



# Gas Value Chains to Europe

“Energy system resilience: The future of gas supply in Europe”

UNECE - 10th Session of the Group of Experts on Gas

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LR

# LR - It all started in a coffee house...

Lloyd's Register is a global professional services company specializing in engineering and technology for the maritime industry, created more than 260 years ago in Edward Lloyd's coffee to **improve the safety of ships.**

- World's first ship classification society
- Deep Expertise in Marine & Offshore Industries
- Owned by Lloyd's Register Foundation: a UK Charity that supports research & innovation related to **Safety, Risk, and Sustainability.**

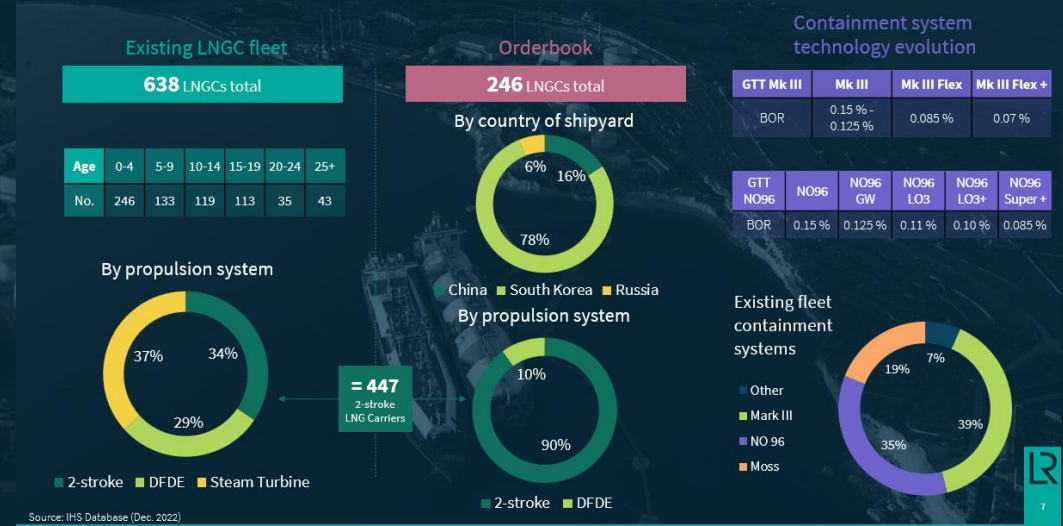
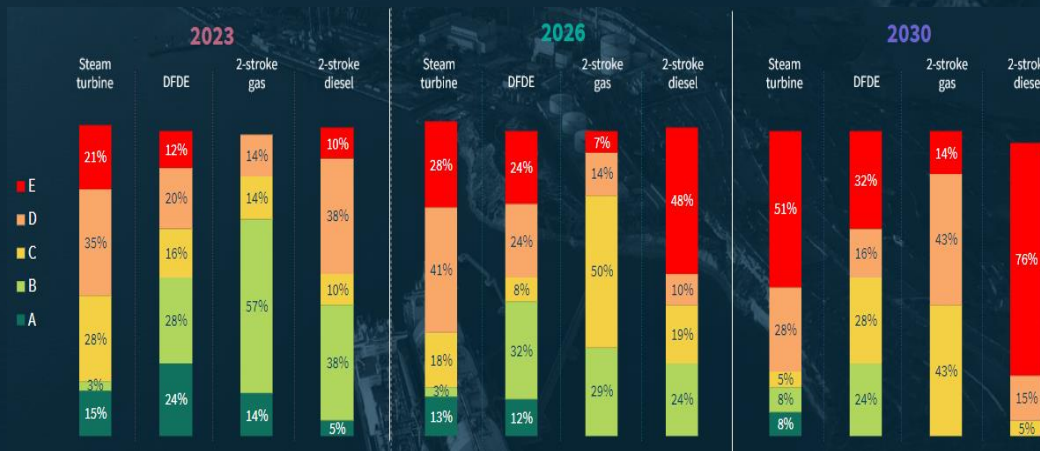


We care. We share our expertise. We do the right thing.

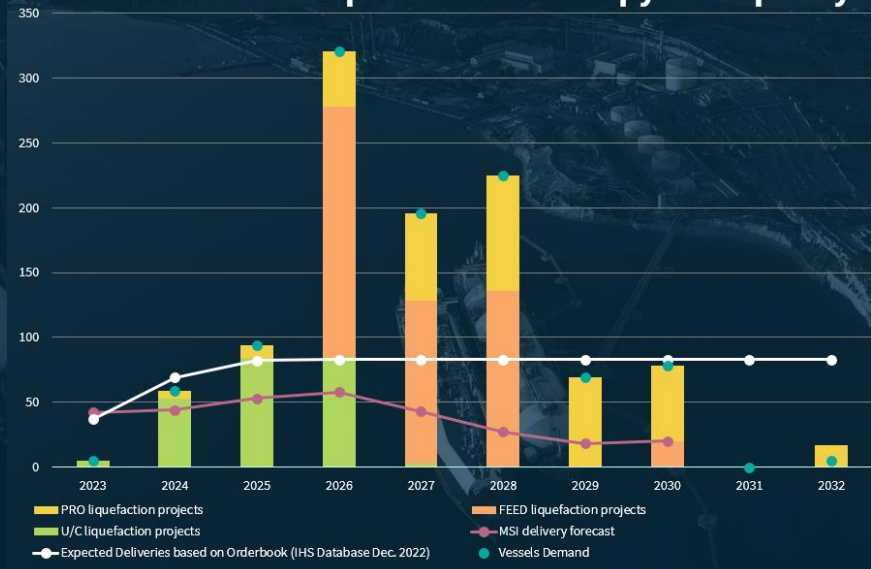


# The LNG Supply Chain – not to be taken for granted

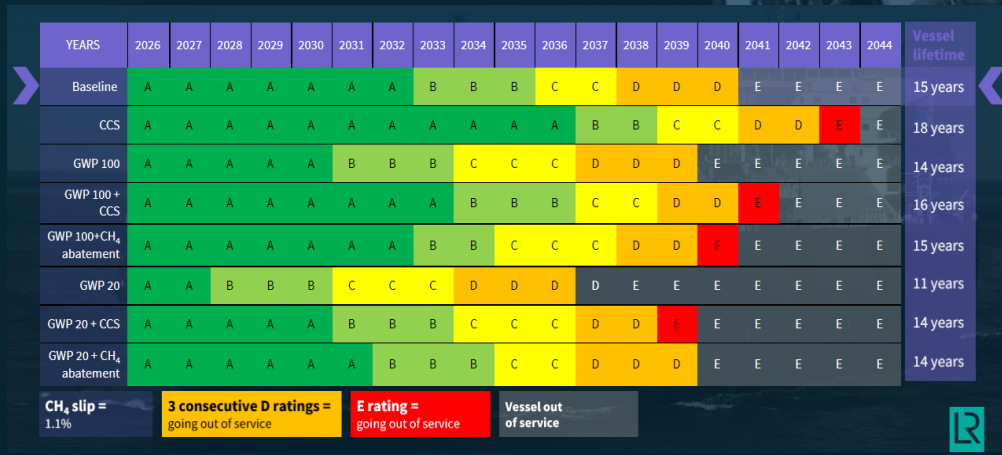
- ✓ Shipping Supply Consistently failing Demand
- ✓ Shipbuilding Capacity on its knees
- ✓ Zero Fleet Renewal Rate
- ✓ Projected Lifecycle of modern designs at 10 years
- ✓ Older tonnage on the verge of non-compliance



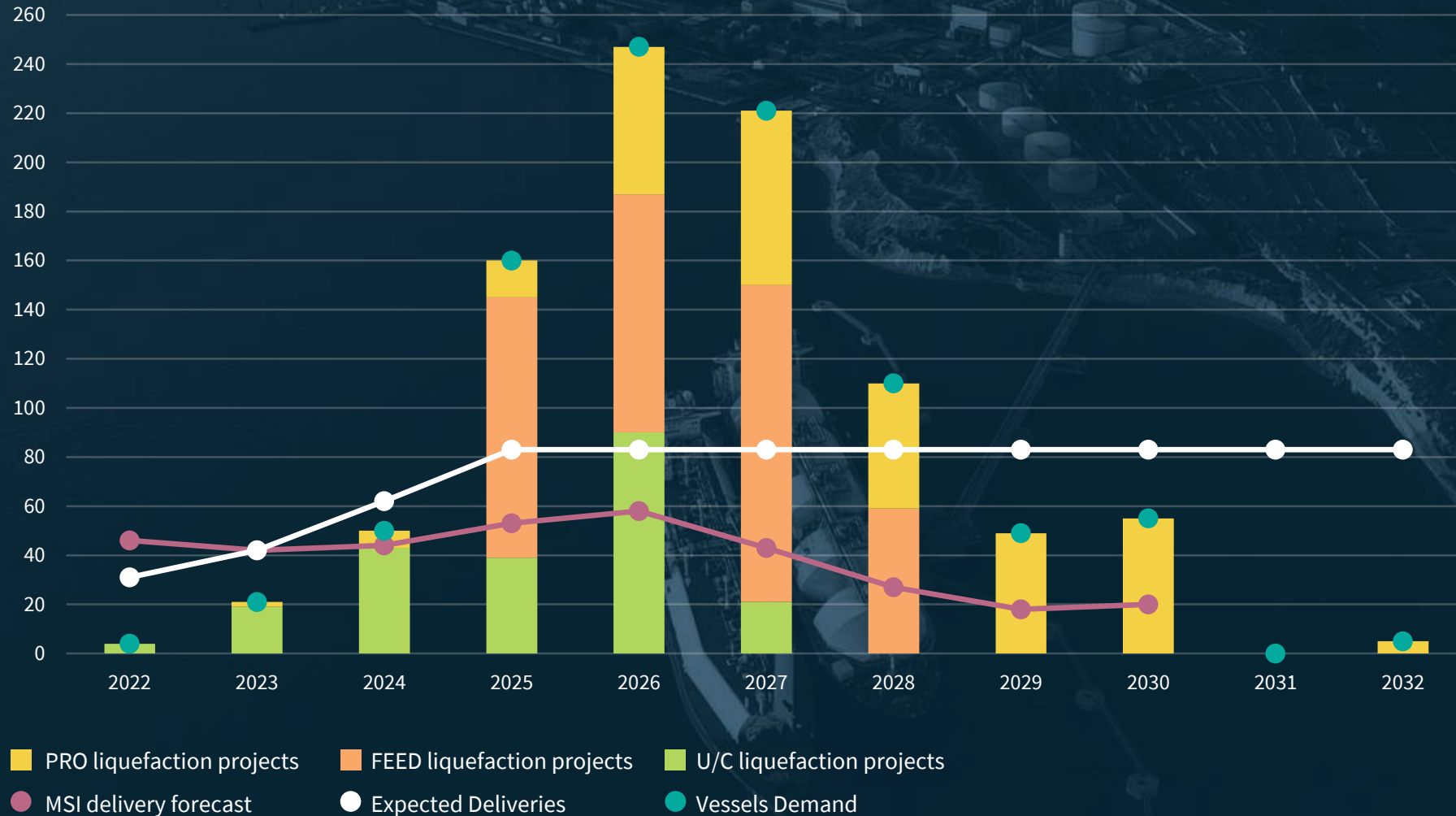
## The demand for ships will exceed shipyard capacity



Yard	Annual capacity for LNGC units
HHI (Ulsan)	14-16
HSHI	8-9
HDZ	4-8
Jiangnan	2-4
DSIC	2-4
SHI	18-22
DSME	18-20



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# LNG Carriers

More than quarter of a billion USD for an asset that may become stranded in 10 years time

YEARS	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Vessel lifetime
Baseline	A	A	A	A	A	A	A	B	B	B	C	C	D	D	D	E	E	E	E	15 years
CCS	A	A	A	A	A	A	A	A	A	A	A	B	B	C	C	D	D	E	E	18 years
GWP 100	A	A	A	A	A	B	B	B	C	C	C	D	D	D	E	E	E	E	E	14 years
GWP 100 + CCS	A	A	A	A	A	A	A	A	B	B	B	C	C	D	D	E	E	E	E	16 years
GWP 100+CH <sub>4</sub> abatement	A	A	A	A	A	A	A	B	B	C	C	C	D	D	E	E	E	E	E	15 years
GWP 20	A	A	B	B	B	C	C	C	D	D	D	D	E	E	E	E	E	E	E	11 years
GWP 20 + CCS	A	A	A	A	A	B	B	B	C	C	C	D	D	E	E	E	E	E	E	14 years
GWP 20 + CH <sub>4</sub> abatement	A	A	A	A	A	A	B	B	B	C	C	D	D	D	E	E	E	E	E	14 years

CH<sub>4</sub> slip = 1.1%

3 consecutive D ratings = going out of service

E rating = going out of service

Vessel out of service



# MAMii - Methane Abatement in Maritime Innovation Initiative

## A Global Alliance of key Shipping Players to address the Methane Risk

LR recognises that the key to **securing the longevity of the LNG sector** is to pool resources and work together to efficiently tackle the environmental pressures concerning methane emissions.

This is why we started this exclusive industry alliance: **Methane Abatement in Maritime**

### COMMITTED ANCHOR PARTNERS:



### MAMii Objectives

- ✓ No disruption and no criticism for using LNG fuel
- ✓ Seen to be addressing the environmental issues with LNG
- ✓ Define the regulatory landscape, commercial risk around emissions
- ✓ Explore the current state of play – technology for methane monitoring and abatement
- ✓ Shared knowledge, experience and due diligence through roadmaps, technology showcases, white papers and pilots
- ✓ Shaping a Methane strategy - addressing in a smart way.

### What is projected to be the methane cost for shipping?

- Incremental methane cost on the basis of Carbon pricing for a modern LNGC is estimated to be **USD 4-12 million** over a 15-year period
- Under a **GWP 20** assumption this increases up to a max of **USD 36 million** per vessel.
- The Global LNG Carrier Fleet will need to absorb an incremental methane cost of **USD 3-9 billion** in the next 15 years

# Future Gas Value Chains

## Ammonia

### As a Hydrogen Carrier

#### Next generation clean energy source

- ❖ Incremental Ammonia demand focusing on Asia-Pacific industrial & power generator uses
- ❖ Only 11% of ammonia production is traded (over half turned into urea in situ)
- ❖ Oman, Australia, Saudi Arabia, Mauretania & Chile active projects for expansion
- ❖ Most green ammonia capacity designed for export with vast majority to be seaborne

### New Gas Value & Supply Chain

#### Ammonia transportation as commodity

#### Ammonia use in gas thermal power plants & receiving stations

**20 MTPA** trade volume out of **200 MTPA** production.

Expected demand **85 MTPA** by 2030\*

\*High Case



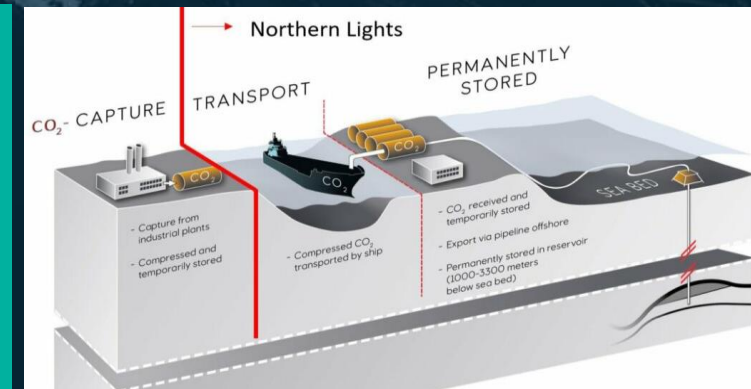
## Carbon Dioxide

### Closing the Carbon Cycle

- **Syndicating into clusters of emitters** proves challenging
- **Carbon Dioxide recycling** may prove critical in integrating economic sectors in the transition
- **LCO2 Carriers are coming to reality** but interface to shore is a barrier we need to address
- **Vessel Size, Haul distance** and pressure stand as barriers to LCO2 Carriers

Approximately 50% of CH<sub>4</sub> Calorific Value, ie Market Value, is linked to the Carbon Atom

The CO<sub>2</sub> Value Chain could be saving dozens of \$ trillions in Hydrocarbon assets



*Current estimates imply adequate CO<sub>2</sub> storage capacity in the world's saline aquifers and oil and gas reservoirs to store more than a 100 years of anthropogenic CO<sub>2</sub> emissions.*

**LR and LISCR award Design Approval for world's first 30,000cbm LCO2 carrier**

18 Sep 2022

HEALTHY DECARBONIZATION HEALTHY SHIPPING

New storage tank design and materials to increase efficiency

## Key Takeaways

- ✓ Outside production, shipping remains a key link in the LNG value chain
- ✓ Climate alignment may pose a risk in the LNG fleet meeting shipping demand for Gas
- ✓ We need to keep in mind our shipbuilding capacity to build new ships is constrained
- ✓ Flexibility and rational seem like the shipping and gas industries asks
- ✓ Methane emissions remain as key risk to the industry both onshore but also at sea
- ✓ The new Gas Value Chains have an important role to play in transition scenarios coupled with energy security
- ✓ Carbon Dioxide recycling appears as a key prospect and a possible negation mechanism to GHG emissions



An aerial photograph of an industrial facility, likely a refinery or chemical plant, situated on a peninsula. Two large red and white LNG tankers are docked at a pier in the foreground. The facility includes several large storage tanks, buildings, and piping. The surrounding area is a mix of industrial structures and natural terrain.

# Thank you

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A large, stylized logo consisting of the letters 'L' and 'R' in a bold, sans-serif font. The letters are white with a dark, textured fill that matches the background image. The logo is set against a white rectangular background.

# LR