Future-Fit Ships:
How to Maximise Existing Assets & Renew a Fleet through Transitional Times

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The maritime energy transition is a multi-faceted challenge

LR has made large investments across the industry to support clients to navigate the technical, commercial and strategic challenges associated with this transition

TOP-DOWN APPROACH: STRATEGIC POSITIONING

Fleet Replacement

Charterer Ambition

Fuel Readiness & Availability

OUTPUTS

FLEET STRATEGY

FUTURE FUEL STRATEGY

MITIGATE RISK & POSITION COMPANIES FOR FUTURE SUCCESS

BOTTOM-UP APPROACH: FLEET MODELLING

Vessel-level Emissions Modelling

Trading Patterns

Drydock Cycles & CAPEX Budgets

OUTPUTS

OPERATIONAL MEASURES

TECHNOLOGY IMPLEMENTATION

SHIP VALUE CHAIN

DESIGN

FINANCE

BUILD

OPERATE

ALTERNATIVE FUEL VALUE CHAIN

PRODUCTION

DISTRIBUTION

BUNKERING

CARGO VALUE CHAIN

UPSTREAM CARGO SUPPLY CHAIN

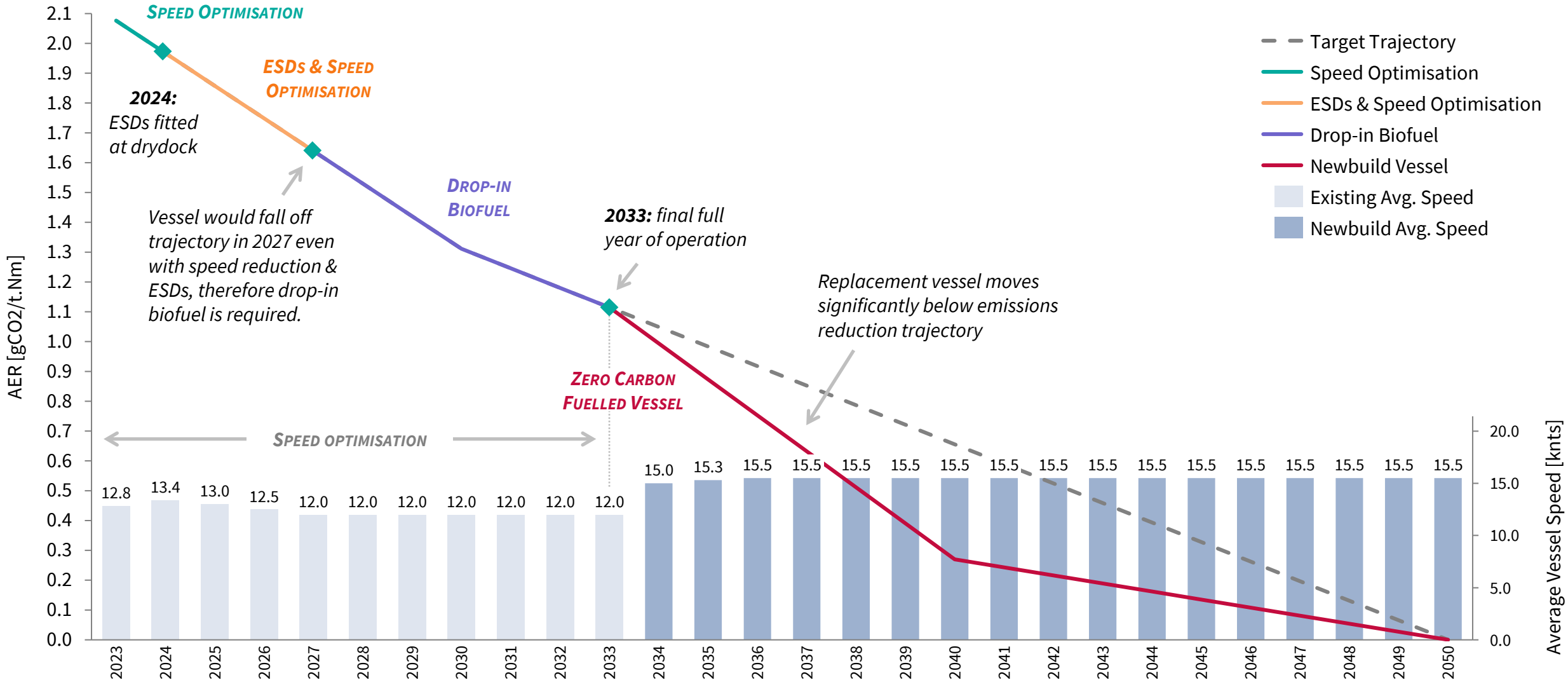
LOADING

SHIP

VOYAGE

How can we maximise the life of our existing assets?

Vessels require transition pathways based on robust techno-economic modelling that builds a chain of technical and operational solutions to ensure that vessels align with emissions reduction targets



How we evaluate newbuild investment decisions is changing rapidly

In order to effectively evaluate the commercial and environmental performance of a newbuild, LR have built a framework that evaluates both the technical specification of the vessel and its operational profile to help owners make well-informed investment decisions

IT IS MORE IMPORTANT THAN EVER FOR STAKEHOLDERS TO FUTURE-PROOF THEIR INVESTMENTS TO AVOID THE FOLLOWING CONSEQUENCES:

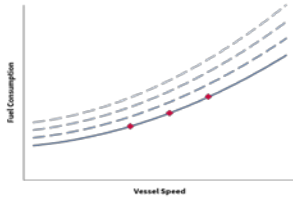
- Stranding of assets
- Regulatory penalties
- Loss of market share & competitive position

These consequences are by-products of the following dynamic drivers:

- CHANGING ENVIRONMENTAL REGULATIONS
- SHIPPING MARKET TIERING
- NEW CHARTERER ENVIRONMENTAL NEEDS
- CHARTERER FUEL & TECHNOLOGY PREFERENCES
- FUEL READINESS & AVAILABILITY

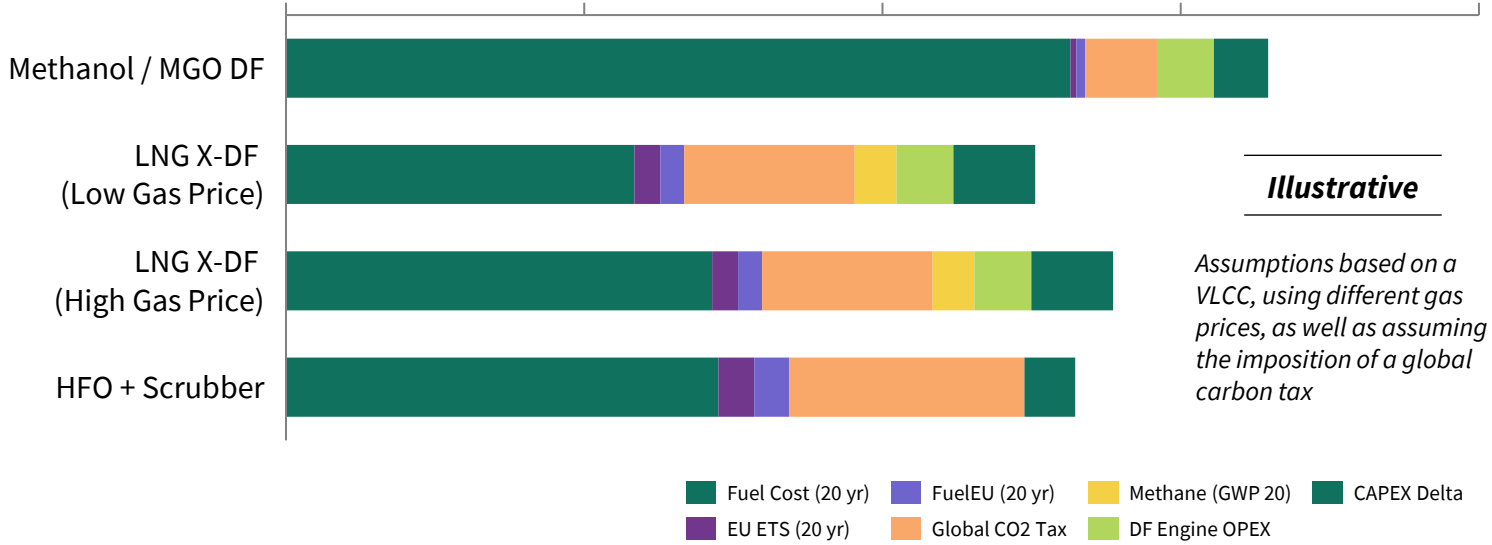
NEWBUILD OPPORTUNITY

TECHNICAL NEWBUILD MODEL



OPERATIONAL PROFILE

Total Cost of Ownership (20 year) [Mn USD]

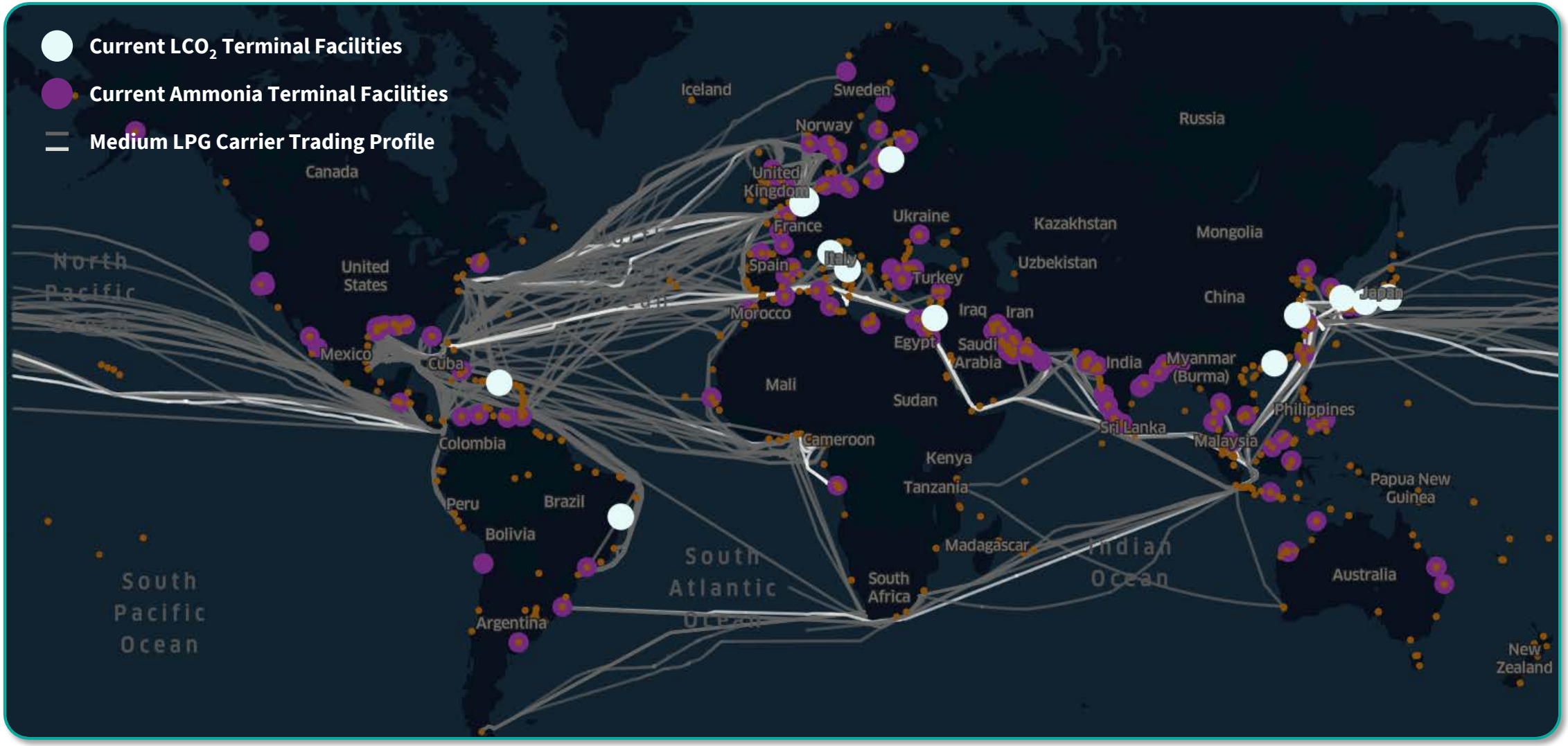


Illustrative

Assumptions based on a VLCC, using different gas prices, as well as assuming the imposition of a global carbon tax

Multi-Gas Carriers: Technically Feasible but Operationally Impractical?

As future energy markets evolve, having cargo optionality between LPG and NH3 will maximise value extraction from vessels but is it practical to add LCO2 into the mix?



Source: Lloyd's Register, Clarksons

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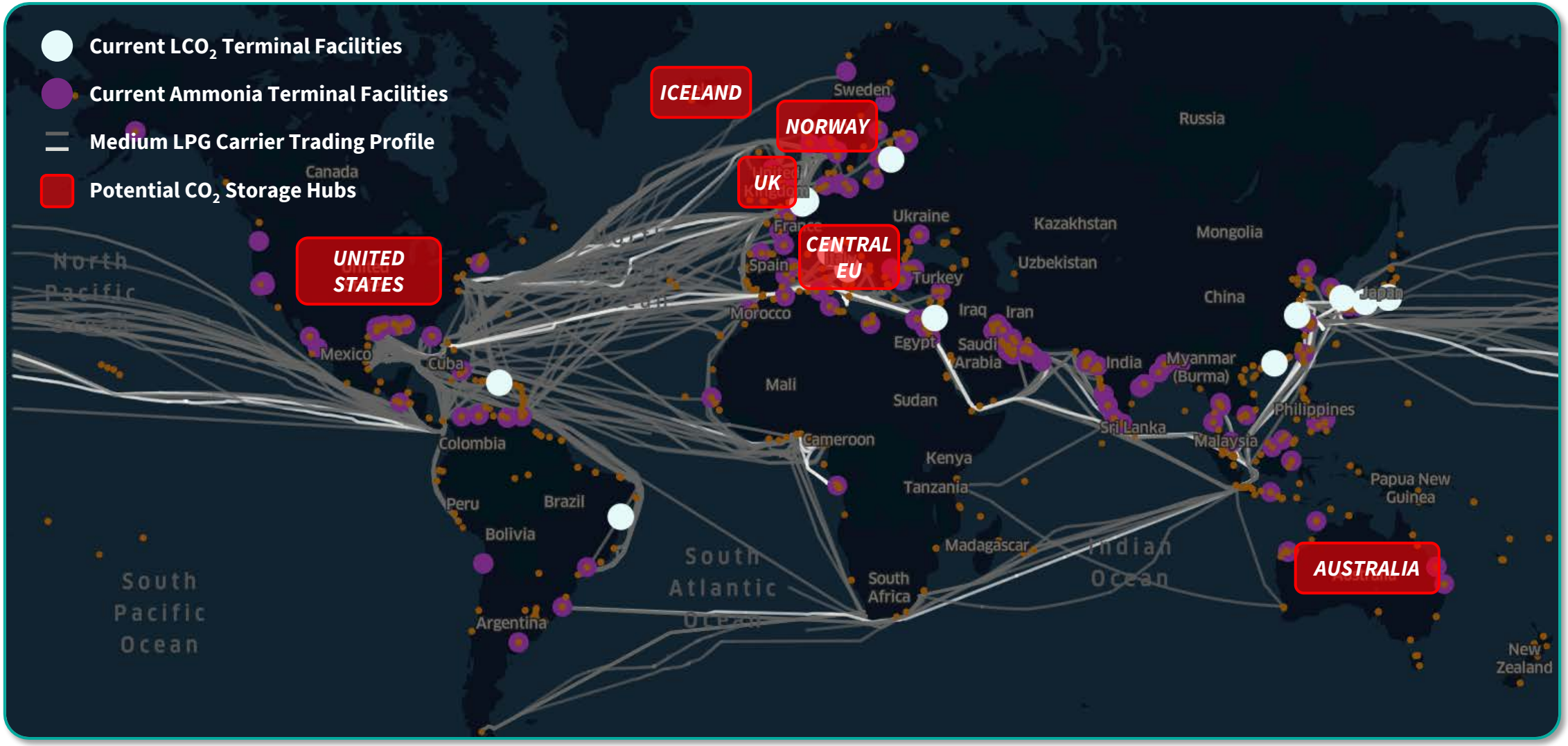

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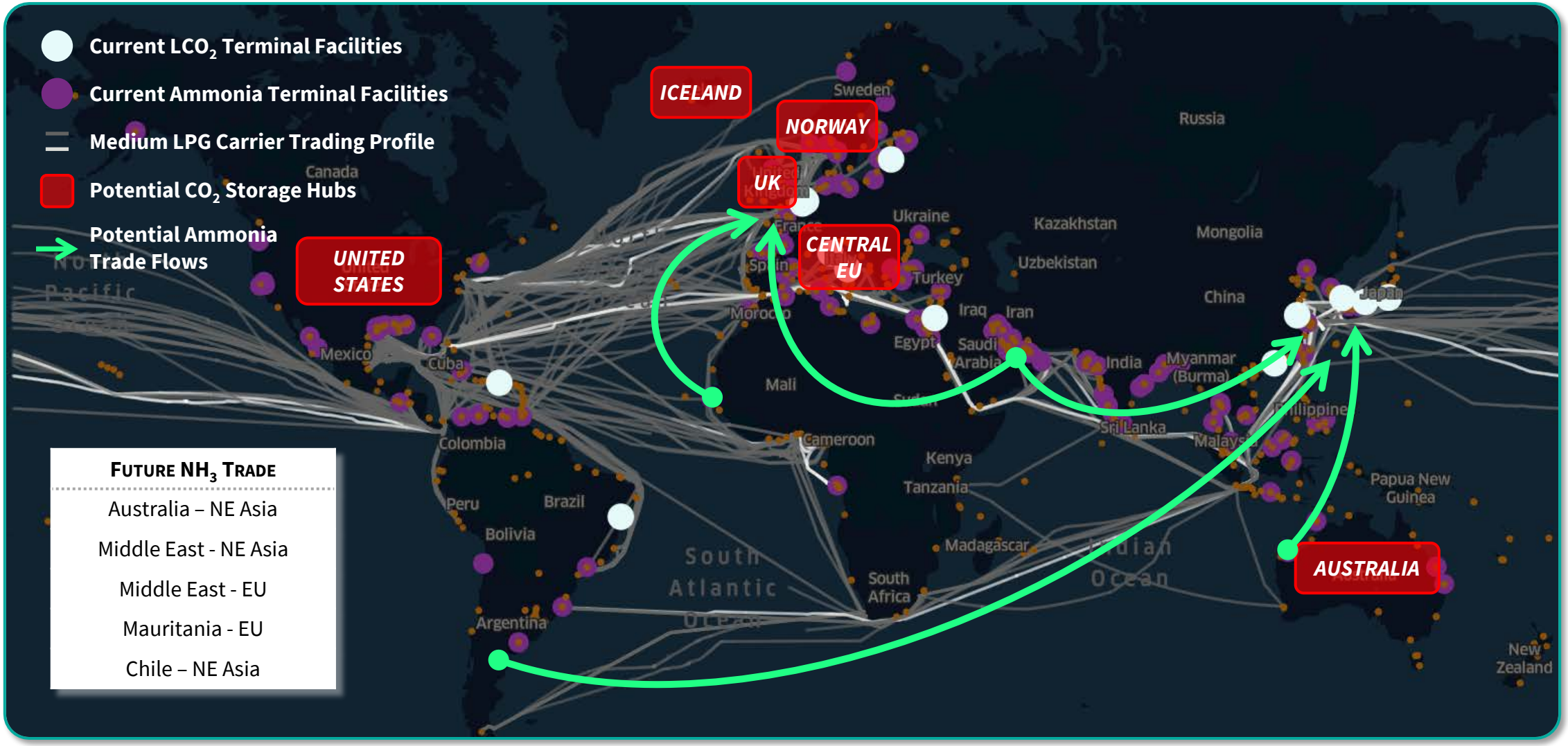

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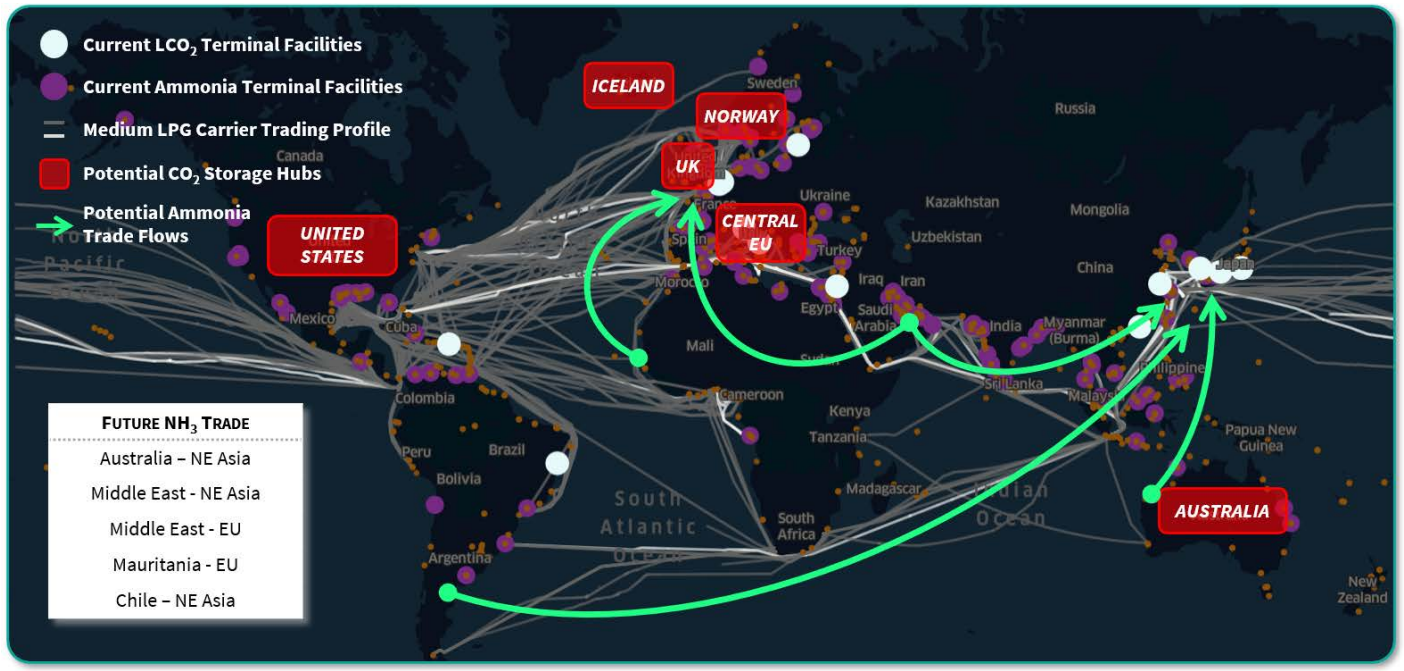
Multi-Gas Carriers: Technically Feasible but Operationally Impractical?

Across the 2030s, having the ability to triangulate LPG and NH_3 trade will have significant commercial upside however bringing LCO_2 into the mix faces significant challenges and therefore we are likely to see dedicated smaller LCO_2 carriers rather than tri-cargo multi-gas carriers.



Vessel Type	Condition	Voyage Split
Medium LPGC (Max: 46k cum)	Ballast	~40%
	Laden	**~60%**

Current Cargo Mix

- LPG
- Ammonia

Tri-Cargo Multi-gas Carrier Challenges

Making a multi-gas carrier capable of carrying LCO_2 faces the following challenges:

- **Significant additional CAPEX** will be required with LR estimates standing at a premium of approximately 15% on the newbuild cost (approx. USD 9-12 Mn).
- Vessel range will be impacted due to increased vessel lightweight due to tank material requirements meaning that **vessels will struggle to ballast far enough to load ammonia for their backhaul trade** due to the additional weight that will drive up fuel consumption.
- **NH_3 and LCO_2 cannot be mixed** due to being reactive (creating urea) therefore tanks need to be completely emptied prior to loading. This could take several days at a time (6+ days in some cases) thus impacting annual hire days.
- **Misalignment of LCO_2, NH_3 and LPG trading profiles** will make it challenging to triangulate trades between the three cargoes due to the location of CO_2 storage hubs.

Thank you

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