

Alternative Fuel Bunkering

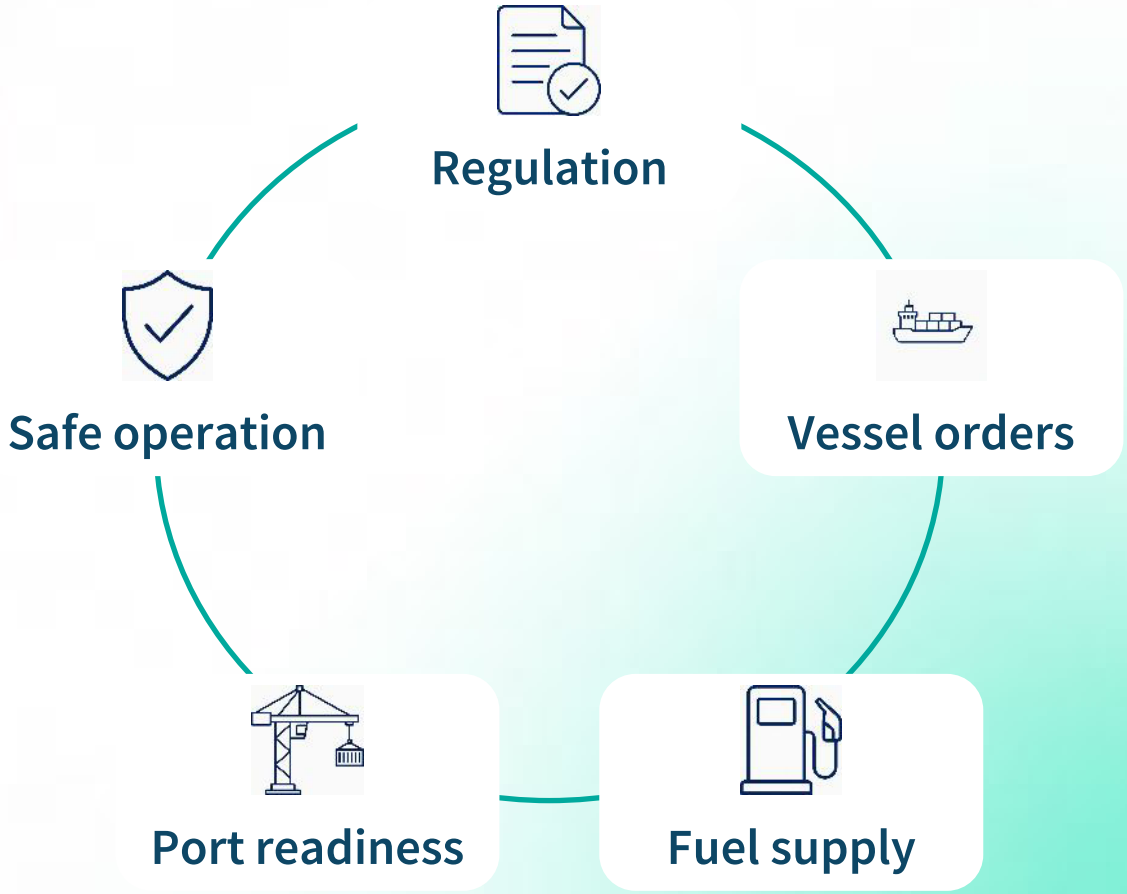
An industry update

ARCSOPT in person meeting 2025

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The transition has moved from ships to ship-shore interface

Future-fuel bunkering is no longer a technology question alone





The destination is clear. The route remains uncertain.

Recent events have led to an uncertain long term regulatory future.



ISWG-GHG 22: outcome of discussions on the proposals

Technical architecture is stabilising; political convergence remains incomplete

Technical core increasingly stable

Implementation choices under negotiation

Economic design remains unresolved

Areas of convergence

- Ship-level GFI architecture retained
- GFI Registry and LCA remain the foundation
- Strong support for “regulations plus guidelines”
- Broad support for onboard compliance and pooling

Movement, but not agreement

- **Openness** to a slower-start GFI trajectory
- **Some support** for a single tier GFI curve
- **Conditional support** for netting and ZNZ reward multipliers on the basis of further work
- **Interest in** reviews of fuel availability and affordability for 2040 checkpoint

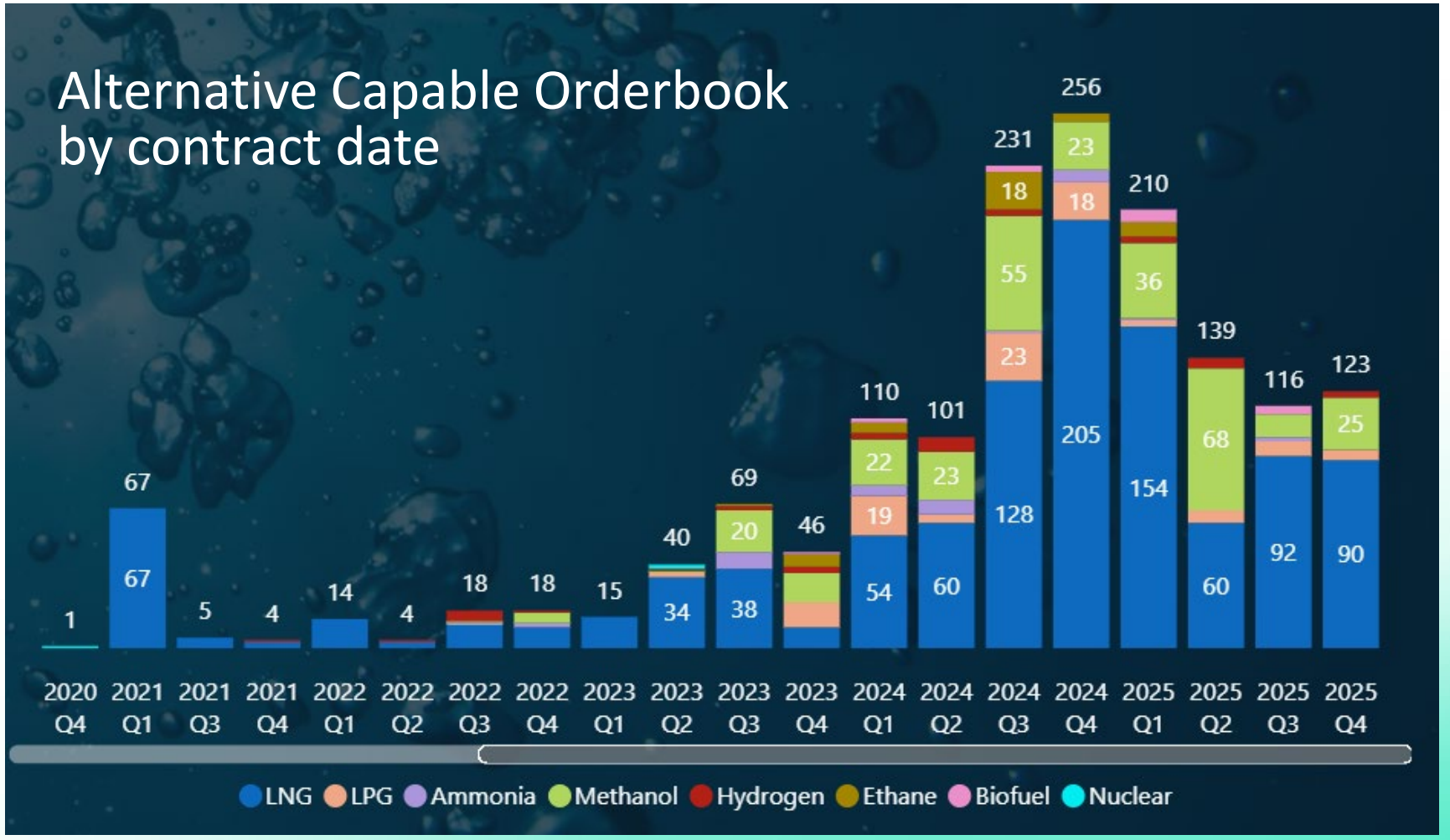
Core divergence

- Fund purpose and governance
- Mandatory pricing contributions
- ZNZ reward mechanism
- Revenue distribution and just and equitable transition support
- Voluntary or direct project contributions remain a compliance option for exploration

Overall status: there is still a large gap to consensus and no agreed base regulatory text.

Capable vessels are available, but fuel use lags

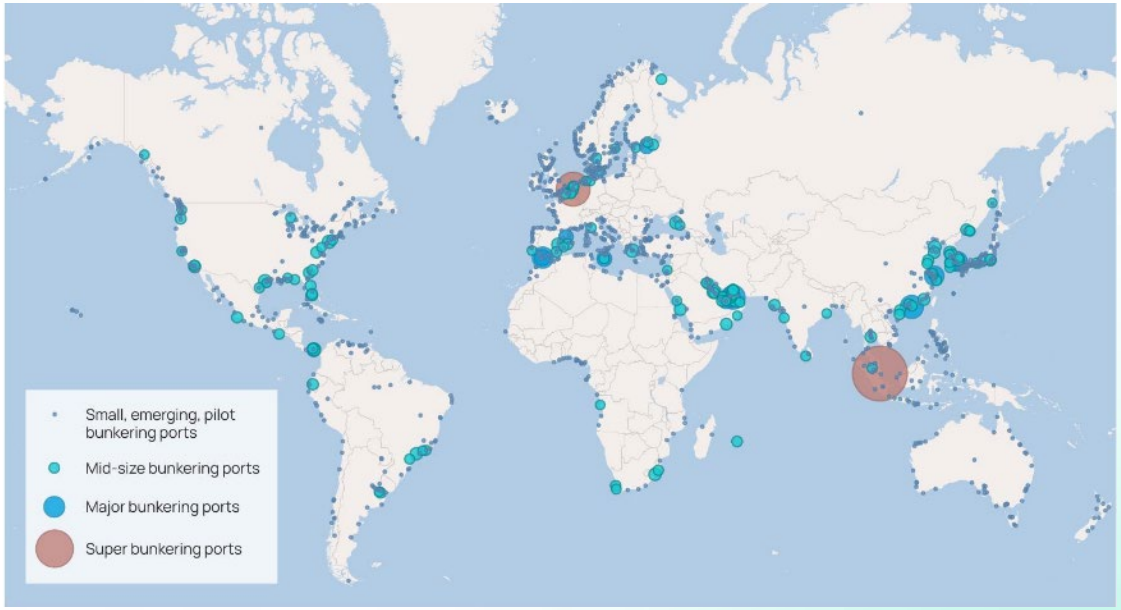
Adoption slowed in the absence of regulatory drivers and commercial parity



Source: HIS Database, Clarksons – Renewable Intelligence Network, Lloyd's Register Research

Current bunkering and future e-fuel supply

Current bunker landscape



Bubble size: estimated marine fuel sales

19 ports account for ~50% of bunker volumes

Global market: >200 Mt/yr (IMO 2024). The remaining ~50% spans ~1,240 smaller ports.

E-fuel project development



Bubble size: project capacity. Colour: distance to port

127 projects across 88 potential export ports

63% co-locate with industrial clusters. The pipeline includes projects before final investment decision.

Alignment is partial: Europe overlaps with established demand, while Australia and other production regions point to export corridors linking new supply with bunker hubs.

Source: LR Decarbonisation Hub.

Indicative Global Bunkering availability

Various fuels at availability at differing stages of maturity

Alternative Fuel	Approx. port coverage	Status
LNG	270+*[1]	Established global network
Methanol	~48	Commercial, rapidly expanding
Biofuel	No robust global operational count	Available at major bunker hubs
Ammonia	Trials at ≥9 locations identified	Pre-commercial / pilot
Ethanol	Select ports exploring	Very early-stage marine market

[1] LNG figure includes active **and under-construction** facilities.
Various sources through research

Examples of what ports are actually doing

Port readiness is moving from declarations to repeatable operations

Singapore
Standards and multi-fuel scale

LNG and bio fuels readily available

Methanol trials inform operational standards.

Anticipate Ammonia trials and safety work support a technical reference.

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ARA
Multi-fuel and SIMOPS

Explicit multi-fuel strategy. Broad fuel ecosystem.

BIO and LNG established and Methanal can be arranged.

Demonstrated Methanol SIMOPS.

China
Ammonia crosses into operation

LNG established and Methanol developing

Available supply of Green Ammonia and Methanol

First Ammonia Bunkering Completed

Pilbara, Australia
Demand-aggregation opportunity

Various studies centred around ammonia completed

Planned First ammonia Bunkering

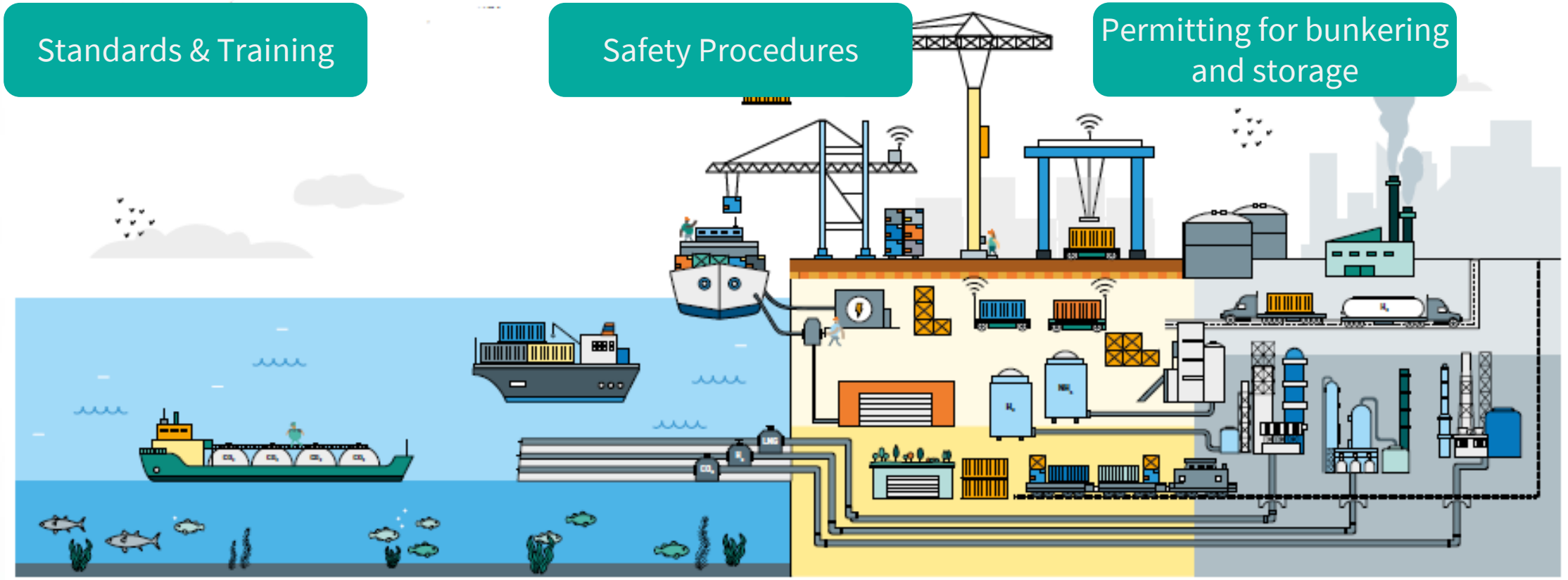
Various projects focused on domestic supply

Source: LR fuel for thought, research, media outlets, manifold times.

Readiness requires more than a storage tank

A fuel is not ‘available’ until it can be bunkered safely and without disrupting the port call

- Prepare for Multifuel Scenario
- Last Mile Delivery
- Shoreside Infrastructure
- Standards & Training
- Safety Procedures
- Permitting for bunkering and storage



Thank you

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