



# Shell LNG

Outlook 2024



# Cautionary note

The companies in which Shell plc directly and indirectly owns investments are separate legal entities. In this LNG Outlook “Shell”, “Shell Group” and “Group” are sometimes used for convenience where references are made to Shell plc and its subsidiaries in general. Likewise, the words “we”, “us” and “our” are also used to refer to Shell plc and its subsidiaries in general or to those who work for them. These terms are also used where no useful purpose is served by identifying the particular entity or entities. “Subsidiaries”, “Shell subsidiaries” and “Shell companies” as used in this LNG Outlook refer to entities over which Shell plc either directly or indirectly has control. Entities and unincorporated arrangements over which Shell has joint control are generally referred to as “joint ventures” and “joint operations”, respectively. “Joint ventures” and “joint operations” are collectively referred to as “joint arrangements”. Entities over which Shell has significant influence but neither control nor joint control are referred to as “associates”. The term “Shell interest” is used for convenience to indicate the direct and/or indirect ownership interest held by Shell in an entity or unincorporated joint arrangement, after exclusion of all third-party interest.

## Forward-Looking Statements

This LNG Outlook contains forward-looking statements (within the meaning of the U.S. Private Securities Litigation Reform Act of 1995) concerning the financial condition, results of operations and businesses of Shell. All statements other than statements of historical fact are, or may be deemed to be, forward-looking statements. Forward-looking statements are statements of future expectations that are based on management’s current expectations and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in these statements. Forward-looking statements include, among other things, statements concerning the potential exposure of Shell to market risks and statements expressing management’s expectations, beliefs, estimates, forecasts, projections and assumptions. These forward-looking statements are identified by their use of terms and phrases such as “aim”, “ambition”, “anticipate”, “believe”, “could”, “estimate”, “expect”, “goals”, “intend”, “may”, “milestones”, “objectives”, “outlook”, “plan”, “probably”, “project”, “risks”, “schedule”, “seek”, “should”, “target”, “will” and similar terms and phrases. There are a number of factors that could affect the future operations of Shell and could cause those results to differ materially from those expressed in the forward-looking statements included in this Outlook, including (without limitation): (a) price fluctuations in crude oil and natural gas; (b) changes in demand for Shell’s products; (c) currency fluctuations; (d) drilling and production results; (e) reserves estimates; (f) loss of market share and industry competition; (g) environmental and physical risks; (h) risks associated with the identification of suitable potential acquisition properties and targets, and successful negotiation and completion of such transactions; (i) the risk of doing business in developing countries and countries subject to international sanctions; (j) legislative, judicial, fiscal and regulatory developments including regulatory measures addressing climate change; (k) economic and financial market conditions in various countries and regions; (l) political risks, including the risks of expropriation and renegotiation of the terms of contracts with governmental entities, delays or advancements in the approval of projects and delays in the reimbursement for shared costs; (m) risks associated with the impact of pandemics, such as the COVID-19 (coronavirus) outbreak, regional conflicts, such as Russia’s invasion of Ukraine, and a significant cybersecurity breach; and (n) changes in trading conditions. No assurance is provided that future dividend payments will match or exceed previous dividend payments. All forward-looking statements contained in this LNG Outlook are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. Readers should not place undue reliance on forward-looking statements. Additional risk factors that may affect future results are contained in Shell plc’s Form 20-F for the year ended December 31, 2022 (available at [www.shell.com/investors/news-and-filings/sec-filings.html](http://www.shell.com/investors/news-and-filings/sec-filings.html) and [www.sec.gov](http://www.sec.gov)). These risk factors also expressly qualify all forward-looking statements contained in this Outlook and should be considered by the reader. Each forward-looking statement speaks only as of the date of this Outlook, February 14, 2024. Neither Shell plc nor any of its subsidiaries undertake any obligation to publicly update or revise any forward-looking statement as a result of new information, future events or other information. In light of these risks, results could differ materially from those stated, implied or inferred from the forward-looking statements contained in this LNG Outlook.

## Shell’s net carbon intensity

Also, in this LNG Outlook we may refer to Shell’s “Net Carbon Intensity”, which includes Shell’s carbon emissions from the production of our energy products, our suppliers’ carbon emissions in supplying energy for that production and our customers’ carbon emissions associated with their use of the energy products we sell. Shell only controls its own emissions. The use of the term Shell’s “Net Carbon Intensity” is for convenience only and not intended to suggest these emissions are those of Shell plc or its subsidiaries.

## Shell’s net-Zero Emissions Target

Shell’s operating plan, outlook and budgets are forecasted for a ten-year period and are updated every year. They reflect the current economic environment and what we can reasonably expect to see over the next ten years. Accordingly, they reflect our Scope 1, Scope 2 and Net Carbon Intensity (NCI) targets over the next ten years. However, Shell’s operating plans cannot reflect our 2050 net-zero emissions target and 2035 NCI target, as these targets are currently outside our planning period. In the future, as society moves towards net-zero emissions, we expect Shell’s operating plans to reflect this movement. However, if society is not net zero in 2050, as of today, there would be significant risk that Shell may not meet this target.

Shell expects to publish its 2024 Energy Transition Strategy on March 14, 2024, which will include an update on Shell’s energy transition strategy and set out Shell’s climate targets and ambitions for the future.

## Forward Looking Non-GAAP measures

This LNG Outlook may contain certain forward-looking non-GAAP measures such as [cash capital expenditure] and [divestments]. We are unable to provide a reconciliation of these forward-looking Non-GAAP measures to the most comparable GAAP financial measures because certain information needed to reconcile those Non-GAAP measures to the most comparable GAAP financial measures is dependent on future events some of which are outside the control of Shell, such as oil and gas prices, interest rates and exchange rates. Moreover, estimating such GAAP measures with the required precision necessary to provide a meaningful reconciliation is extremely difficult and could not be accomplished without unreasonable effort. Non-GAAP measures in respect of future periods which cannot be reconciled to the most comparable GAAP financial measure are calculated in a manner which is consistent with the accounting policies applied in Shell plc’s consolidated financial statements.

The contents of websites referred to in this report do not form part of the LNG Outlook 2024.

We may have used certain terms, such as resources, in this LNG Outlook that the United States Securities and Exchange Commission (SEC) strictly prohibits us from including in our filings with the SEC. Investors are urged to consider closely the disclosure in our Form 20-F, File No 1-32575, available on the SEC website [www.sec.gov](http://www.sec.gov).

# Summary

## Industry, heating and emerging Asia to drive LNG demand growth

- Demand for natural gas has peaked in some regions and globally is set to peak after 2040.
- The global LNG market will continue growing into the 2040s, mostly driven by China's industrial decarbonisation and strengthening demand in other Asian countries.



## Gas prices more stable in 2023 but volatility lingered in a tight market

- Global trade in LNG expanded slightly in 2023, with tight supplies constraining growth and prices staying above historic averages.
- A milder winter, high gas storage levels, modest economic recovery in China and lower demand in Europe helped balance the global gas market during 2023.

## Rising global demand for LNG expected to keep pace with new supply

- In the medium term, latent demand for LNG – especially in Asia – is set to consume new supply that is expected to come onto the market in the second half of the 2020s.
- To offset falling domestic gas production in South-east Asia, significant infrastructure investment will be needed to access the LNG that these countries need for their economic development.



# Industry, heating and emerging Asia to drive LNG demand growth

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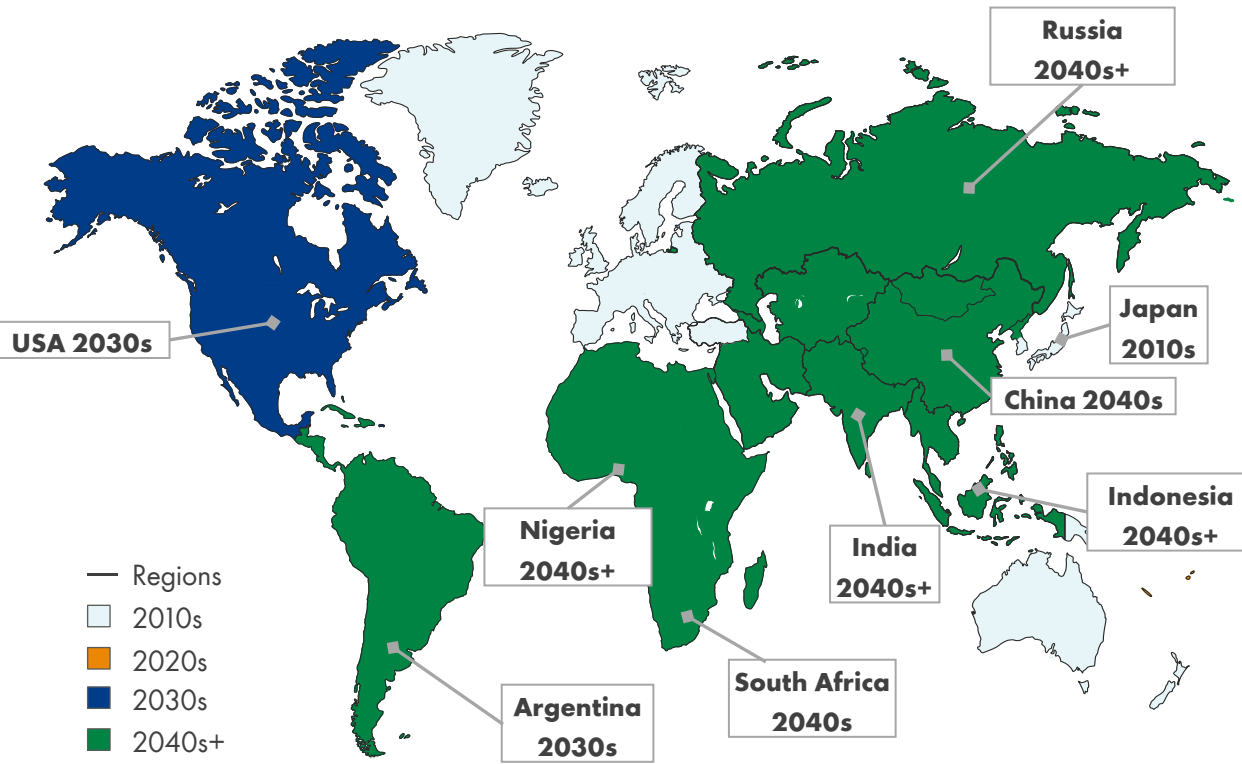
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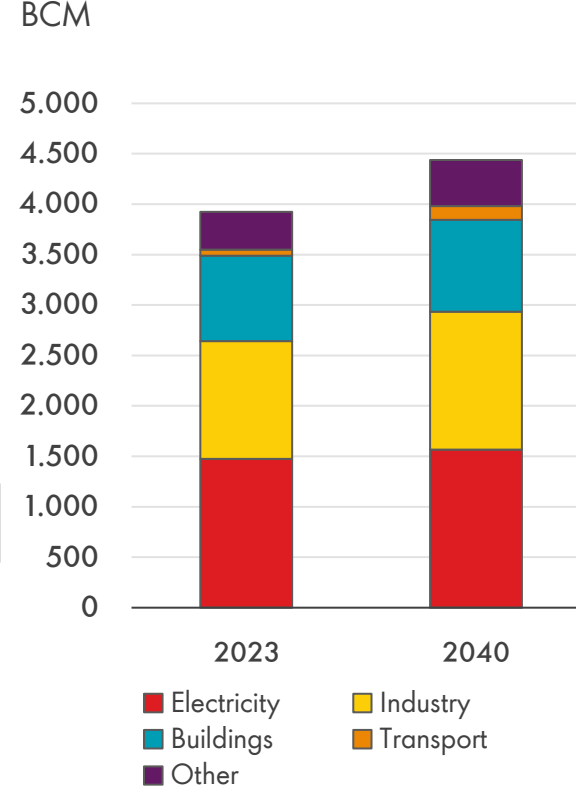
# Gas use peaks in some markets, continues to grow globally

## LNG to play increasingly important role in global gas supply

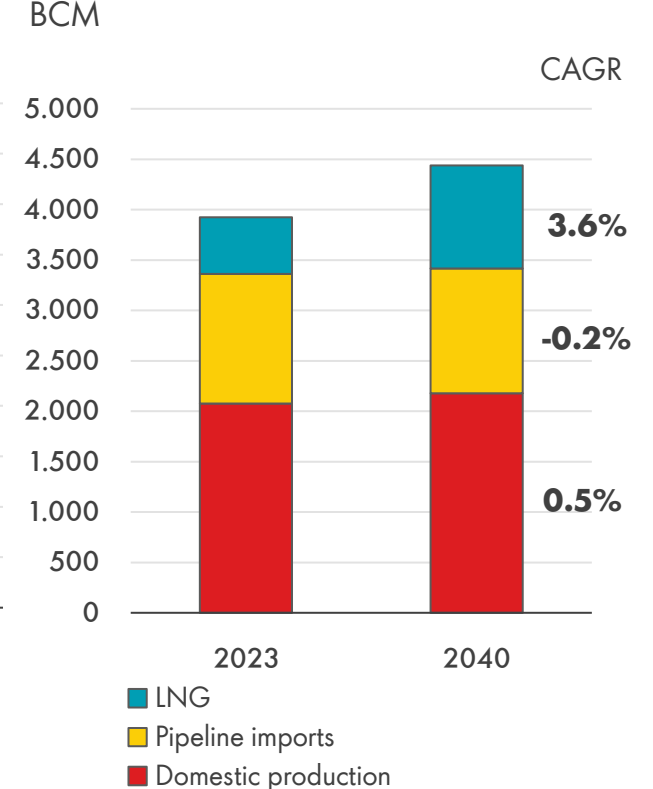
Peak gas demand by decade



Gas demand by sector



Natural gas supply source



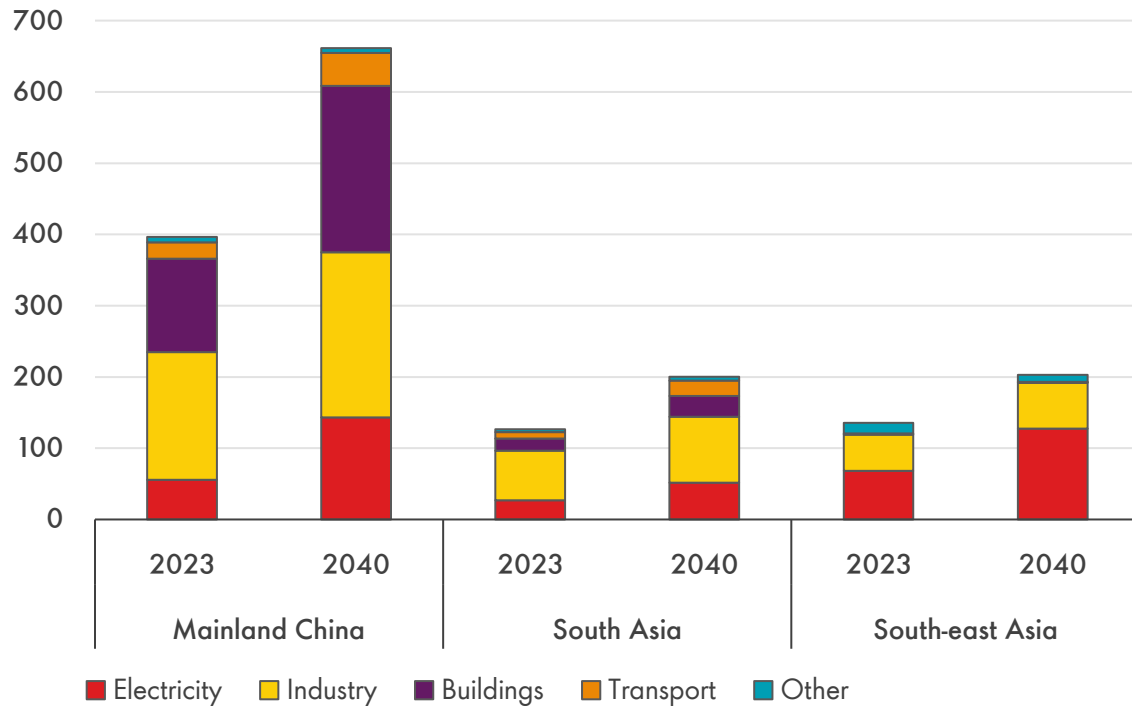
Source: Shell interpretation of Wood Mackenzie data  
CAGR: Compound annual growth rate

# Industry, buildings to be key demand drivers in emerging Asia

LNG expected to meet more than 75% of this growth

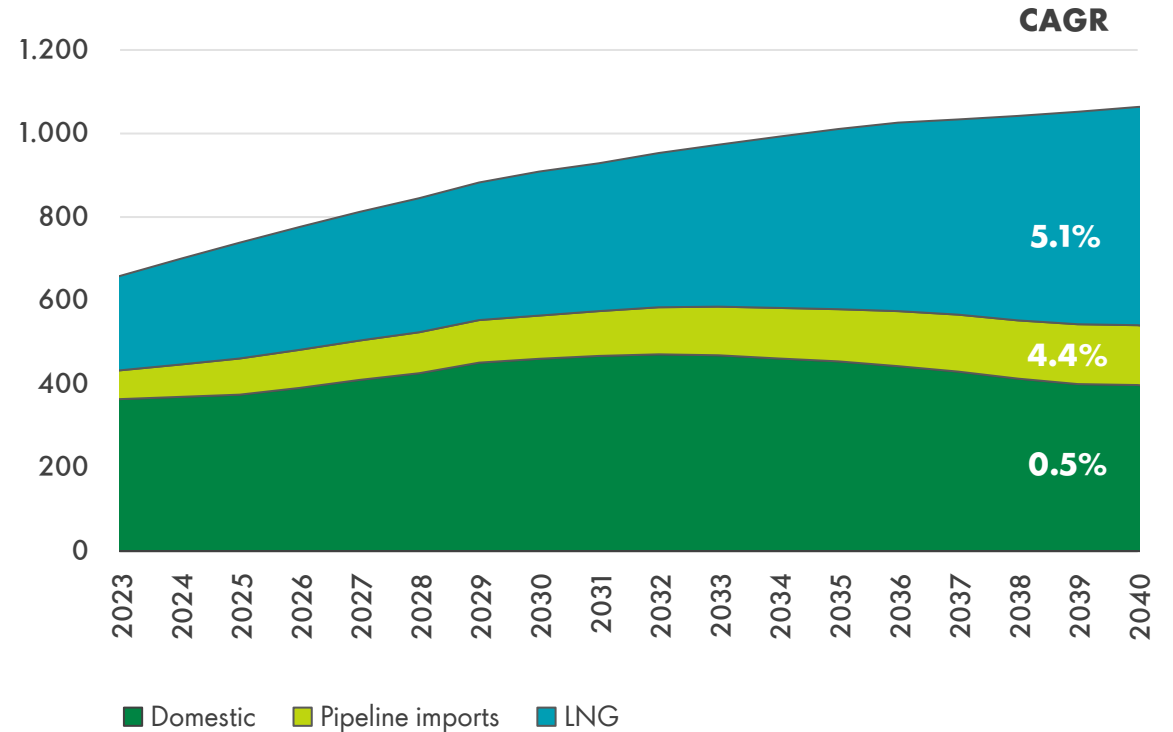
## Emerging Asia natural gas demand

BCM



## Emerging Asia gas supply source

BCM



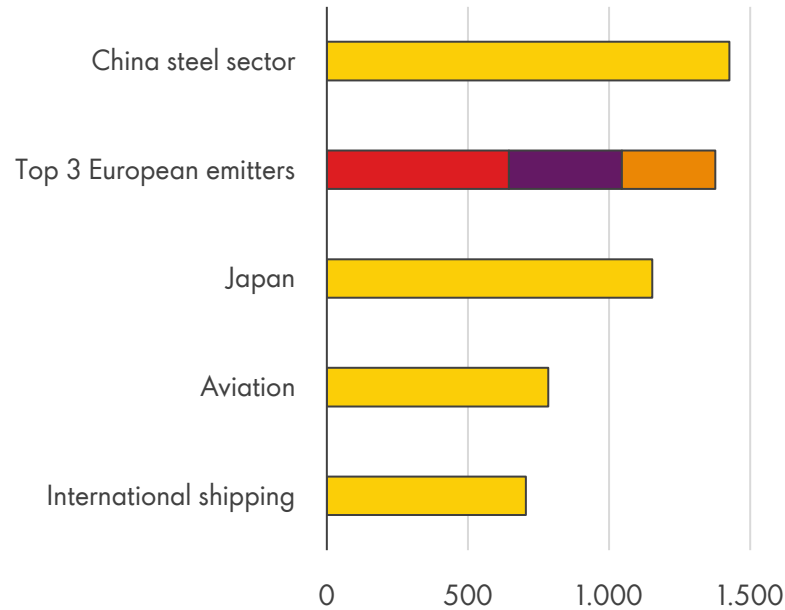
Source: Shell interpretation of Wood Mackenzie data

# Industry must address CO<sub>2</sub> emissions

Gases expected to play an important role in reducing sector emissions

## Comparative emissions

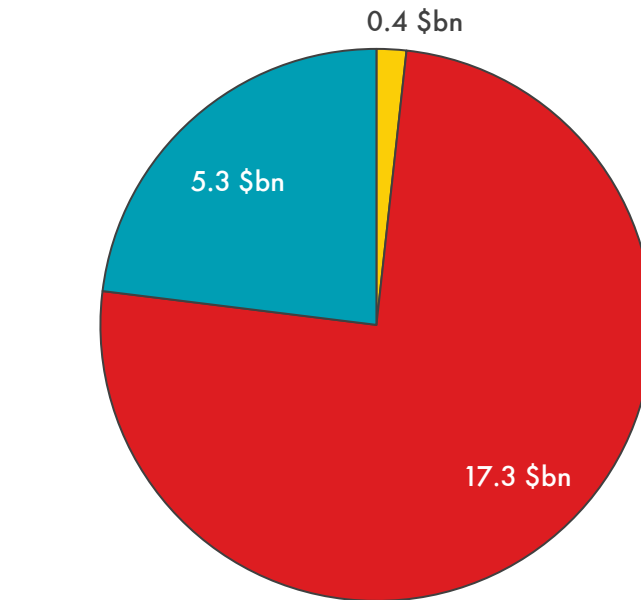
Mt CO<sub>2</sub>/yr.



■ Germany ■ UK ■ Turkey

## China exposure to EU CBAM

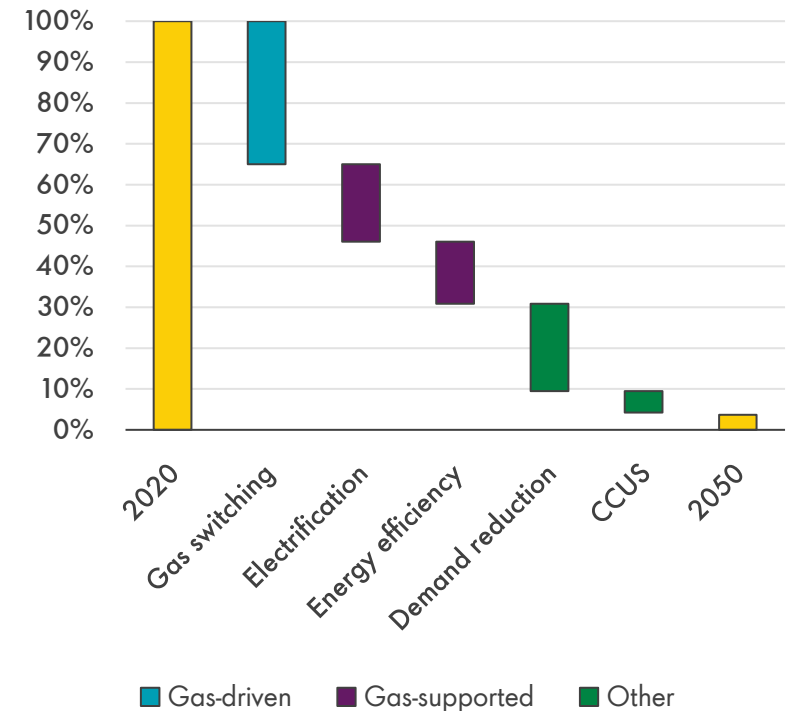
2022



■ Fertiliser ■ Iron and steel ■ Aluminium

## Ways to decarbonise Chinese steel

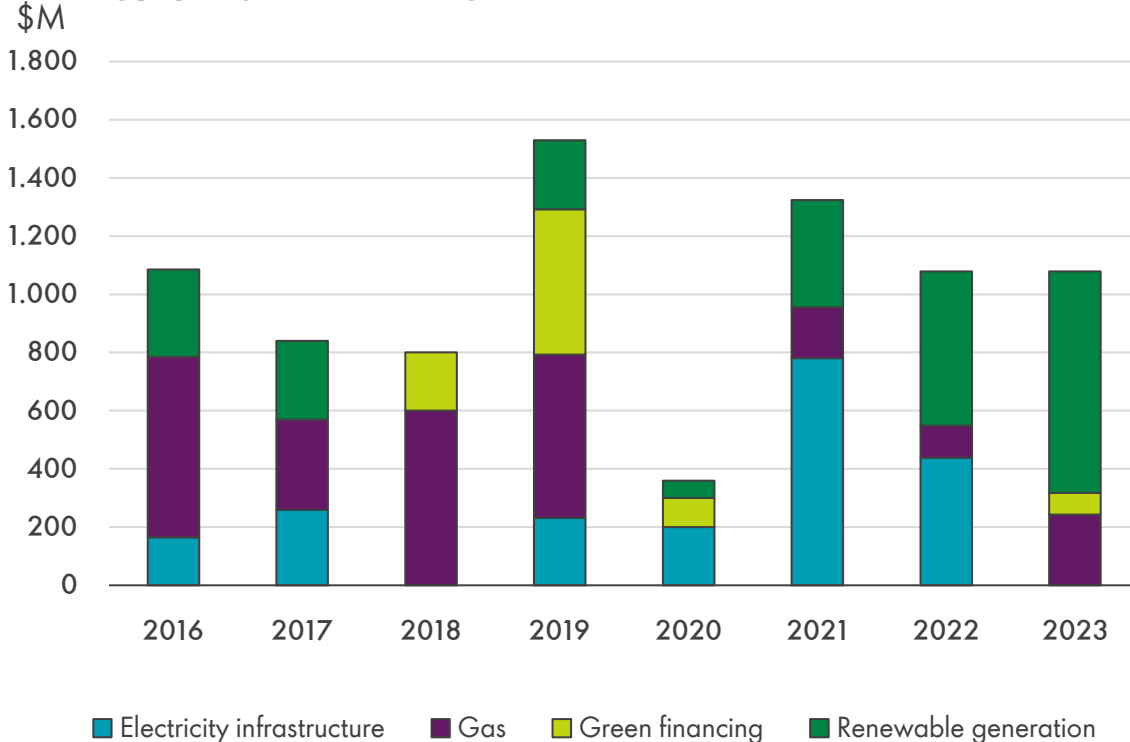
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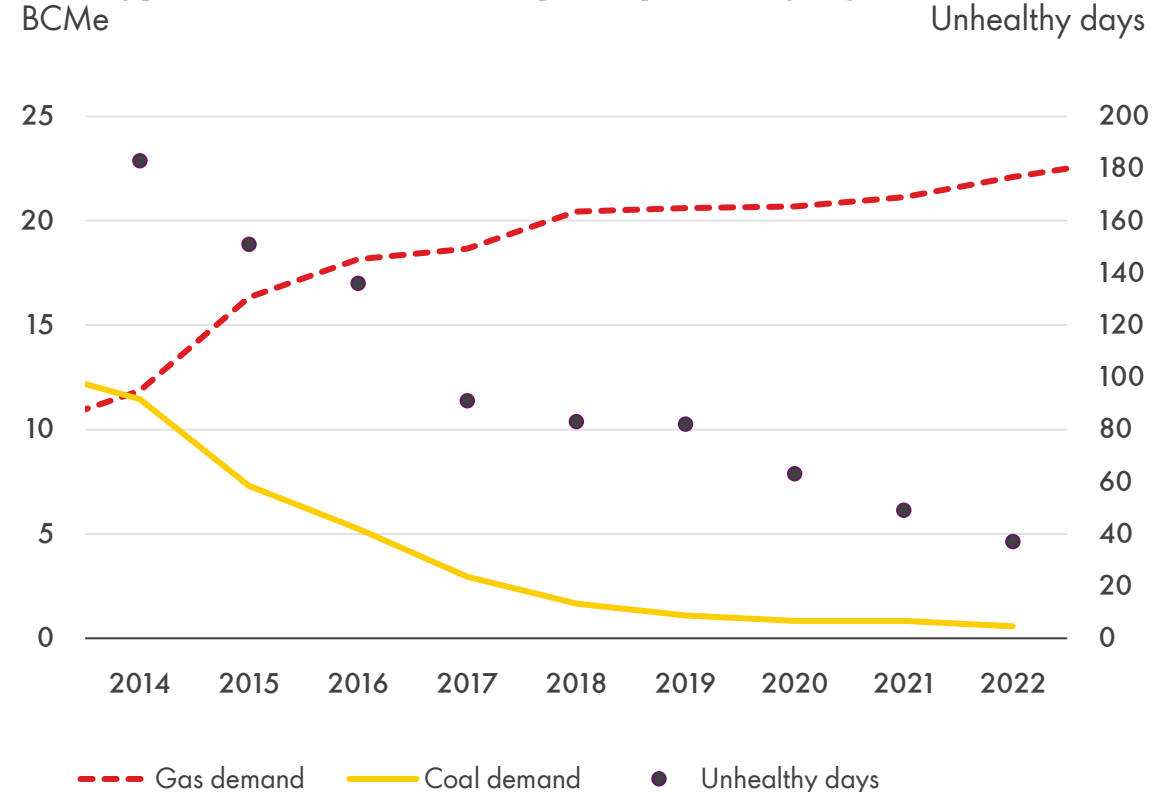
Source: Shell interpretation of Wood Mackenzie, IEA data, Net Zero Roadmap for China's steel industry study for Global Efficiency Intelligence & Lawrence Berkeley National Laboratory 2023  
 CBAM: Carbon Border Adjustment Mechanism. Value of Chinese exports to EU that will be covered by CBAM at implementation. CCUS: carbon capture, utilisation and storage (includes bio-energy CCUS). Three largest European emitters: Germany, UK, Turkey

# Policy and investment continues for gas projects with environmental and emissions benefits

## Asia Infrastructure Investment Bank energy project funding 2016 - 2023



## Energy demand and air quality in Beijing



Sources: Shell interpretation of Asia Infrastructure Investment Bank data, Beijing Municipal Bureau of Statistics and Air Quality Index data  
Unhealthy days: defined as an Air Quality index with PM 2.5 greater than 150 µg/m<sup>3</sup>

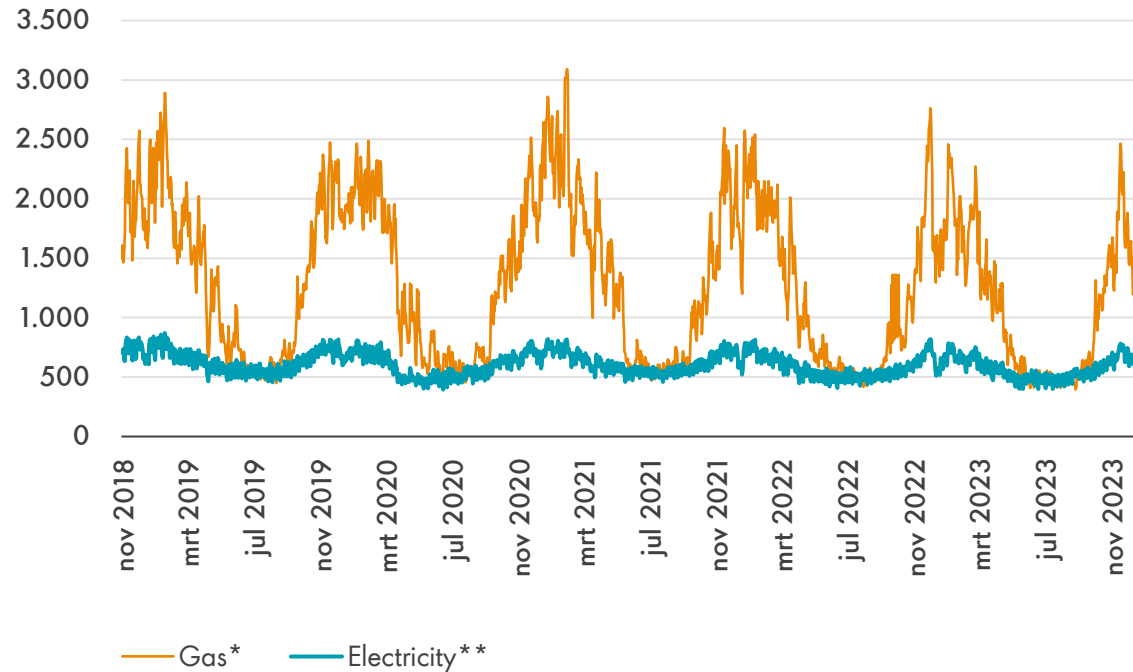


# Gas currently plays key role in meeting heating demand

Electrification will need investment, supply chain and buildings improvements

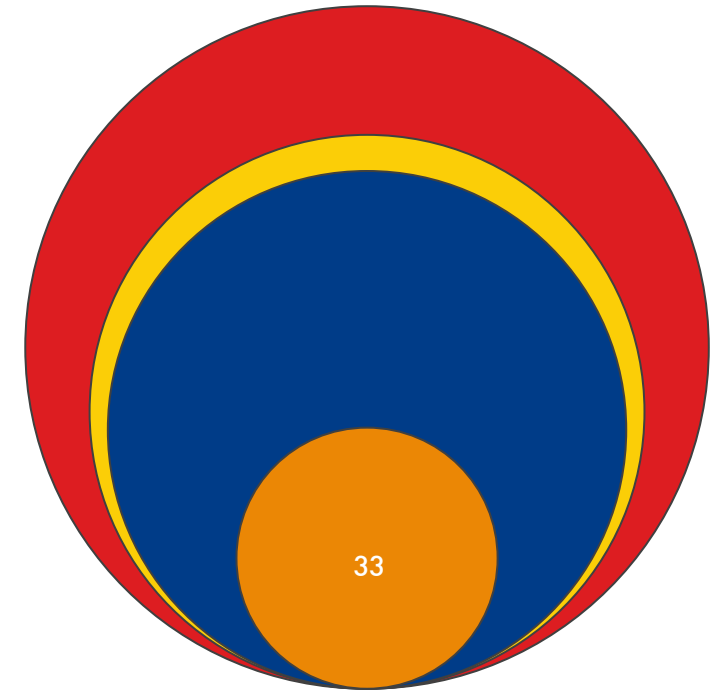
## England and Wales buildings: gas\* and total electricity demand

GWh/d



## Buildings gas demand BCM (2022)

- UK
- Mainland China
- European Union
- USA

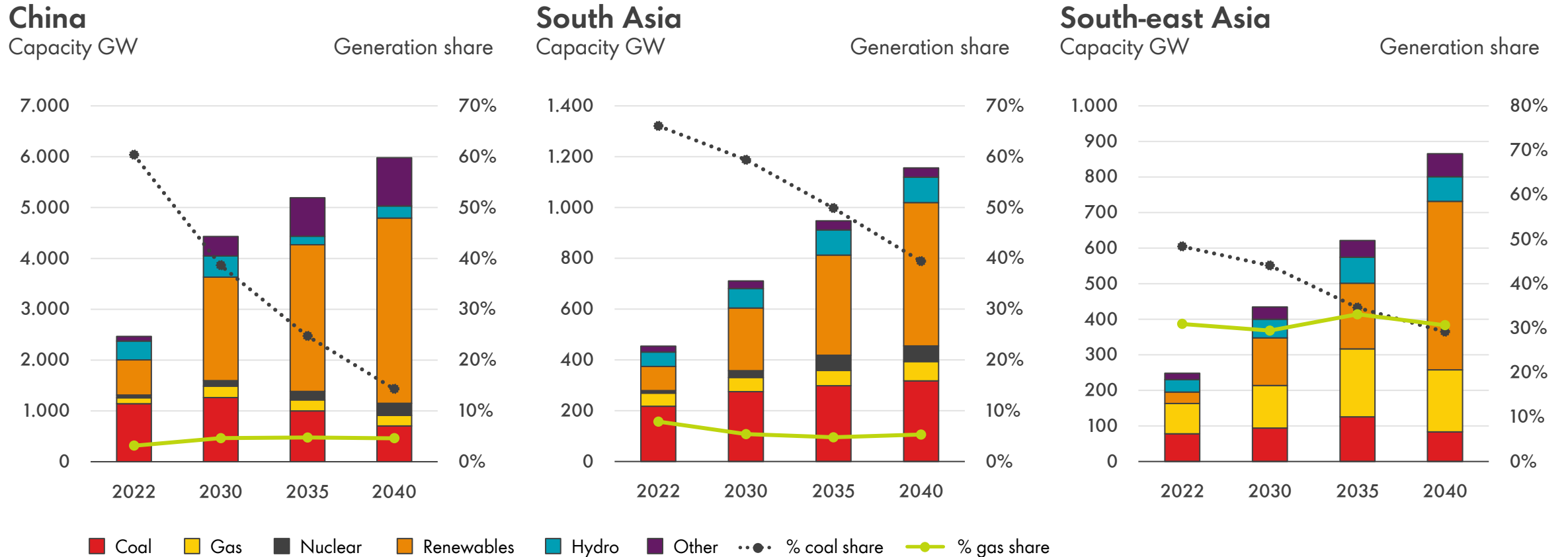


Sources: Shell interpretation of UK National Grid ESO and UK National Gas data 2023, Wood MacKenzie data 2023

\*Local Distribution Zones (low-pressure gas supplied to buildings) in England and Wales

\*\* Total electricity demand for England and Wales

# Renewables, supported by gas, erodes coal's role in Asia

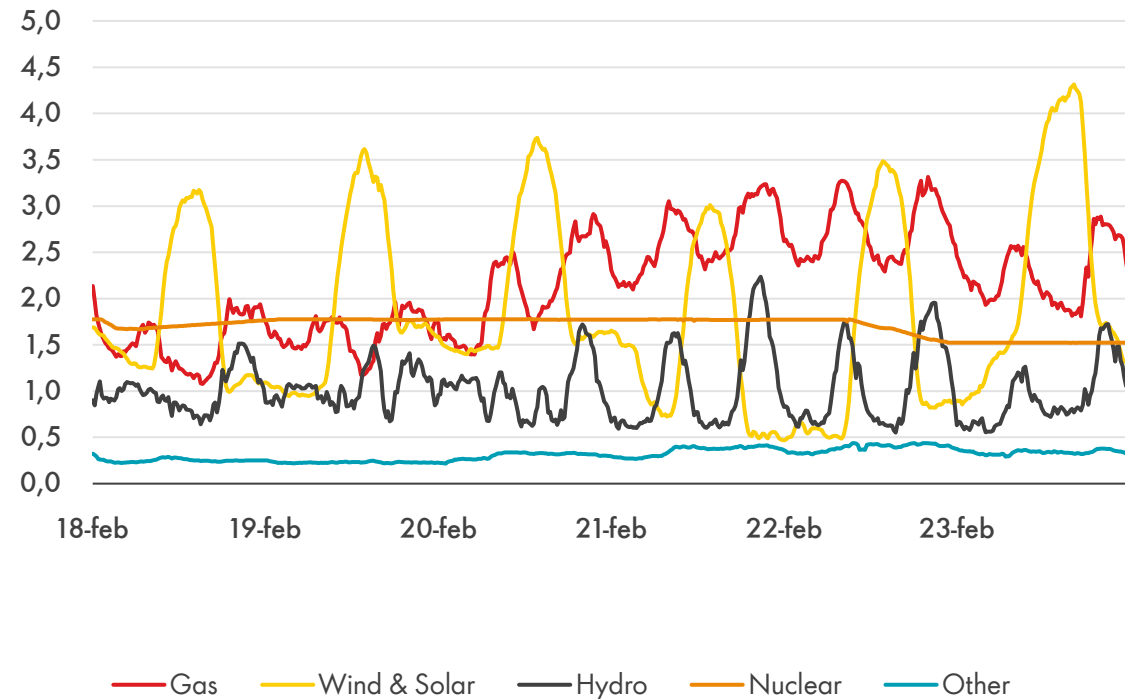


Source: Shell interpretation of Wood Mackenzie data

# Gas provides grid stability, enabling a higher share of renewables in generation

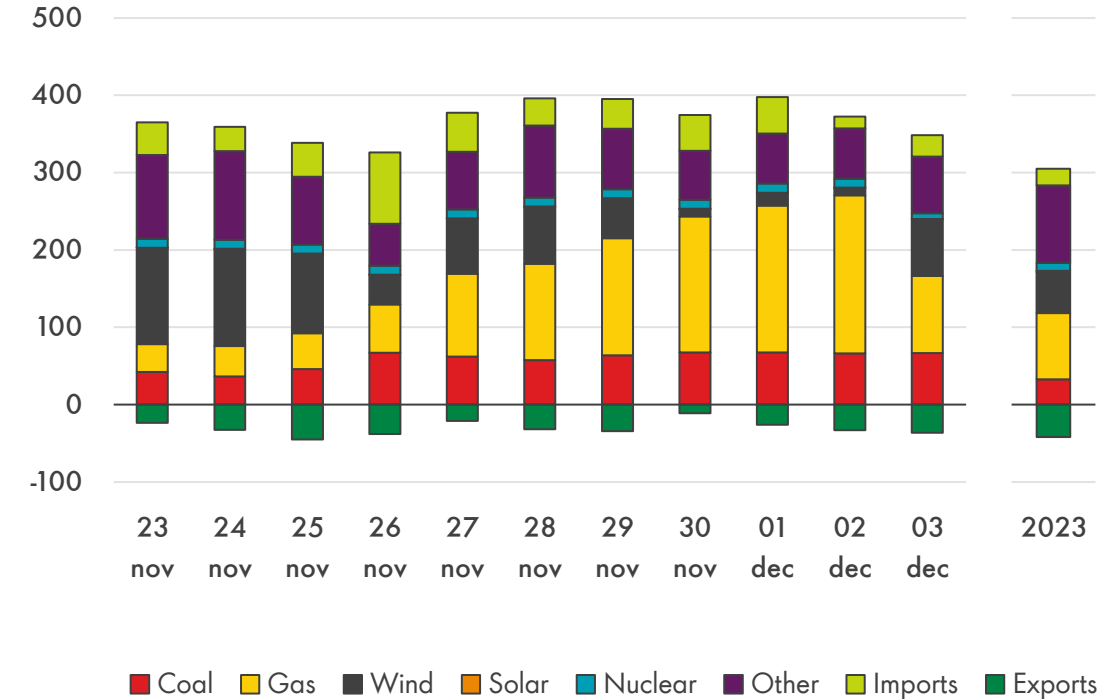
## Variable hourly power generation in Spain

GWh/h



## Variable daily power generation in the Netherlands

GWh/d

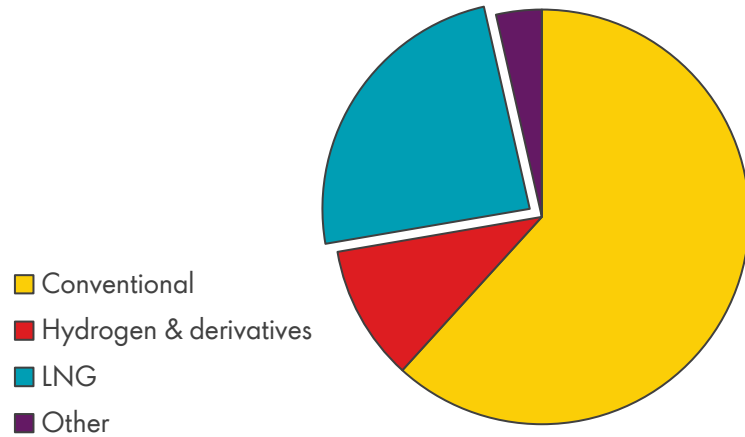


Source: Shell interpretation of European Network of Transmission System Operators data 2023  
Spanish figures calculated from 15-minute intervals  
Other includes biomass, other renewables and coal

# Marine sector continues to reduce emissions through LNG

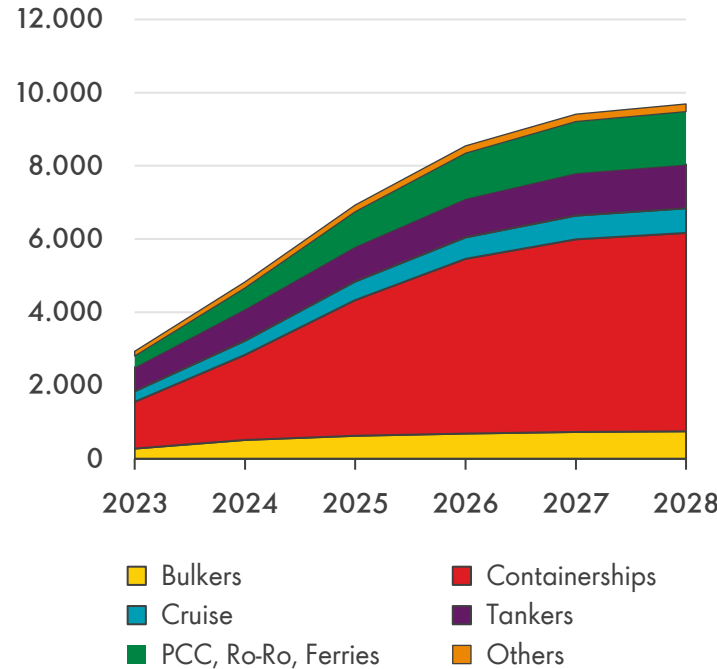
Liquefied gases can combine with technologies to help reduce emissions

## Vessel order book (2023) (Gross tonnage)

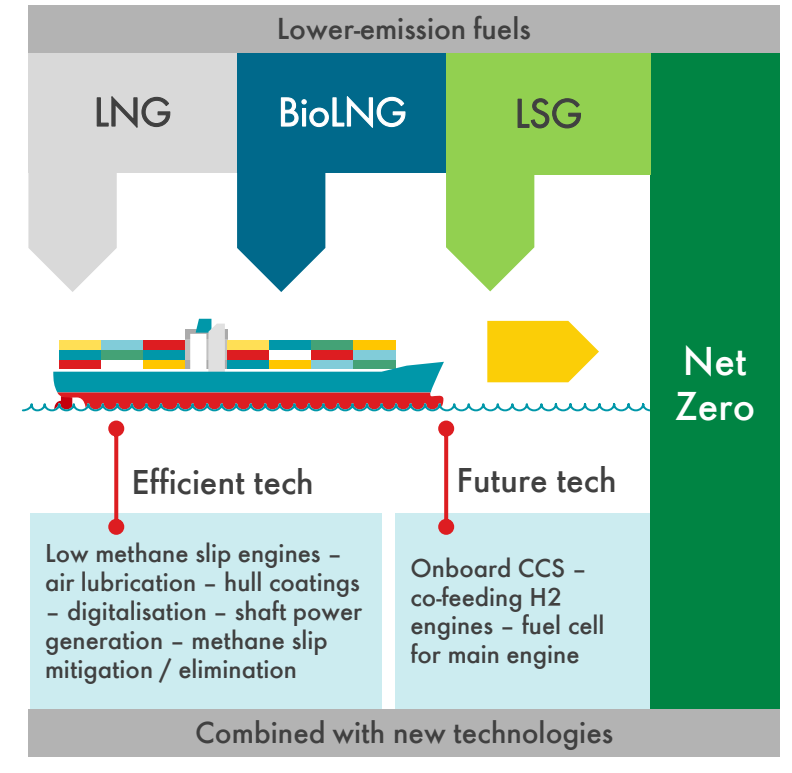


**537** LNG-fueled vessels on order  
**469** LNG-fueled vessels in operation

## Projected LNG bunkering to 2028 ('000 tonnes)



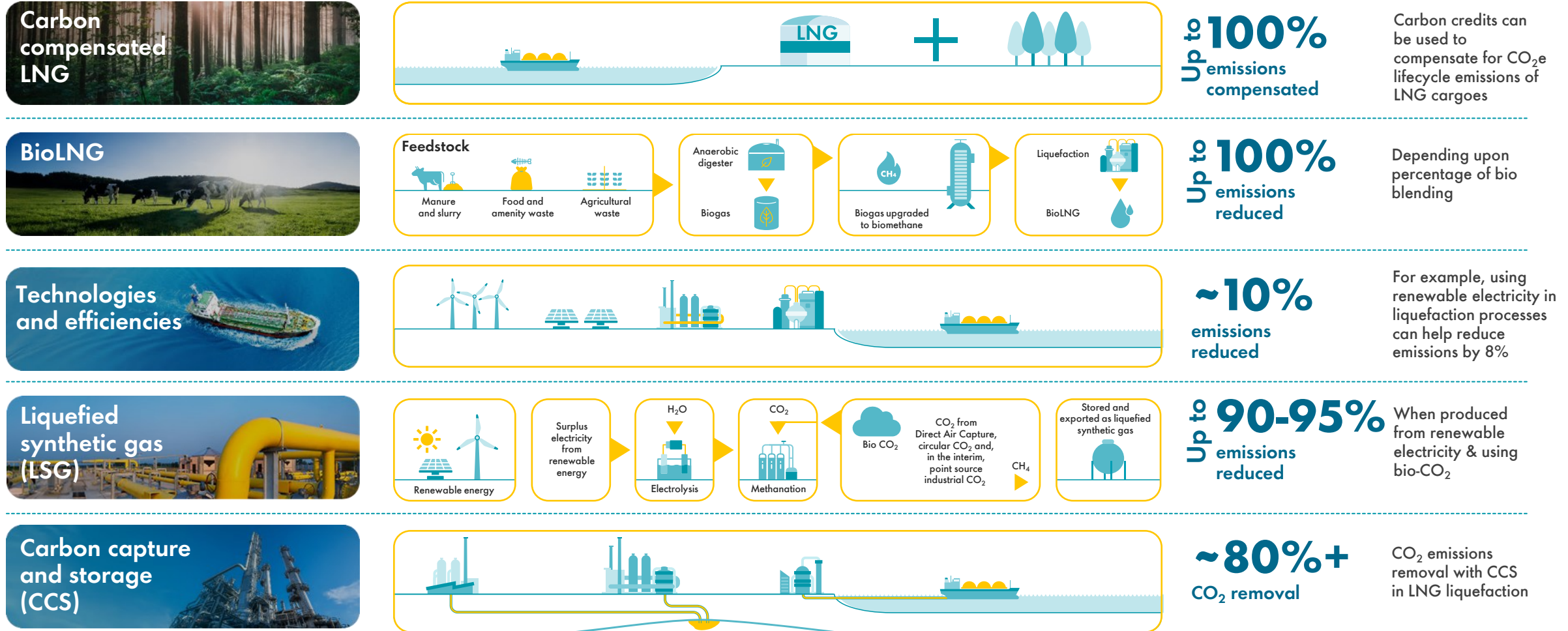
## Pathways to CO<sub>2</sub>e reduction



Source: Shell interpretation of Clarksons Research, DNV  
Hydrogen & derivatives: methanol, ammonia, hydrogen, biofuel. Other: Ethane, LPG, nuclear. PCC: pure car carriers. Ro-Ro: roll-on/roll-off. Others: dredgers, ferries, multi-purpose, LPG, tugs. LSG: liquefied synthetic gas. Energy efficient technologies include air lubrication, shaft power generation, digital technologies, wind technologies and improved hull coatings. Future Technologies include onboard carbon capture and storage, co-feeding hydrogen combined with dual-fuel LNG engines, fuel cell for main engine.

# LNG decarbonisation pathways need to be explored together

To address emissions today and progress zero emission options



Source: Shell interpretation of UK Department for Environment, Food and Rural Affairs (DEFRA) GHG conversion factors 2022, JEC Well-to-Tank report v5, Wood Mackenzie announcement

# A common goal: reducing methane emissions to 'near zero'

## Driven by government, institutions and policy



**156 countries** now part of **Global Methane Pledge**, covering 86% of LNG importing countries\*

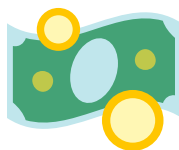


Groundbreaking **methane regulation** for oil and gas, including imports of gas and LNG into the **EU**

**Agreement** of EU, Japan, South Korea, USA and Australia to harmonised MRV

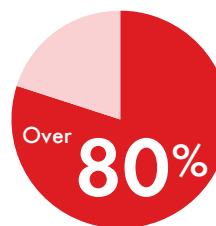


**\$255 mln** mobilised for **World Bank methane and flaring fund**



Source: Oil & Gas Methane Partnership (OGMP), public announcements, Methane Intelligence (MiQ) announcements, \*including EU; \*\* Announcement by Daphne Technologies (SlipPure™)

## Driven by industry

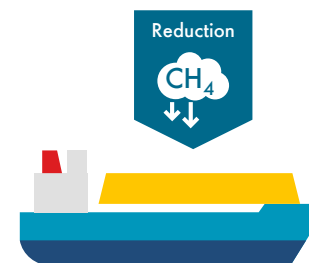


of LNG flows covered by more than **120 companies** and **70 countries** have joined **OGMP 2.0**



**52 signatories** to oil and gas decarbonisation charter launched at **COP 28**

Lab tests of new shipping technology shows **methane reduced to low levels\*\***



## Driven by customers



**First GIIGNL's MRV and GHG Neutral** aligned cargo delivered in Taiwan



**Increasing customer** led demand for **transparency** and **third-party verification**

**Gas prices more stable in 2023  
but volatility lingered in tight  
market**

**2**

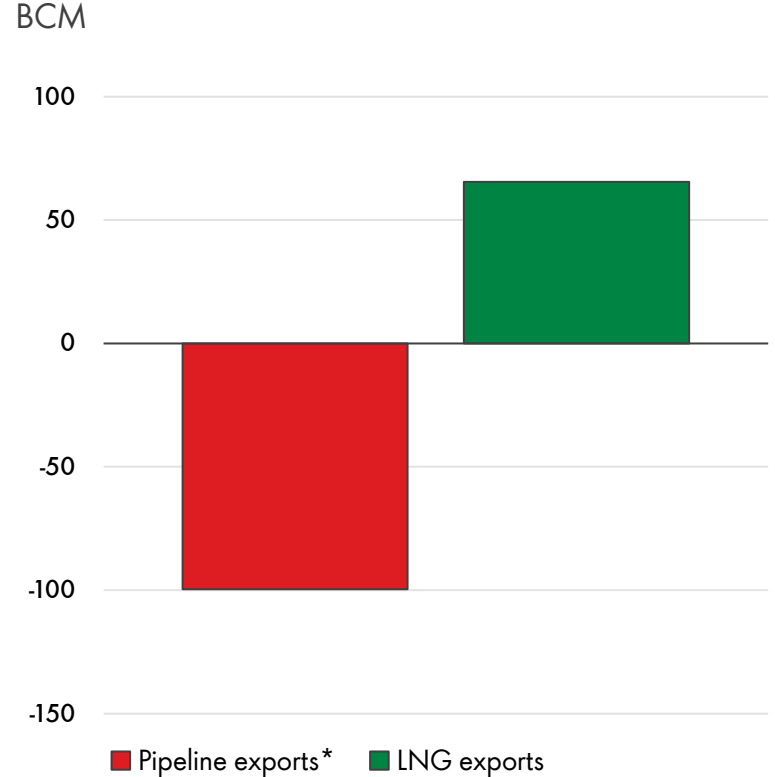
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# Despite structural tightness prices moderated in 2023

JKM prices fell but remained above historical norms

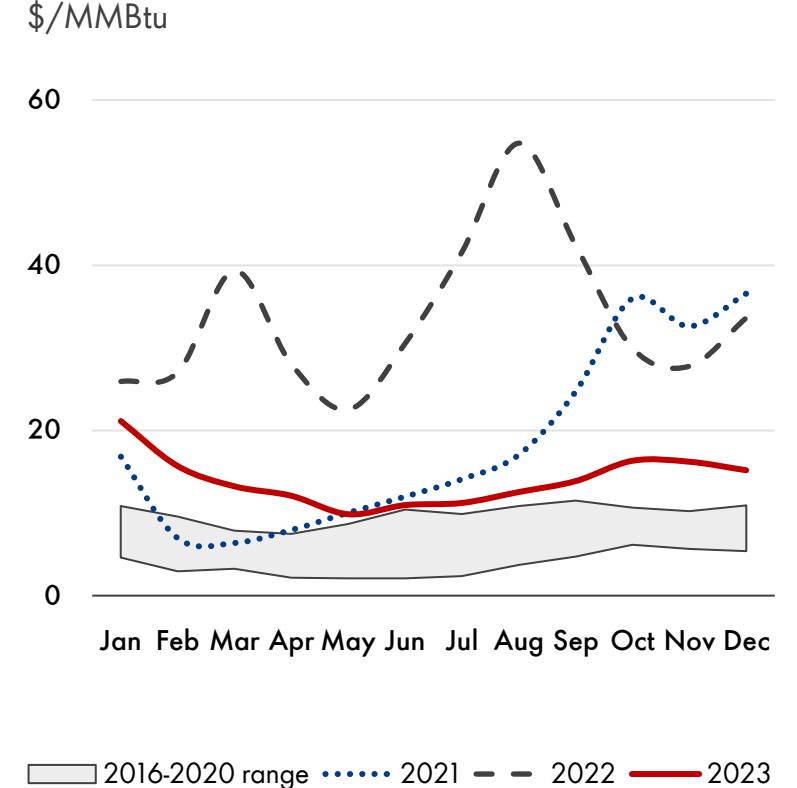
## Global gas trade change (2019 vs 2023)



## 2023 demand factors

- Mild winter temperatures
- High gas & LNG inventories in Europe & Asia
- Strong nuclear generation in France, Japan & South Korea
- Modest Chinese economic recovery
- Weak European demand & energy savings

## Average monthly JKM prices



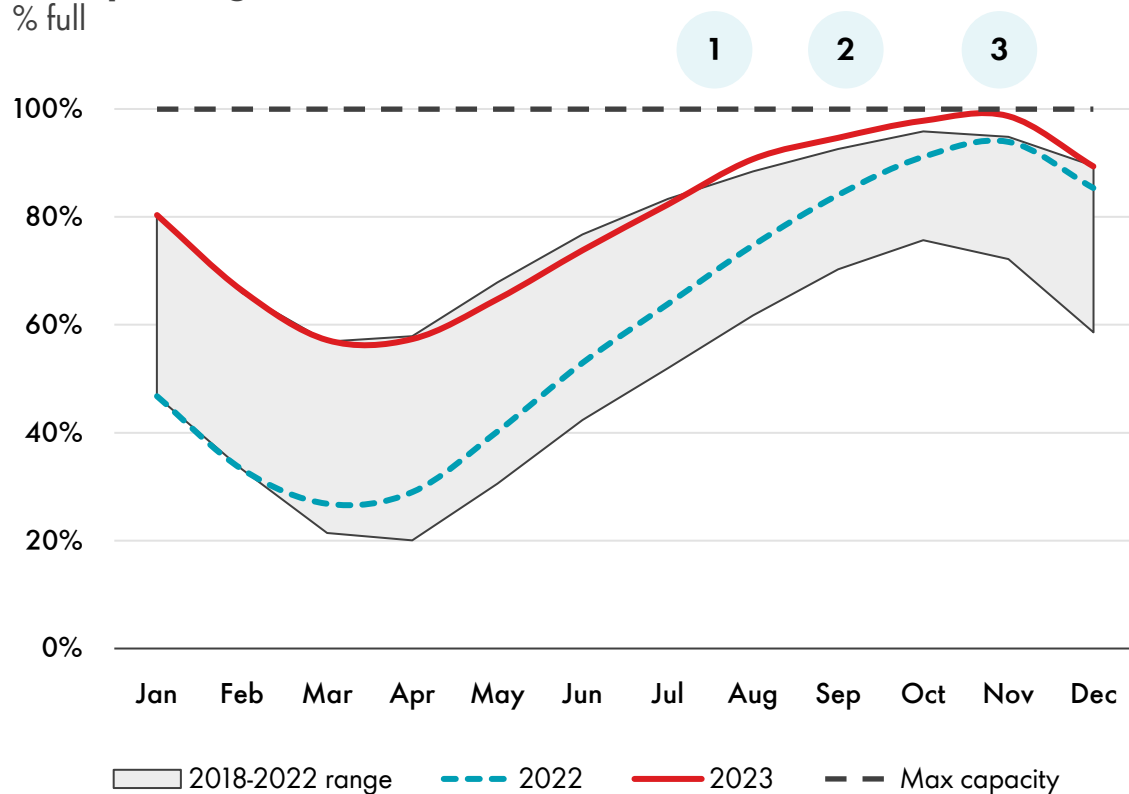
Source: Shell interpretation of Intercontinental Exchange (ICE) and Wood Mackenzie data  
JKM: Japan Korea Marker  
\*Pipeline exports exclude North America pipeline trade



# Supply security concerns sparked periods of volatility

Global events impacted market even with record-high inventories

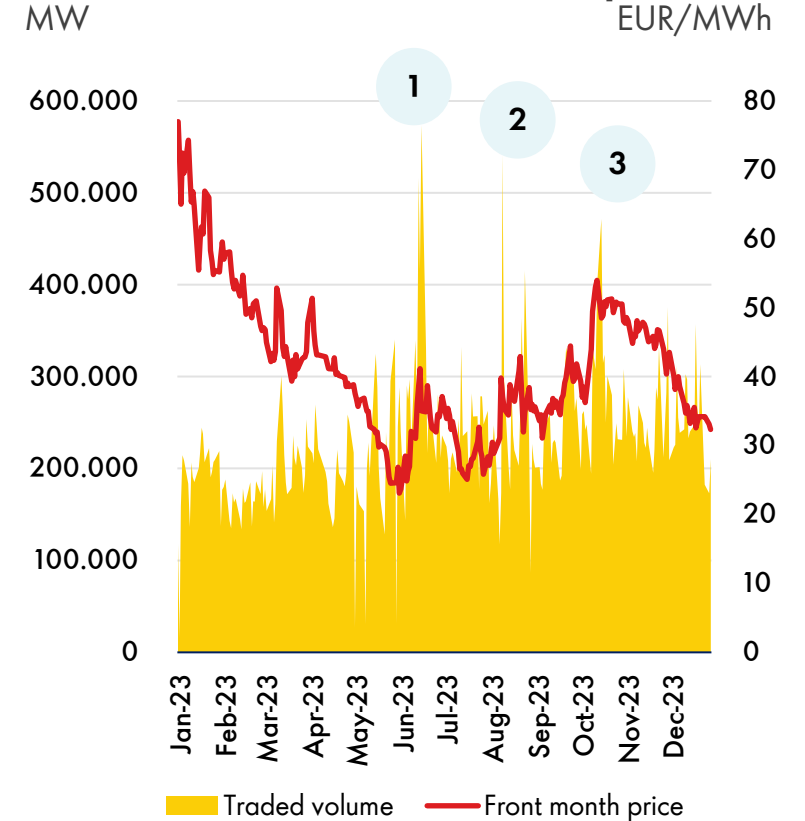
## European gas inventories



### Event-driven volatility

- 1 Prolonged Norwegian maintenance
- 2 Australian industrial action concern
- 3 Israel-Hamas conflict

## Dutch TTF traded volume vs price



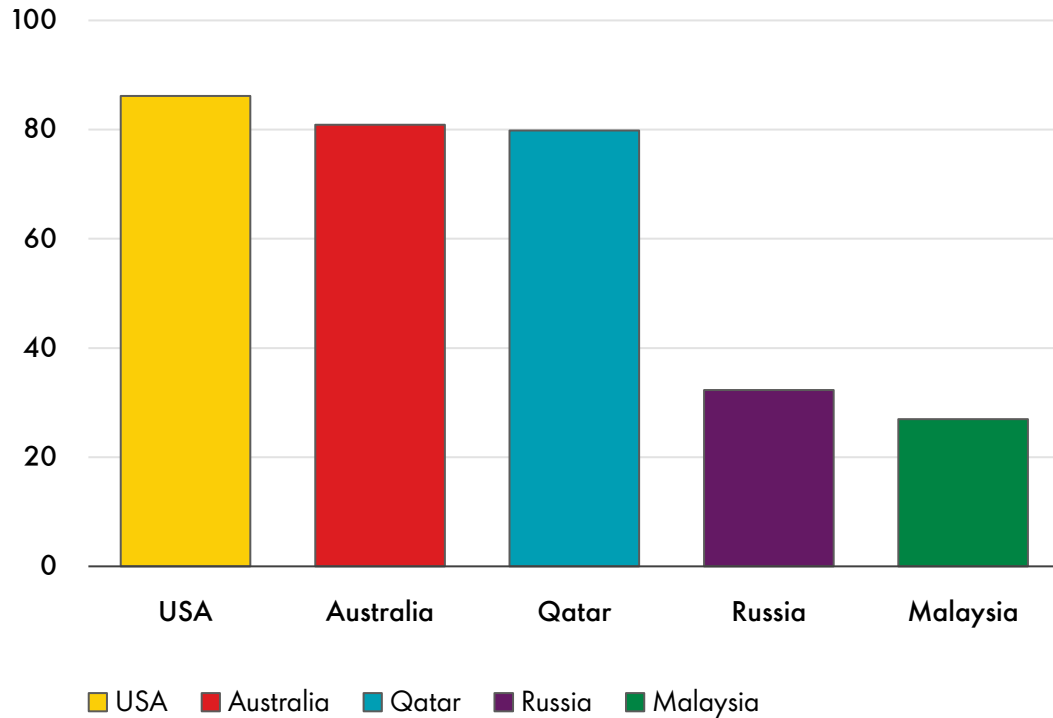
Source: Shell interpretation of Commodity Essentials and ICE data  
Europe includes UK, Germany, Belgium, France, Denmark, Netherlands, Spain, Italy, Austria, Slovakia, Czech Republic and Switzerland  
TTF: Title Transfer Facility

# USA became the largest LNG exporter

## Panama Canal constraints shifted trade patterns

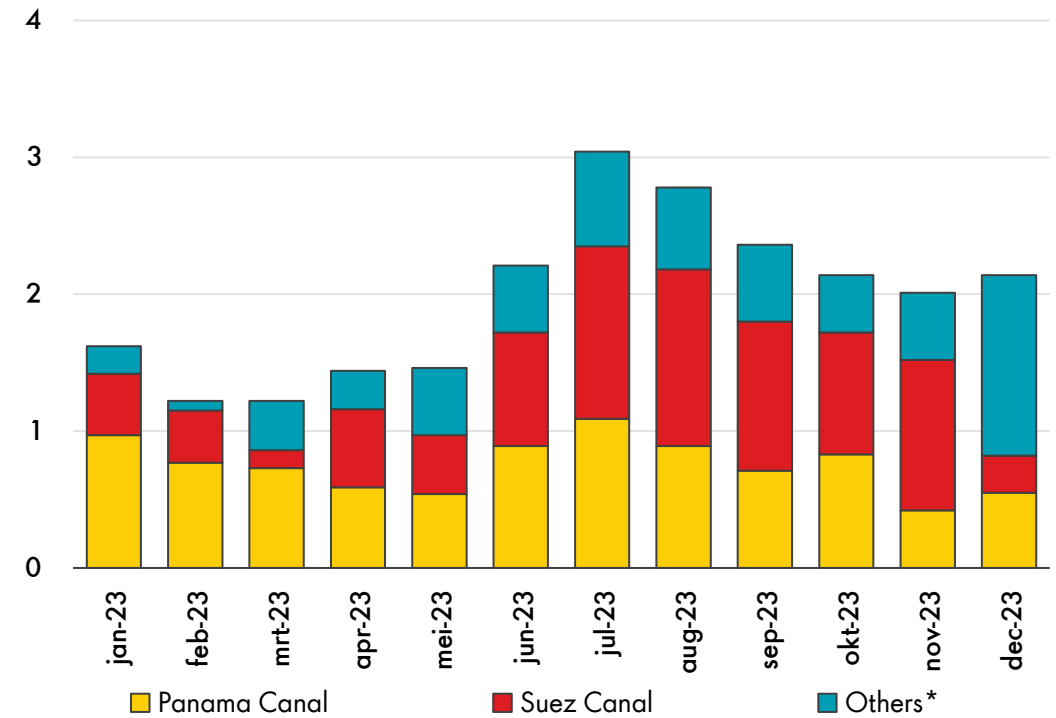
### Top exporters in 2023

MT



### US exports to Asia

MT



Source: Shell interpretation of Kpler data  
\*Others: Cape of Good Hope

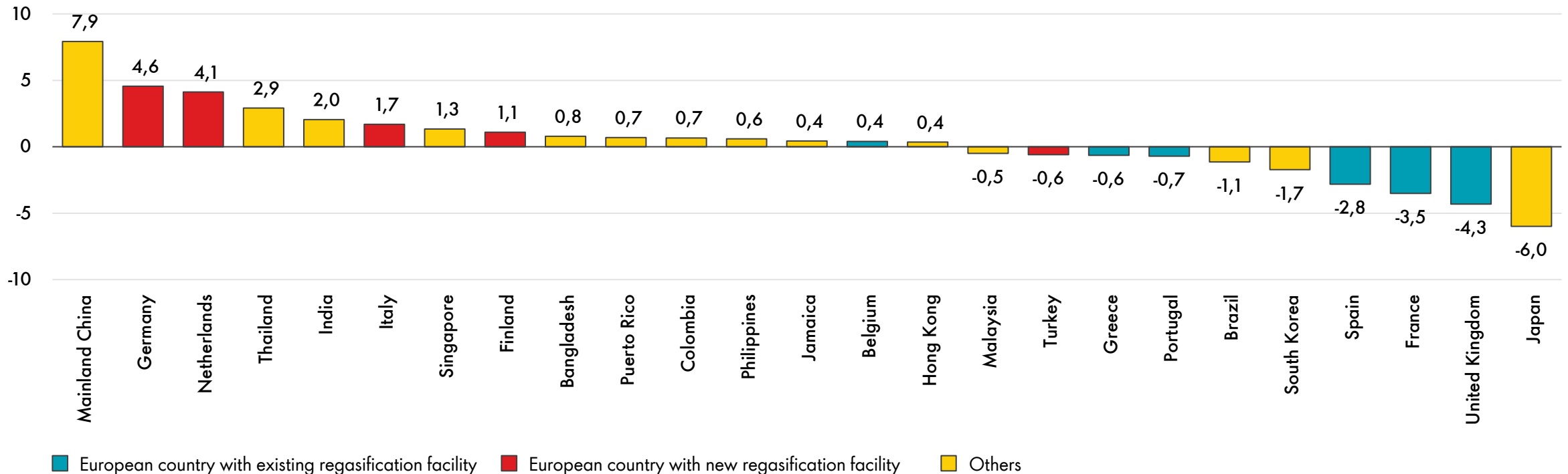
# New infrastructure helps redistribute European LNG imports

China retook top importer spot, emerging Asia shows growth potential

## Change in LNG imports 2023 (YoY)

MT

Total LNG trade: 404 MT



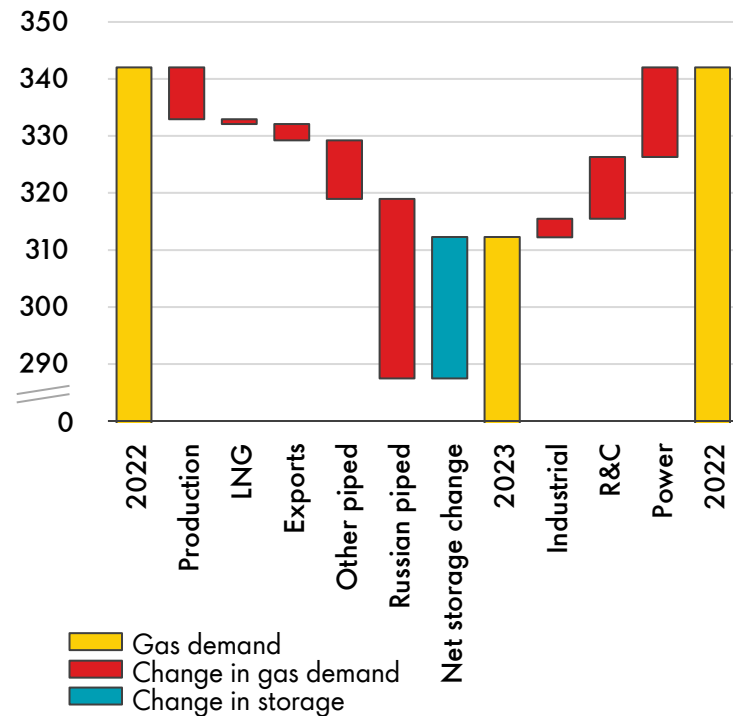
Source: Shell interpretation of Kpler data

# European gas demand fell in 2023

Demand destruction continued due to lower supplies and elevated prices

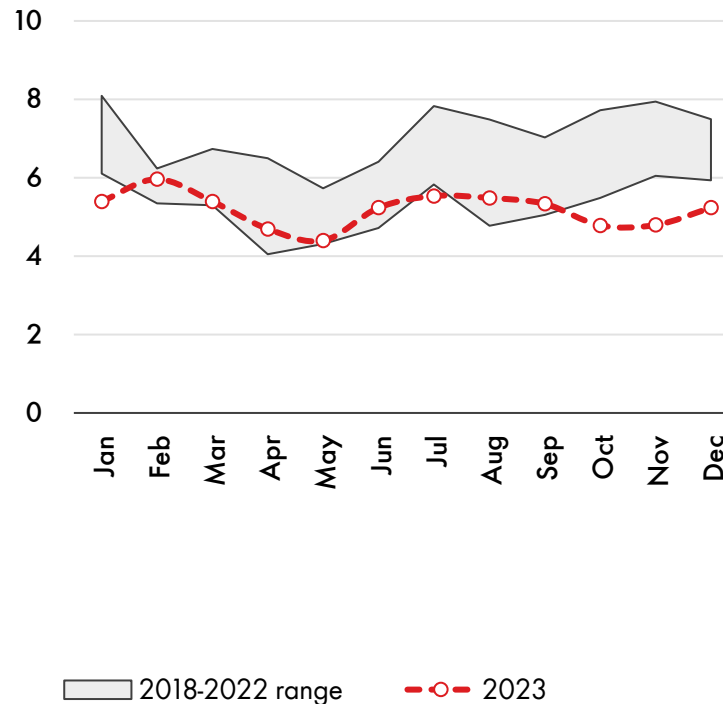
## Change in European gas balance

BCM



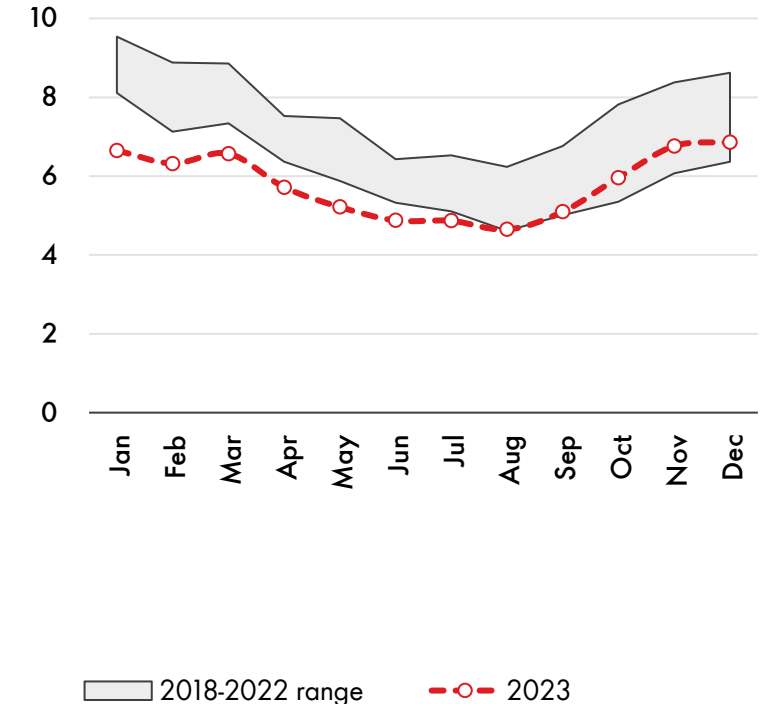
## Gas-power demand in Europe

BCM



## Industrial gas demand in Europe

BCM



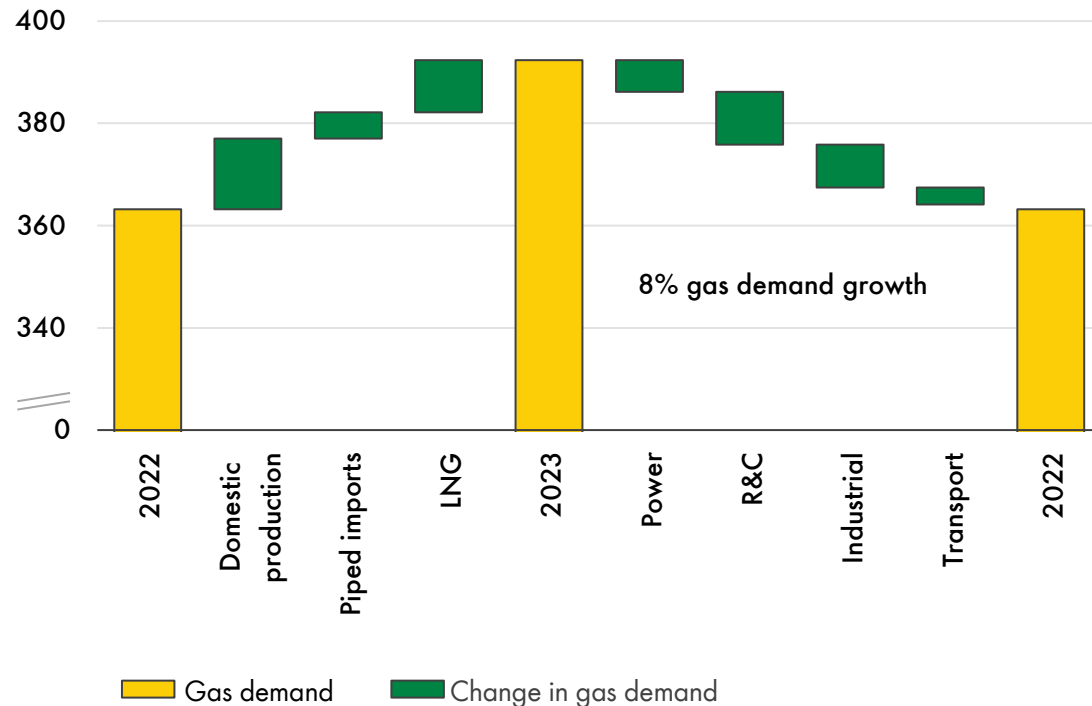
Source: Shell interpretation of Commodity Essentials data  
 European demand includes UK, Germany, Belgium, France, Denmark, Netherlands, Spain, Italy, Austria, Slovakia, Czech Republic and Switzerland  
 R&C: Residential and commercial

# China gas demand outpaced moderate economic growth

Robust domestic supply, piped imports and term LNG limited spot buying

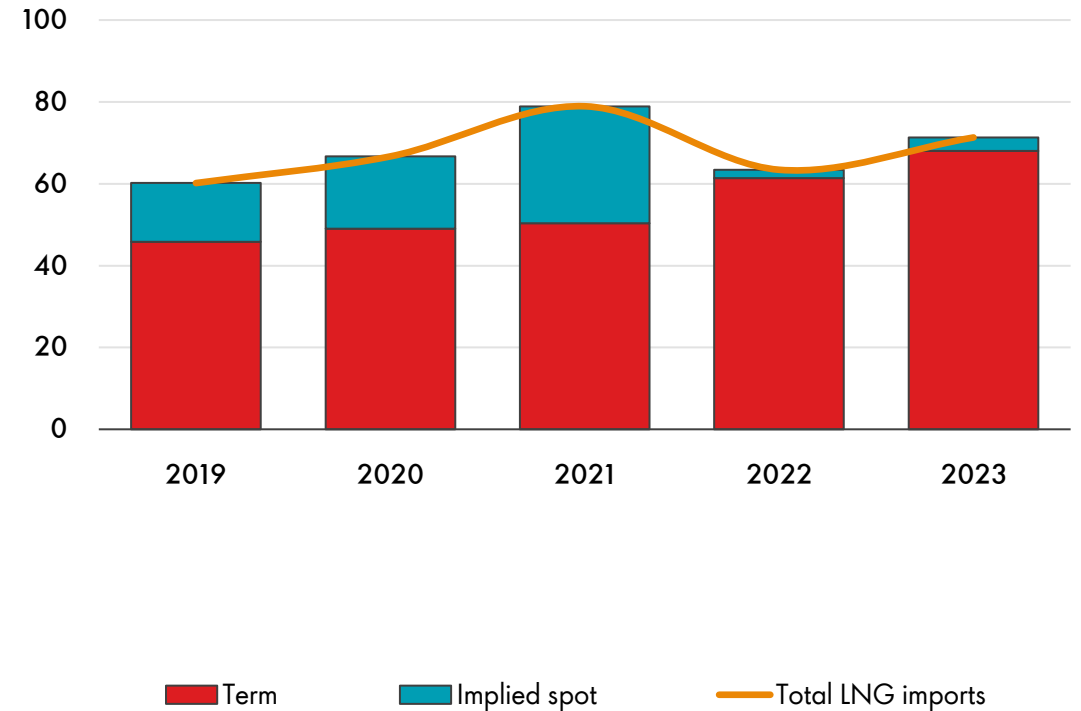
## Change in China gas balance

BCM



## China term vs spot LNG imports

MT

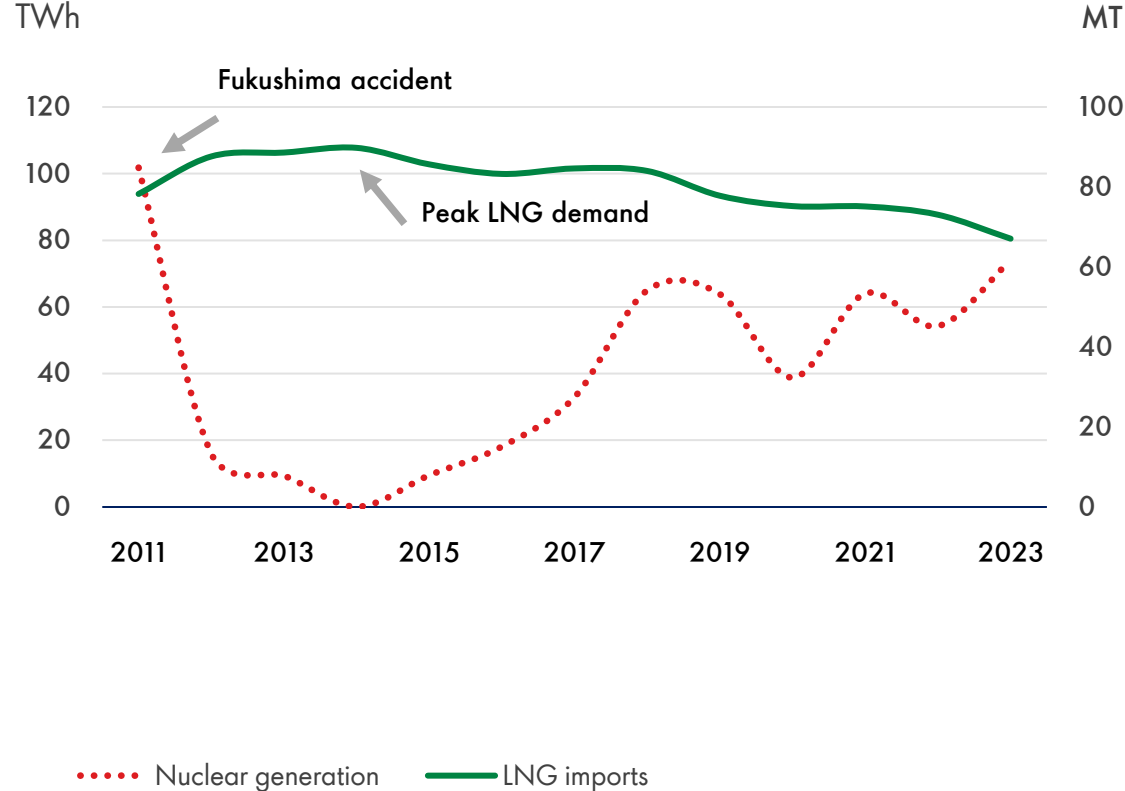


Source: Shell interpretation of National Bureau of Statistics of China and Wood Mackenzie data

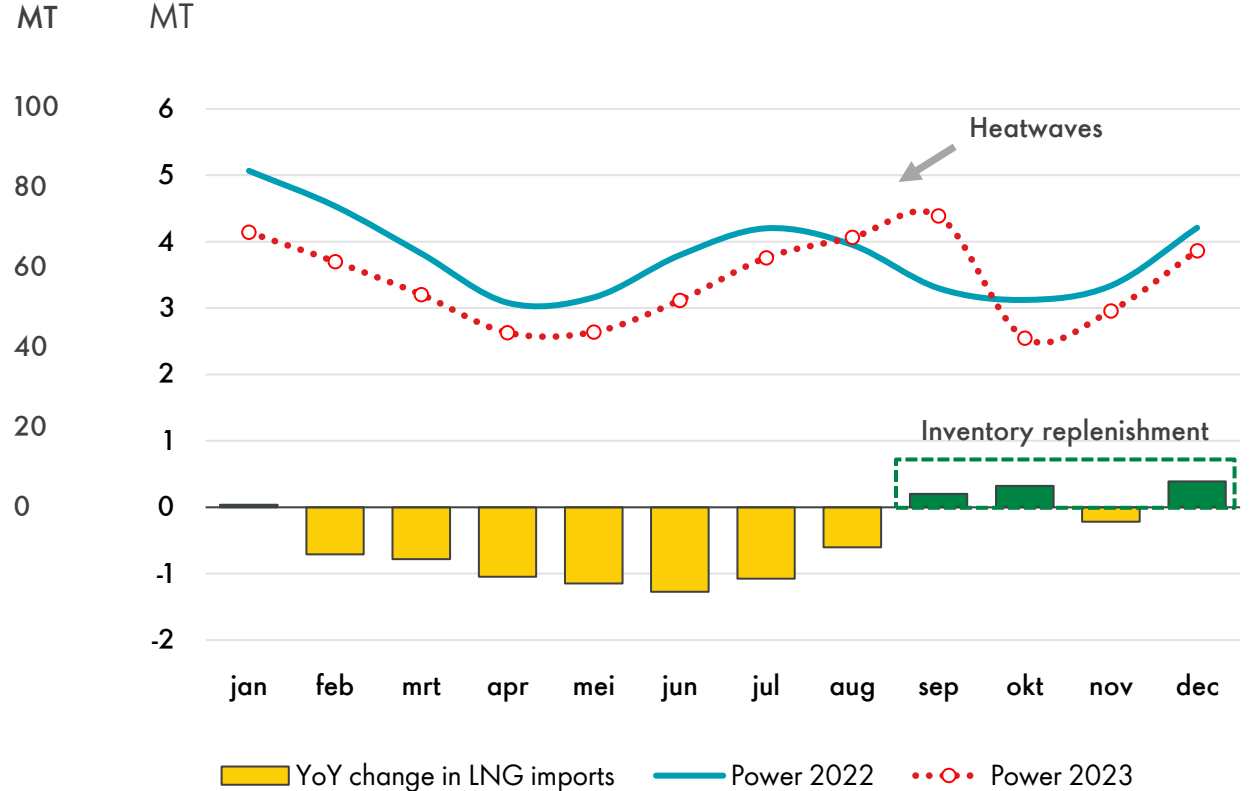
# Japan gas demand declines as more nuclear plants restart

## Heatwaves drove up imports briefly

### Nuclear availability vs LNG imports



### Gas-fired power demand vs LNG imports

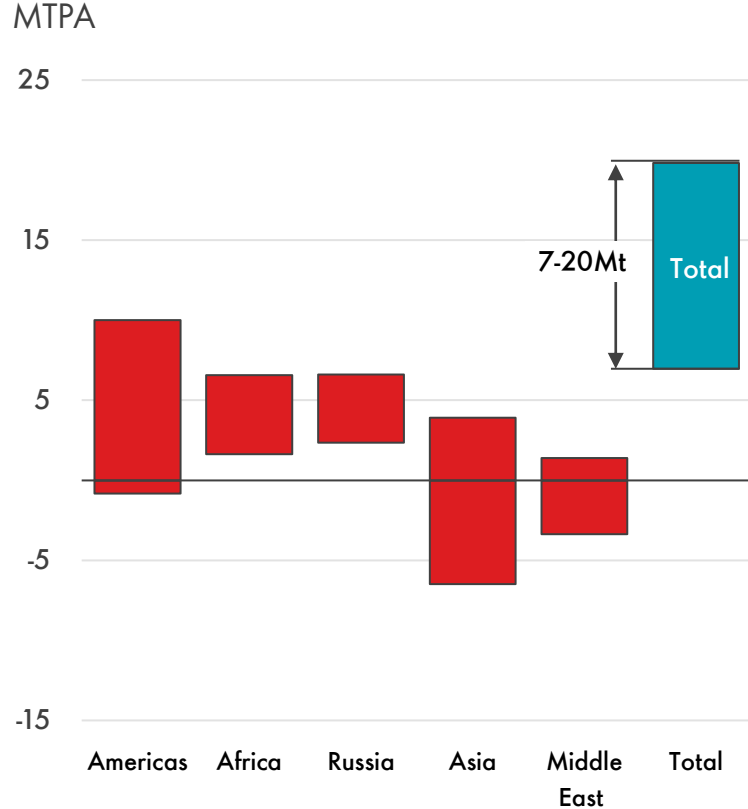


Source: Shell interpretation of Japan Ministry of Economy, Trade and Industry (METI), Wood Mackenzie, Energy Aspects data

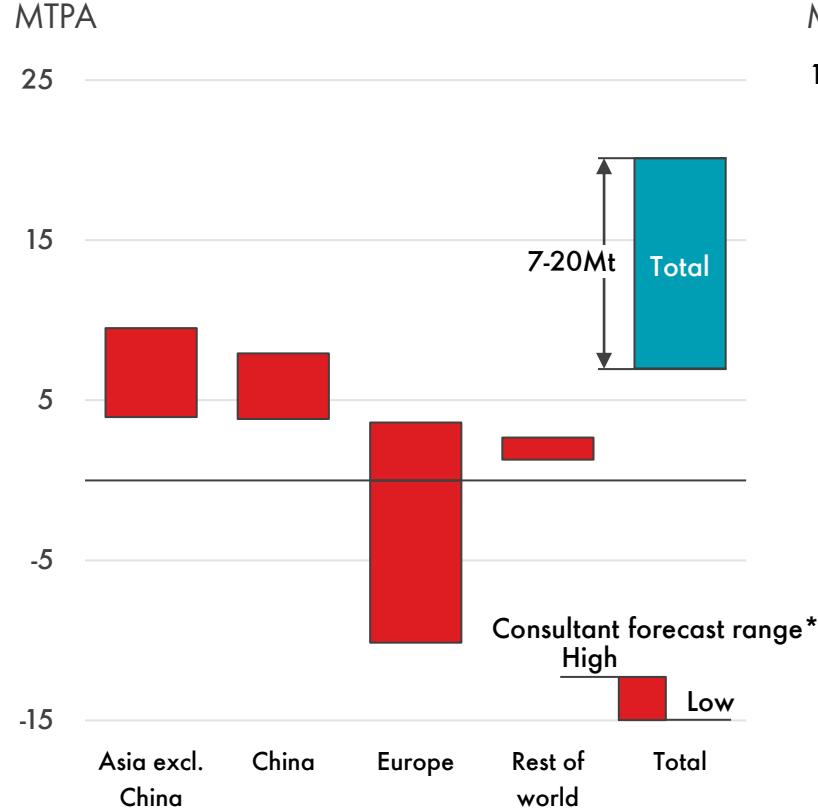
# US supply and Asian demand to lead growth in 2024

Import infrastructure ready to meet potential demand upsides

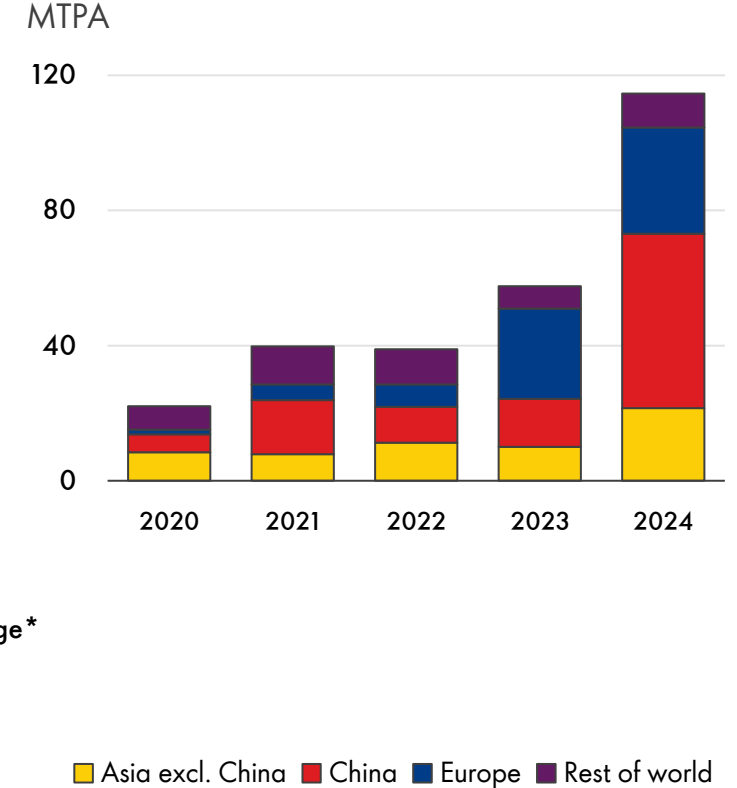
## Forecast LNG supply growth 2024



## Forecast LNG demand growth 2024



## Global regas capacity growth



Source: Shell interpretation of Wood Mackenzie, Poten & Partners, S&P Global Commodity Insights and FGE data  
All forecasts are normalised to delivered volumes

\*Consultant forecast range represents the distribution of year-over-year supply and demand growth forecasts from Wood Mackenzie, Poten & Partners, S&P Global Commodity Insights and FGE

# Rising global demand for LNG expected to keep pace with new supply

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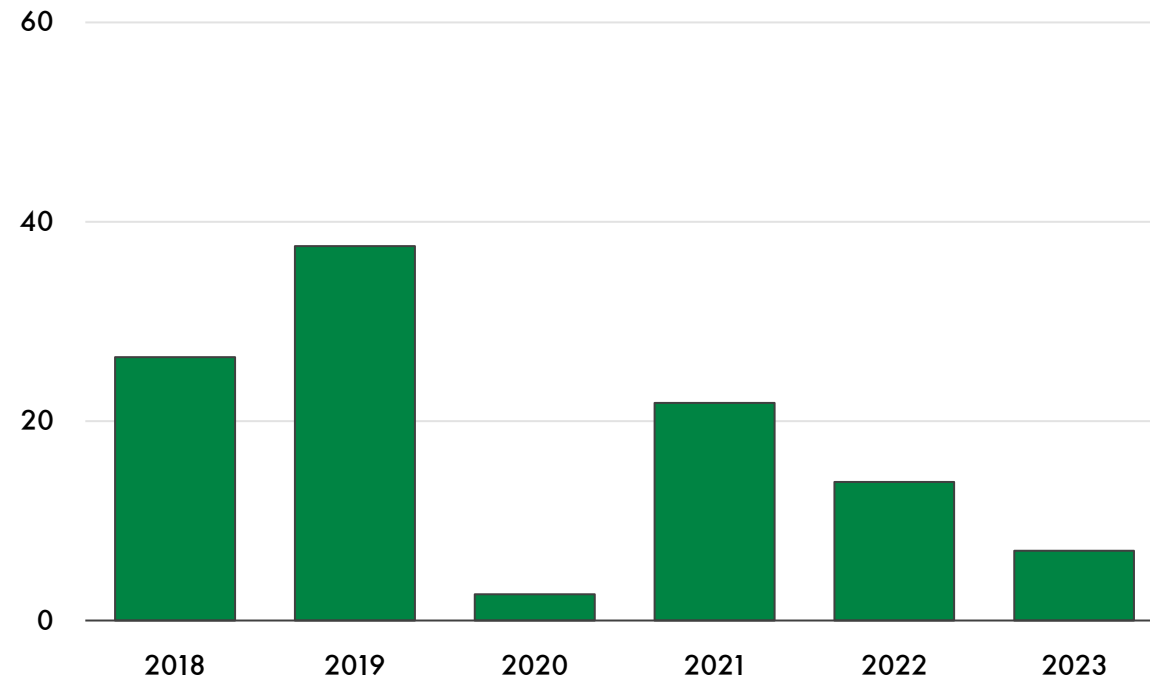




# Significant LNG supply coming but start-up timings uncertain

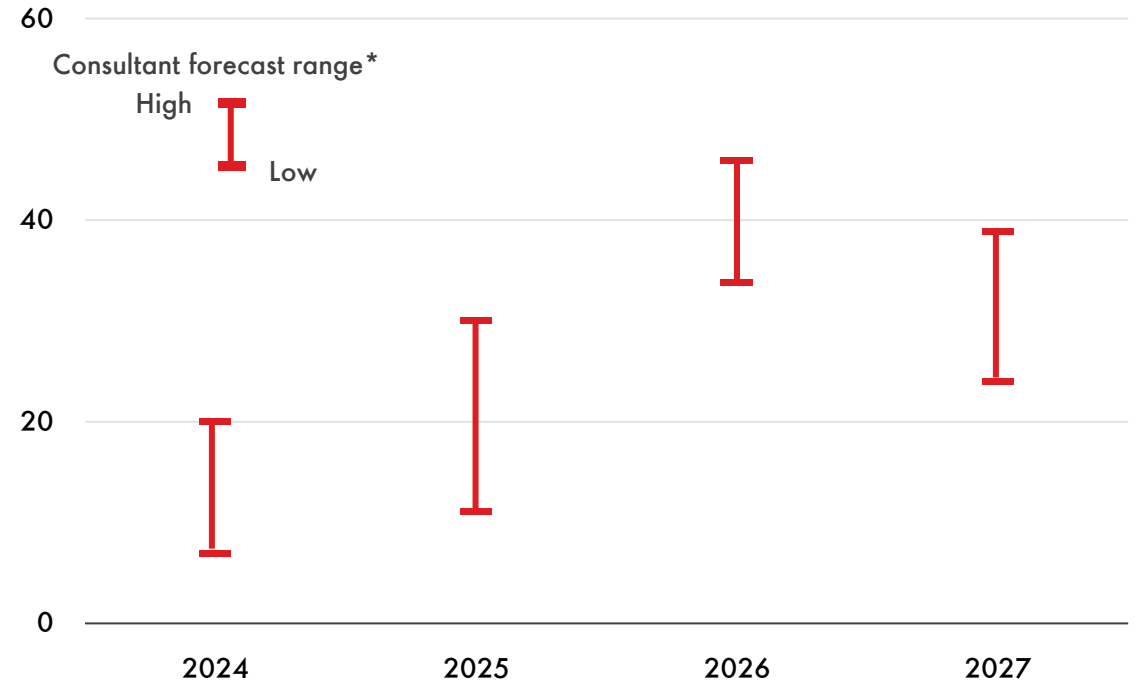
## Historical global LNG supply growth

MTPA



## Global LNG supply growth forecast range

MTPA



Source: Shell interpretation of Wood Mackenzie, Poten & Partners, S&P Global Commodity Insights and FGE data

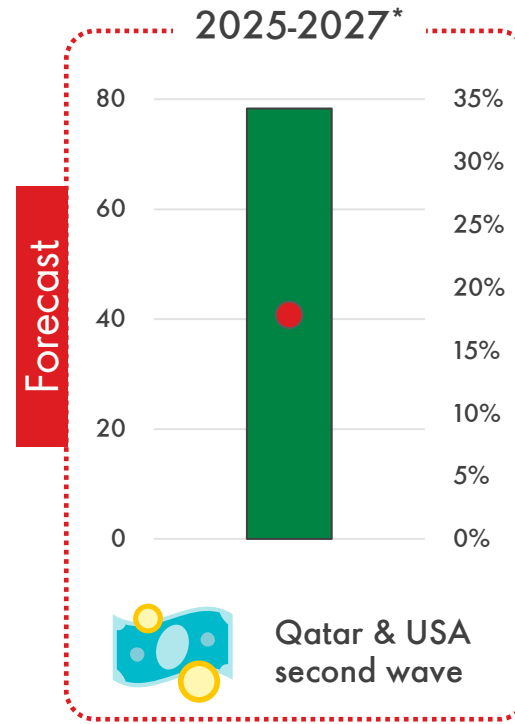
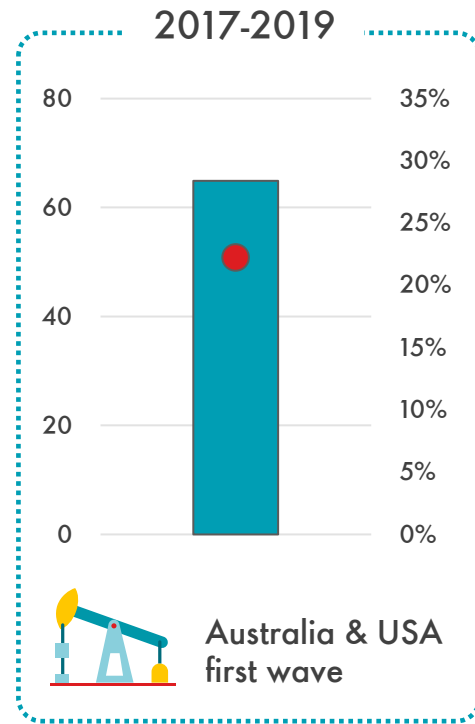
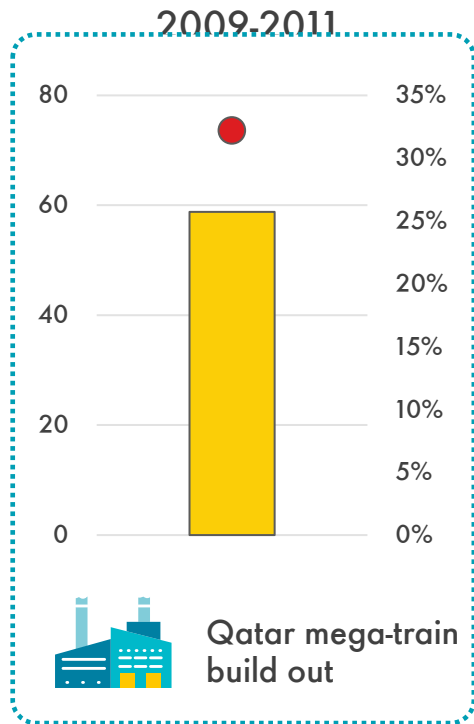
\*Consultant forecast range represents the distribution of year-over-year supply growth forecasts from Wood Mackenzie, Poten & Partners, S&P Global Commodity Insights and FGE.

# LNG industry has managed large expansions before

Diverse demand sectors poised to consume new LNG supply

## Three-year historical and forecast global LNG supply increases

MTPA - % increase



### Latent demand for LNG

**New markets**

**Shipping demand**

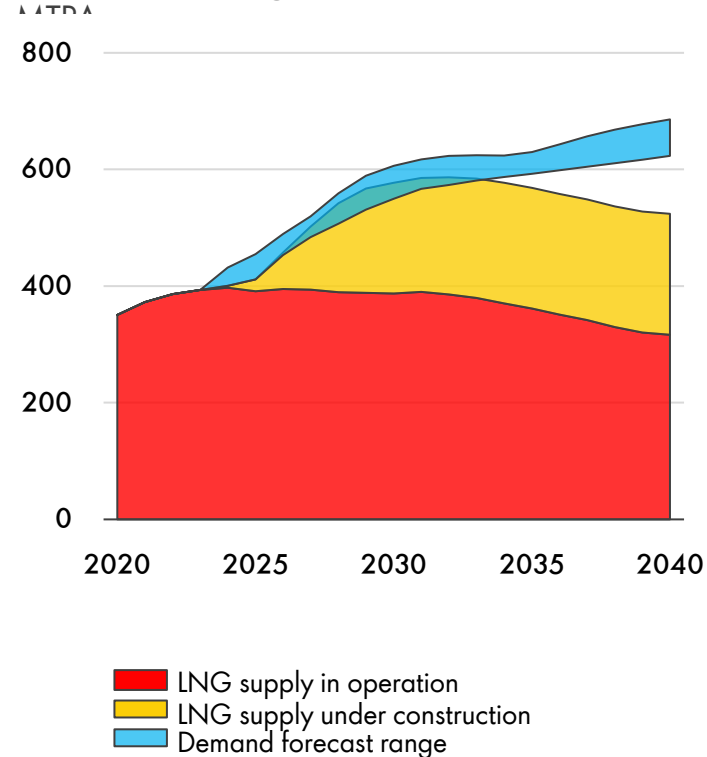
**Price sensitive buyers**

**Fuel switching**

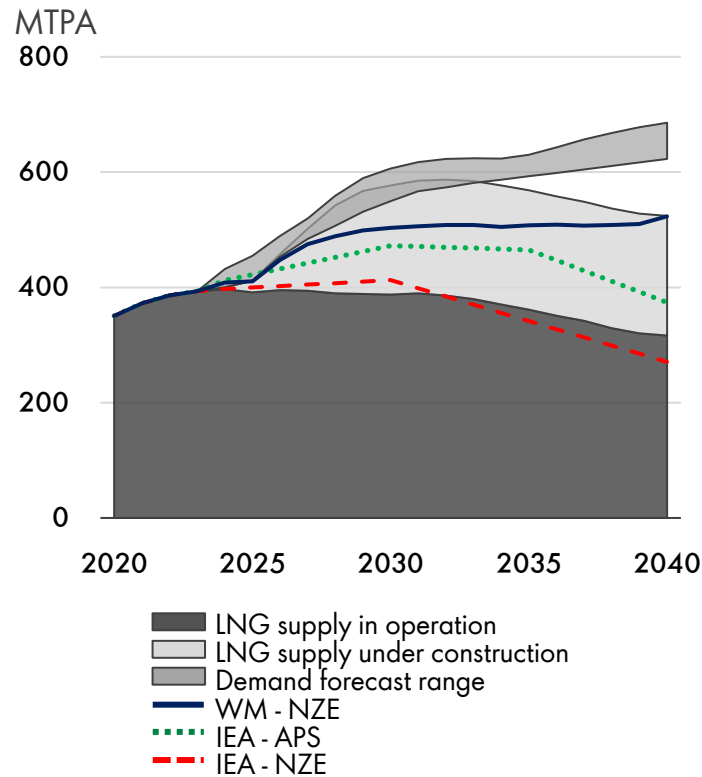
Source: Shell interpretation of Wood Mackenzie, Poten & Partners, IEA, S&P Global Commodity Insights and FGE data  
\*2025-2027 represents the straight average of consultant forecast growth from 2025 to 2027.

# New LNG liquefaction investment underpinned by demand growth in China, South Asia and Southeast Asia

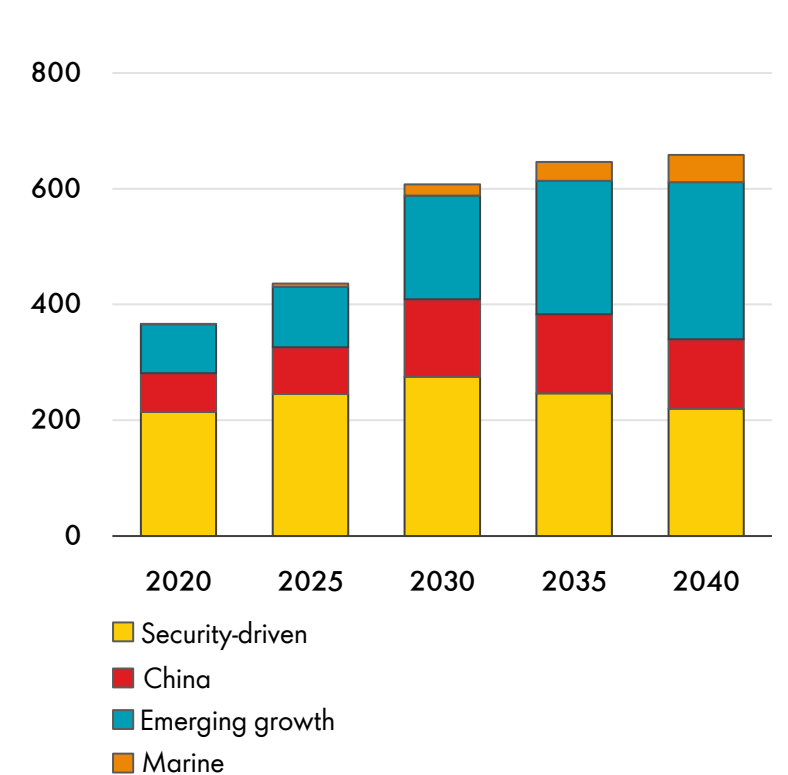
## Global LNG supply vs demand forecast range



## Global LNG supply vs demand scenarios



## Global LNG demand MTPA



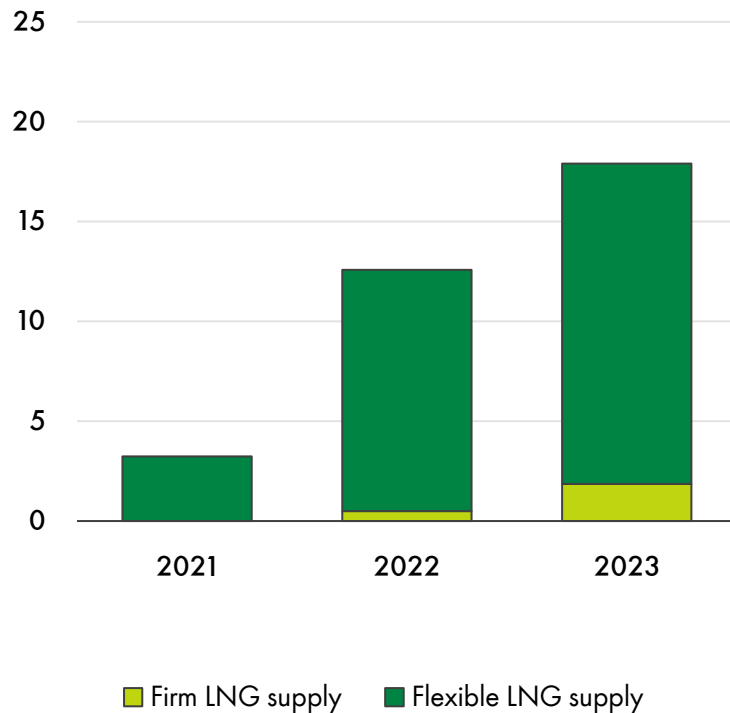
Source: Shell interpretation of Wood Mackenzie, Poten & Partners, IEA, S&P Global Commodity Insights and FGE data  
 WM - NZE: Wood Mackenzie Net Zero Scenario. IEA - APS: IEA Accelerated Pledges Scenario. IEA - NZE: IEA Net Zero Emissions Scenario  
 Security-driven: Japan, South Korea and Europe. Emerging growth: South Asia, South-east Asia and other demand

# Europe will still need LNG despite declining gas demand

Increased term contracting in 2022-2023 is not enough

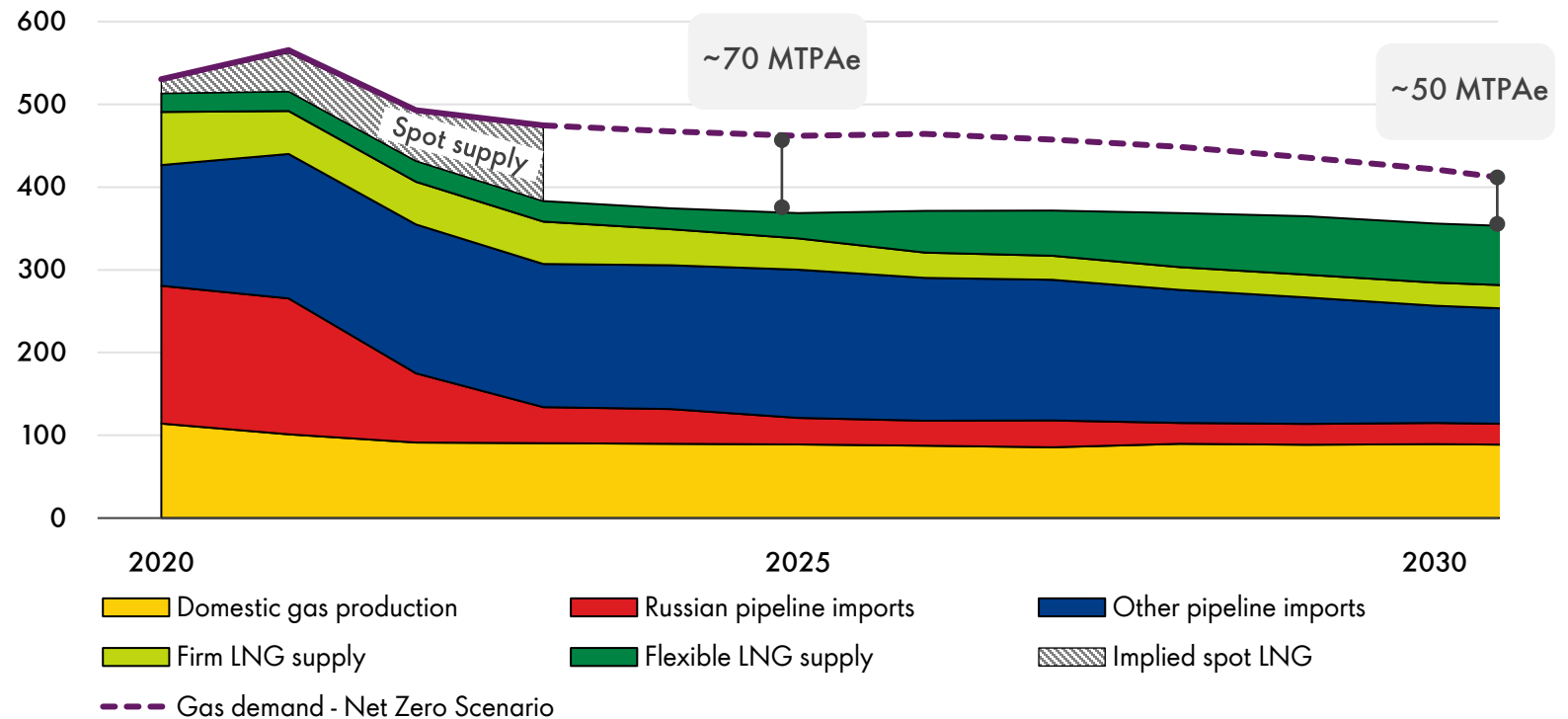
## Europe LNG SPAs

MTPA



## Europe gas balance

BCM

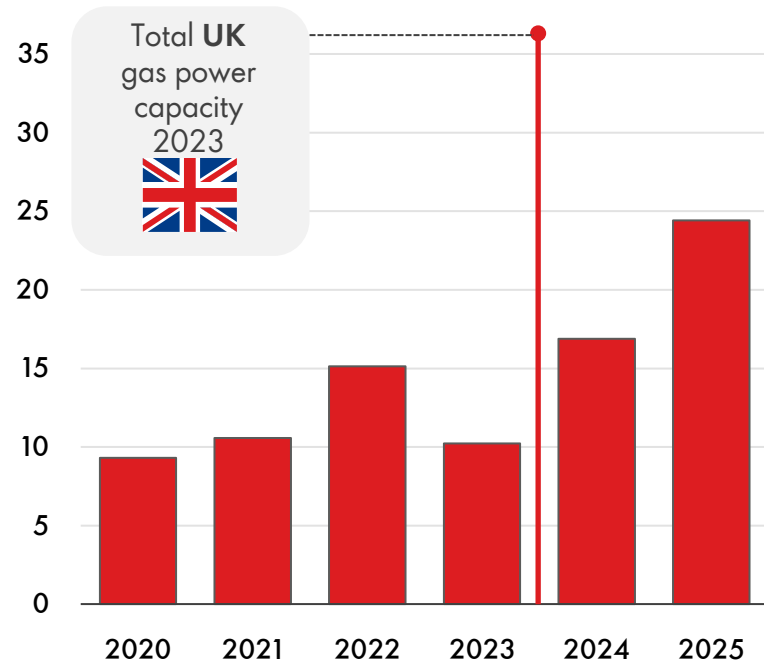


Source: Shell interpretation of Wood Mackenzie data  
 LNG contracts include LNG SPAs and secondary contracts. Europe comprises EU, UK, Norway, Turkey and Ukraine. Flexible LNG supply: supply that can be diverted. Firm LNG supply: supply contracted for delivery to the buyer.  
 Gas demand - Net Zero Scenario is Wood Mackenzie's net-zero forecast, which represents the European Commission's Fit for 55 decarbonisation policy.

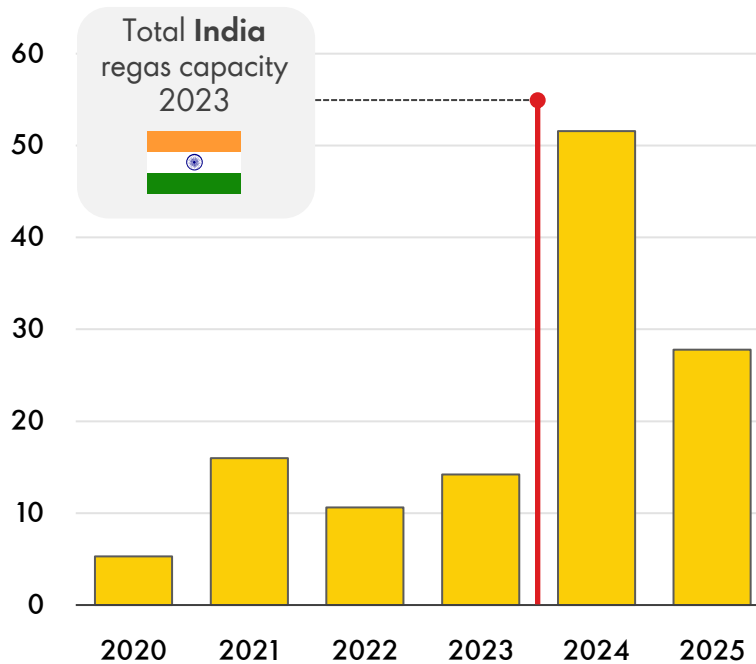
# China's gas infrastructure development accelerates

Growth in scale and connectivity enables China to balance the LNG market

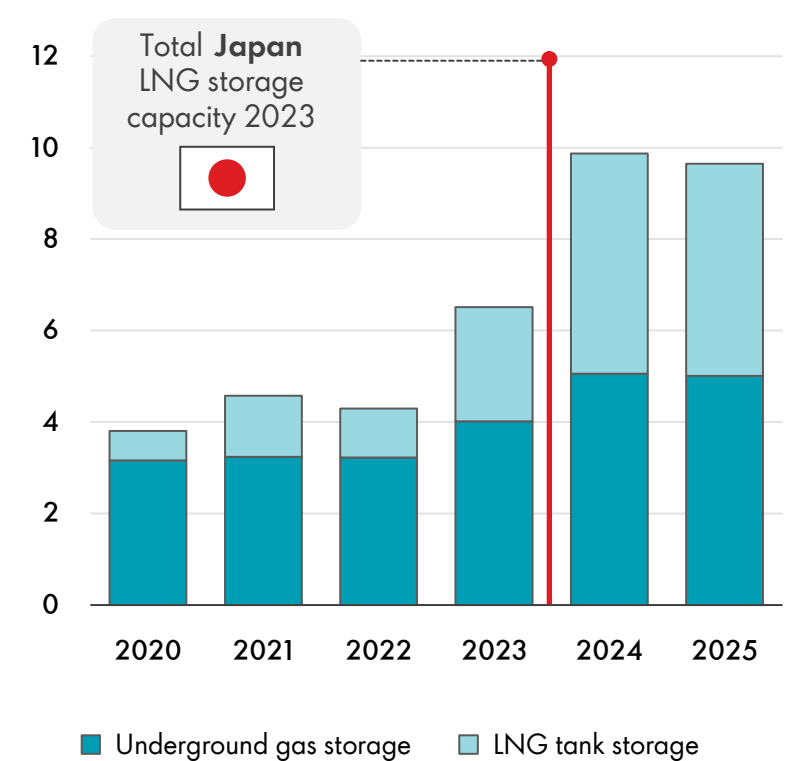
## China gas-power capacity growth GW



## China regas capacity growth MTPA



## China storage capacity growth BCM

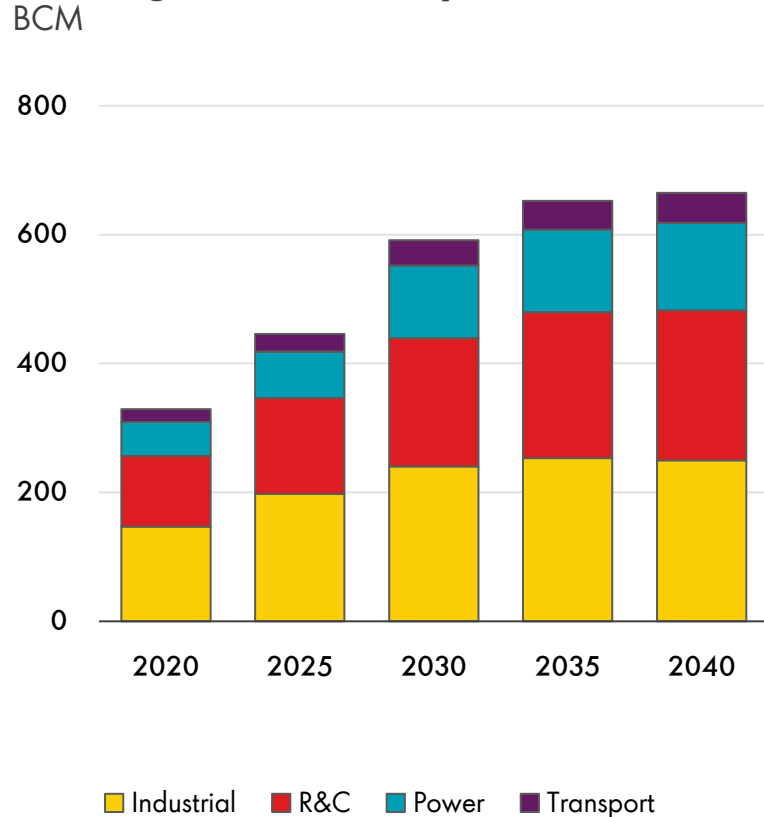


Source: Shell interpretation of Wood Mackenzie, UK Department for Energy Security and Net Zero and Gastank data  
Capacity growth considers projects that are operational and under construction.

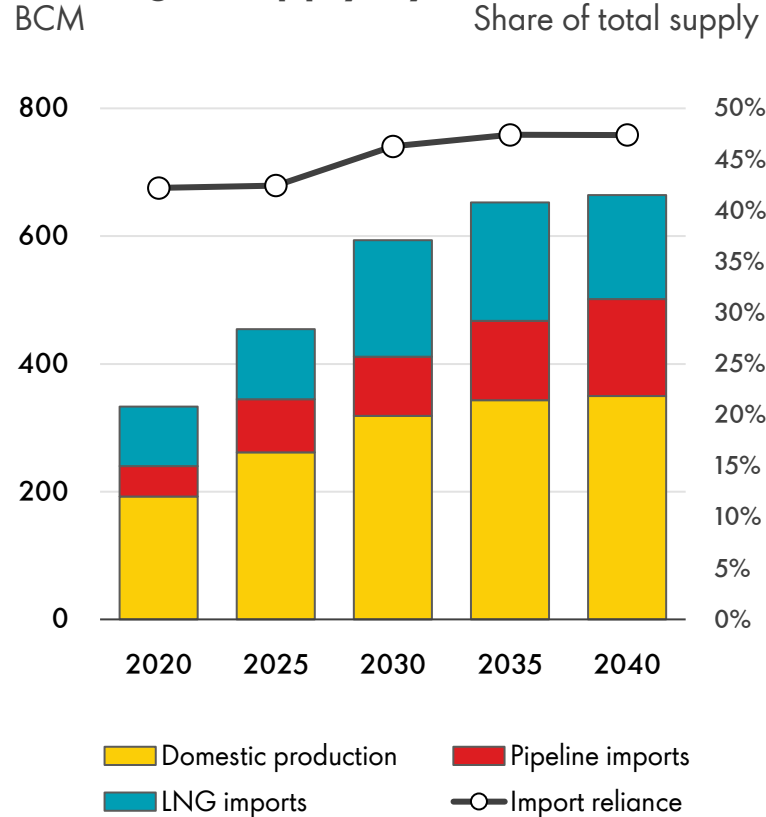
# China's long-term gas and LNG demand outlook is strong

Supply diversification is a key characteristic of China's growth

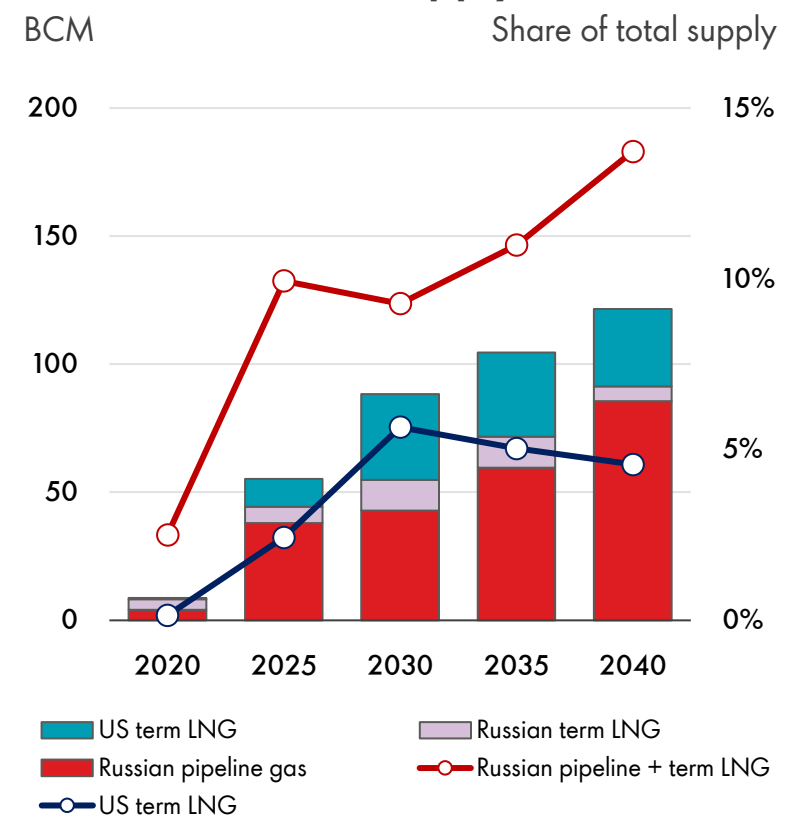
## China gas demand by sector



## China gas supply by source



## Russian, US term supply to China



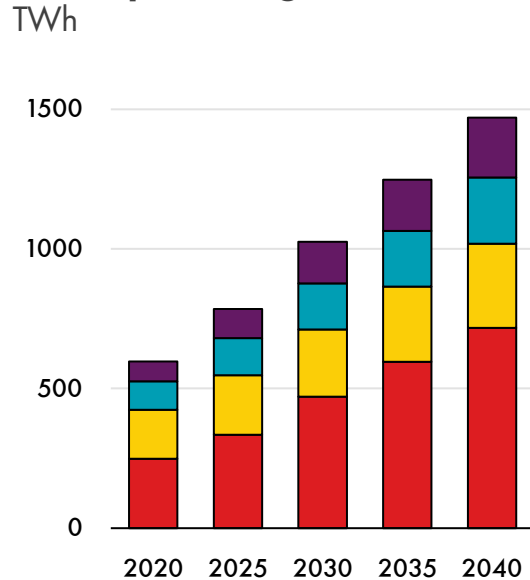
Source: Shell interpretation of Wood Mackenzie data

# South, South-east Asia emerging as major LNG import regions

Vietnam, Philippines started importing LNG to backfill domestic gas declines

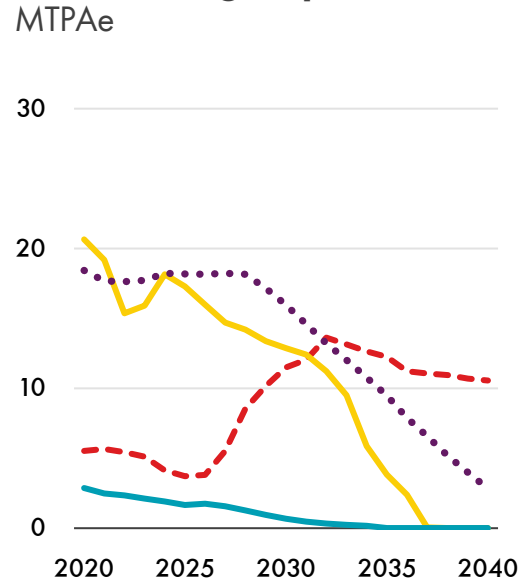


## Total power generation



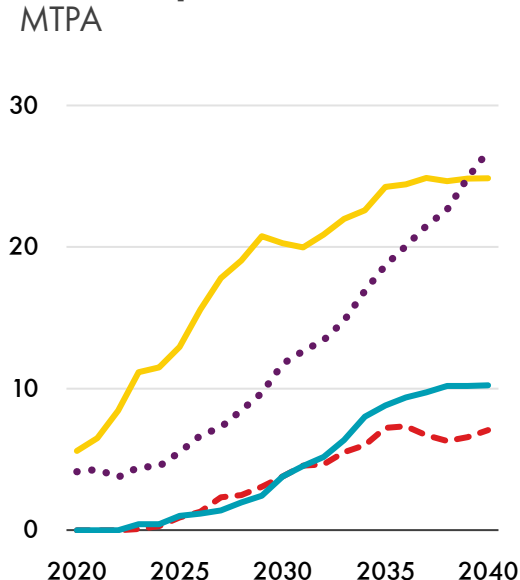
■ Vietnam ■ Philippines ■ Thailand ■ Bangladesh

## Domestic gas production



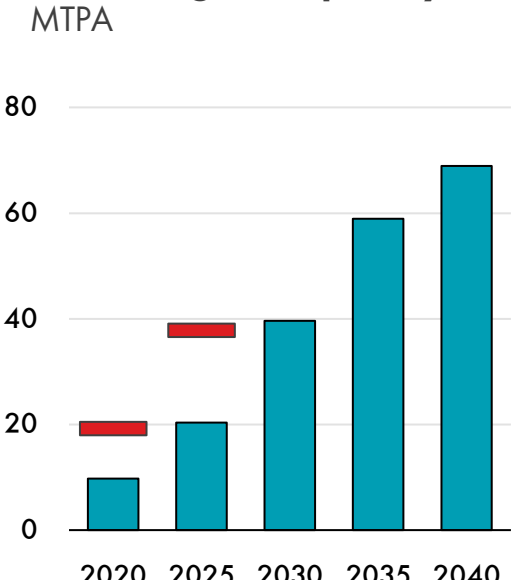
--- Vietnam --- Philippines --- Thailand ..... Bangladesh

## LNG imports



--- Vietnam --- Philippines --- Thailand ..... Bangladesh

## Total regas capacity\*



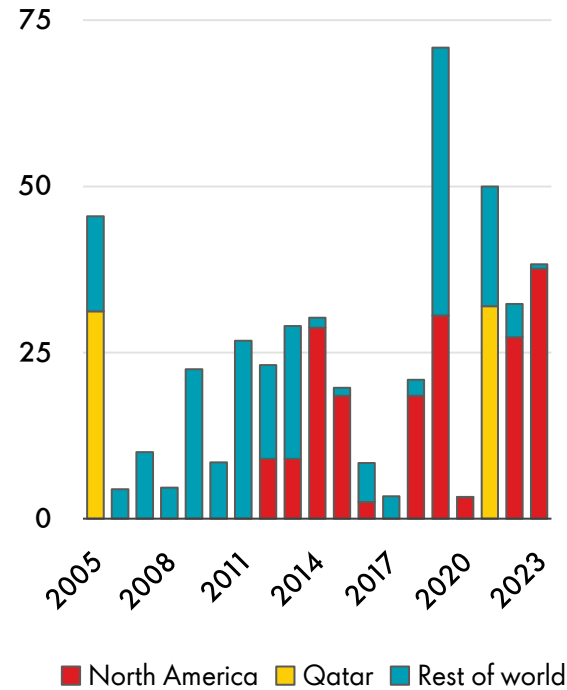
■ LNG Imports ■ Regas capacity\*

Source: Shell interpretation of Wood Mackenzie data  
MTPAe: billion cubic metre equivalent in million tonnes per annum of LNG

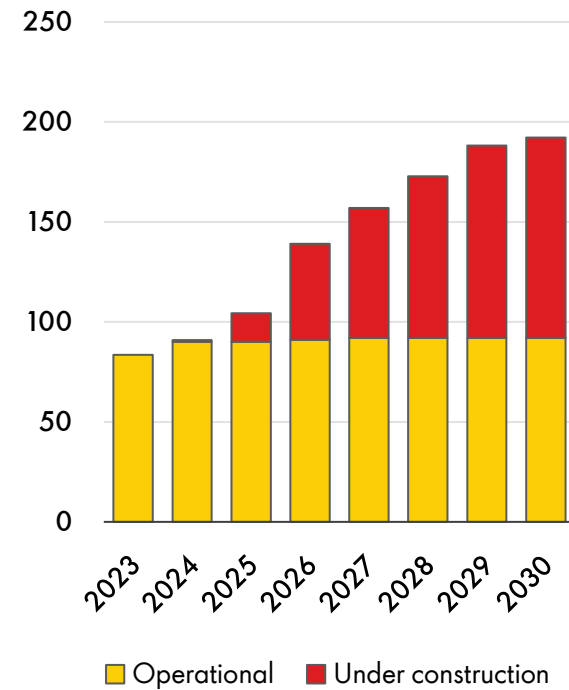
\*Total regas capacity includes projects that are operational and under construction for the four countries referenced (Vietnam, Thailand, Philippines & Bangladesh).

# Global gas market increasingly exposed to US risks

**Global liquefaction investment\***  
MTPA capacity



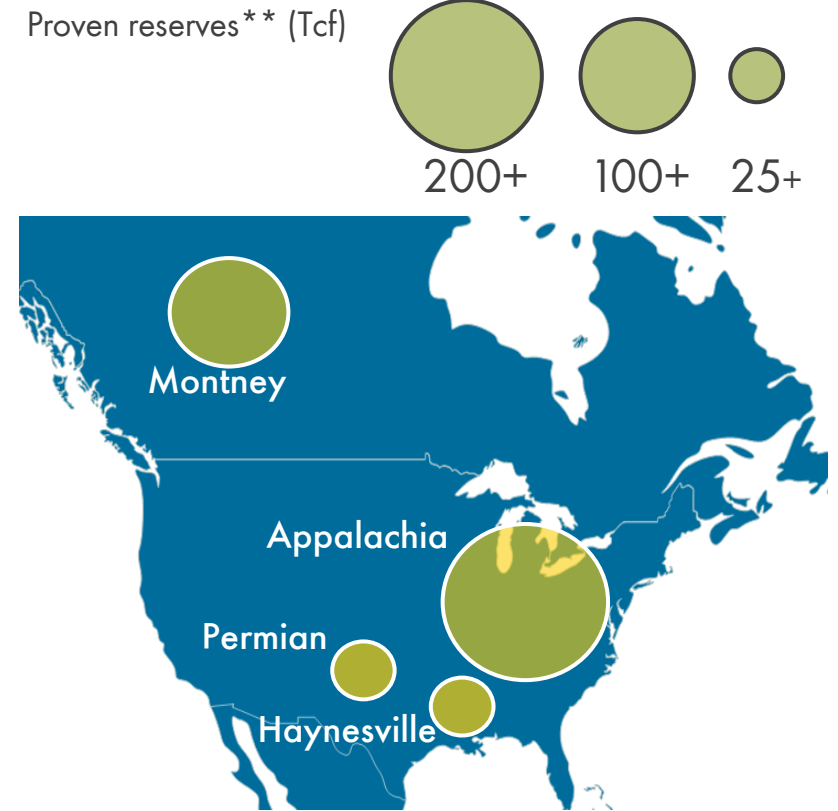
**North American LNG supply**  
MTPA



**2030**  
North American LNG supply as % of:

- Global gas demand ~5%
- Global LNG demand ~30%
- North American gas demand ~20%

**Major North American gas basins**



Source: Shell interpretation of Wood Mackenzie data

\*Global liquefaction investment considers projects that have taken a Final Investment Decision (FID)

\*\*Proven reserves: represent 2P commercial reserves as defined by Wood Mackenzie. Bubbles are not exact geographical representations of the shale basins. Appalachia includes Marcellus and Utica plays

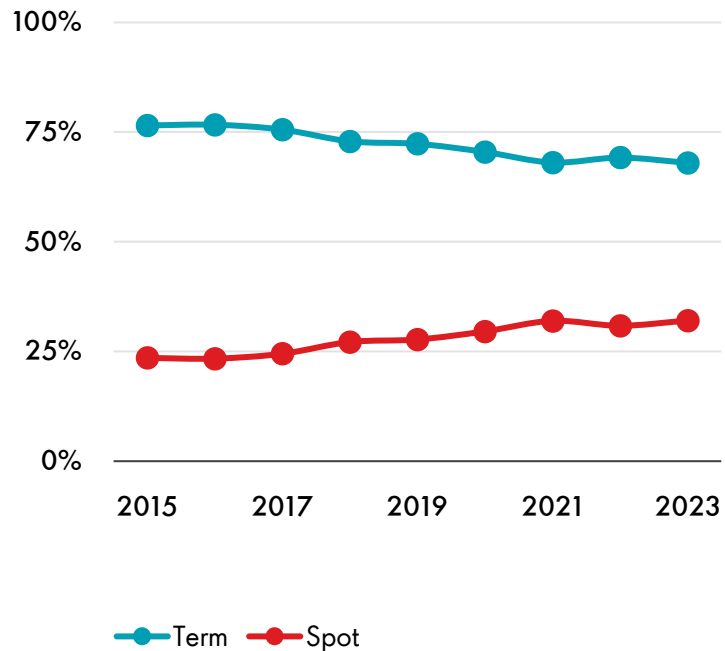


# Qatar and USA deals dominate long-term contracting

Brent and Henry Hub indexation underscores three commercial structures

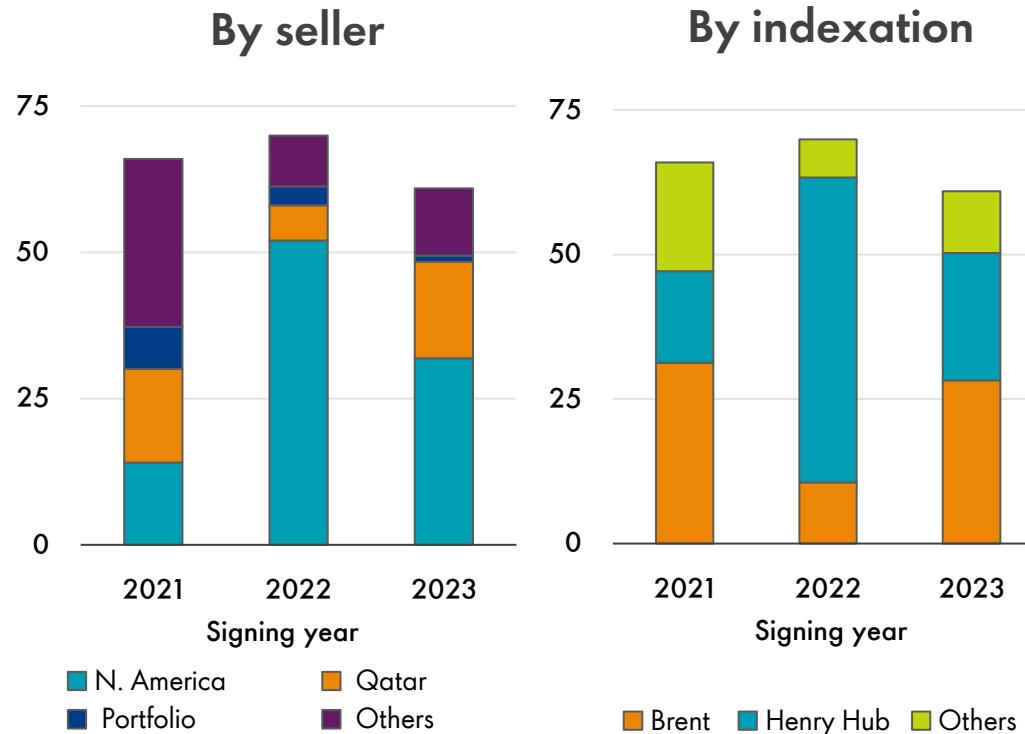
## Global LNG market trade

% total

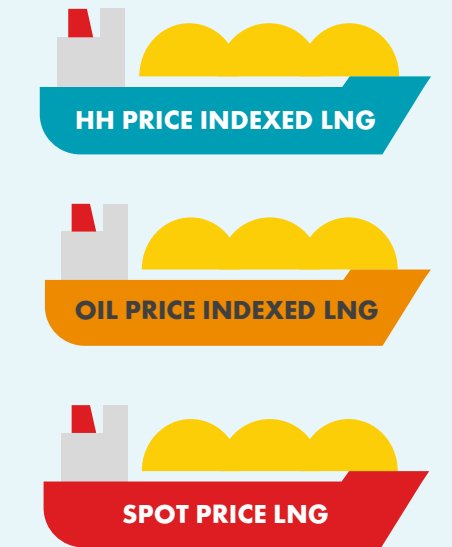


## Long-term LNG SPA signings

MTPA



## Three independent commercial structures

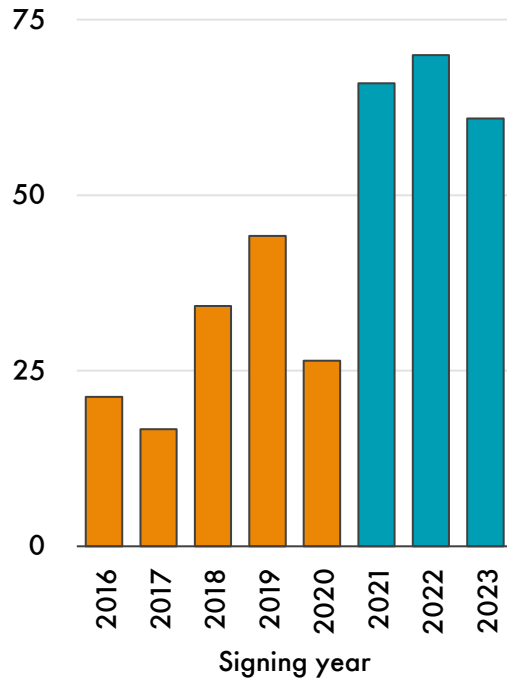


Source: Shell interpretation of Wood Mackenzie and S&P Global Commodity Insights data  
 SPA: Sales and purchase agreement  
 N. America represents USA, Canada and Mexico

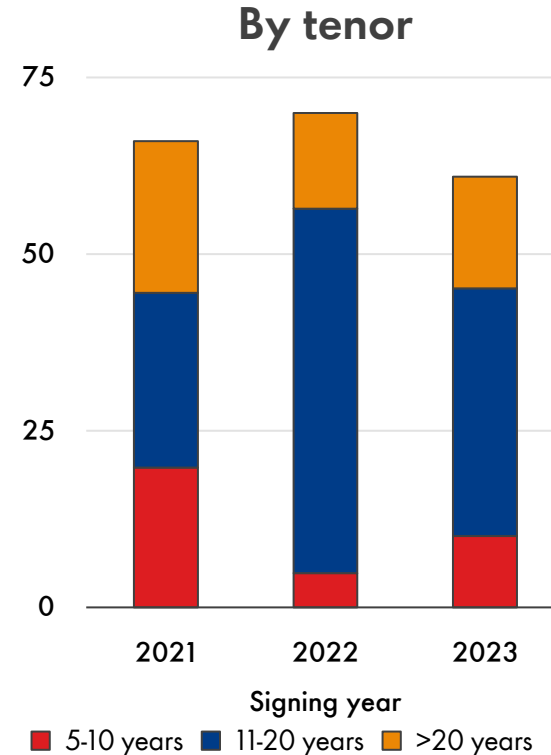
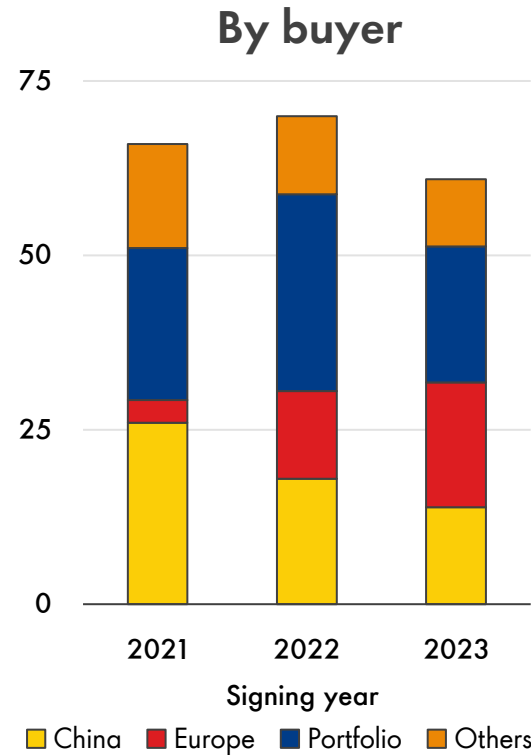
# Buyers pursue long-term supply for energy security

Three-year upswing in contracting shows industry's commitment to LNG

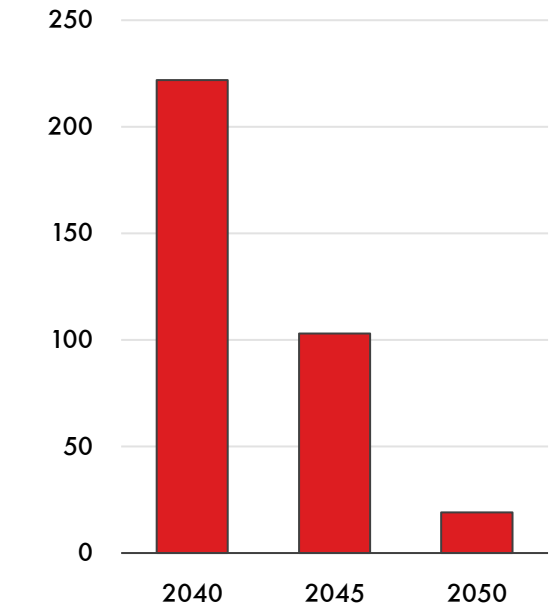
**Long-term LNG SPA signing history**  
MTPA



**Long-term LNG SPA signings**  
MTPA



**Long-term LNG SPAs in effect**  
MTPA

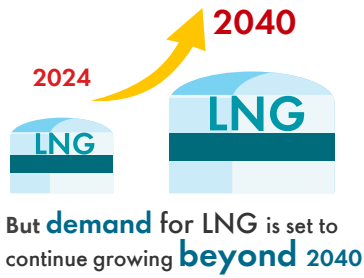


Source: Shell interpretation of Wood Mackenzie and S&P Global Commodity Insights data

## Industry, heating and emerging Asia to drive LNG demand growth



Demand for natural gas has already **peaked** in some regions

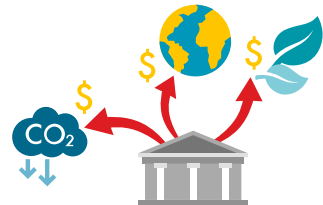


**China to drive demand** for LNG this decade to meet industry needs and decarbonisation goals

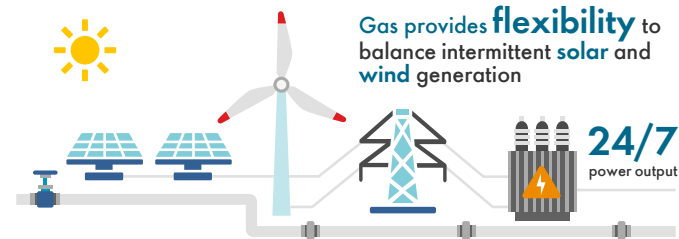
LNG continues to **lower emissions** in the marine sector



**LNG-fuelled vessels** in operation set to double over the coming years



Continuing **policy support** for natural gas projects in **Asia** that deliver environmental and economic benefits



## Gas prices more stable in 2023 but volatility lingered in tight market

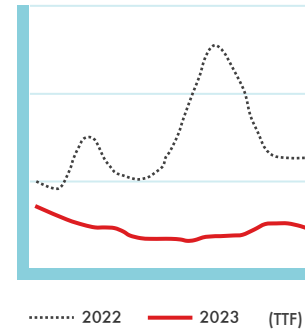


Gas and LNG prices **stabilised** during 2023

But limited new LNG supply has kept gas prices **above** historic averages

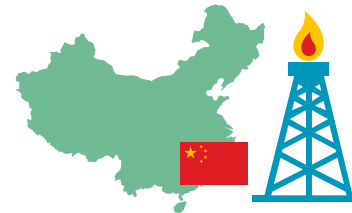


USA became **largest** LNG exporter in 2023, shipping **86 million tonnes**



Chinese gas demand grew **8%** despite modest economic recovery

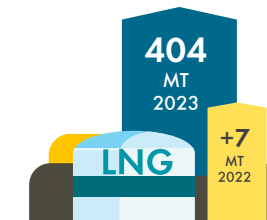
**Overtakes Japan** to become largest LNG importer again



European gas use **fell** due to continued elevated prices



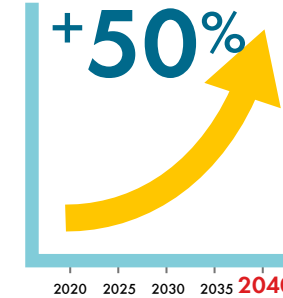
LNG continued to play a vital **energy security** role with Europe importing more than 120 million tonnes



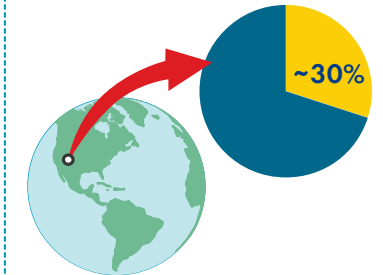
Global trade in LNG reached **404 million tonnes** in 2023, an **increase** of 7 million tonnes compared to 2022

## Latent LNG demand to keep pace with new supply but dependent on regas infrastructure investment

China's gas demand expected to **rise** by more than **50%** by 2040



North America expected to meet ~30% of **total global LNG demand**. But reliance on four basins could create midstream constraints



Europe will **continue** to need LNG to meet gas supply needs despite consensus for falling gas demand



Global LNG supply **expansion** coming this decade but startup timings uncertain



**Declining** domestic gas and growing power markets set to drive South and South-east Asia LNG imports

Dependent on **investment** in regasification **infrastructure**



