

SEA-LNG

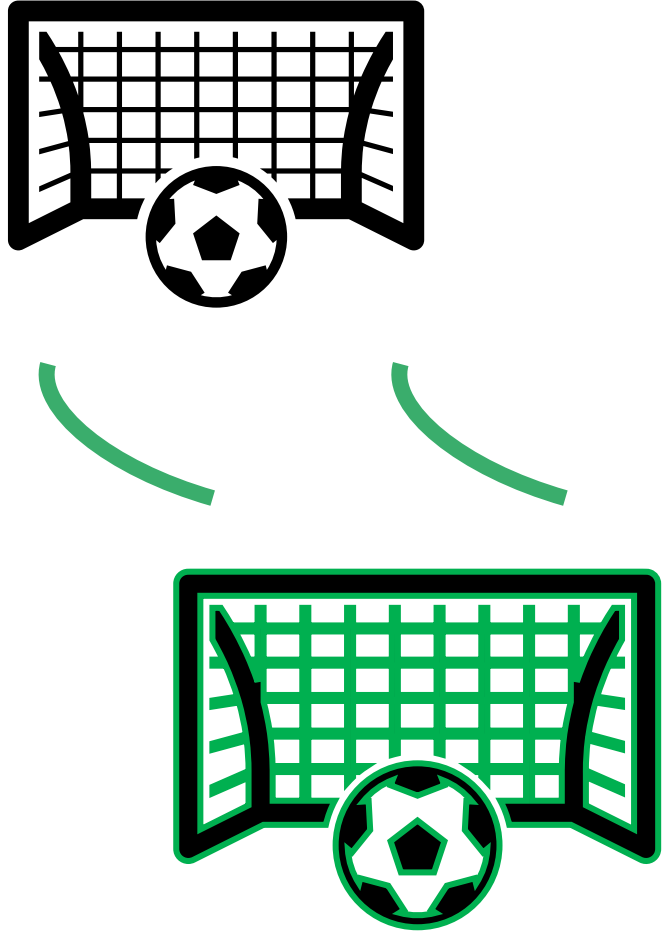
IMO Technical Seminar on Methane-Based Fuels

12th May 2026



Why LNG?

Focus shift from air pollution to GHG emissions



From 2005 - Focus IMO air pollution regulations

- LNG cuts air pollution
 - 99% less SOx emissions
 - Up to 95% less NOx emissions
 - Reduced particulate matter and black carbon

Today – Focussing on GHG emissions (*but air pollution still matters*)

- Well-to-wake greenhouse gas emissions
- LNG transitioning to bio and synthetic

LNG as a Marine Fuel

Its evolution as a practical and realistic option

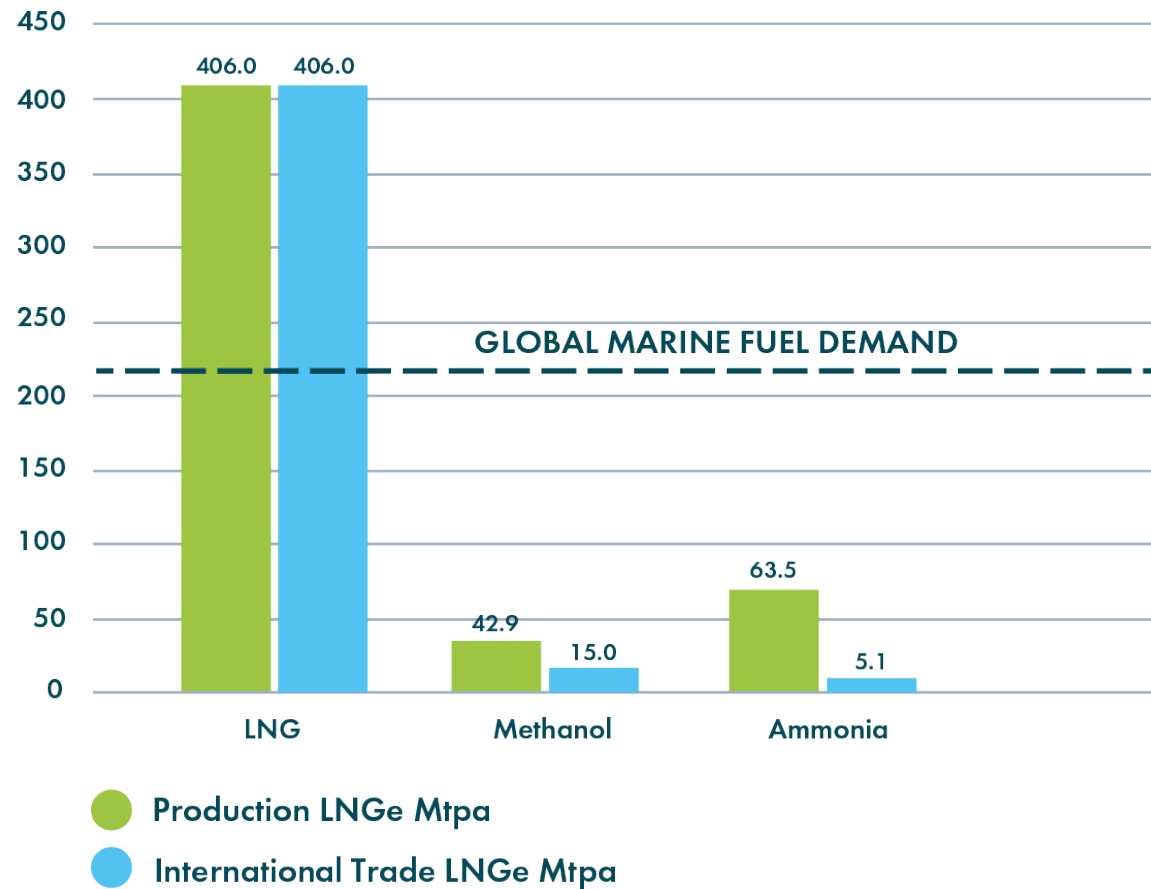
- LNG already exists at scale
- Collaboration solved chicken vs egg market situation
- LNG is a fuel on a journey, a fuel in transition



Large International Commodity Market

LNG has been safely shipped for 60+ years

SIZE OF CURRENT FUEL MARKETS (Mtpa LNGe)



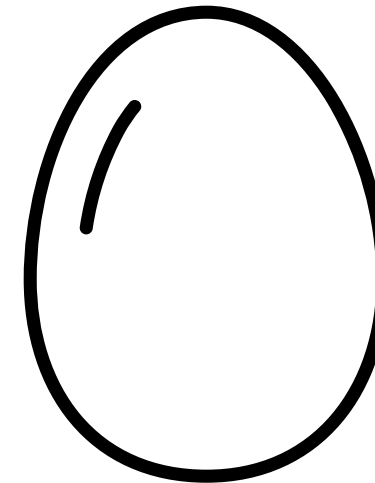
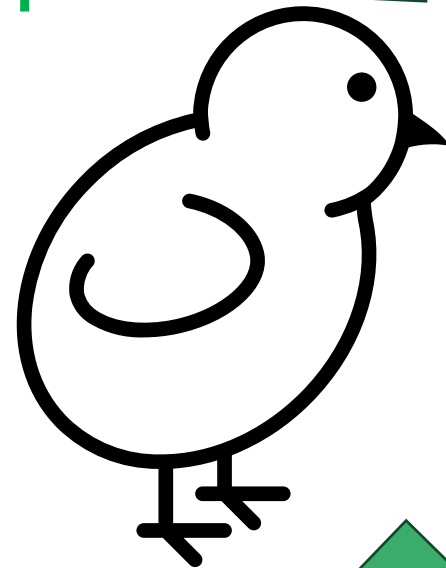
- Existing international trade in LNG is larger than shipping
- Shipping market provided an additional customer for existing producers
- Bunkering utilises global bulk distribution infrastructure and operating procedures

Chicken or Egg

Industry collaboration solved the problem

LNG-Fuelled
Ships

LNG
Bunkering
Infrastructure



No Bunkering,
No Ships

SEA-LNG

No Ships,
No Bunkering

- High CAPEX
- Long asset life
- Fuel supply certainty before ordering

- High CAPEX
- Long term investments
- Guaranteed offtake agreements before investing in supply

Requirement to Overcome the Last Mile

3 key options that allow a ramping up of activity and costs



Image: Shell



Image: Shell

Scaling in Practice

Two decades of progress reduced operational and regulatory uncertainty for LNG bunker vessels and ports

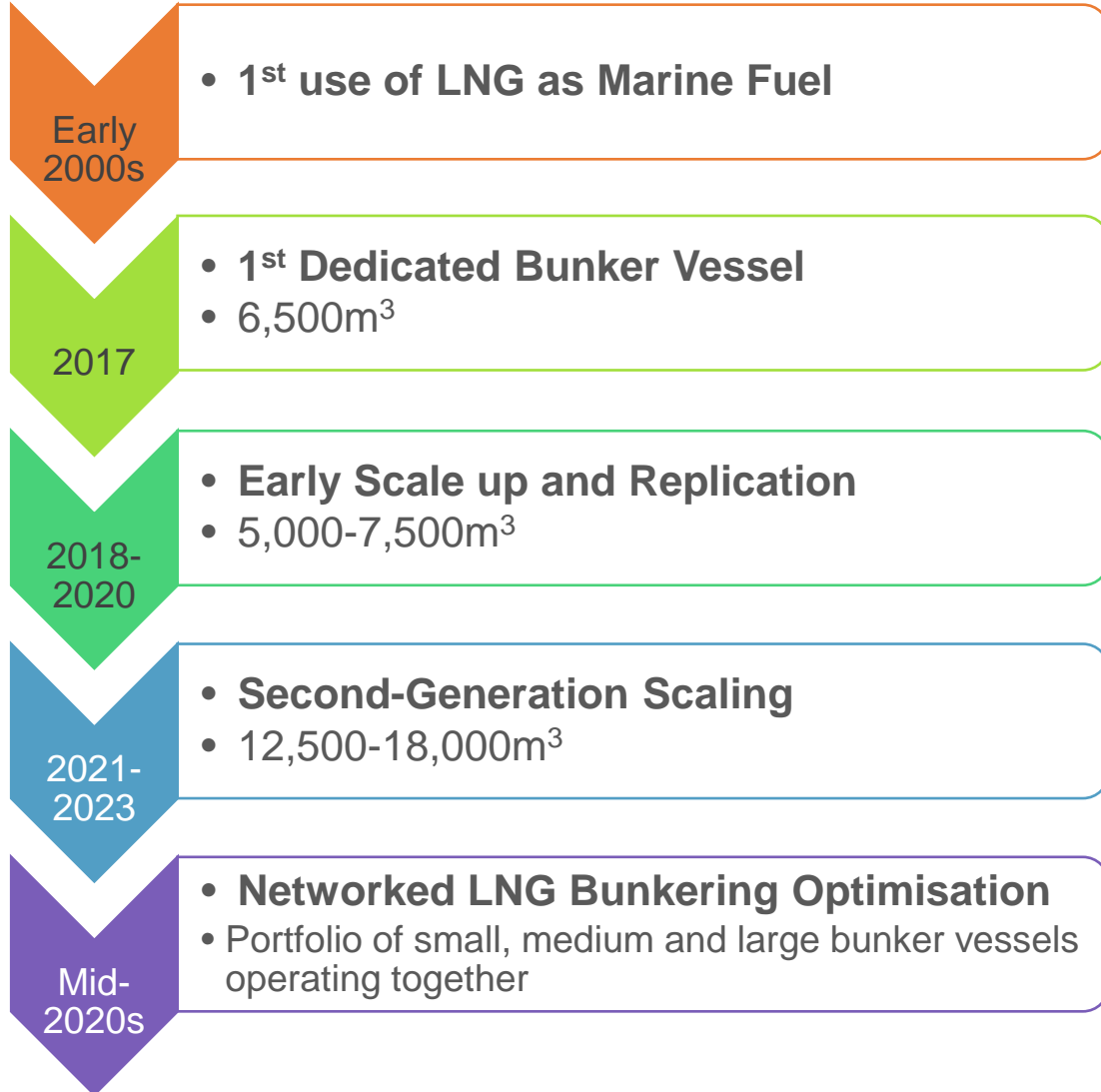


Image: Shell

LNG Bunkering: Built on Certified Safety Frameworks

Safety maturity; built layer by layer - from pilots to governed systems

Early Phase (2000s)

Project-specific operations

- Case-by-case approvals

Controlled Pilots (2010–2015)

Risk-managed demonstrations

- First bunkering trials

Standardisation (2015–2020)

Procedures and equipment codified

- Emergence of ISO guidelines (e.g. ISO 18683, ISO 20519)

Industrialisation (2020–mid 2020s)

Repeatable and scalable operations

- Port authority frameworks established

Mature System (Today)

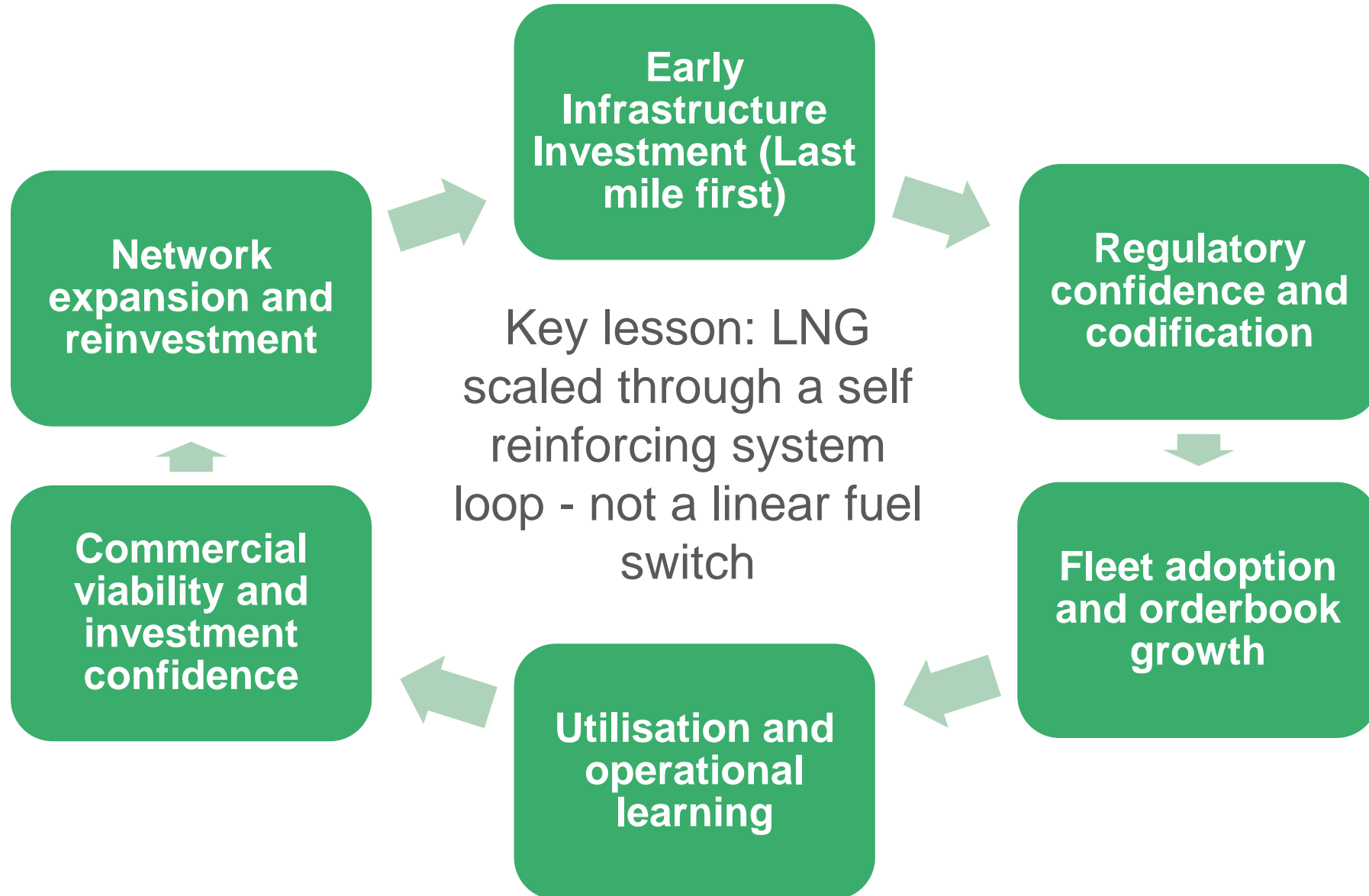
Governed, auditable safety system

- Integrated IMO + ISO + Class framework

Today's LNG bunkering operations are conducted under internationally recognised standards, governed procedures, and certified systems across the full value chain.

LNG Bunkering: Case Study for Collaboration

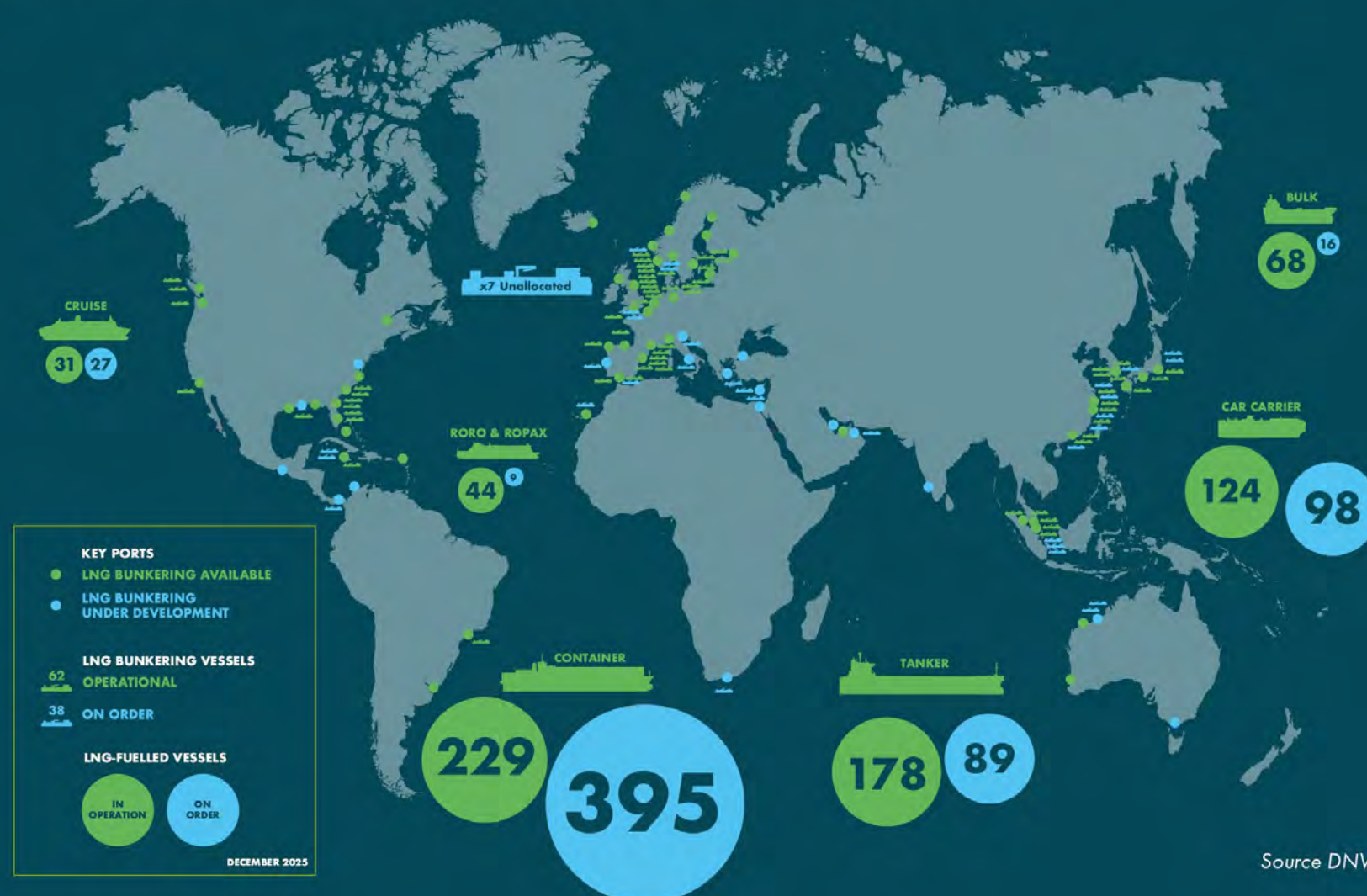
Infrastructure, regulation and fleet adoption progressed collectively



Status of LNG as a Marine Fuel in 2026

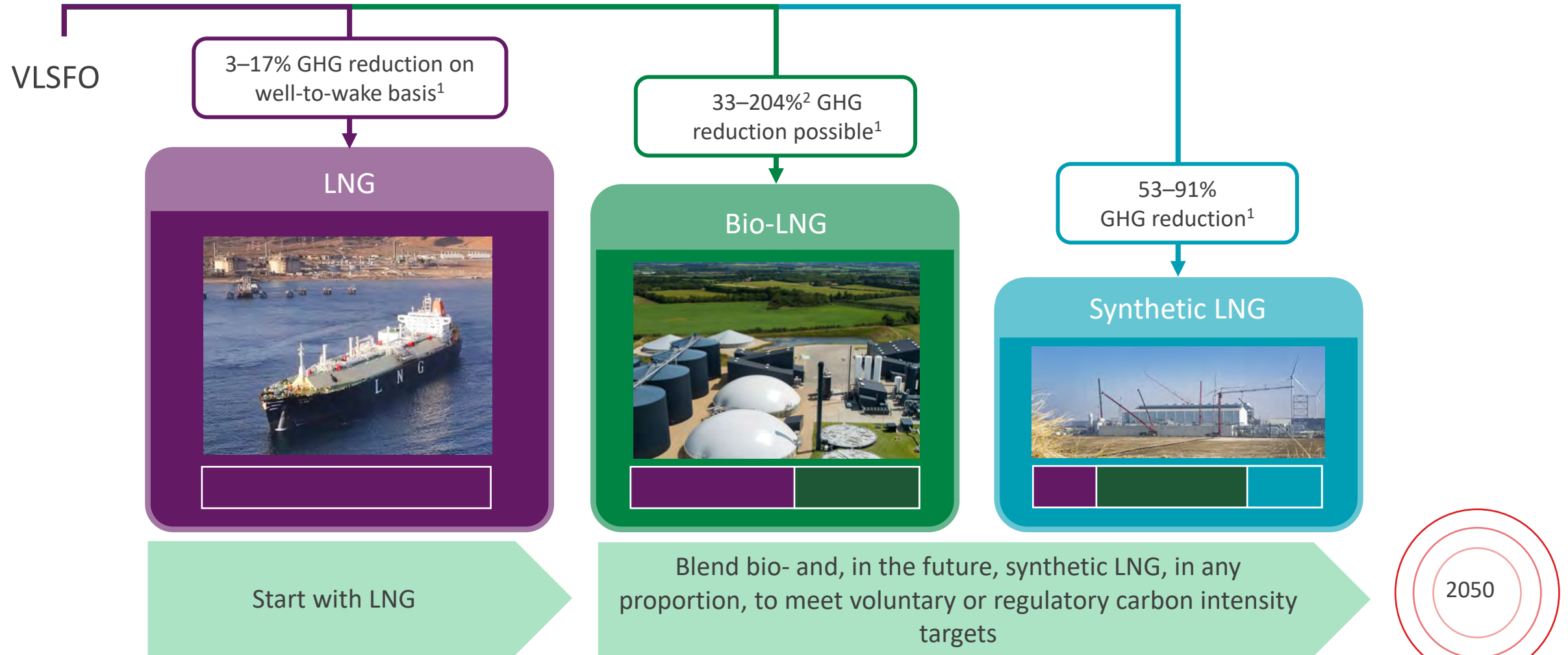
Rapidly growing numbers of LNG-fuelled ships & bunkering volumes

WORLDWIDE GROWTH IN LNG USE AND INFRASTRUCTURE



Source DNV

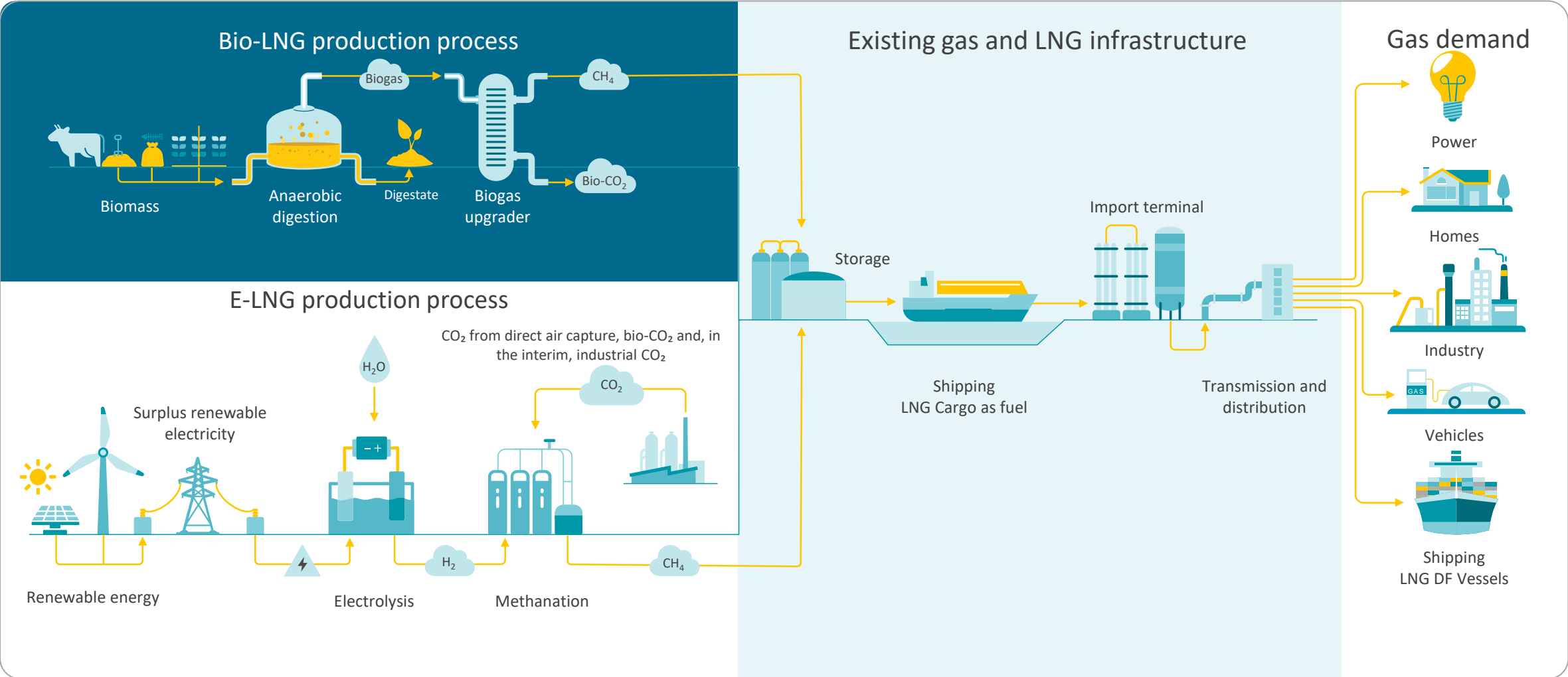
The Methane Decarbonisation Pathway



GHG reduction is calculated using fuel default values from:
 FEUM: REGULATION (EU) 2023/1805
 RED: DIRECTIVE (EU) 2018/2001
 JEC WTW Study Version 5 2020 - CBM Workbook from Appendix 1

1. Compared to Very Low Sulphur Fuel Oil (VLSFO), the differences in greenhouse gas (GHG) reductions on a well-to-wake basis for each fuel are due to variations in the materials used, how the fuel is made, and how emissions are measured.
 2. Bio-LNG can achieve one of the lowest or even negative CO₂e emissions intensity values on a life cycle basis when manure is used as a feedstock, when considering all emissions associated with the production and use of the fuel, including avoided emissions, recognized in EU REDII and US CARB LCFS methodologies.

Gas & LNG Infrastructure Ready for Bio and e-LNG



What LNG has Taught us – for All Future Fuels

Pathway for all deep-sea alternatives is fossil->bio->synthetic

Early risk takers reduce system risk later

Fleet and fuel must scale together

The last mile is decisive

Regulation is a key enabler

Bio and synthetic for net zero

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Questions?

