



The future of natural gas and the role of LNG



Funded by
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Peter Thompson
Director – Baringa Partners
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A look at the past

Why LNG?

- The energy density of gas is about 1/1000 lower than that of oil (at normal atmospheric conditions)
- Transportation across long distances (across seas) is therefore complex for natural gas in a gaseous form
- Today, one-third of total gas demand crosses borders
- LNG reduces the volume of natural gas 600-fold
- It makes it possible to supply distant markets across oceans that could not be crossed otherwise (by pipeline or CNG)

LNG today

- 372 million tons (mt) of LNG* (506 bcm) traded in 2021 (+4.5% vs 2020)
 - Almost 4 times the volumes traded in 2000
 - ~ 1/8 of global gas demand is traded as LNG
 - Likely to increase by over 5% in 2022
- 19 **exporting countries** as of 2021 (vs 11 in January 2000)
 - +2 countries no longer exporting (Libya, Yemen)
 - Mozambique started in 2022 and Senegal/Mauritania within the next year
- 44 **importing countries** across all continents as of 2021 (vs 9 in January 2000)
- Many countries can re-export LNG
- A few countries are both importers and exporters (the US, Egypt, UAE, Indonesia and Malaysia)

The birth of LNG

- First accounts of LNG during the end of the 19th century
- Peak shaving LNG plant in Cleveland (accident in 1944 killed 130 people)
- William Wood-Prince is regarded as the founder of the commercial LNG industry
- **1959:** the Methane Pioneer arrived from Calcasieu at Canvey Island in the UK
- **1964:** first Methane Princess delivered first Algerian LNG to the UK (official start of LNG trade)

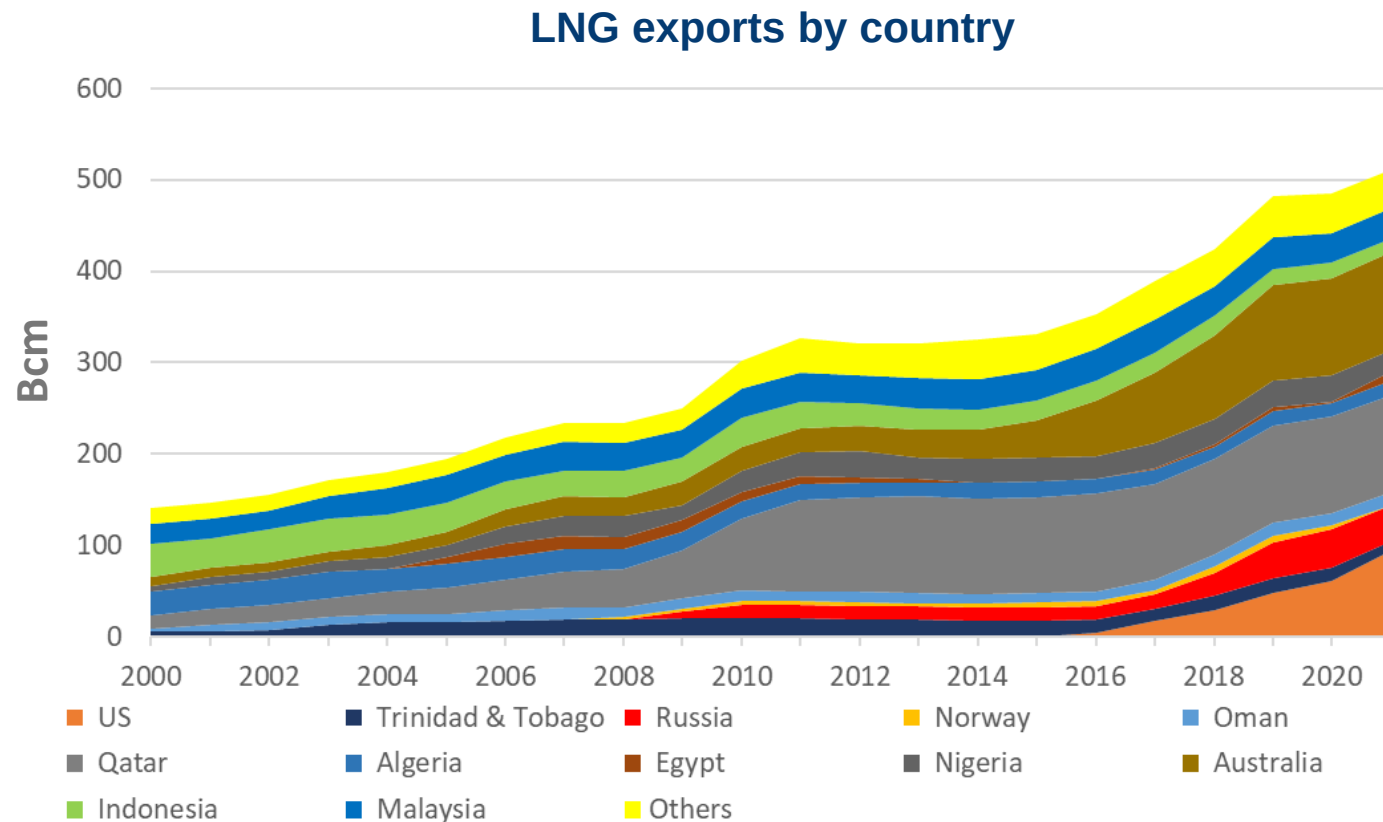


Methane Pioneer



William Wood-Prince

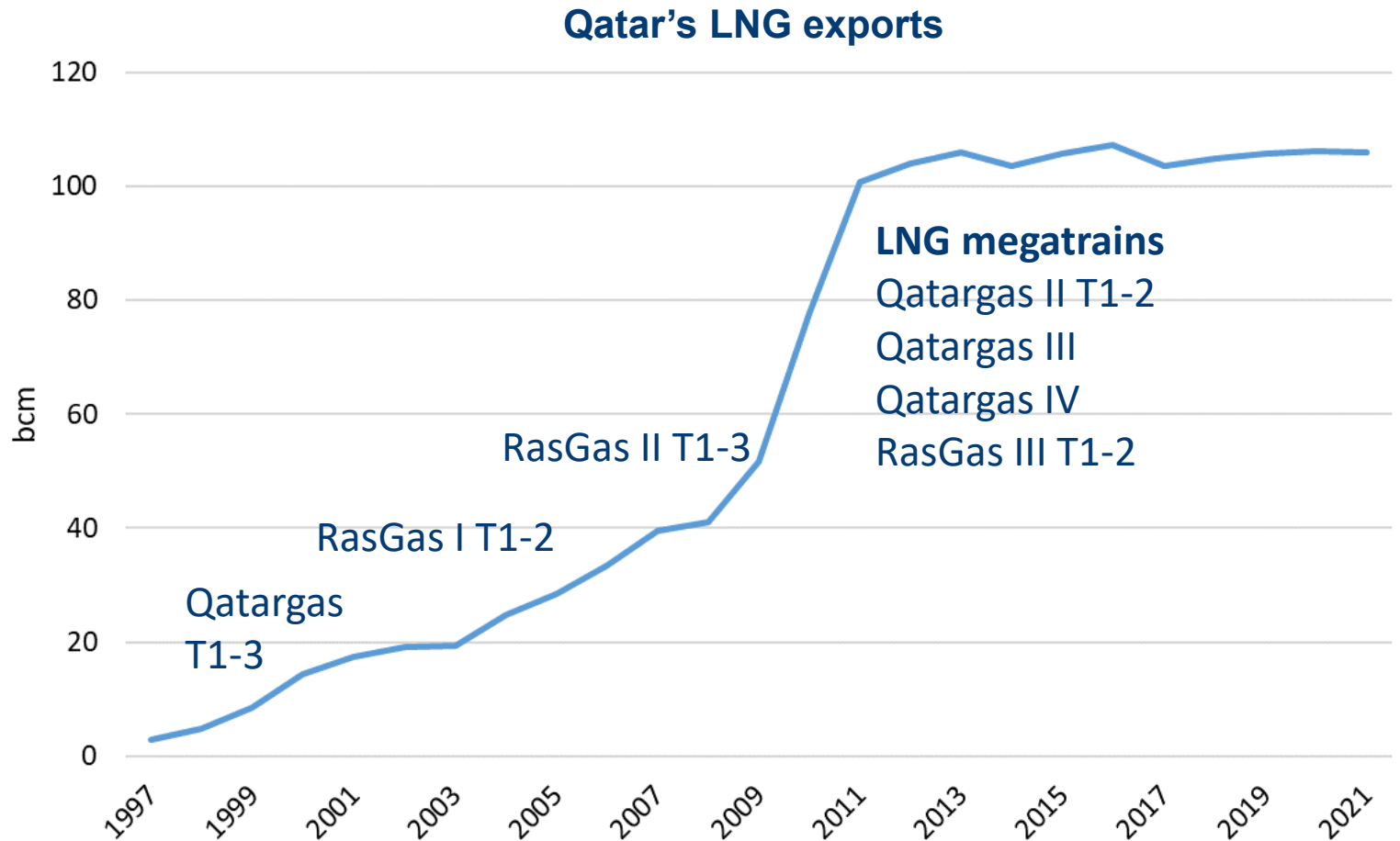
A multiplication of LNG exporters



Source: bp Statistical Review 2022

The rise of Qatar

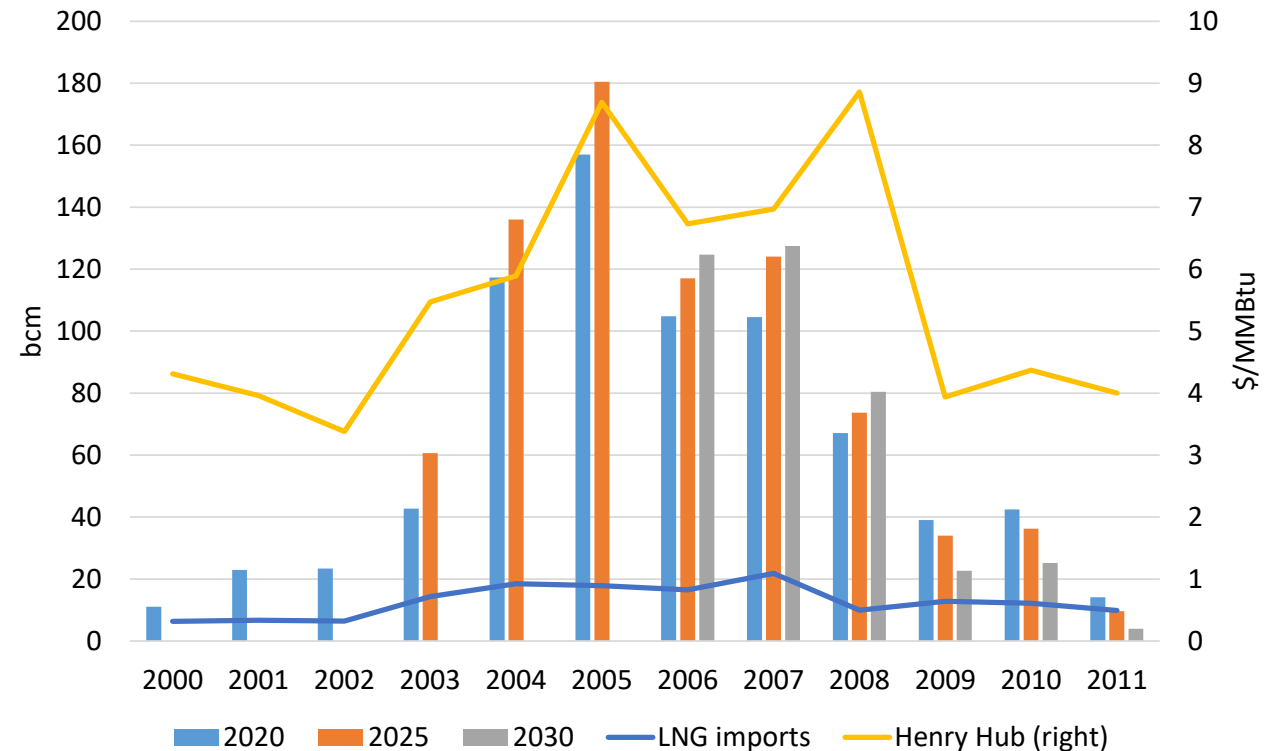
- 1971: Discovery of the North field
- 1991: signature of a LOI between Qatargas and Chubu for 4 mtpa for 25 years (DES)
- 1992: establishment of RasGas (QP/Mobil)
- 1997: first exports
- 2009-2011: LNG megatrains (7.8 mtpa)
- 2011: 77 mtpa (105 bcm)
- 2021: FID on North Field Expansion project (33 mtpa), starting in 2025



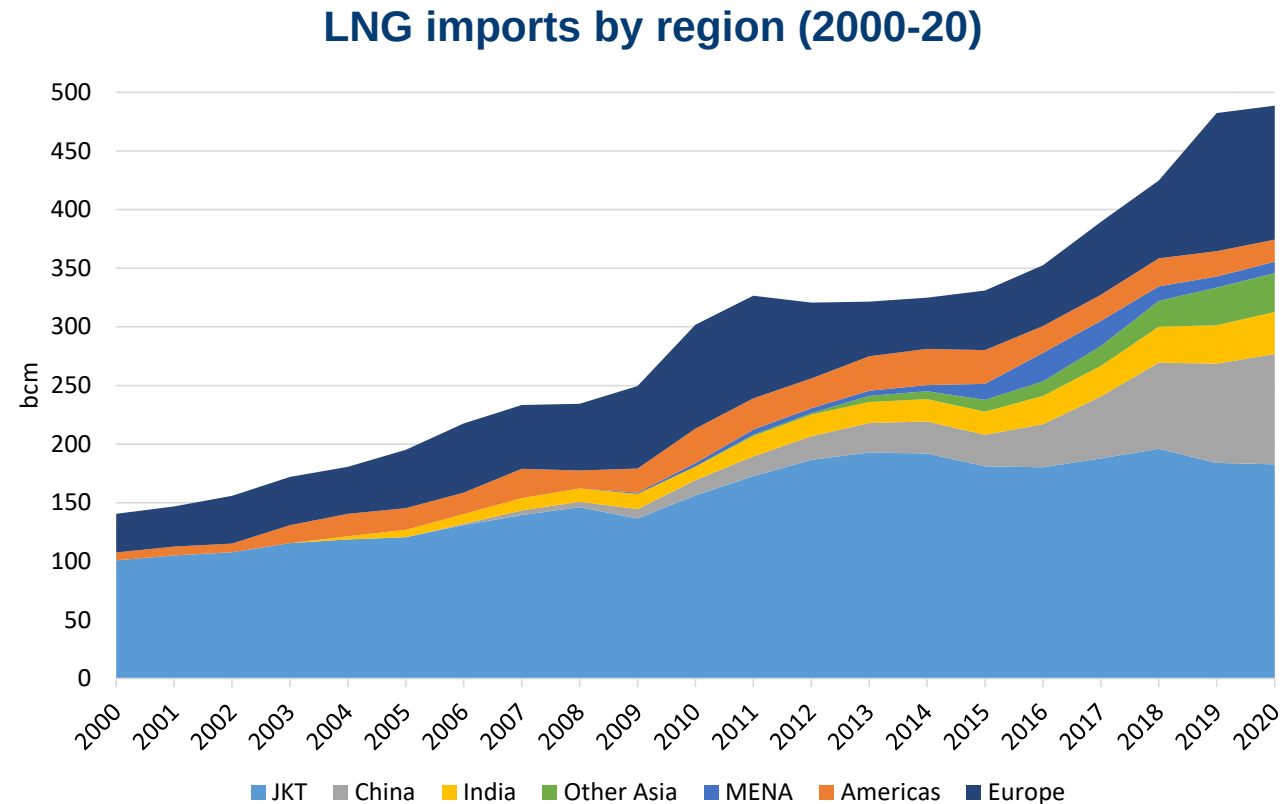
The US surprise

- The US used to be considered as a future large LNG importer
 - EIA 2005: the US to import 180 bcm by 2025
- Today the US imports about 1-2 bcm per year
- Many importing LNG terminals have been transformed into export terminals
- US now exports 90+ bcm and **is to become the largest LNG exporter in 2022**
- Totally changed the way LNG is sold (HH+, flexibility, offtakers)

US LNG imports forecasts vs LNG imports



After 2000: LNG demand increases fast, many new importers



Source: bp Statistical review

Different drivers for LNG demand growth post 2000

Europe

- Decline of domestic production
- Growing demand (up to 2010)
- Need to diversify away from Russia
- Liberalisation/new entrant's strategy

Asia (Excl. JKT)

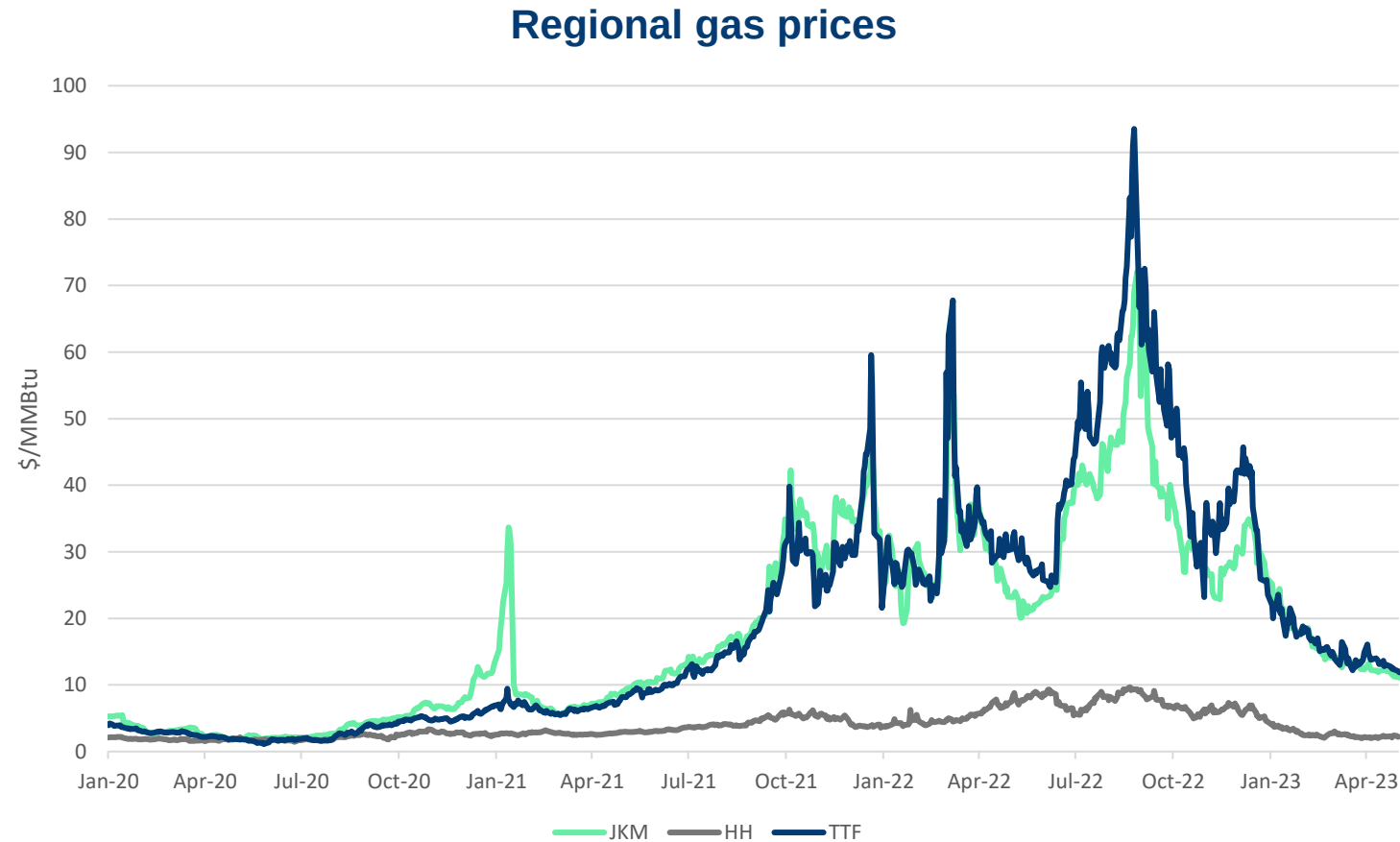
- China – largest LNG importer in 2021 (2nd tier players)
- India – 15% target of gas in PE
- Growing natural gas demand
- Decline of domestic gas production (Pak, Ban, Thai)
- Mismatch prod/demand (Indonesia, Malaysia)
- Replacing pipeline gas (Sing)
- Replace/stop the growth of coal

Latin America/MENA

- Growing natural gas demand
- Need to complement hydro and other renewables (LatAm)
- Failure of regional integration by pipeline
- Domestic production issues (Arg, MENA)

Recent trends & Questions for the future

Markets had never experienced such high and volatile gas prices



Record high gas prices – How did we get there?

DEMAND

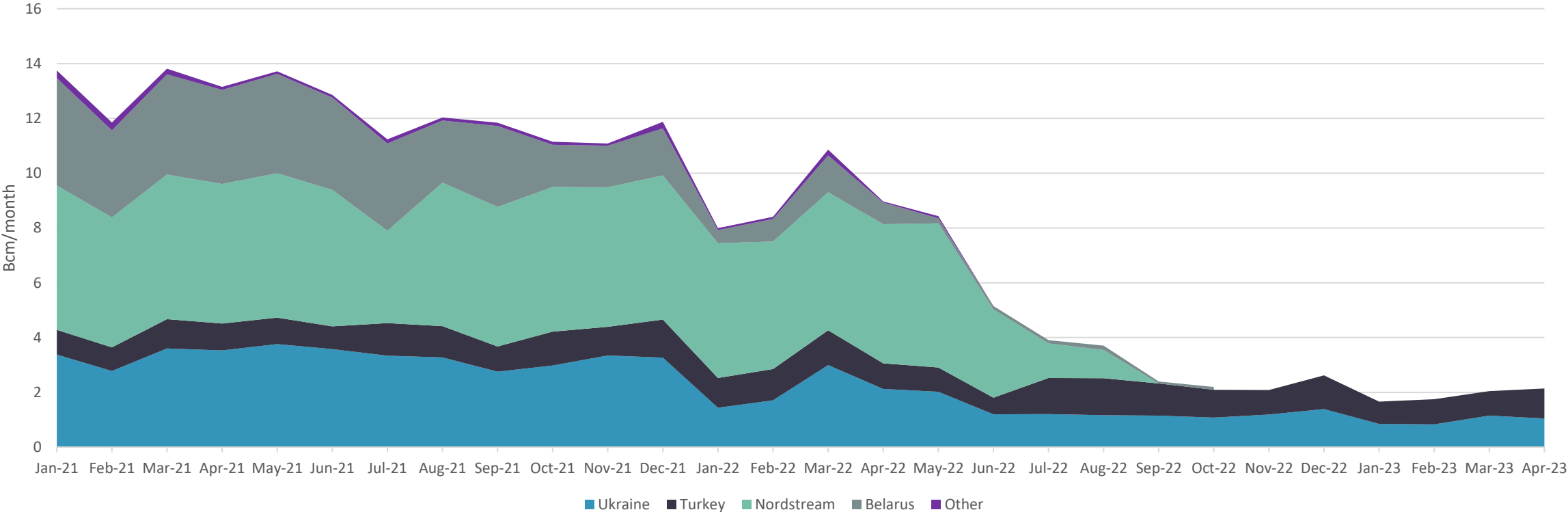
- A strong economic rebound
- Lower than expected renewable generation (droughts in Brazil & China; lower wind in Europe)
- Colder winters (in January 2021 in NE Asia, long winter 2020/21 in Europe); hot summers
- A combination of high coal prices and carbon prices pushing natural gas switching prices upwards in the power sector

SUPPLY

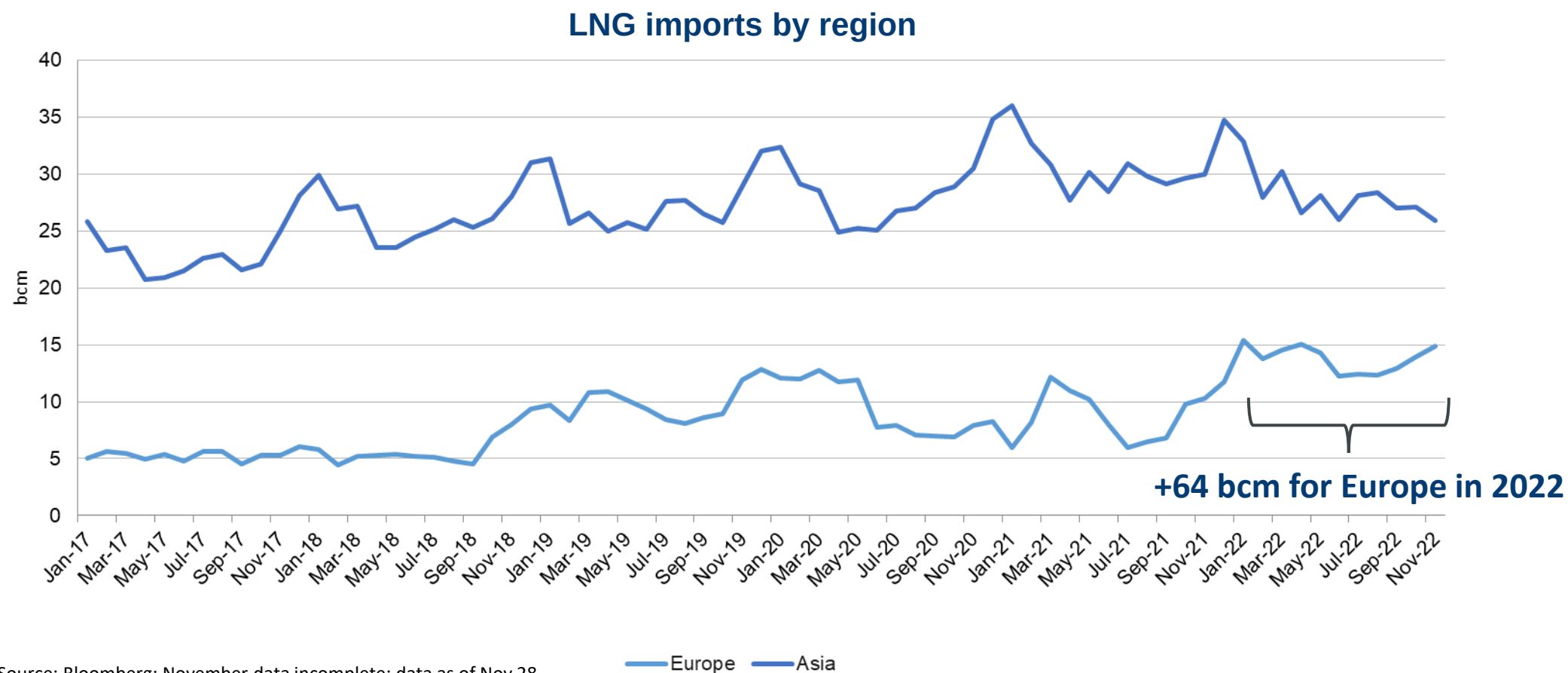
- Under-investments in upstream gas
- Many LNG supply issues (delayed maintenance, fire, supply shortages)
- Lower than expected deliveries from Russia due to:
 - Very high withdrawals from storage during Winter 2020/21 in Russia due to cold weather
 - Tense geopolitical situation around Nord Stream 2 and Ukraine (up to February)
 - Absence of sales on the ESP since October 2021
 - **The war:** cancellation of contracts, lower pipeline exports to Germany (NS1) and sabotage of NS1 & NS2

European imports of Russian gas

Russian pipeline supply by route

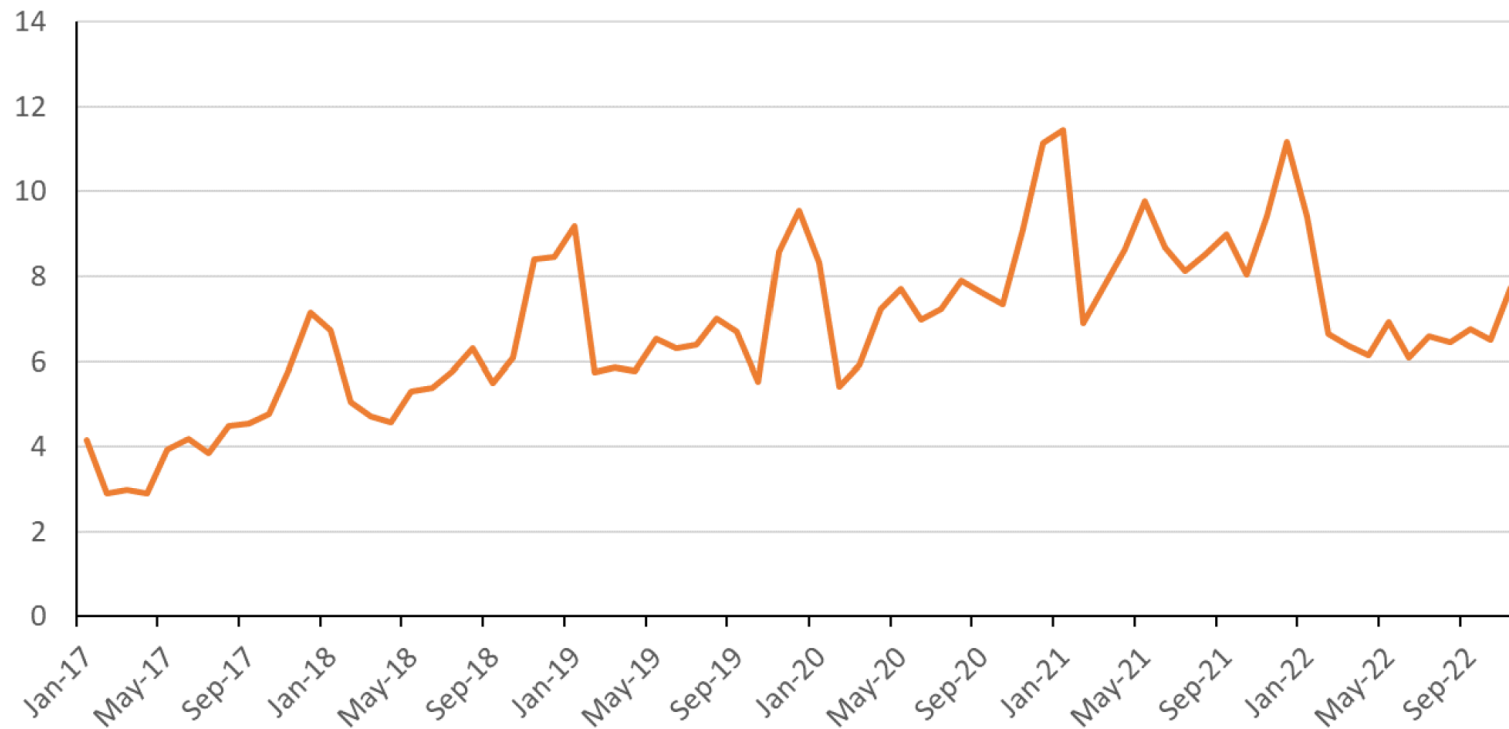


Europe imported significantly more LNG in 2022



But a decline in Chinese LNG imports helped to loosen markets...

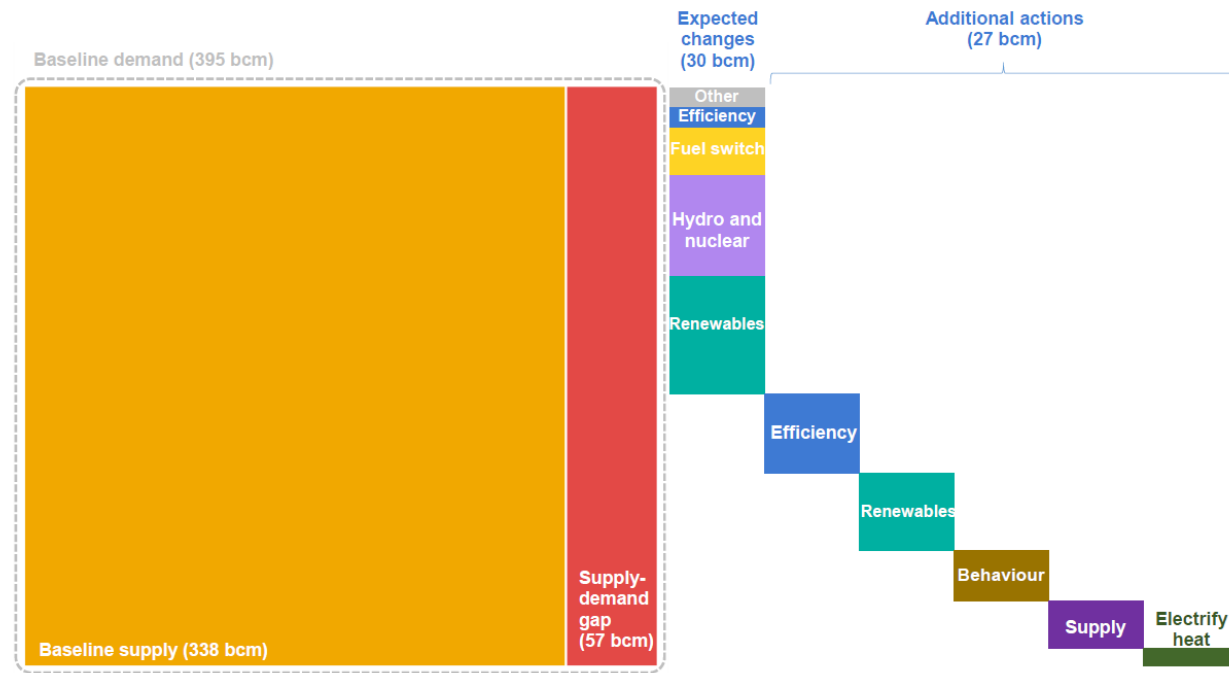
China LNG imports



Source: Bloomberg; November data incomplete: data as of Nov 28

Concerns about next winter in Europe

Expected changes and additional actions to close the EU's supply-demand gap in 2023



Note: Other = heat pumps and biomethane.

IEA. CC BY 4.0.

Source: IEA

Lack of incremental LNG supply pre-2025

Country	LNG plant	Start	Capacity
Russia	Portavaya	2022 (Sept)	2 bcm
Mozambique	Coral FLNG	2022 (Nov)	4.7 bcm
Indonesia	Tangguh T3	2023	5.2 bcm
Senegal & Mauritania	Tortue FLNG	2023	3.5 bcm
Congo	Fast LNG	2023	2 bcm
Russia	Arctic LNG 2	2023-25	27 bcm
United States	Plaquemines	2024	18 bcm
United States	Golden Pass	2024-25	25 bcm
Qatar	NFE	2025-27	45 bcm
Canada	Canada LNG	2025-26	16.6 bcm
Unites States	Corpus Christi S3	2025	14 bcm
Australia	Pluto T2	2026	6.8 bcm

Chinese players have been the primary buyers of long-term LNG recently

Date	Buyer	Seller	Quantity (mtpa)	Start	Duration (years)
Feb 2021	Shenergy Group	Novatek	0.2	Arctic LNG 2	15
Mar 2021	Shenergy Group	TotalEnergies	1.4	2021	20
Mar 2021	Sinopec	QatarEnergy	2.0	2022	10
Apr 2021	CNOOC	Arctic LNG 2	1.98	Arctic LNG 2	20
Apr 2021	CNPC	Arctic LNG 2	1.98	Arctic LNG 2	20
Jul 2021	Shell	QatarEnergy	1.0	2022	10
Jul 2021	Guangzhou Development	bp	0.65	2022	13
Jul 2021	CNOOC	Petronas	2.2	LNG Canada	10
Sep 2021	CNOOC	QatarEnergy	3.5	2022	15
Oct 2021	Shenzhen Gas	bp	0.3	2023	10
Oct 2021	ENN	Cheniere Energy	0.9	Jul 2022	12
Nov 2021	Sinochem	Cheniere Energy	0.9–1.8	Jul 2022	17.5
Nov 2021	Foran Energy Group	Cheniere Energy	0.3	2023	20
Nov 2021	Sinopec	Venture Global LNG	4.0*	Plaquemines LNG	20
Nov 2021	UNIPPEC	Venture Global LNG	1.0	Mar 2023	3
Dec 2021	CNOOC	Venture Global LNG	2.0	Plaquemines LNG	20

Date	Buyer	Seller	Quantity (mtpa)	Start	Duration (years)
Dec 2021	CNOOC	Venture Global LNG	0.5	Mar 2023	3
Dec 2021	SPIC	bp	0.2	2023	10
Dec 2021	Guangdong Energy	QatarEnergy	1.0	2024	10
Dec 2021	Suntien Green	QatarEnergy	1.0	2022	15
Jan 2022	ENN LNG	Novatek	0.6	Arctic LNG 2	11
Mar 2022	ENN NG	ET LNG	1.8	Lake Charles LNG	20
Mar 2022	ENN Energy	ET LNG	0.9	Lake Charles LNG	20
Apr 2022	ENN	NextDecade	1.5	Rio Grande LNG	20
Apr 2022	Guangzhou Development	Mexico Pacific	2.0	MPL LNG	20
Jun 2022	China Gas	ET LNG	0.7	Lake Charles LNG	25
Jul 2022	China Gas	NextDecade	1.0	Rio Grande LNG (T2)	20
Jul 2022	Guangdong Energy	NextDecade	1–1.5**	Rio Grande LNG (T1)	20
Jul 2022	PetroChina	Cheniere Energy	1.8	Corpus Christi Stage 3	25
Nov 2022	Sinopec	QatarEnergy	4.0	NFE (2026)	27
Nov 2022	Shenzhen Energy	bp	na	na	na
TOTAL			42.3–43.7 mtpa (57.5–59.4 bcm)		

How is Europe's natural gas crisis changing the LNG/natural gas supply picture?

LNG SUPPLY

- Geopolitical implications (gas diplomacy)
- Revival of some LNG projects and increased interest from those quite advanced (2 FID in the US in 2022 so far)
- US-EU or US-UK announcements (more US LNG)
- Increased interest in East Mediterranean, Africa (pipeline/LNG)
- Potential gas from the Middle East/Caspian region?
- Remember: Europe's will look carefully at the gas supply's carbon footprint!

GAS SUPPLY

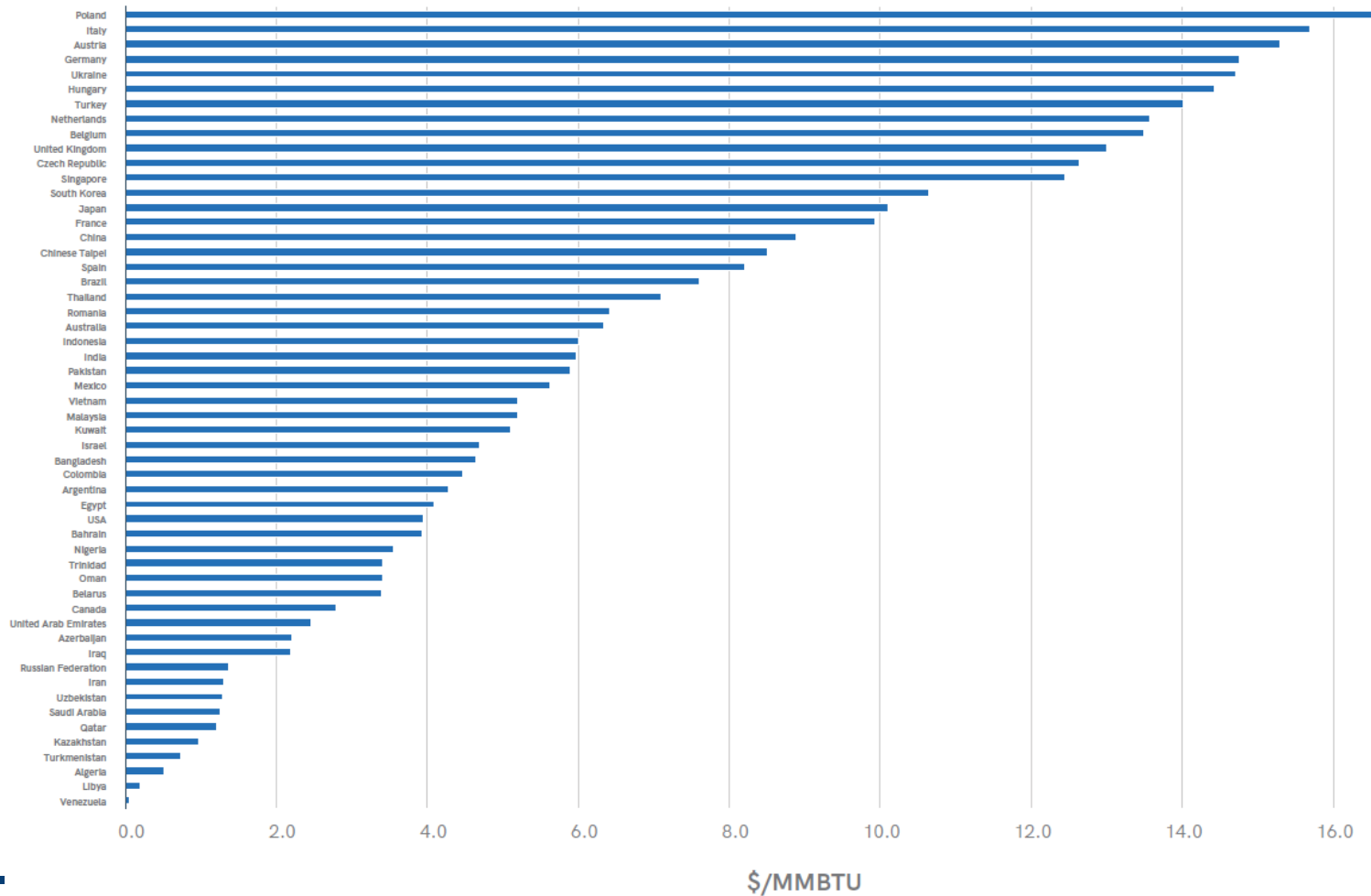
- LNG projects unlikely to start before 2025, while supply is needed now
- How is Europe changing the global LNG equilibrium? (ie: from a balancing market to a competitor?)
- How much gas/LNG does Europe really need by 2030? By 2040?
- Impact of high gas/LNG prices on Asian gas/LNG demand in the short and medium term
- Will more European players sign LT contracts?
- What will happen to infrastructure?

*Immediate
demand*

*Uncertain long-term
demand*

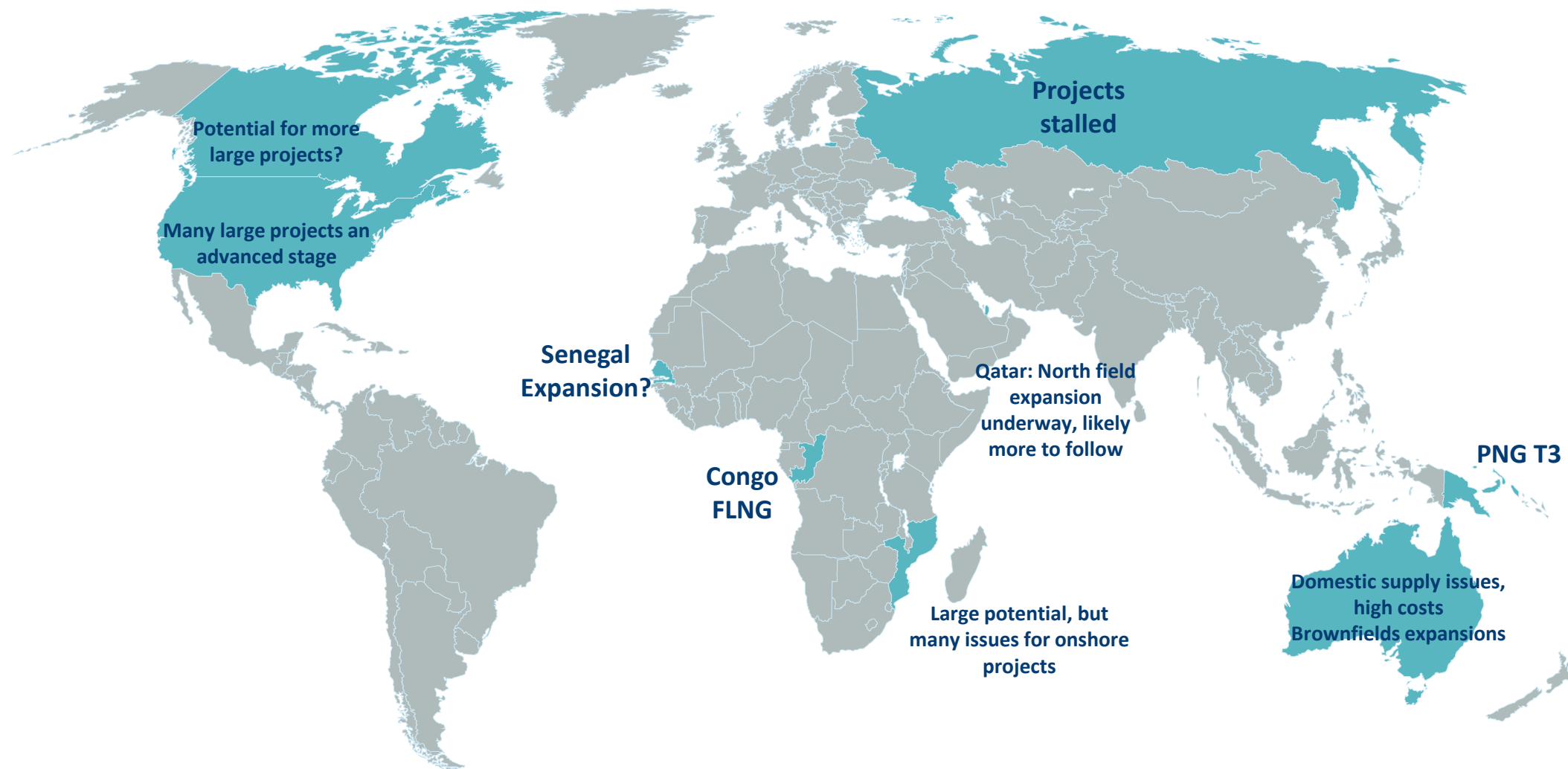
Affordability is important

Wholesale gas prices, 2021



- The level of gas prices is crucial for new LNG importers who tend to have low wholesale gas price
- \$20-30/MMBtu spot is unaffordable for most countries
- Average of JKM in 2021: \$17.8/MMBtu

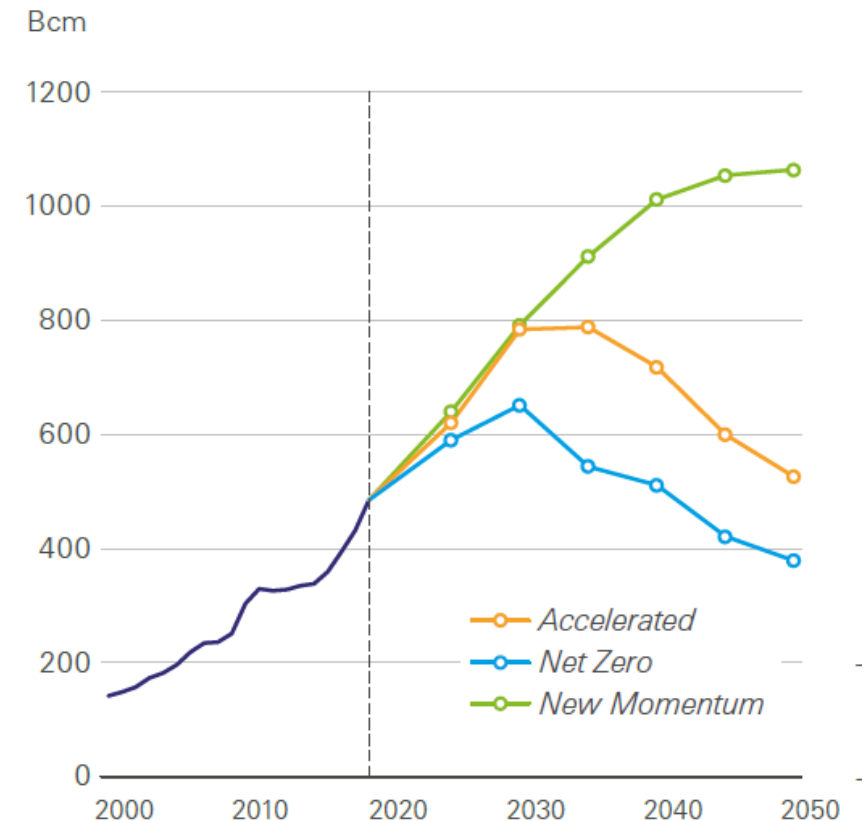
Who will provide LNG beyond 2025?



The future of LNG

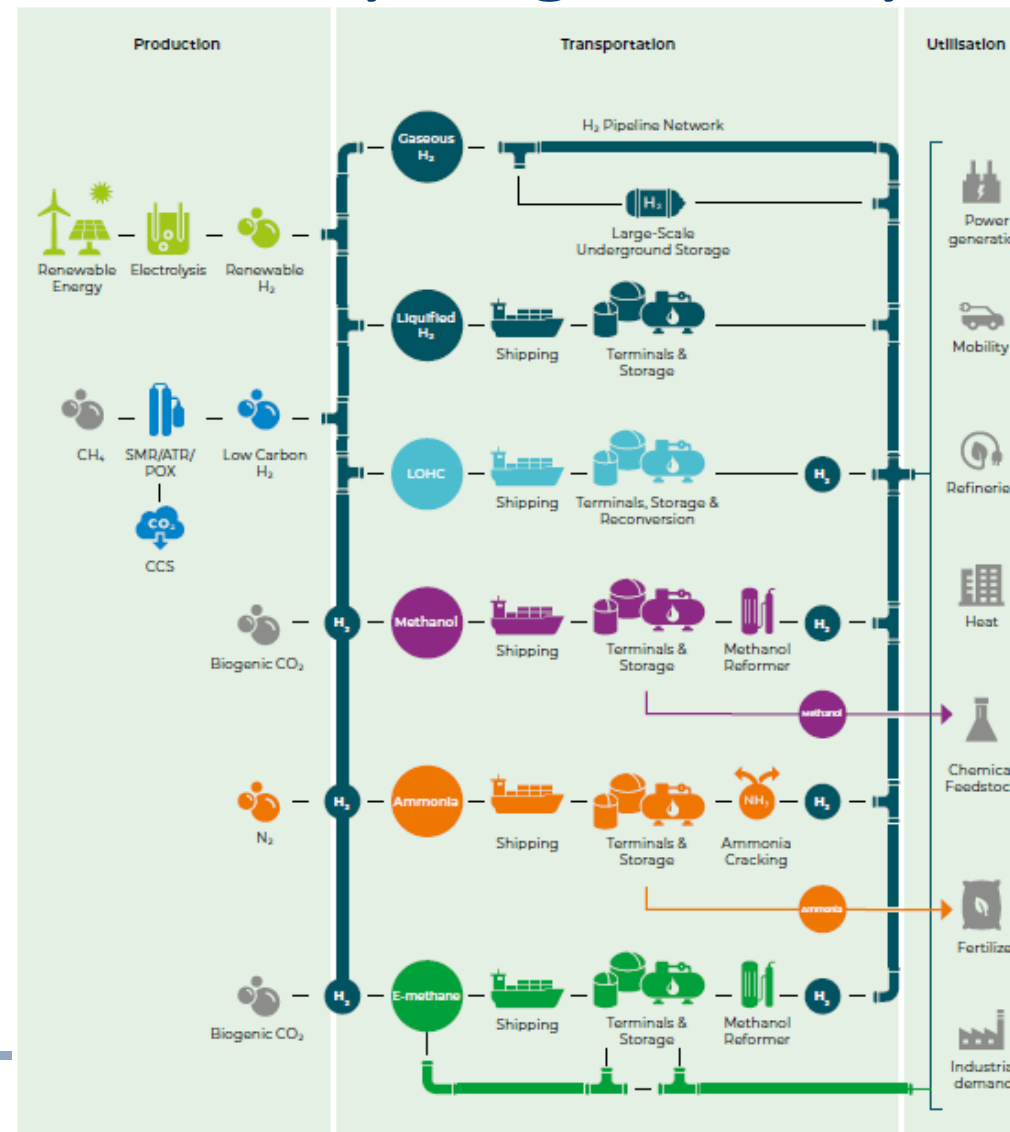
- Asia is key, the future of LNG is linked to the future of gas/LNG demand in Asia
- The carbon footprint of LNG will become increasingly important
 - Carbon neutral LNG
 - Producers to address Scope 1 and 2 emissions
 - Methane emissions to be addressed
- Gas needs to be decarbonised (CCS needs to be developed) to stay in the long-term
- Link between LNG and hydrogen?
- Will the current situation lead to structural changes in terms of gas/LNG demand?
 - Reconfiguration of flows towards Europe
 - Long-term impact of high gas prices

LNG trade scenarios



Source: bp Energy outlook 2022

Infrastructure – what is a hydrogen-ready LNG terminal?



Source: Gas for Climate (2022)



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