

United Nations Trade and Development (UNCTAD)

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14-16 October 2024, Geneva

Exploring the Prospects of Greener Gas & Energy Value Chains as value added commodities

Constantinos Chaelis, Global Gas Markets & Technology Lead

The views expressed are those of the author and do not necessarily reflect the views of UNCTAD.

The background of the slide features a composite image. On the left, there is an aerial view of a large red and white LNG carrier ship docked at a pier, with its white storage tanks clearly visible. To the right of the ship, the image transitions into a landscape of terraced agricultural fields, possibly olive groves, under a clear sky. The entire slide is overlaid with a large, white, diagonal geometric shape that separates the top-left image from the text area.

Exploring the Prospects of Greener Gas & Energy Value Chains as value added commodities

Multi-year Expert Meeting on Commodities and Development, 15th Session, 14-16 October 2024

Constantinos Chaelis
Global Gas Markets & Technology Lead



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The background of the slide is a photograph of an offshore oil platform at sunset. The platform's complex network of white pipes and metal structures is visible, extending from the bottom center towards the horizon. The sky is a vibrant mix of orange, yellow, and blue, with the sun low on the horizon. The sea is calm and reflects the colors of the sky. A semi-transparent grey rectangle is positioned in the upper left, containing the title text. White L-shaped corner brackets are placed around the top and left sides of this rectangle.

LR Gas Governance

More than Class - Acting As Thought Leaders

LNG may not be a silver bullet but it doesn't have to be dirty
Make the wrong call today on LNG and the consequences – financial and environmental – could be dire, warns Panagiotis Mitrou

During the 32nd GREEN4SEA Athens Forum, Mr. Panagiotis Mitrou, Global Gas Segment Manager, Lloyd's Register Marine & Offshore, shared his views on LNG as a fuel, towards 2050 compliance and beyond.

Es necesitaría una enorme ampliación de la flota de buques de GNL para impulsar la transición energética
La grave interrupción de las dilatadas cadenas de suministro energético en todo el mundo ha puesto a la seguridad

New methane abatement coalition plans to unveil guidelines in a year
Seven major players will give quarterly updates on its progress and make all its information publicly available

Slow steam ahead for older LNG carriers
Changes to the IMO's draft carbon regulations can give LNG tankers a new lease of life, albeit at reduced speed

Lessons from LNG for the fuels of tomorrow

Wellweiter Run auf LNG-Tanker – Reeder wettfeiern um Wert-Kapazitäten
Die weltweite Energie-Transition rückt vor und hat weitreichende Auswirkungen auf die Schifffahrt. Doch in den letzten Monaten regnete eine Reihe von Ankündigungen über die Erweiterung der LNG-Tankers-Flotten.

LNG industry hears horror story: the market could run out of ships
Fears voiced that shipping could become bottleneck for LNG industry as regulatory and market pressures collide

Global Gas Presence & Expertise

Technical expertise

LR Gas Segment Team | Global Presence

Panos Mitrou
Global Gas Segment Director, Athens

- Joined LR in 2005
- Naval Architect & Marine Engineer Diploma from NTUA, MBA from ALBA Business School and PhD candidate at Uni of Strathclyde.
- Fellow member of ICS.
- Member of the Board of SEA-LNG, the Global Gas Centre and the Environment Committee of SGMP.
- Chairs the Methane Abatement in Maritime Innovation Initiative (MAMI) and the Marine Working Group of the World Liquid Gas Association (WLGA).

Jose Navarro
Global Gas Technology Director, Busan

- Joined LR in 1991
- Represents IACS within SIGTTO Organisation
- Provides specialised advice during innovation, R&D and consultancy studies HAZID/HAZOP and risk assessment of gas technology projects.
- Provides specialised technical support to gas new building projects

Ken Lucas
Principle Gas Specialist, Shanghai

- Joined LR in 2001
- Over 20-years' experience as a Senior Surveyor throughout China, Korea and the Middle East.
- New construction Project Manager since 2010, covering projects in both China and Korea
- New Construction Project Manager for BP, Alpha Gas and Avance Gas projects in Korea

Tanaraj Rajoo
Gas Technology Manager, Busan

- Joined LR in 1996
- Holds a Class One Marine Engineer Certification and an MBA from Leicester University.
- Ex-Sea-going Chief Engineer on LNGC
- Specialist in LNG ship operation and the LNGC new-construction process following extended periods in both Japan & South Korea.

Hamid Etemad
Global Gas Technology Specialist, Busan

- Re-joined LR in 2022
- 26+ years in Gas Technology with focus on Gas Carriers, Gas Bunkering Vessels, FSRU's, FLNGs & IGF vessels, GHG (Carbon Capturing, CO₂, CH₄, N₂O).
- PHD in LNG, Alternative / LFL Fuels handling and System, LGI / GI ICE's, Bunkering, and relevant Risk Assessment.
- Development of Rules and Regulations in the field of Gas, Emission, and Decarbonisation Technology

Constantinos Chaelis
Global Gas Markets & Technology Lead, Athens

- Joined LR in 2012
- MEng in Naval Architecture, University of Southampton, UK
- Business Strategy & Financial Performance, INSEAD
- Chartered Engineer (CEng) & Chartered Shipbroker (MICS)
- Member of RINA & IMarEST
- Classification & Statutory Surveys in Existing Ships & New Construction as LR Survey or/Project Manager in the UK, Spain, Italy, Poland, South Korea
- Technical Superintendent experience, Aframax Tanker Fleet, Greek shipping company

Christina Christopoulou
Business & Technology Partner, Athens

- Joined LR in 2021
- Naval Architect & Marine Engineer, MEng from NTUA, Greece
- Methane Abatement in Maritime Innovation Initiative (MAMI) Workstream I Leader
- Ship designer (AutoCAD, NAPA, Rhino) on LNG-fuelled design & retrofit projects as part of Poseidon Med II

LR Gas Segment

We have a proven track record in servicing major international LNG & LPG ship owners and operators. We are strongly placed to deliver a complete range of classification and support services globally.

#1 Class
Leading classification society in all Gas value chains [LNG, LPG, NH3, LCO2]
IHS June 2024

sgmf
sea change.

Environmental Committee
Chairing Maritime Working Group 31

GLOBAL GAS CENTRE

Board Member

SEA-LNG

Board Member

WLGA
Energy Anywhere

Chairing Maritime Working Group

Greener Gas



Energy
transition



Energy
security

LNG

a source of
Energy for
the world

Certified Greener Gas

Making Gas as Sustainable as Possible

Compliance for EU importers tightening with newly enforced EU methane regulations and emissions-related reporting requirements

Applied pressure from national/regional carbon pricing systems
e.g. *EU Carbon Border Adjustment Mechanism (CBAM)*

Growing demand on producing & exporting certified, greener natural gas and verifying methane emissions performance in operations
e.g. *National Grid operated Grain LNG terminal*
e.g. *EQT supplying 4bcf of MiQ certified NG to Uniper*

Differentiating greener gas based on emissions profile and demonstrating potential through transparency for full supply chain emissions reporting

Reducing upstream (production, processing, transportation) CO₂ & CH₄ emissions during liquefaction on WtT basis

Coal to Gas shift does not work

5% increase

Global use of coal reached over 8 billion tonnes with a 5% year-on-year increase, equating to just 400 million tonnes, as much as current global LNG trade

By performing lifecycle analysis (LCA) on a **Well to Tank** basis, LNG will demonstrate to be 'cleaner' than default LNG

Not all LNG is Created Equal

GHG footprint will become the single, most important attribute in the use of LNG as marine fuel

Improved & certified LNG profile

- CII compliance extension
- Flexible operations and trading
- Reduced Carbon Costs
- Opportunity in LNG Bunkering Space



Providing improved key attributes of LNG as an added value cargo commodity

The LNG Transition Portfolio

Methane Abatement

Realizing the full carbon saving potential of LNG



**Methane Abatement in
Maritime Innovation
Initiative (MAMII)**

Certified Greener LNG

Extending savings to the full potential of WtT



Bio-LNG Blending

Ensuring incremental compliance



Bio-LNG (LBM, LBG) – Liquefied Biogas or Biomethane

e-LNG – Hydrogen derived methane or renewable synthetic LNG



Carbon Capturing & Storage

Greening liquefaction by capturing CO2 emissions at source



An aerial photograph of an industrial facility, likely a port or refinery, situated on a coastal peninsula. The facility features a prominent red and white striped chimney, several large storage tanks, and various industrial buildings. A large ship, the MAERSK SEALAND, is docked at a pier. The background shows a body of water and distant mountains. A semi-transparent blue rectangle with white corner brackets is overlaid on the image, containing the text "Upscaling of Blue Ammonia".

Upscaling of Blue Ammonia

Ammonia Landscape & Prospects

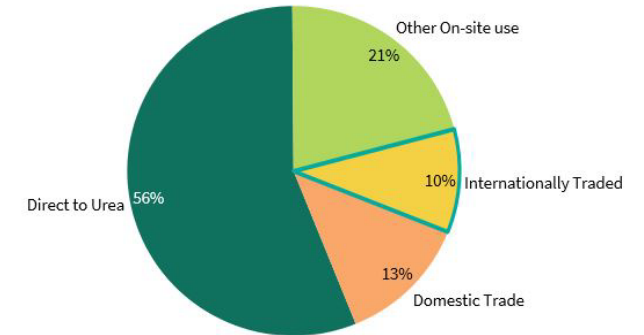
Upcoming Gas Value & Supply Chain

- ❖ **Co-firing of coal plants in Japan** testing Ammonia as fuel and source of electricity generation
- ❖ Each Power Plant -> 4 boiler units in need of 0.5mtpa of NH3 combustion
-> 2mtpa of NH3 needed per Power Plant

Blue Ammonia production
CO2 capture & storage/sequestration
Exporting an added value low-carbon commodity & energy carrier

TOPSOE
AMOGY

20 MTPA international trade volume
out of **200 MTPA** currently produced
Only 10% of ammonia production is traded (over half turned into urea in situ)



Project Examples

- ❖ Qatar to build **blue NH3 plant** to produce **1.2mtpa** by 2026 by capturing & sequestering over 1.5 million tonnes of CO2 per year
- ❖ UAE to **build blue NH3 plant** to produce **1mtpa** by 2025, aiming to capture & store 5 million tonnes of CO2 per year by 2030

Demand – Shipping side

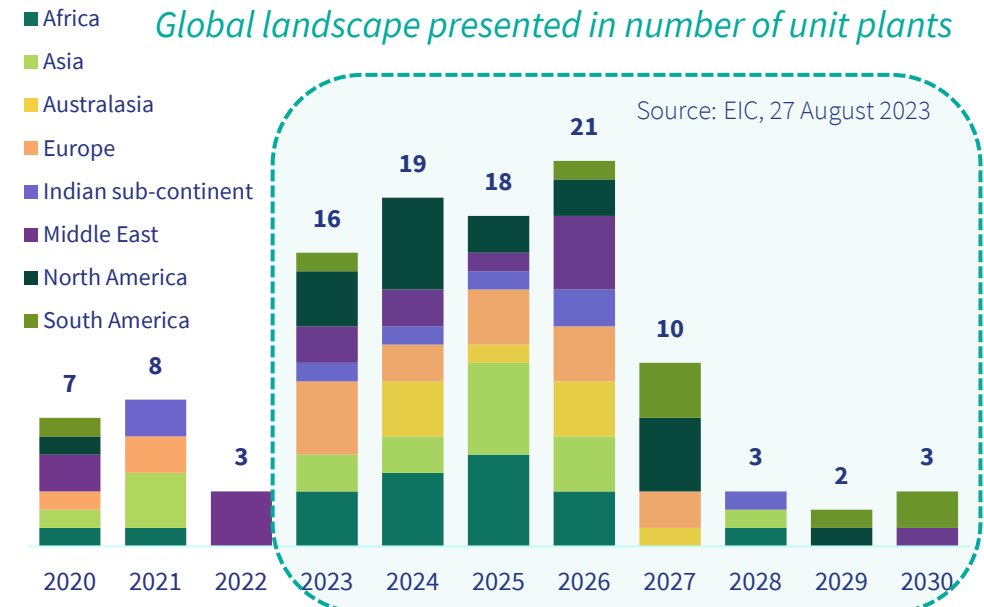
Over **100 ammonia carriers** with capacity >80k cbm may be required by **2030**, capable of transporting over **8 MTPA** of cargo

Next generation clean energy source

- NH3 as **fuel** powering propulsion
- NH3 **transportation** as **commodity**
- NH3 in **gas thermal power plants**

Ammonia/Fertiliser Plants Expansion Projections

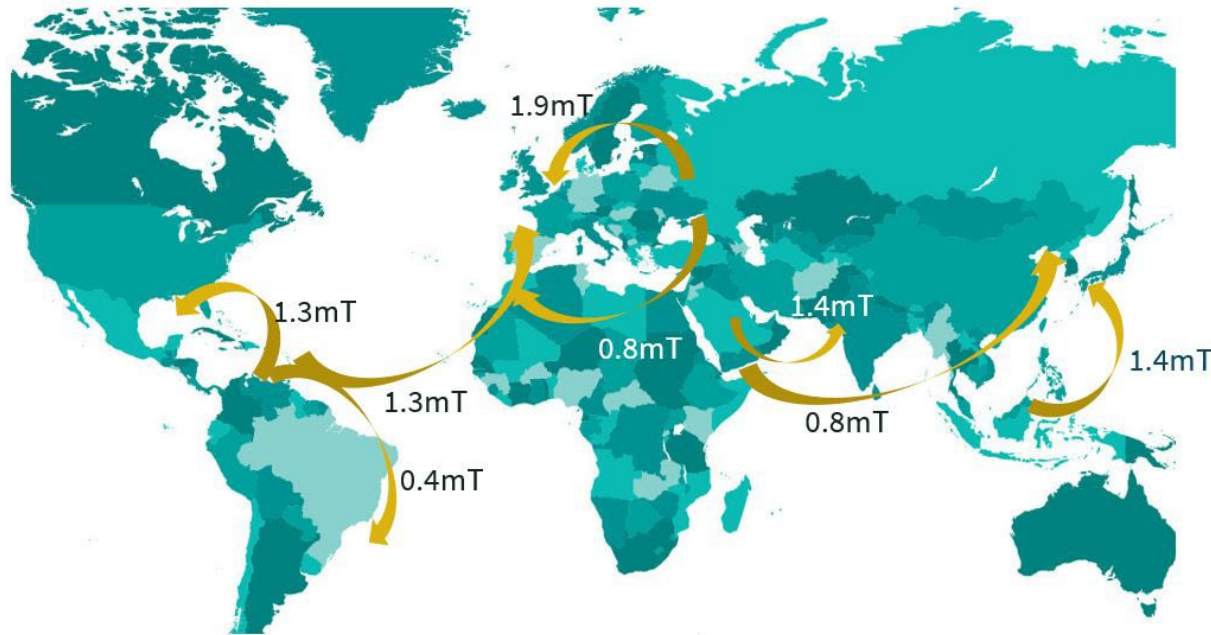
Global landscape presented in number of unit plants



Trading Patterns

Ammonia trade today

Centred on fertilisers, with >67% of global exports accounted for by 5 players. Limited long-haul trade and no desire for larger parcel sizes. Only major long-haul trade* is 800 ktpa from MEG to NE Asia and 1.3 mtpa Transatlantic



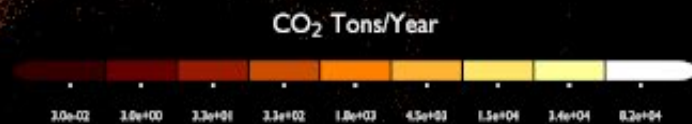
*Long-haul = >3500nm

Ammonia trade by 2040

Long-haul trade will go from 2.1 mtpa to 25 mtpa by 2030 and 200 mtpa by 2050 under high case forecasts



Closing the Carbon Dioxide Cycle



CO₂ Emissions. @PythonMaps

This map shows the world's CO₂ emissions and shows tonnes of CO₂ within 0.1x0.1 degree grid tiles in 2018.

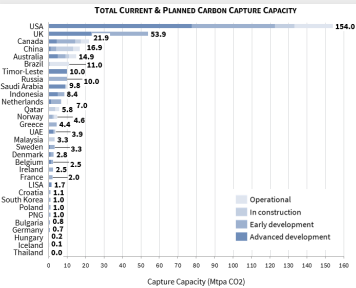
Data source - https://edgar.jrc.ec.europa.eu/dataset_ghg60



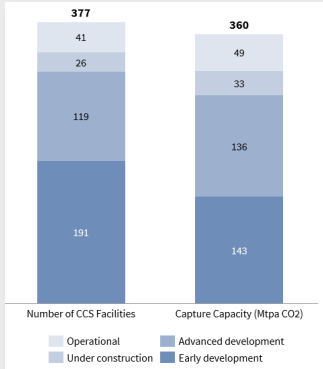
Carbon Value Chain

Market Analysis approach

CAPTURE

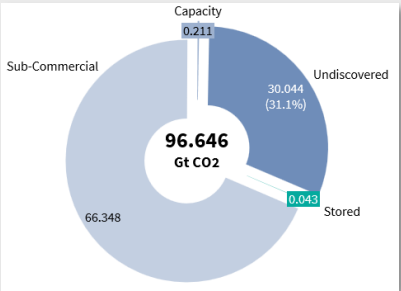
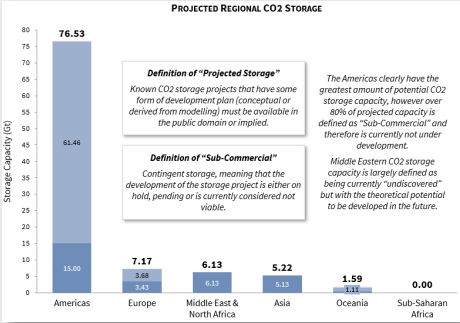


Regional & national capture capacity



Regional & national storage capacity & CO2 usage

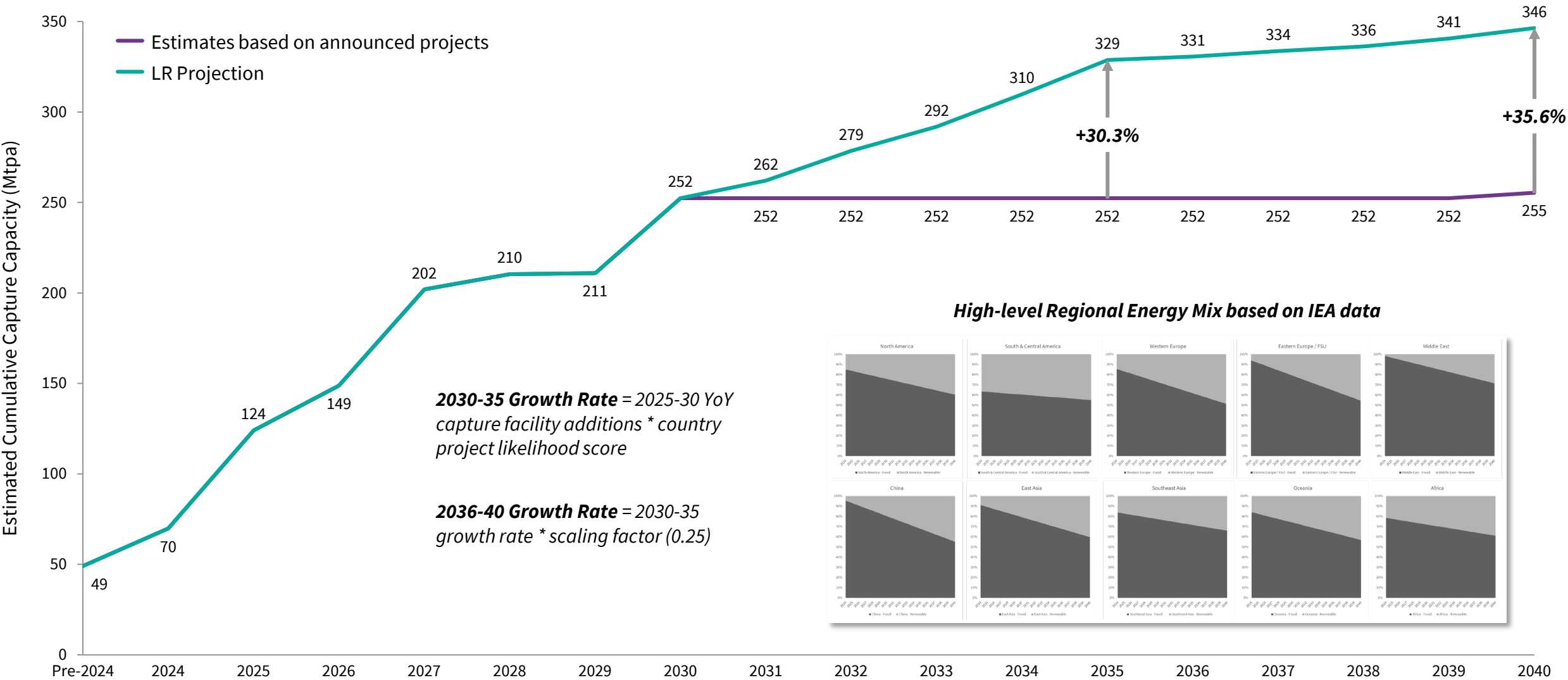
STORAGE



ASSUMPTIONS
JOINTLY DEFINED W/
PROJECT PARTNERS

Global Carbon Capture Capacity

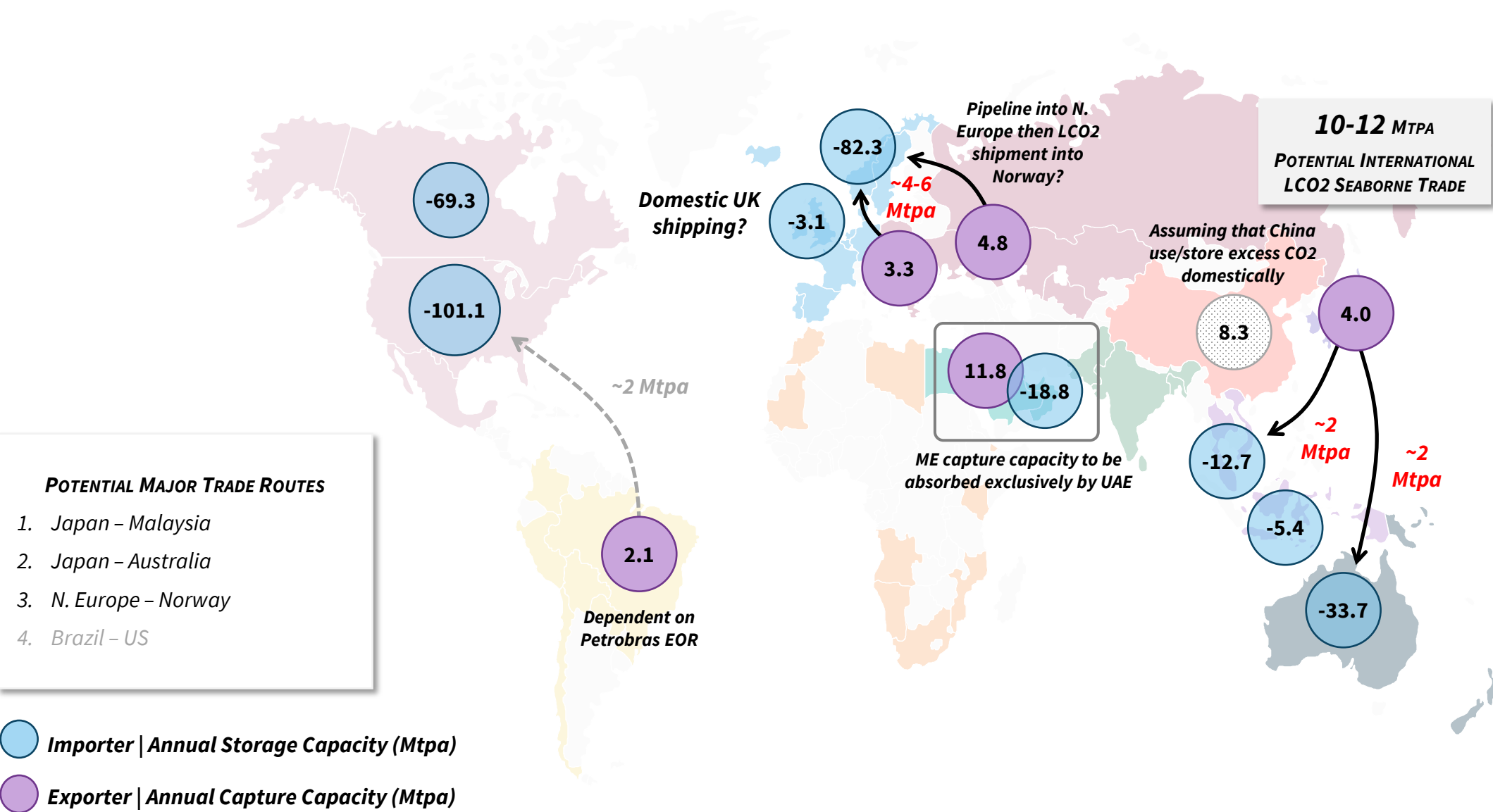
Regional Capture-Storage Imbalance: 2030 vs 2040 | Estimating 346 mpta of carbon captured by 2040



Source: Global CCS Institute

LCO2 Capture-Storage Balances: 2030

A distinct trading profile begins to emerge in 2030 with Japan, Europe and potentially Brazil having excess captured carbon



* Pipeline into N. Europe then LCO2 shipment into Norway?

An aerial photograph of a large red and white ship, possibly a ferry or cargo vessel, being lifted by a crane. The ship is oriented diagonally across the frame. The crane's cables and structure are visible on the left side. The ship's hull is red with white sections. The background is dark. A semi-transparent grey rectangle is centered over the ship, containing the text "Concluding Remarks". Four white corner brackets are positioned around the rectangle.

Concluding Remarks

Concluding Remarks

- Future gas value chains will compete over transition performance
- The LNG value chain presents significant greening potential with green liquefaction and CO2 capturing at source
- Blue ammonia presents a prospect in greening gas reserves at source
- Carbon value chain represents the greatest prospect and synergy in recycling carbon and greening existing hydrocarbons
- Gas & Energy value chain synergies will formulate and shape transition compliant applications



When you partner with LR, you put centuries of collective experience, strong values, and deep maritime and shipbuilding expertise on your side. There is no surer way to build resilience into your overall fleet strategy.



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