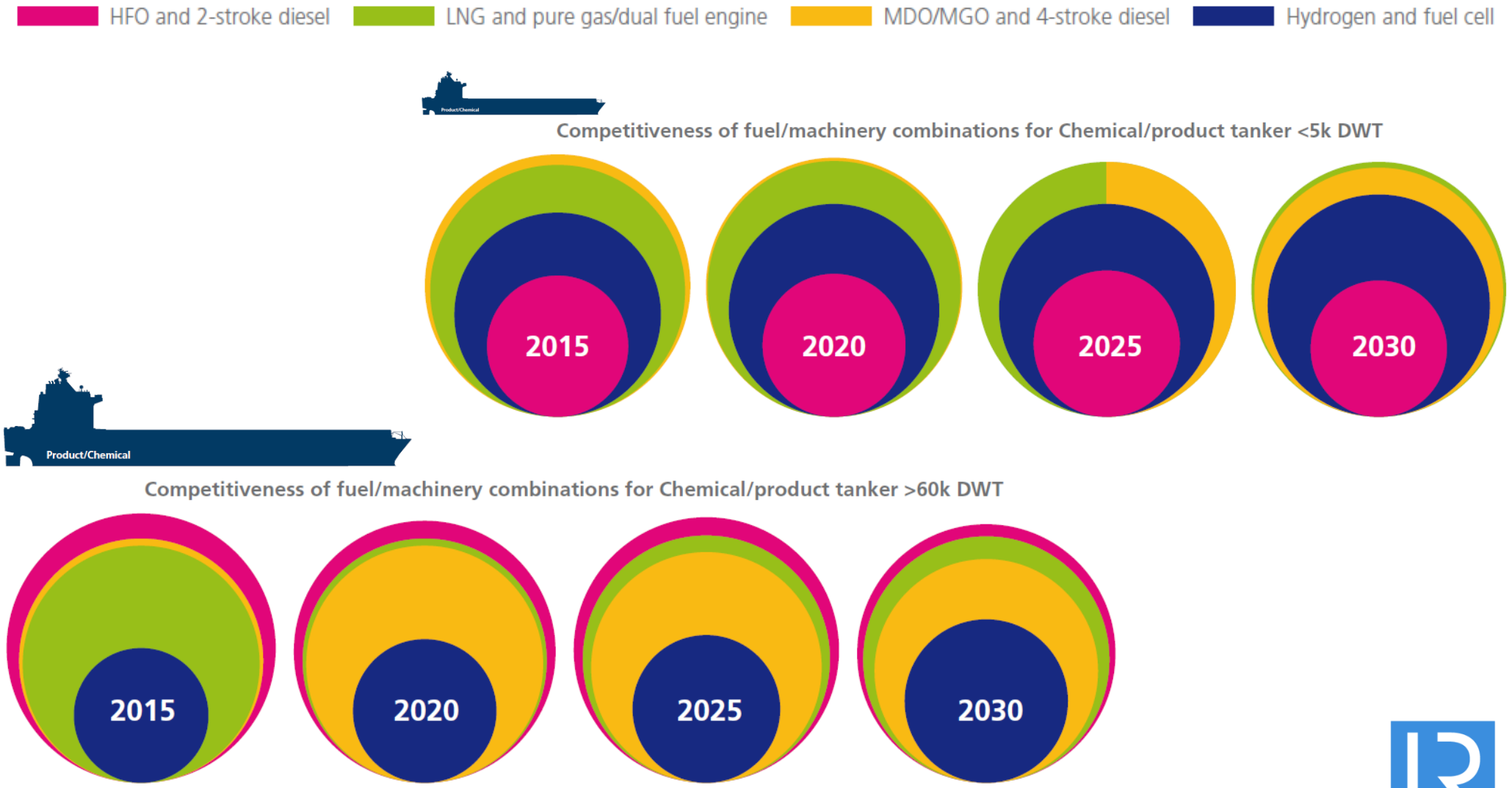
Efficiency technology affects the fuel mix

Containers Bulk Carriers Tankers

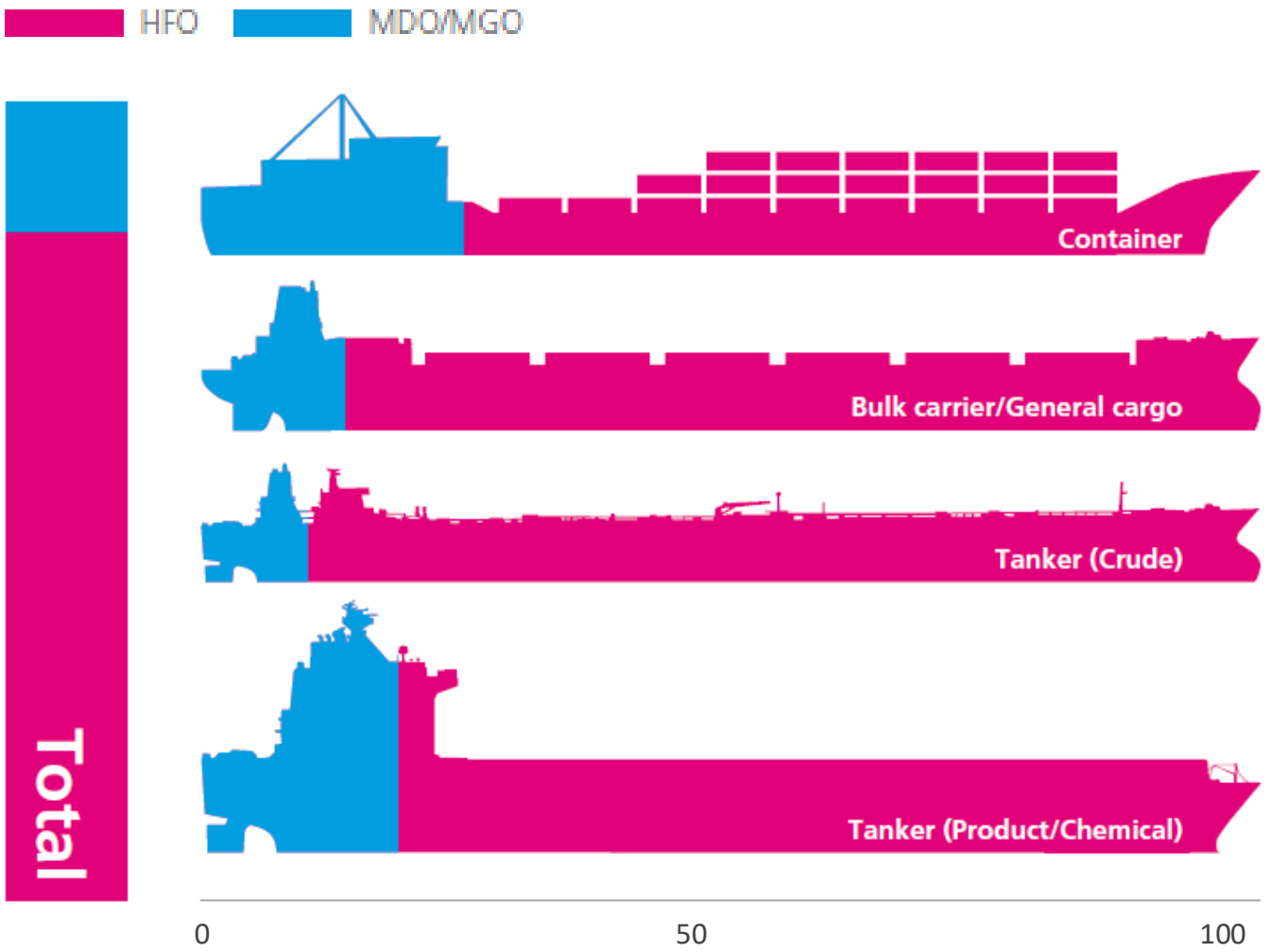
	Containers	Bulk Carriers	Tankers
Superstructure streamlining	▲		
Wing pods	▲	▲	▲
Pulling pods	▲	▲	▲
Contra-rotating props	▲	▲	▲
Vane Wheel			
Prop section optimisation			▲
Ducted Propeller			▲
Pre-swirl duct			▲
Propeller upgrade			▲
Propeller boss cap fin			▲
Asymmettric Rudder			▲
Propeller rudder bulb		▲	▲
Waterline extension	▲		
Hull coating 1 (biocid	▲	▲	▲
Hull coating 2 (fo	▲	▲	▲
Hull cleaning	▲	▲	▲
Propeller p	▲	▲	▲
Wind e		▲	▲
Win	▲	▲	▲
openings	▲	▲	▲
ation of water flow of openings	▲	▲	▲

	Containers	Bulk Carriers	Tankers
Covering hull openings	▲	▲	▲
Speed control pumps and fans	▲	▲	▲
Energy saving lighting	▲	▲	▲
Efficient Boiler			▲
Autopilot upgrade/adjustment	▲	▲	▲
Trim and ballast optimisation	▲	▲	▲
Optimisation of dimensions (fast)	▲		
Prop Hull optimisation	▲	▲	▲
Skeg optimisation	▲	▲	▲
Improved Rudder	▲	▲	▲
Stator fins	▲	▲	▲
Solar Power (Hotel dry and wetbulk)		▲	▲
Solar Power (Hotel container)	▲		
Optimisation of dimensions (slow)		▲	▲
Air lubrication (air curtain with PTO)	▲	▲	▲
Air lubrication (cavity with PTO)	▲	▲	▲
Sails		▲	▲
Shore power / cold ironing	▲	▲	▲
Main Engine Tuning Phase 1	▲	▲	▲
Main Engine Tuning Phase 2	▲	▲	▲

Not all fuels/technology are equally competitive



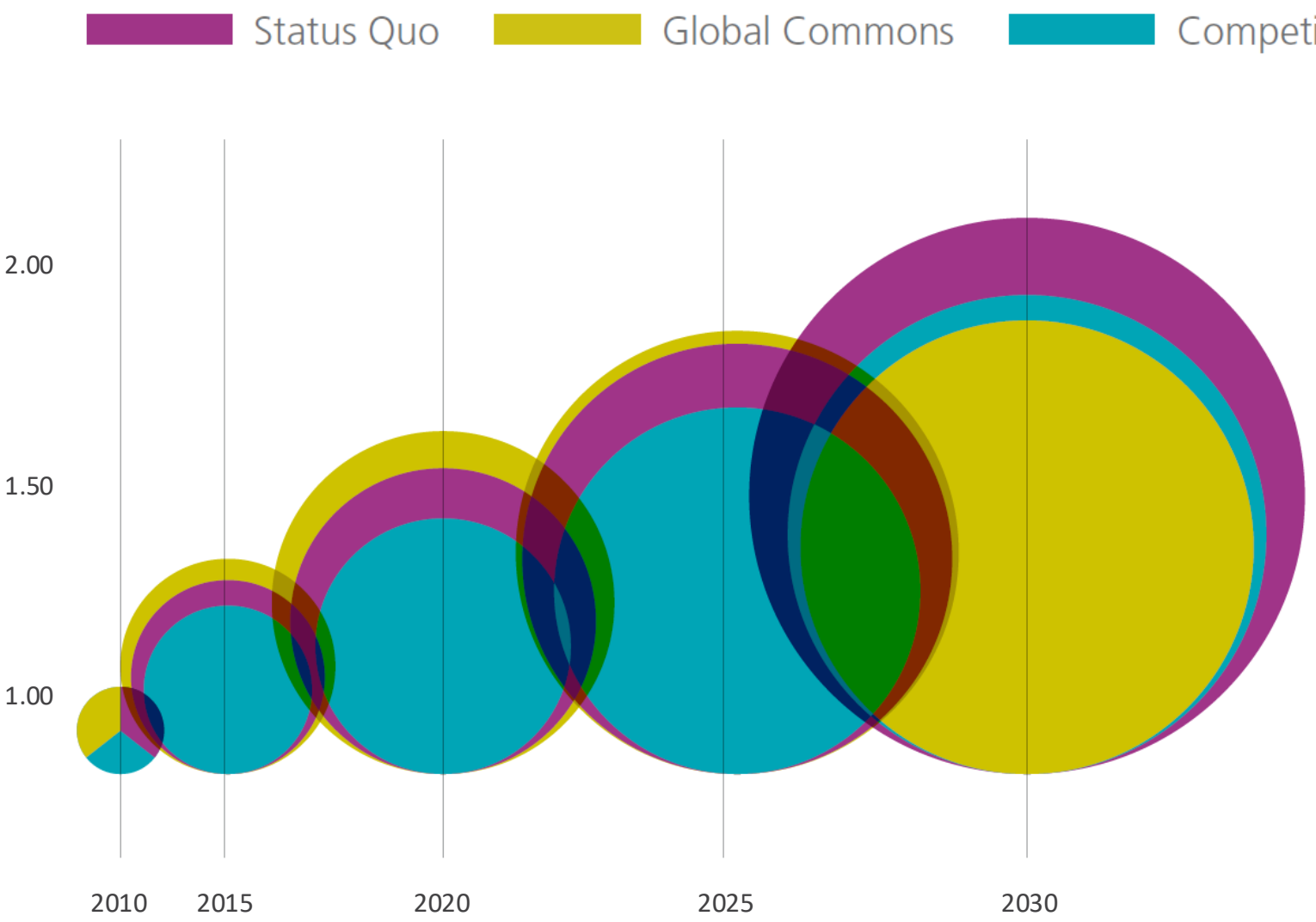
Only 2 fuels for deep sea shipping in the mix today



Baseline

Global Marine Fuel Trends 2030

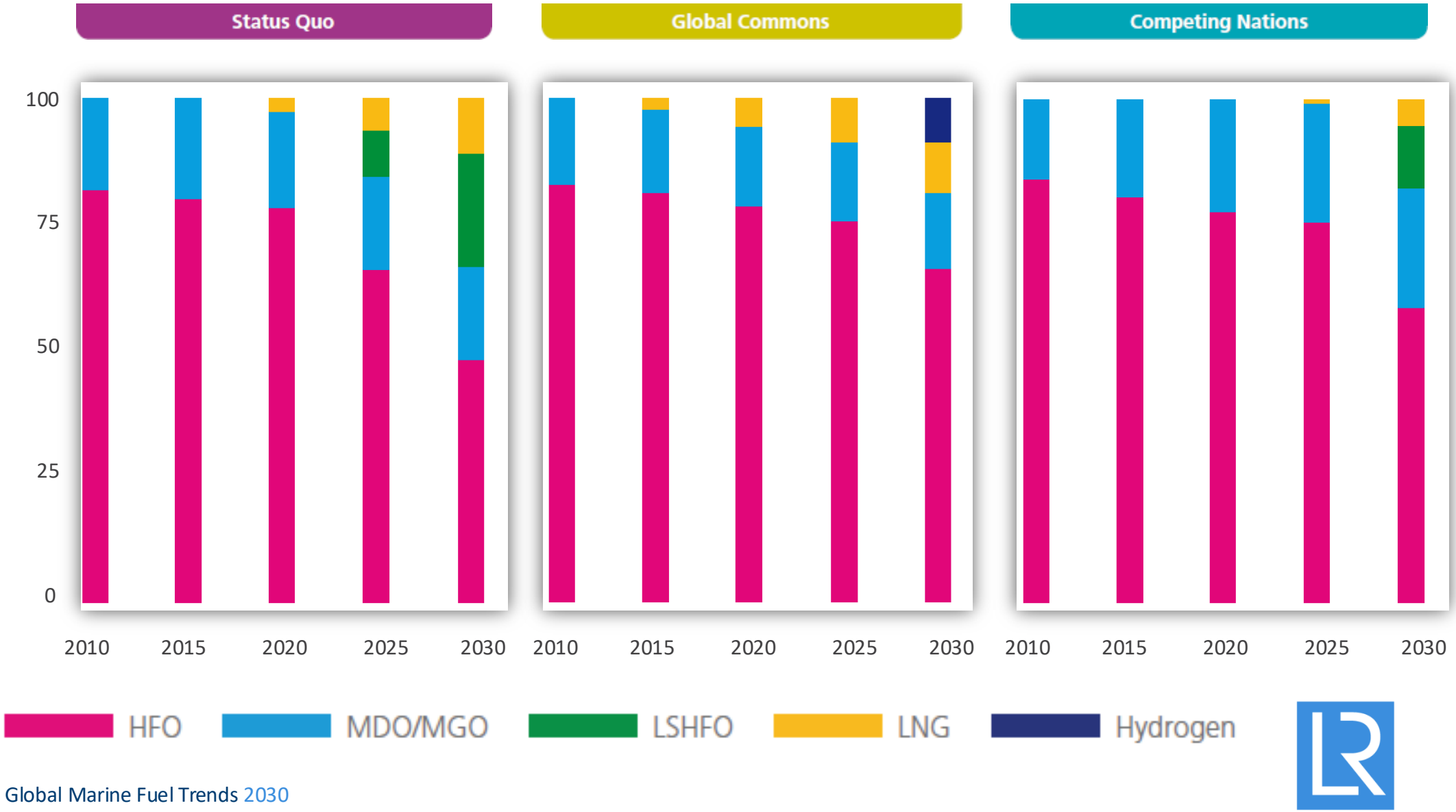
We will need twice as much fuel by 2030



In Global Commons, efficiency improvements and speed reductions will mean less fuel is needed

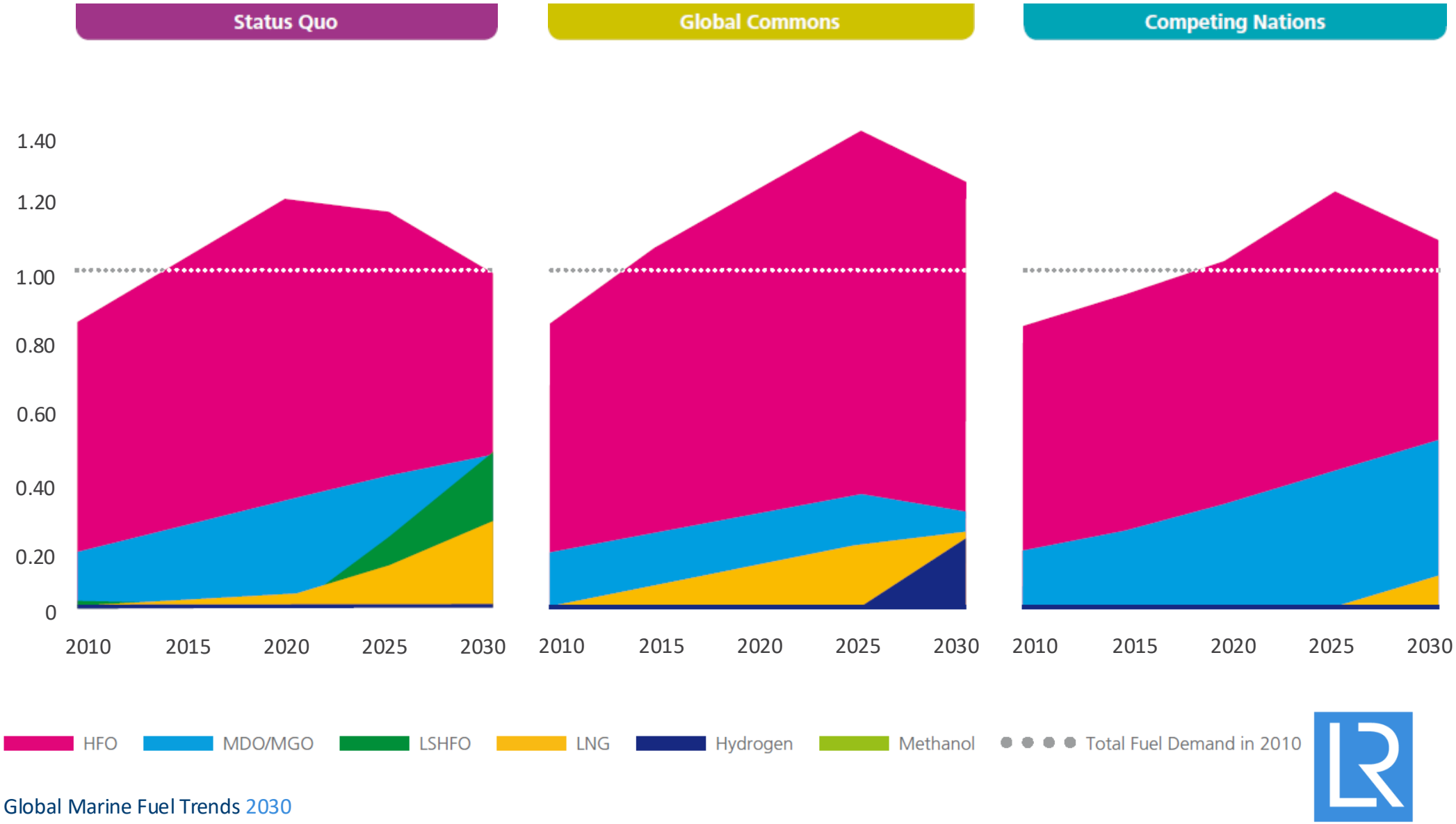
Global Marine Fuel Trends 2030

Up to 11% LNG share for deep sea shipping



Global Marine Fuel Trends 2030

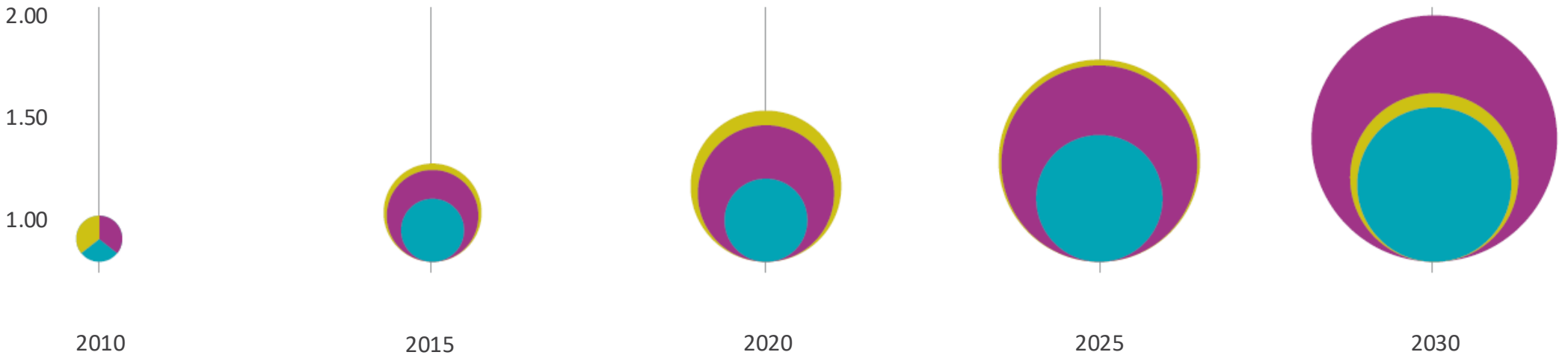
24% LNG compared to 2010 overall fuel demand



Different scenarios for CO_2 emissions

Status Quo: worst case for CO_2 emissions

Competing nations: lowest overall but increasing trend



Global commons: carbon policy reverses the trend from 2025

It will be an interesting transition

Change cannot happen overnight

HFO will have a high but declining share in 2030

LNG will reach up to 11% of the fuel mix by 2030

There will be no “one size fits all” fuel and technology

Society’s response to climate change will be a driver

In a carbon-focused scenario, Hydrogen can emerge

It’s all about adapting to change

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