



THE OXFORD
INSTITUTE
FOR ENERGY
STUDIES

European gas and LNG supply sources and infrastructure

Presentation to GIIGNL CSG

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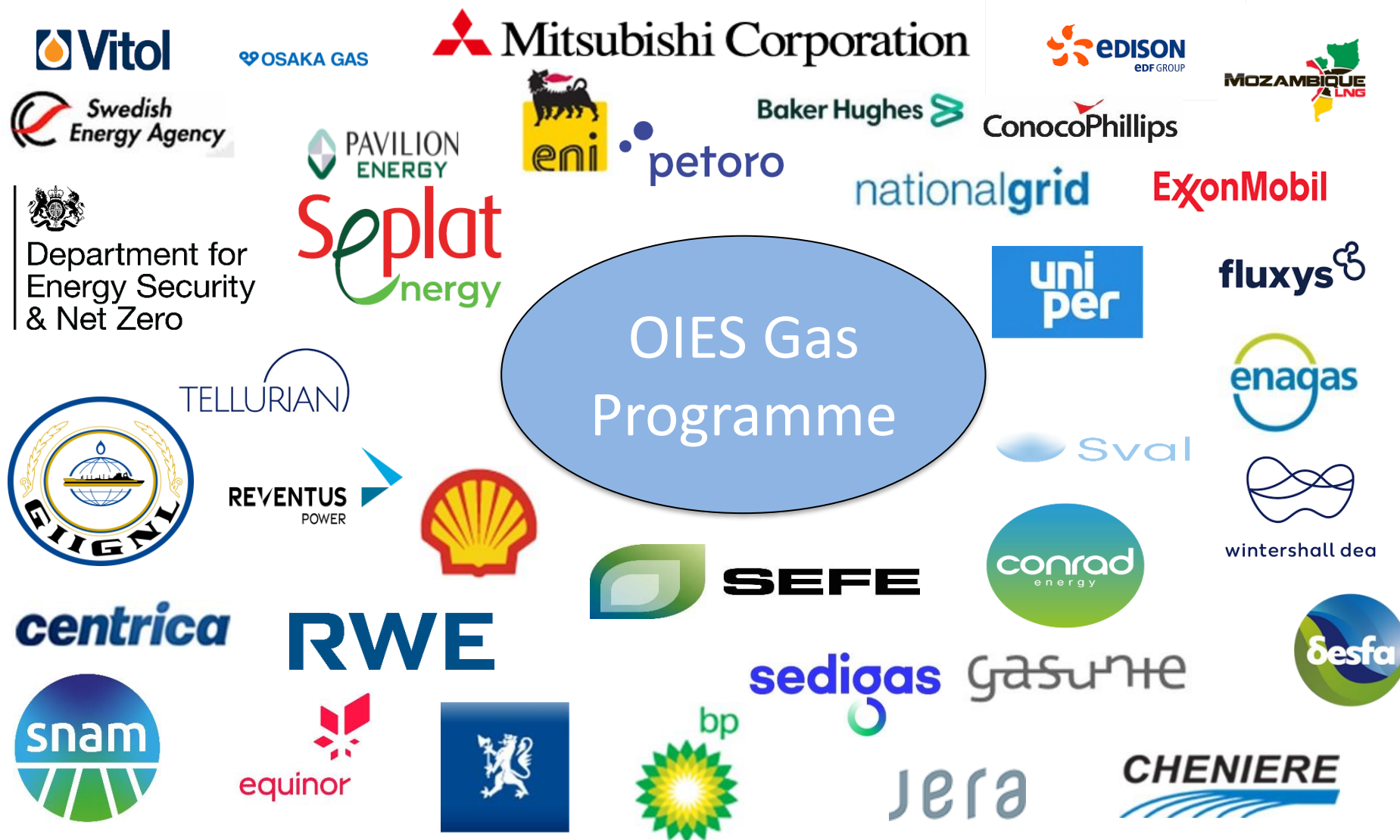


Global gas sector insight and expertise

- **Unique academic focus on the gas value chain**
- **Research fellows with a broad range of geographical and industrial experience**
- **Research programme driven by sponsor interaction**
- **A forum for continuous discussion, debate and networking**
- **Output available over multiple platforms**



Current sponsors of the Gas Programme

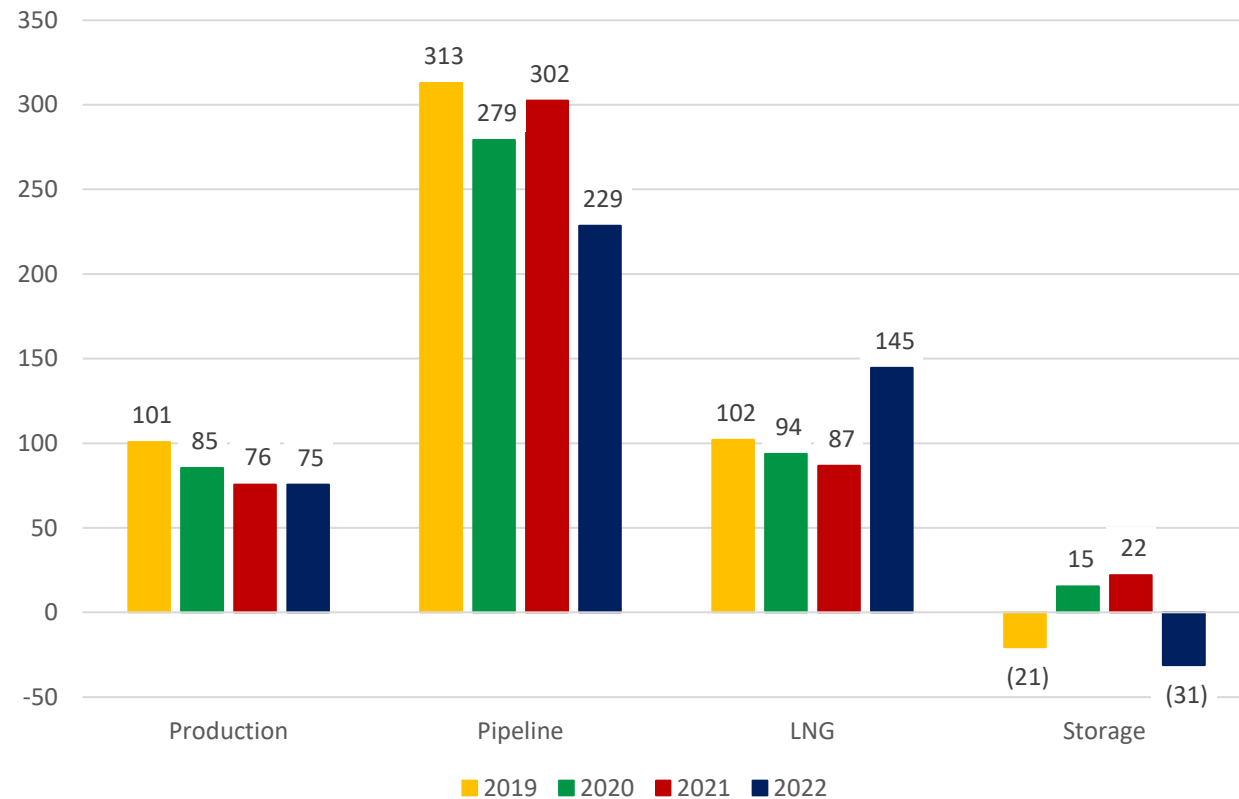




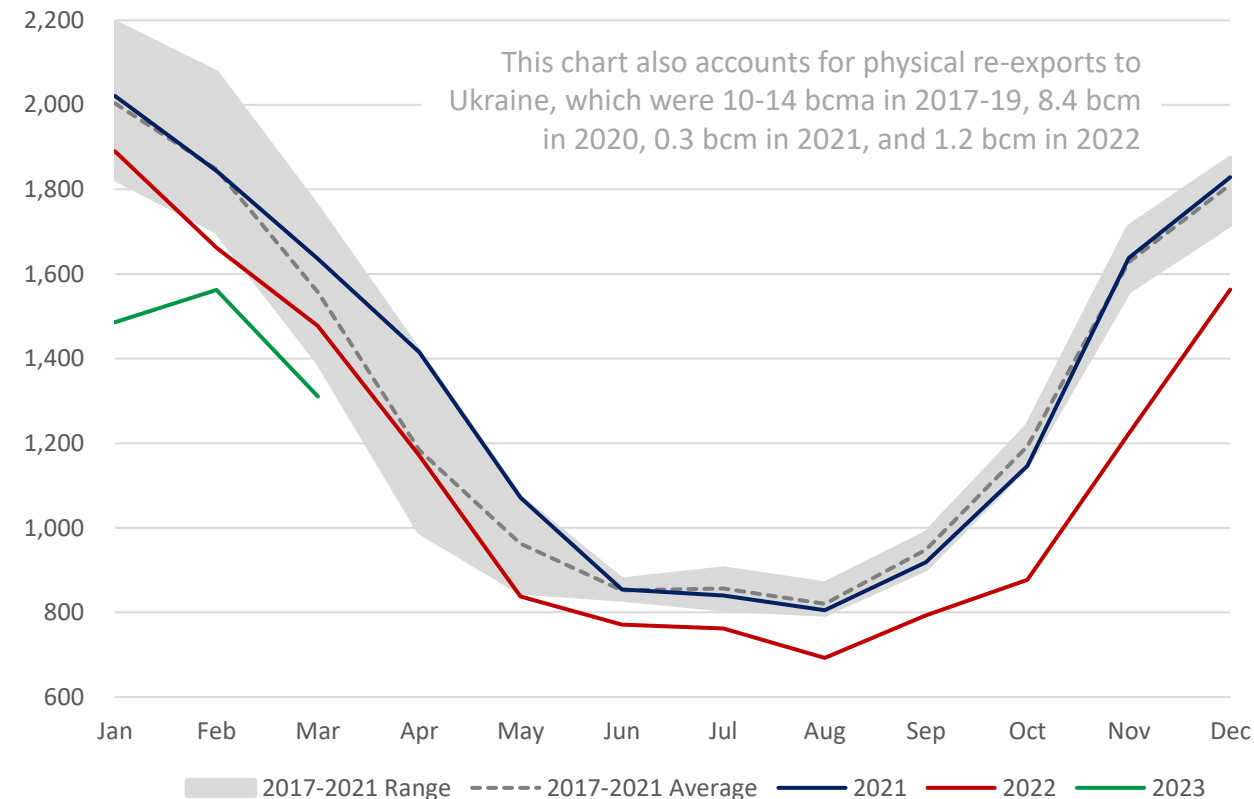
Total European Supply (Production + Imports + Net Storage Withdrawals)

Data sources: ENTSOG Transparency Platform; Eurostat; Gas Infrastructure Europe (AGSI); Kpler LNG Platform

January-December Supply to Europe by Source (Bcm)



Total Supply to Europe (EU+UK), MMcm/d



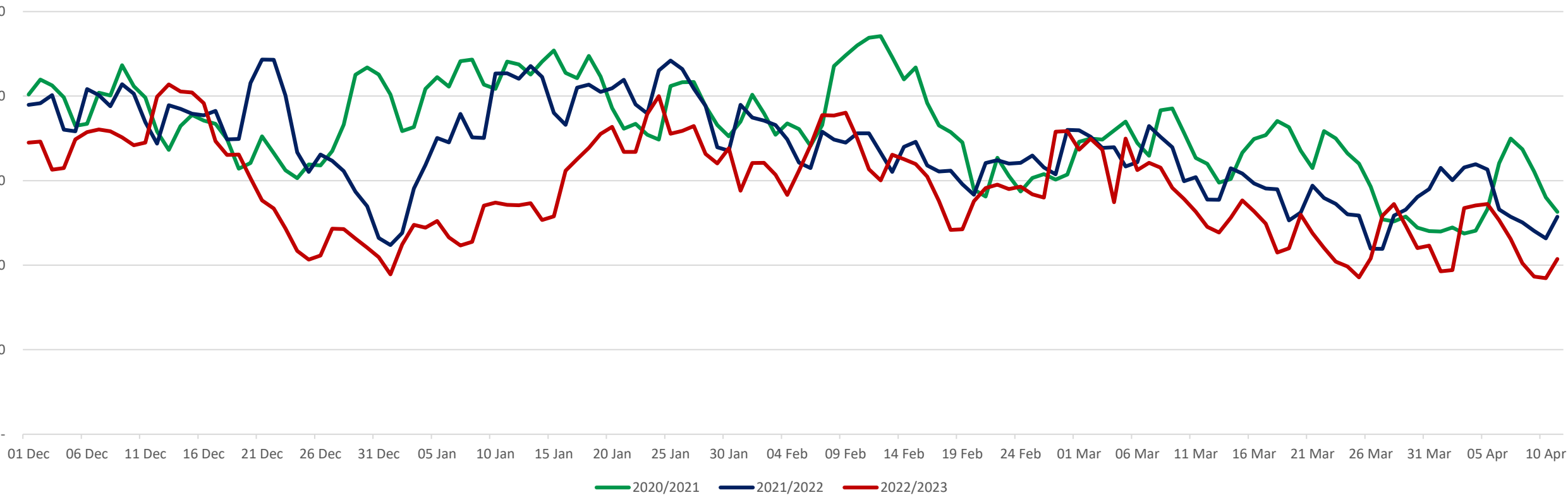
- In 2022, total supply to Europe (production, imports, net storage withdrawals) was -14% both y-o-y and versus the 2017-2021 average
- In Q4-2022, total supply (implied consumption) was down 20% year-on-year (mainly due to mild October and first half of November)
- Q1-2023 total supply was notably lower year-on-year, but much of that decline was in January, and smaller YoY in February and first half of March
- In 2022, power generation was the only sector that saw YoY increase in gas demand - declines of 20% in buildings & 25% in industry [IEA 14 March 2023]



Total European Supply

Data sources: ENTSOG Transparency Platform; Eurostat;
Gas Infrastructure Europe (AGSI); Kpler LNG Platform

Daily Supply to Europe (mmcm/d)



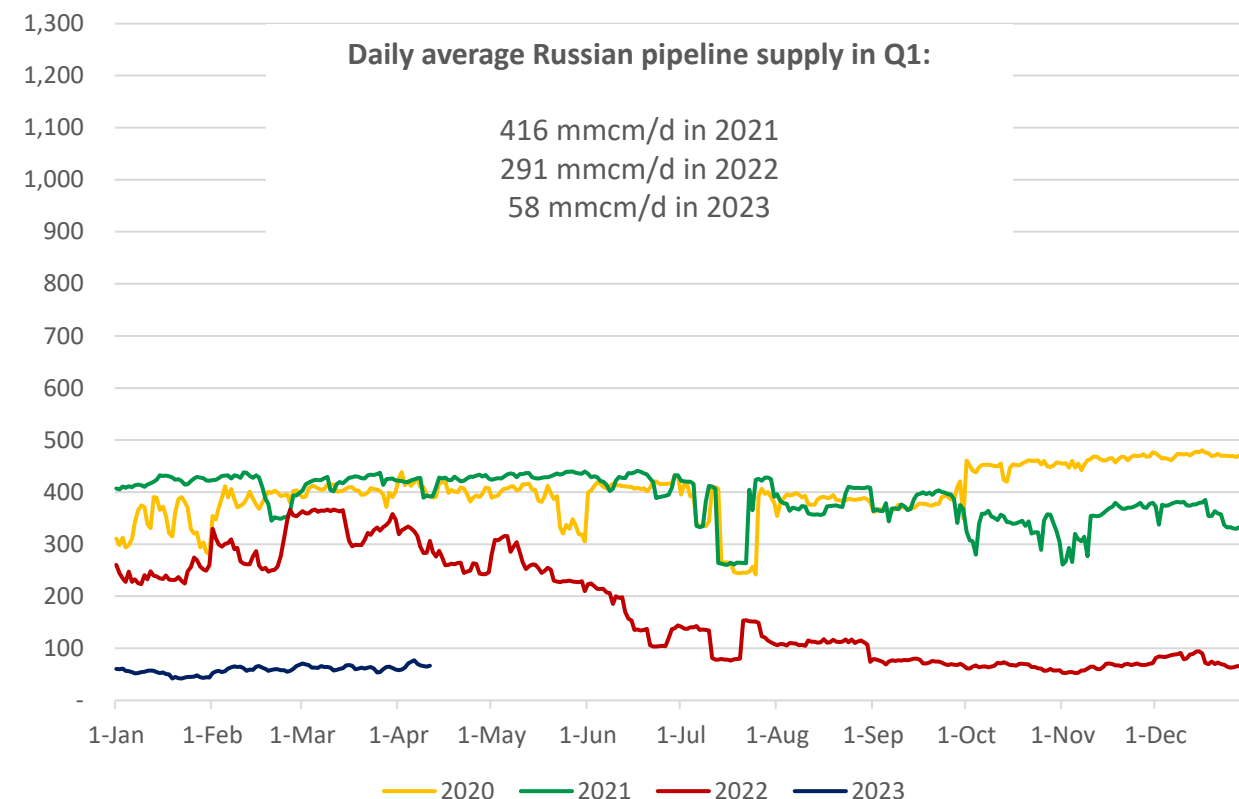
- Total supply (implied consumption) in present winter has been generally lower YoY, except for four brief periods of several days
- This enabled continued net storage injections though to mid-November and curbed net withdrawals in December and January
- Results of this were seen in declining prompt spot prices and even a halt in storage withdrawals in late December/early January
- Market has reached equilibrium, with prices relatively stable at 40-45 EUR/MWh, below the pre-invasion levels of January/February 2022 (68-97 EUR/MWh)



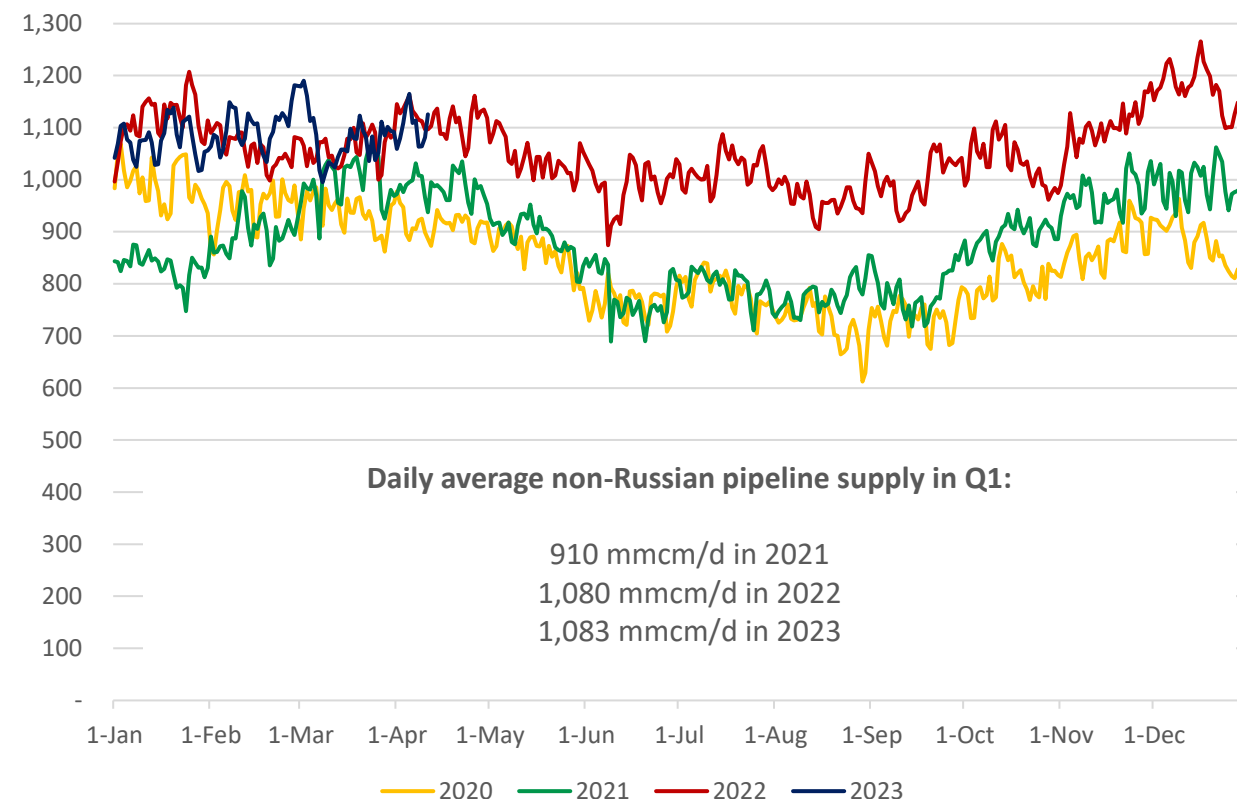
Russian vs Non-Russian Gas Supply to Europe

Data source: ENTSOG Transparency Platform

EU + UK Pipeline Imports from Russia (mmcm/d)



Production + LNG + Non-Russian Pipeline Imports (mmcm/d)



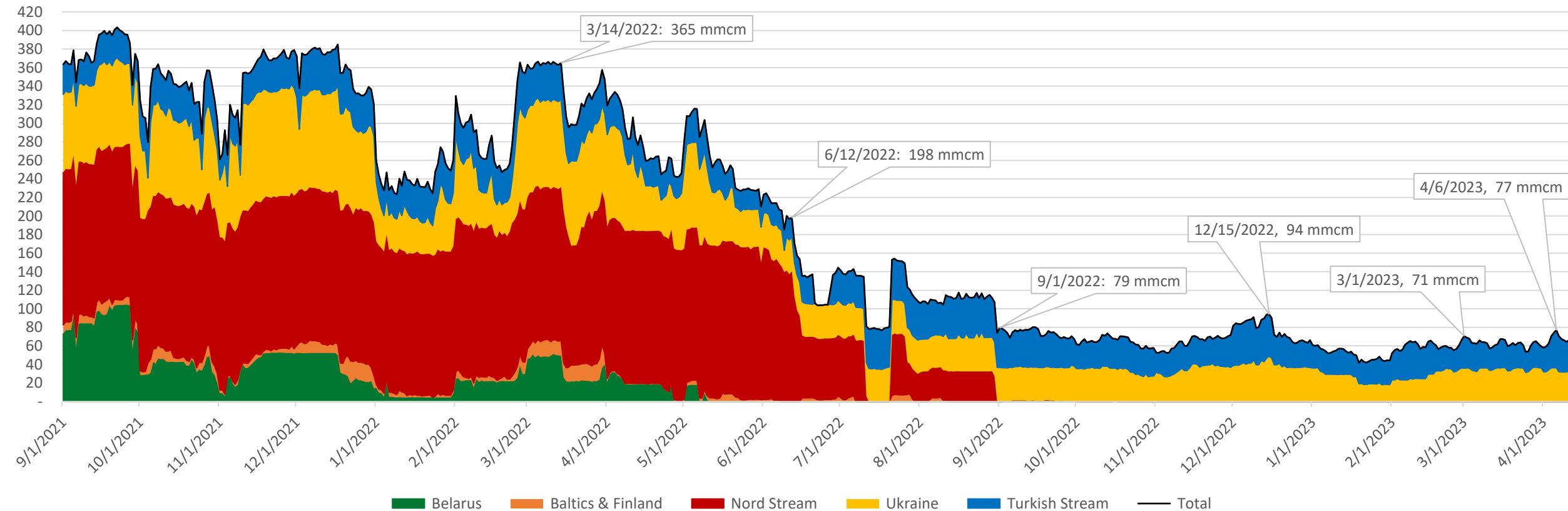
- In Q1-2023, daily average pipeline supply from Russia was 233 mmcm/d lower than in 2022 – a decline of 80%
- Pipeline imports from Russia accounted for just 5% of gross (non-storage) supply to Europe in year-to-date 2023 (1,141 mmcm/d)
- Non-Russian gross supply (production, pipeline & LNG imports) in Q1-2023 was 3 mmcm/d (0.3%) higher than in 2022 (this excludes storage)
- In Q1-2023: Russian pipeline supply was down by 21.0 bcm and non-Russian (production + imports) was up by 0.27 bcm



Russian Pipeline Exports by Route

Data source: ENTSOG Transparency Platform

Daily Russian Gas Flows to Europe by Route (million cubic metres per day)



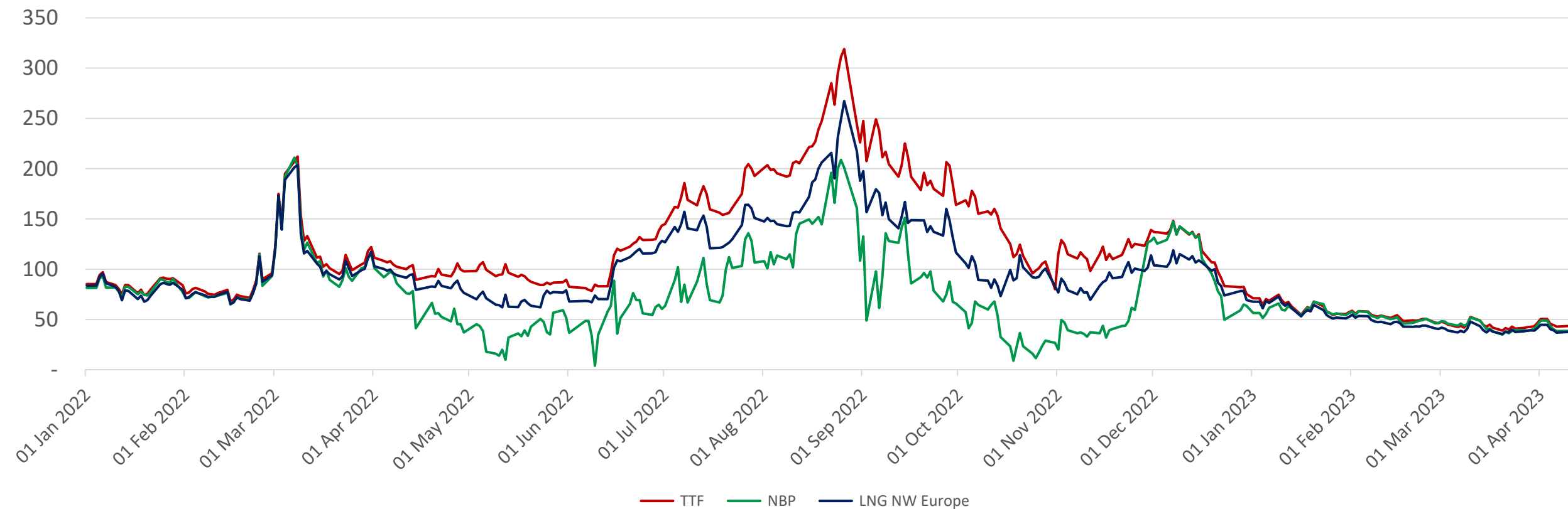
- Flows via Ukraine under threat of Russian sanctions against Naftogaz, in context of Naftogaz pursuing arbitration against Gazprom
- Total Russian pipeline flows below 60 mmcm/d from 4 January to 5 February, including below 50 mmcm/d 17-31 January
- Above 60 mmcm/d since 5 Feb as prompt spot discount to LTC prices narrowed – Peaked at 71 mmcm/d on 1 March & 77 mmcm/d on 6 April
- Since 1 January, roughly 50-50 split between deliveries via Ukraine and deliveries via Turkish Stream to SE Europe (excluding Turkey)



Hub Price Convergence in NW Europe since Nov 2022

Data source: Argus

Front-Month TTF and NBP Hub Prices vs LNG Landed in NW Europe (EUR/MWh)



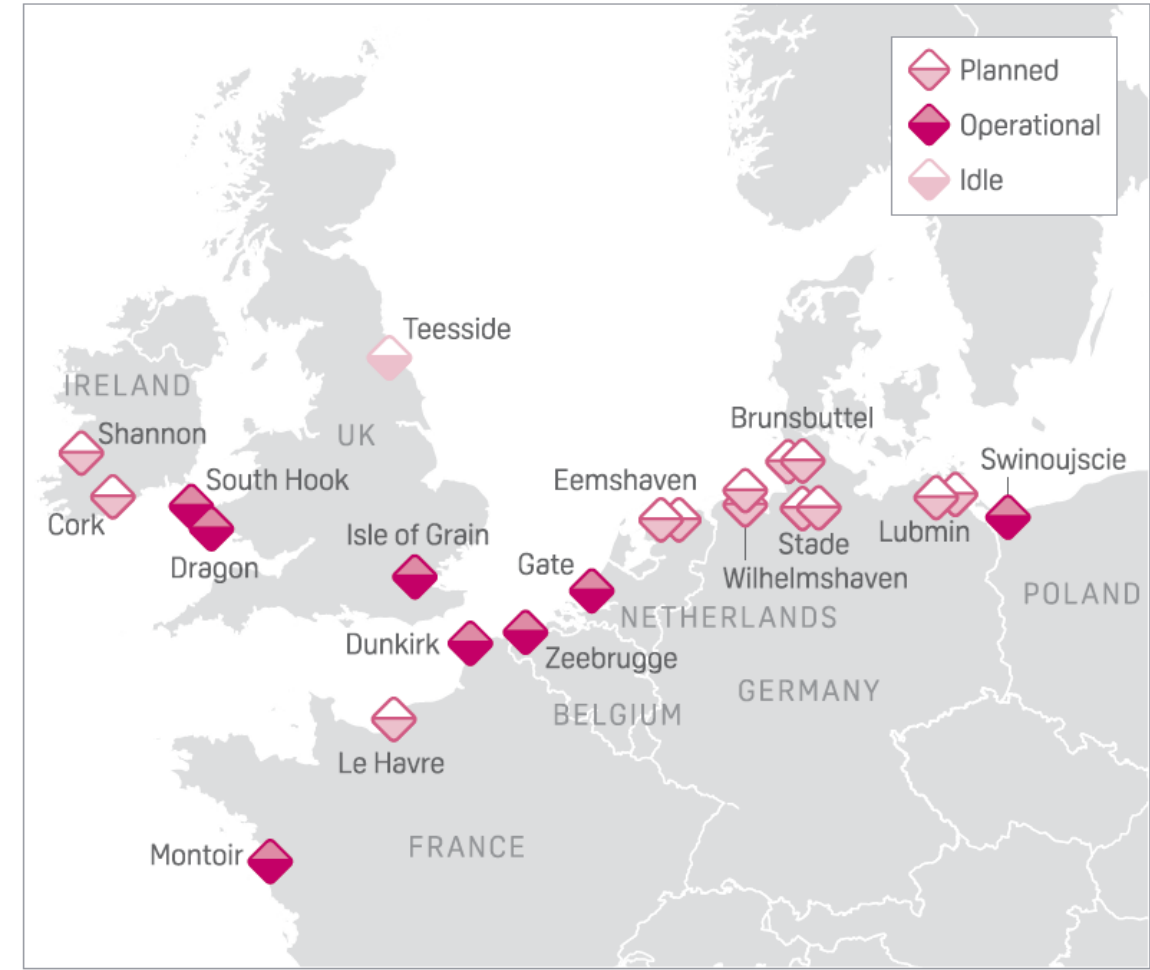
- Divergence between TTF and NBP Front-Month prices between 1 April and 1 November 2022, with landed LNG prices somewhere in between
- A key factor was full capacity utilisation of both interconnectors between UK and BE/NL and LNG import terminals in NW continental Europe
- Launch of Eemshaven (Sept 2022), Wilhelmshaven, Lubmin, & Brunsbüttel FSRUs (Dec-Jan), and storage withdrawals in continental Europe added supply
- Result was convergence of TTF and NBP in winter & decline in UK exports to continental Europe, and convergence of hub and landed LNG prices since Jan 2023



Europe's expansion of LNG terminals

- Prior to Feb 2022 Europe had around 200bcm of LNG import capacity, but much of it was located in the Iberian peninsula
- Since the war started there has been a huge focus on increasing import capacity across the continent
- In Northern Europe a total of 49bcm should be added by end-2023, with further expansion planned by end-2026
 - 2 FSRUs in the Netherlands
 - 6 terminals in Germany
 - Finland, France and Poland also adding capacity
- In Southern Europe 33bcm of capacity could be added by end-2025
 - 3 projects in Greece with 15bcm capacity
 - 3 projects in Italy with 15bcm capacity
 - Croatia to expand Krk facility by 3bcm
- Utilisation clearly depends on availability of LNG in global market
- Also, facilities in NW Europe could divert LNG away from UK and reduce re-exports

NORTHWEST EUROPEAN LNG PROJECT LANDSCAPE



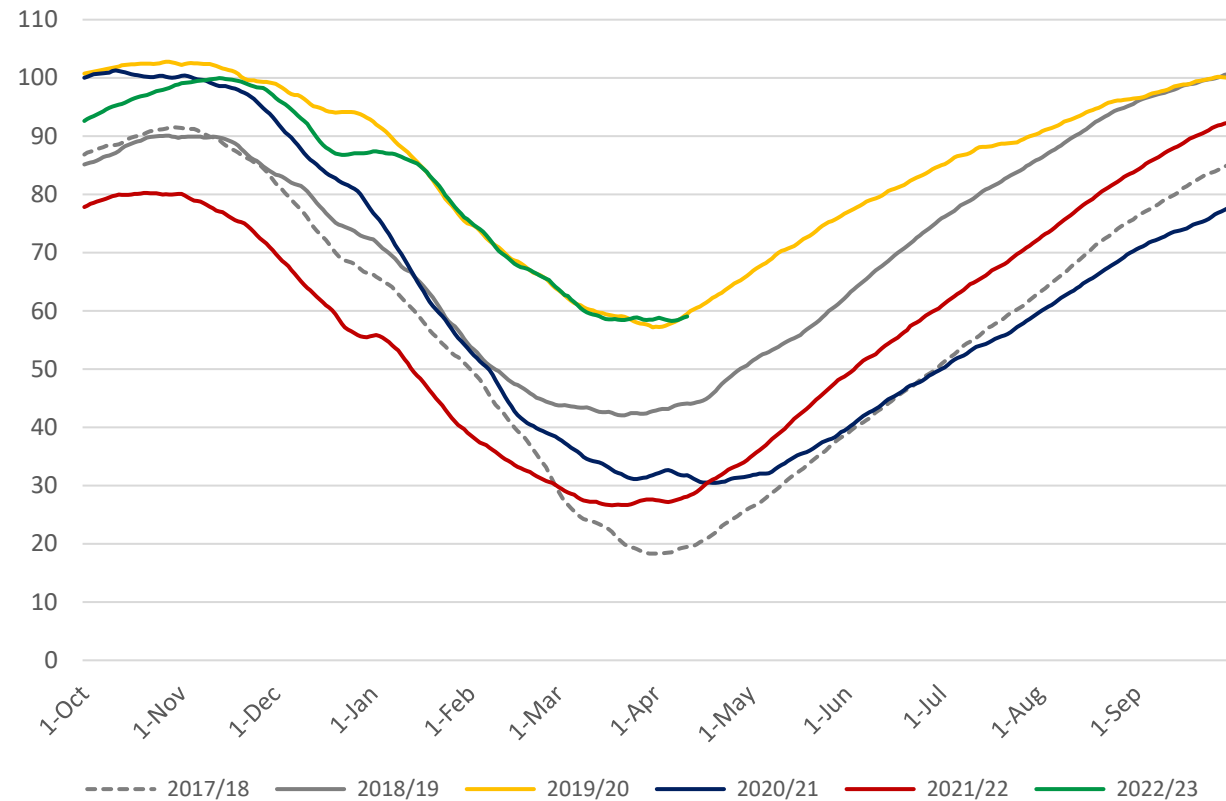
Source: S&P Global Commodity Insights



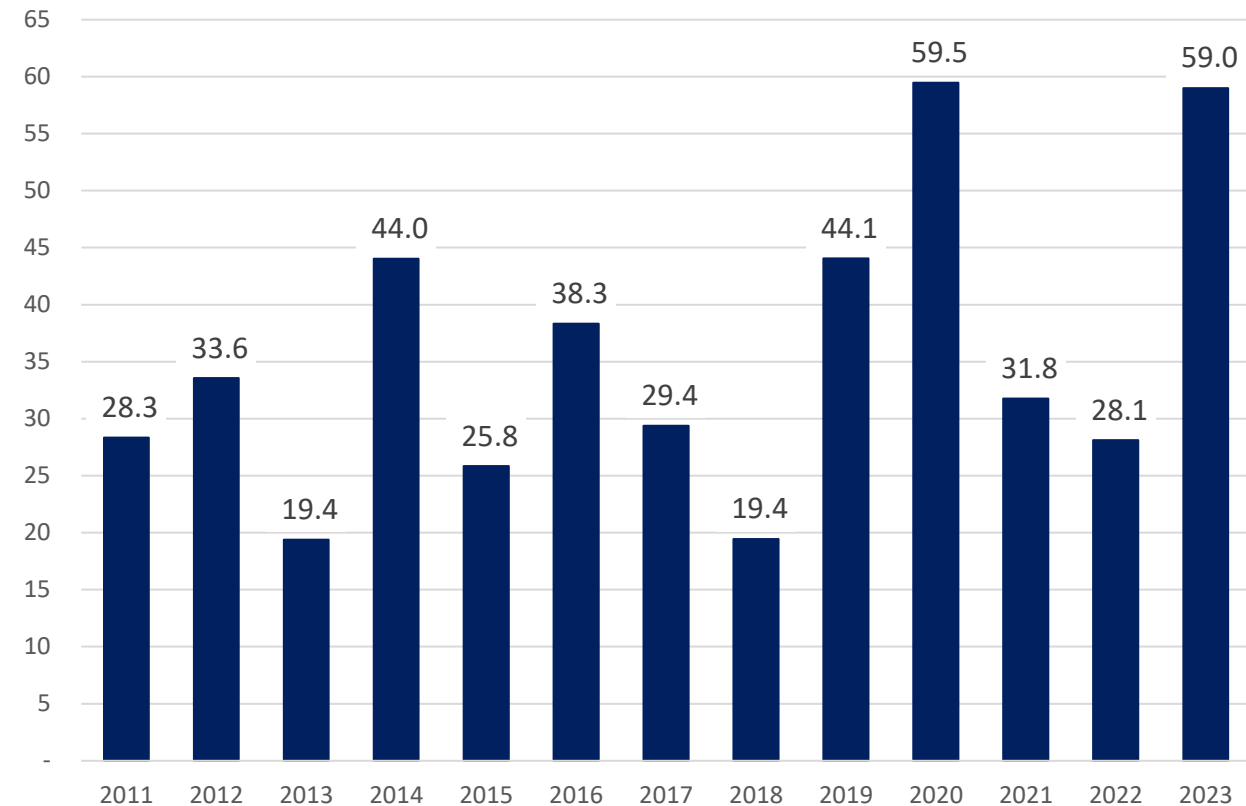
European Gas Storage

Data source: Gas Infrastructure Europe (AGSI)

European Daily Gas Storage Stocks (bcm)



European Storage Stocks on 11 April (bcm)

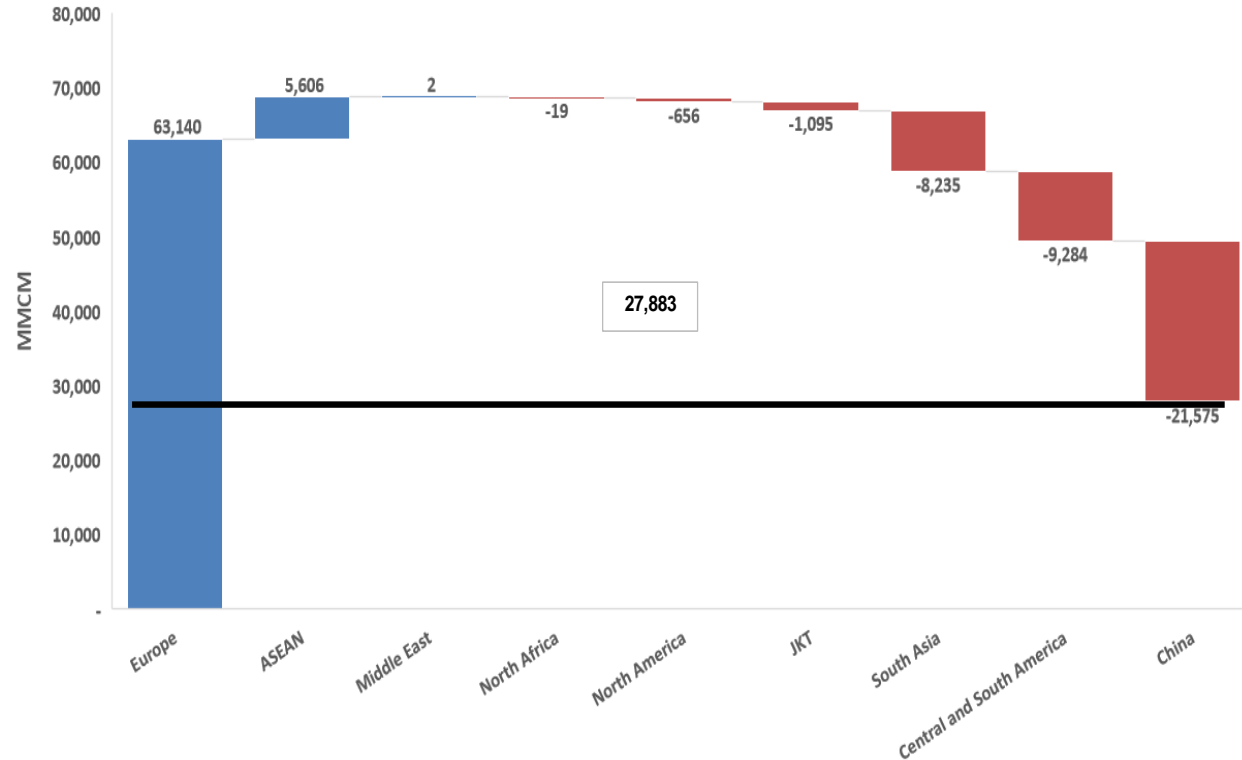


- Europe managed to make net storage injections between 24 and 31 December 2022 amid slump in demand
- By 31 March 2023, stocks were 1.4 bcm higher than the previous record for that date (31 March 2020), and 30.9 bcm higher year-on-year
- It now seems highly unlikely that in 2023 Europe will repeat the large net injection of 31 bcm it made in the calendar year 2022

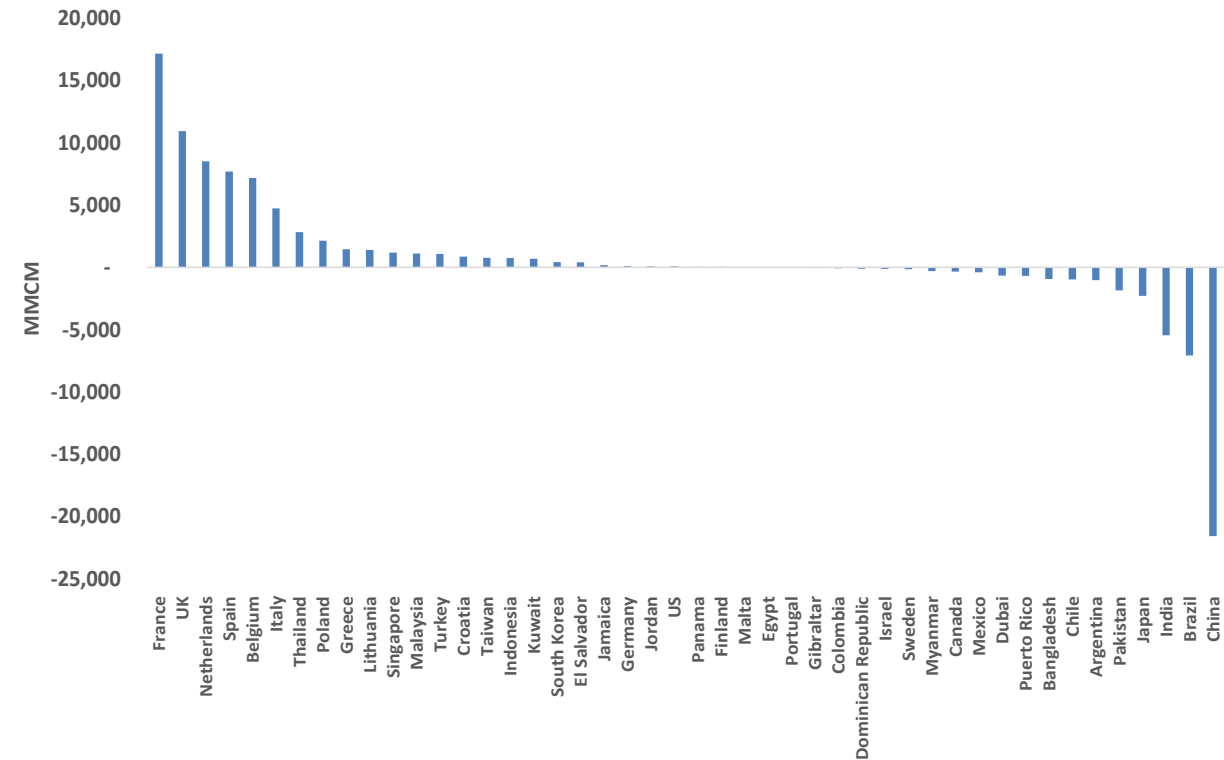


LNG Imports – 2022 v 2021

Change in LNG Imports - 2022 v 2021



Change in Imports - 2022 v 2021

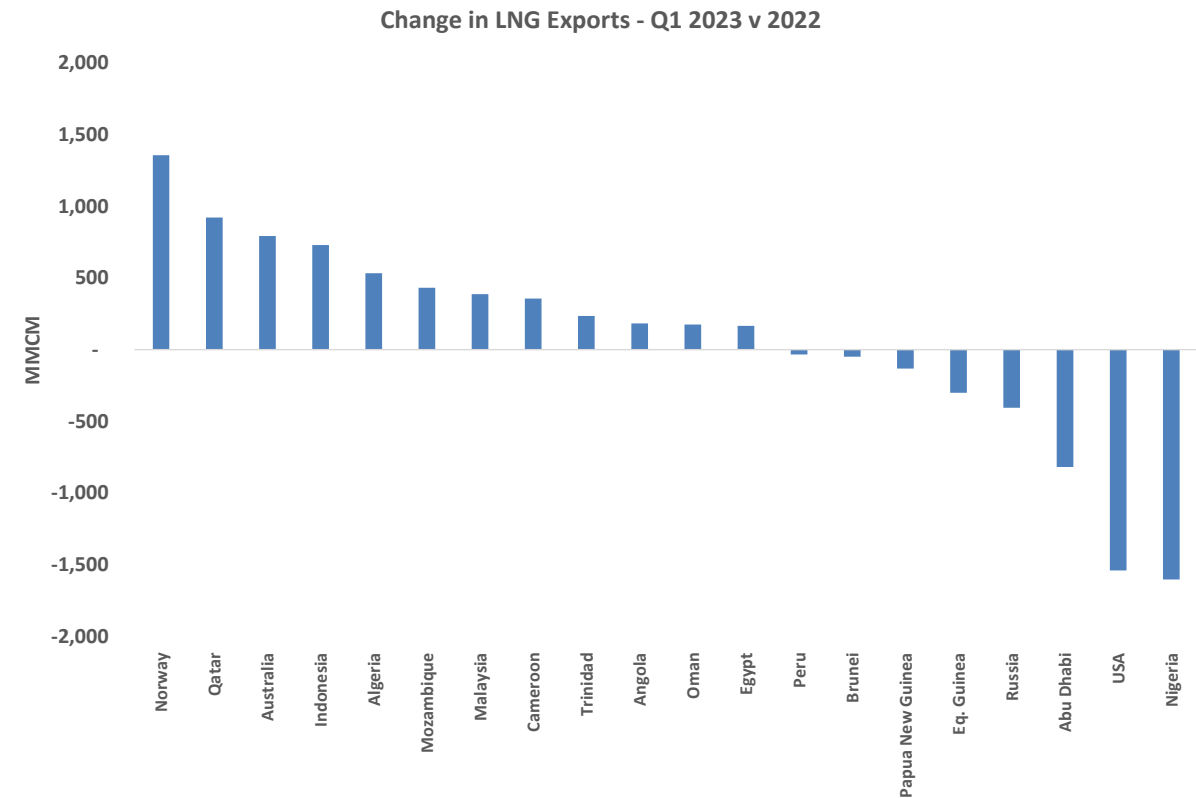
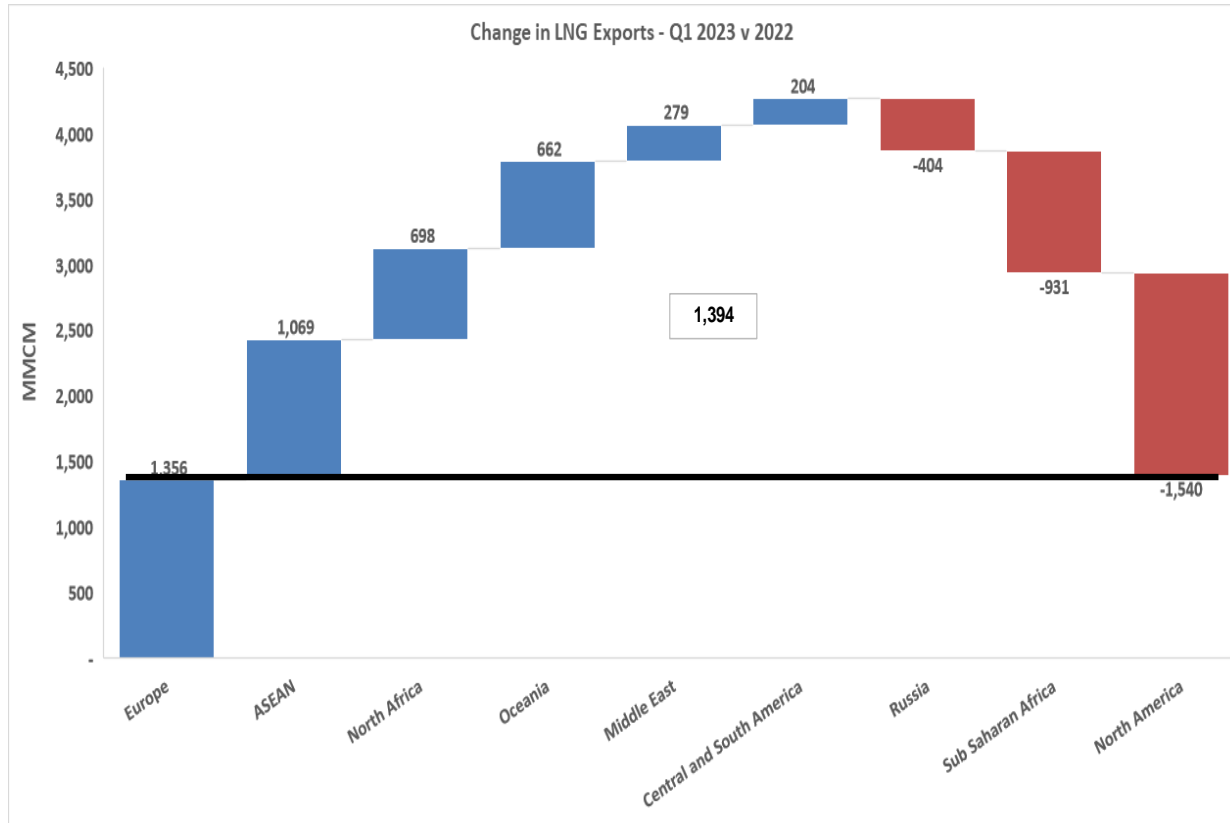


- Significant volumes still coming to Europe – up 62% year on year
- Asia volumes 25 bcm lower than previous year – mostly China
- Total volume up year on year by 6% - some 28 bcm for year

Source: Kpler



LNG Exports – 2023 v 2022



- US volumes lower than in the strong start to 2022 but still higher than 2022 monthly average
- Nigeria weakness is maintained in early 2023 much lower than 2022 monthly average
- Norway back to capacity compared to zero in early 2022
- Algeria recovering and Mozambique beginning to grow
- Trinidad benefitting from more feedgas

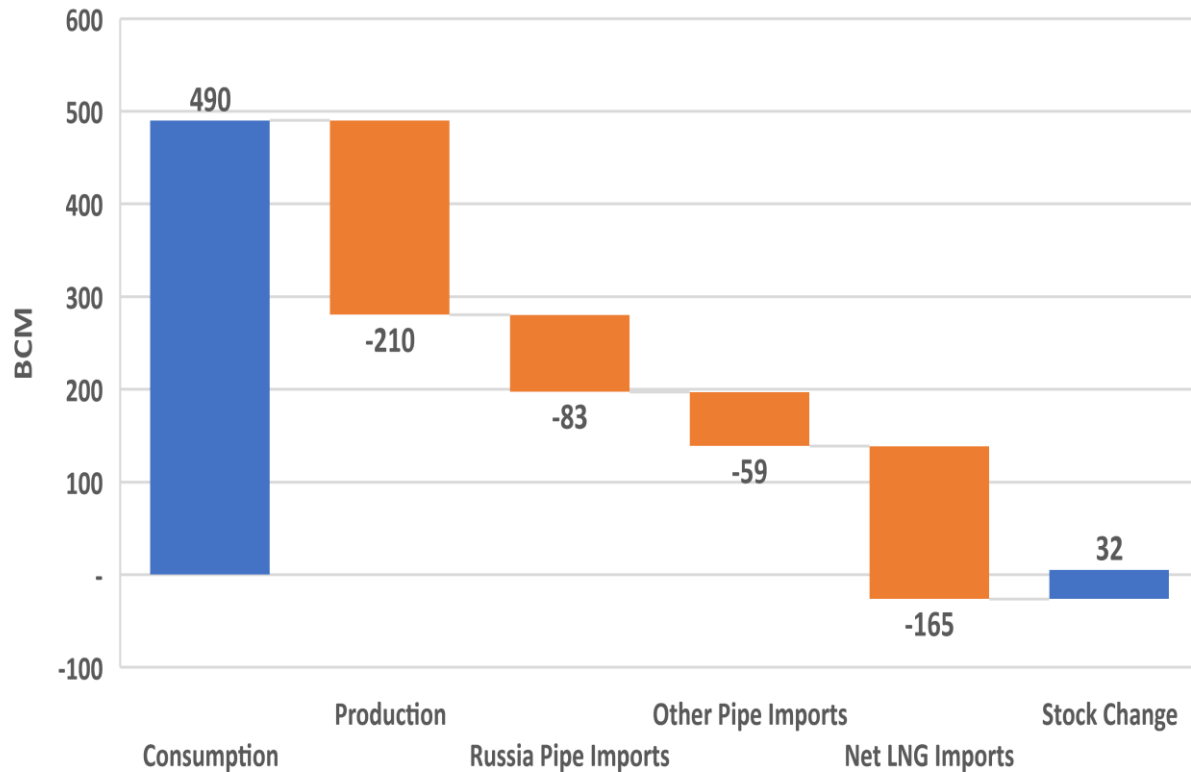
Source: Kpler



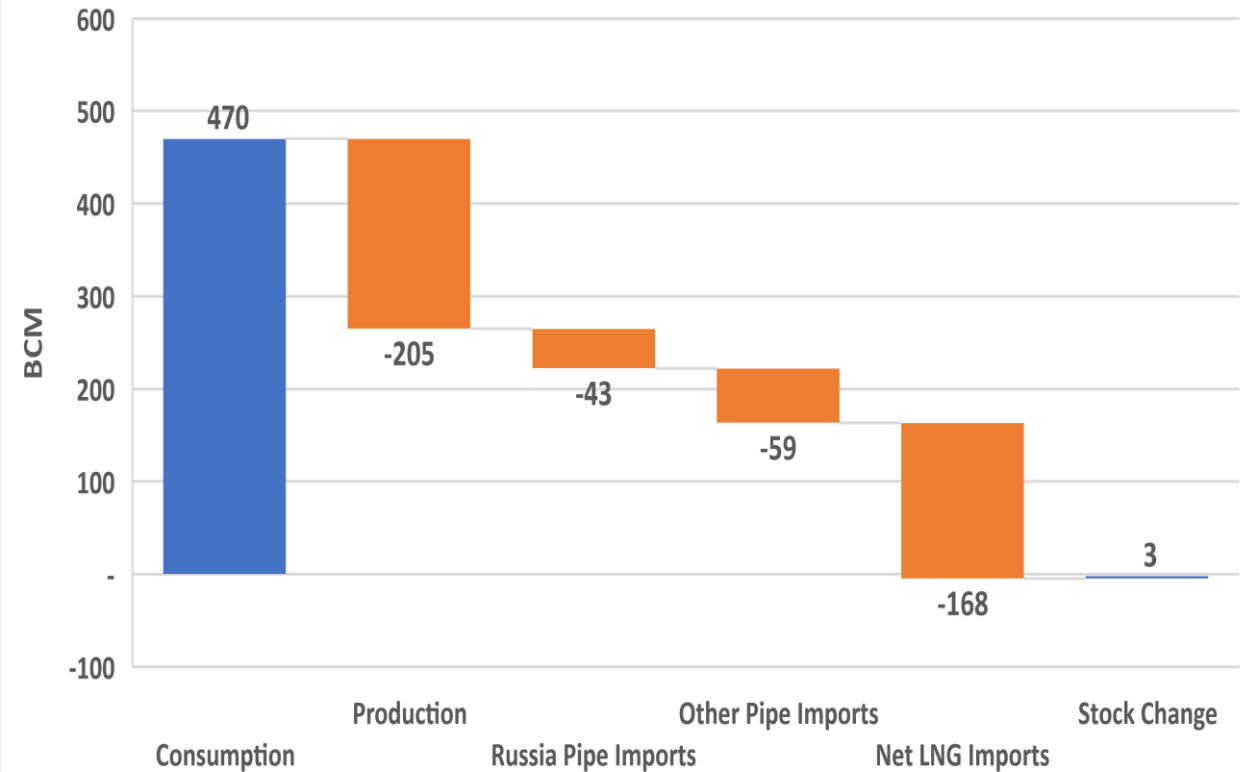
BLUE demand met
by ORANGE supply

Europe Balance

Europe Balance 2022



Europe Balance 2023

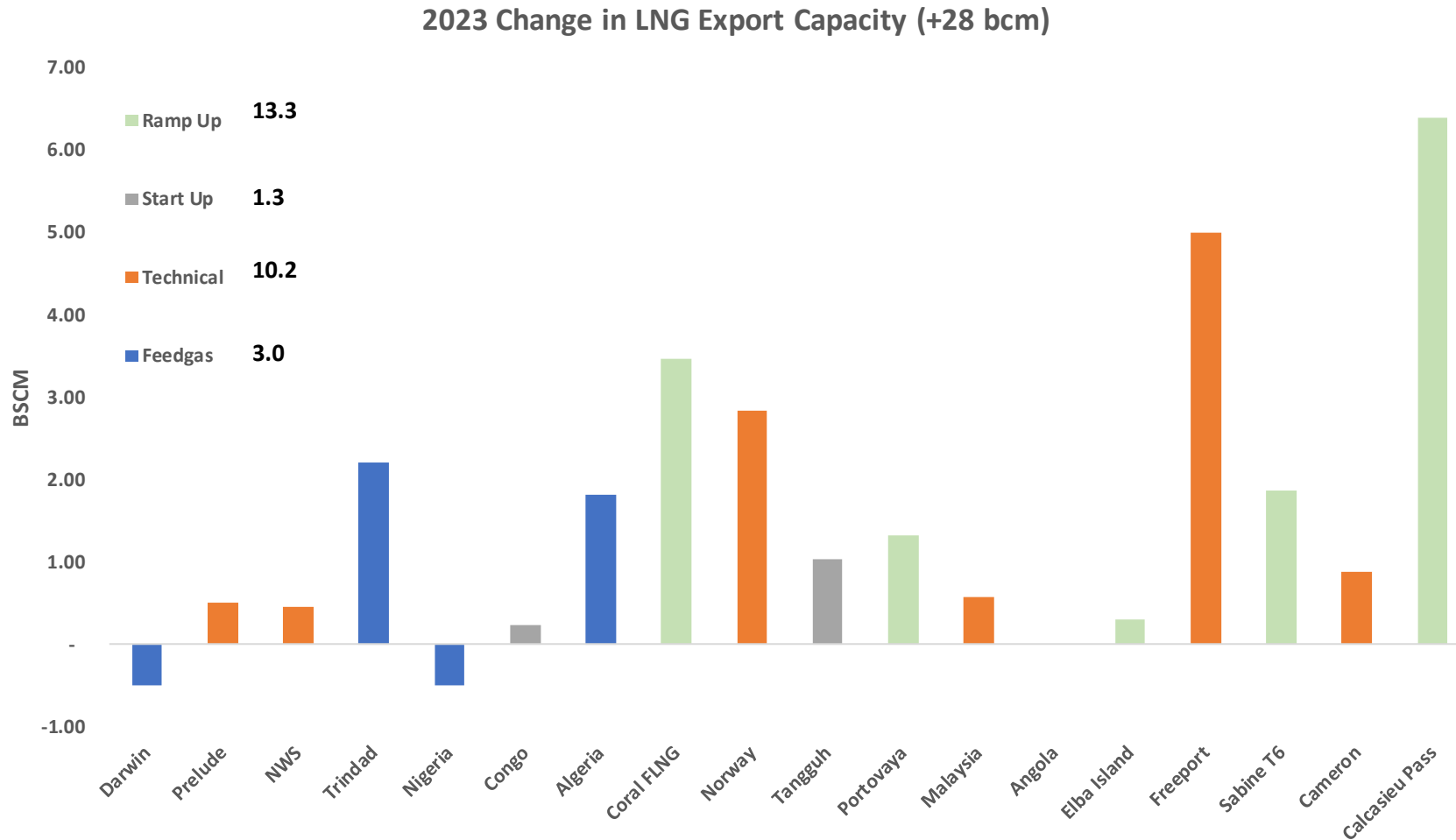


Lower demand in 2022 and higher LNG imports more than offset lower Russia pipe imports, enabling storage to fill
2023 Europe demand already down 20 bcm, lower Russia pipe imports can be accommodated if demand stays at 2022 levels and LNG imports remain high, storage remains at high level

Source: IEA,
ENTSOG, Kpler,
NexantECA WGM



Change in LNG Export Capacity 2023 v 2022



Technical turnrounds from 2022 account for one-third of rise

More feedgas in Trinidad but Nigeria still looking weak

New start ups at end of 2023

Significant ramp ups of 2022 projects

Half of increase comes from the US including Freeport restarting

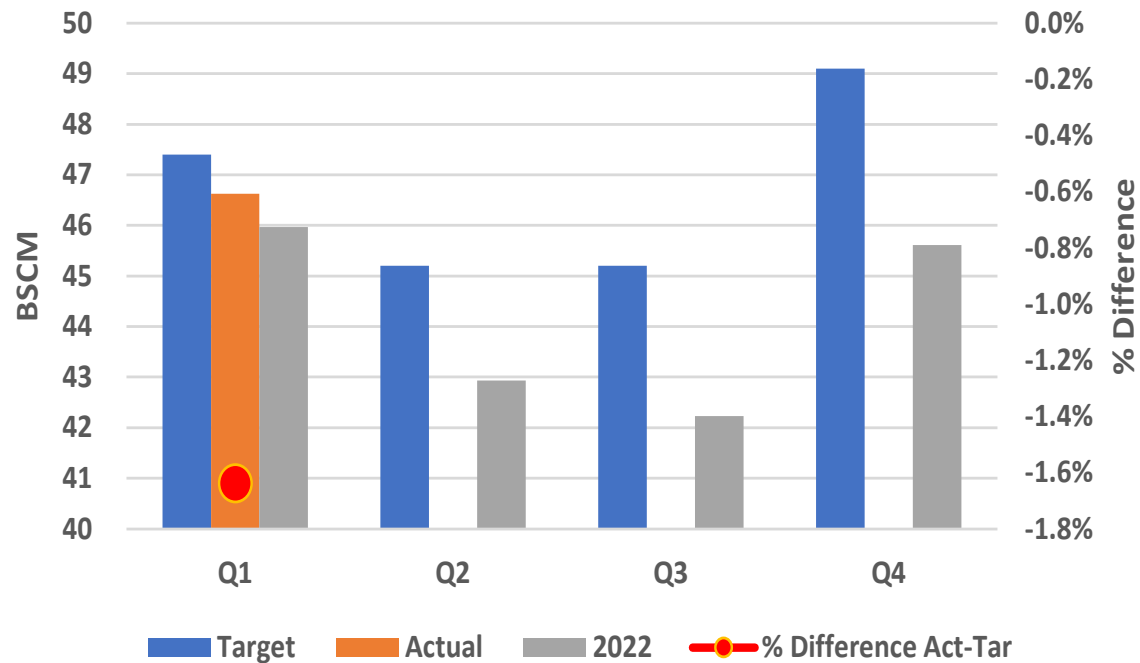
Source: Nexant WGM



2023 Milestones – LNG Supply and Asian LNG Demand

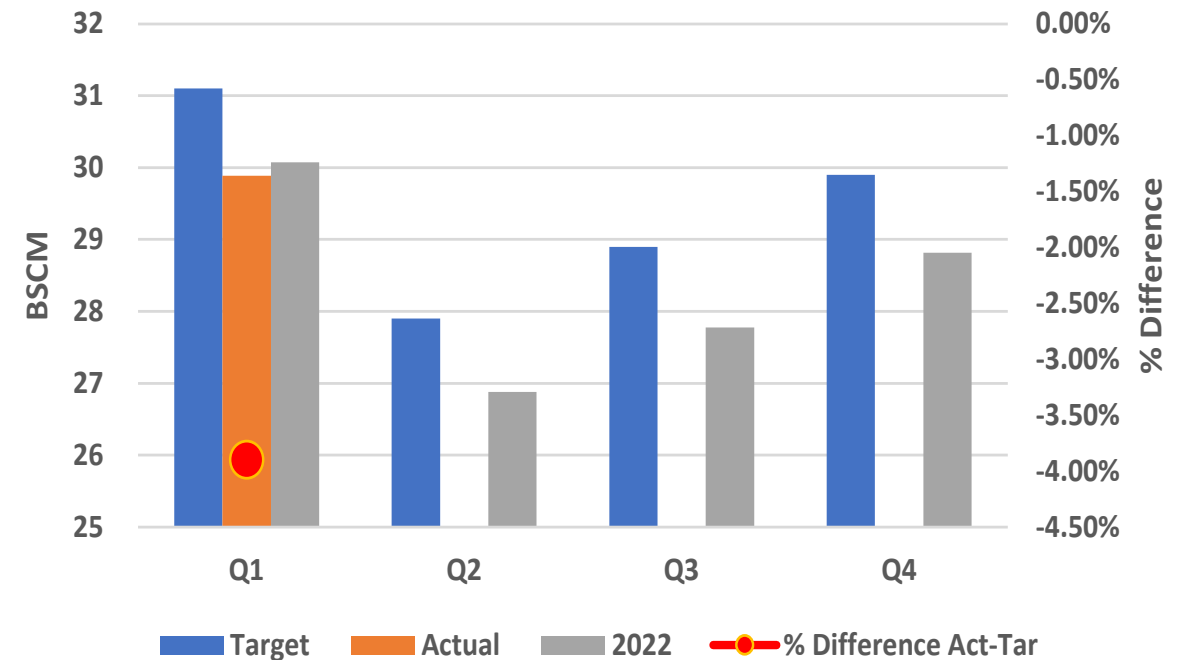
Source: Kpler,
OIES Estimates

Average Monthly LNG Supply



- Target LNG supply projected at 2.4 bcm a month higher in 2023 than 2022 but more loaded towards second half of year
- Supply below target in Q1 but above 2022 level.
- Q2 could reverse this shortfall based on cargoes on water and leaving export terminals

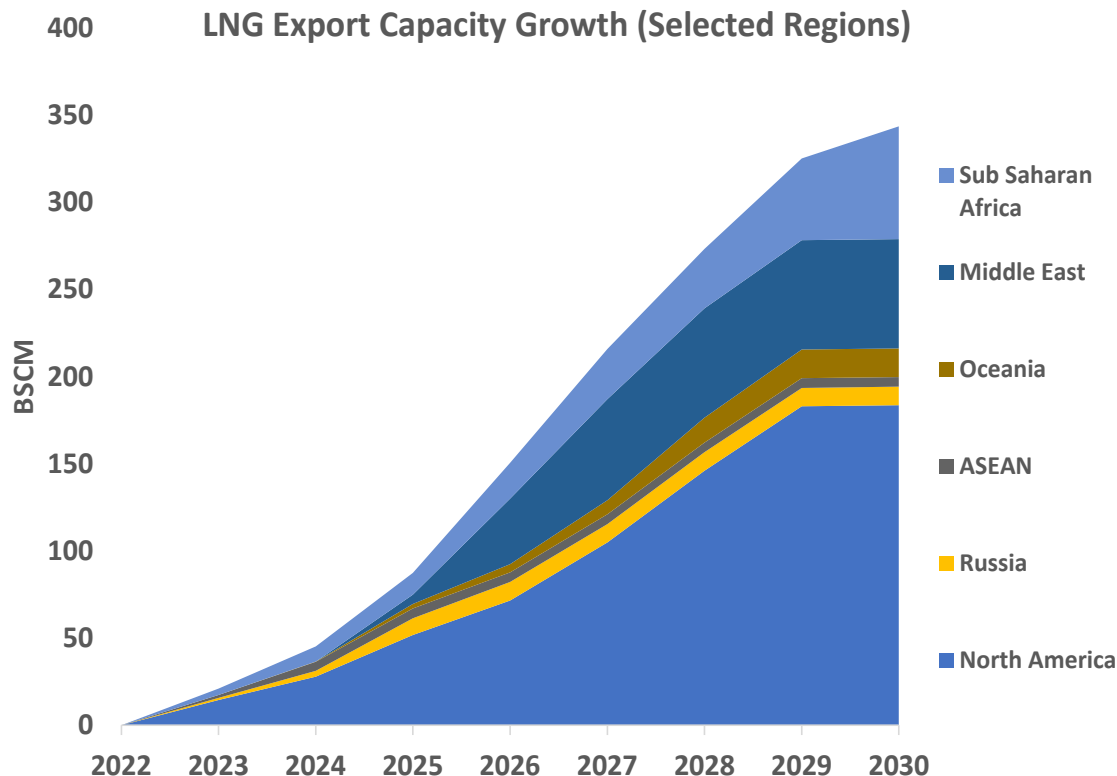
Average Monthly Asian LNG Demand



- Target Asian LNG demand projected at 1 bcm a month higher in 2023 than 2022
- Demand well below target in Q1 and even slightly below 2022 level.
- Will the larger markets of Japan, China and India pick up and also Pakistan and Bangladesh respond to lower prices



LNG Export Capacity growth to 2030



FID TAKEN AND START YEAR

2023 – Tangguh T3 (Indonesia), FLNG Exmar (Congo)
2024 – Tortue FLNG (Senegal/Mauritania), Golden Pass (USA), Arctic 2 LNG T1 (Russia), New Fortress Fast LNG (USA)
2025 – Energia Costa Azul (Mexico), Qatar Additional T1/T2, LNG Canada, Altamira FLNG (Mexico)
2026 – Qatar Additional T3/T4, FLNG Congo Brazzaville, NLNG T7 (Nigeria)
2027 – Corpus Christi Phase 3 (USA), Plaquemines T1 (USA)
2028 – Plaquemines T2 (USA), Calcasieu Pass Phase 2 (USA), Port Arthur (USA), Mozambique T1/T2

Additional likely FIDs include Rio Grande and Cameron Phase 2 (both USA), two further Qatar trains (T5/T6), Papua LNG T1/T2 all of which could come on by 2028.

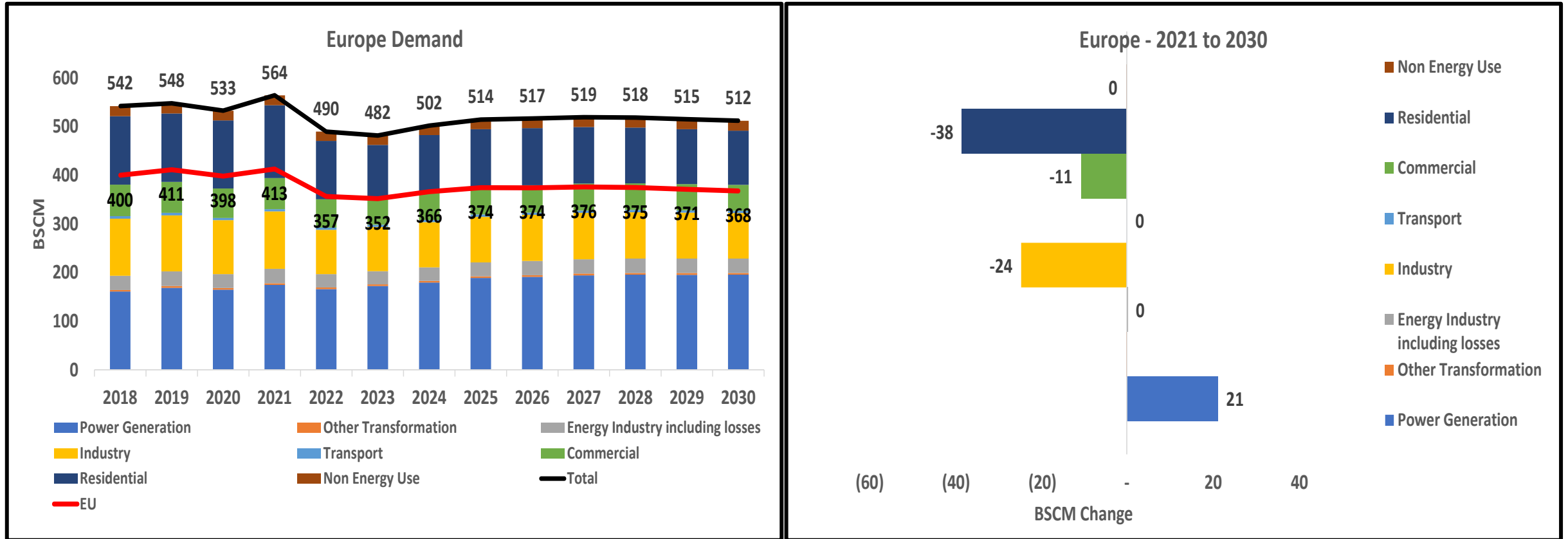
Additionally there is potential for Rovuma LNG (Mozambique) but likely only by 2030. Tanzania LNG is also a possibility but 2030 may be too soon

Additional US projects and Canadian also possible but not included here

LNG export capacity, from new projects, grows by 350 bcm between 2022 and 2030 – a rise of 60%. 80% of this has taken FID. USA accounts for more than half the growth in LNG export capacity. Russia has plans to add considerable amounts of LNG capacity but only Arctic 2 T1 is assumed to come on because of no access to Western technology. In Mozambique Total is looking at restarting construction and ExxonMobil has issued a notice for EOI on the FEED for Rovuma.



Europe demand declines sharply hit by low Russia flows and high prices

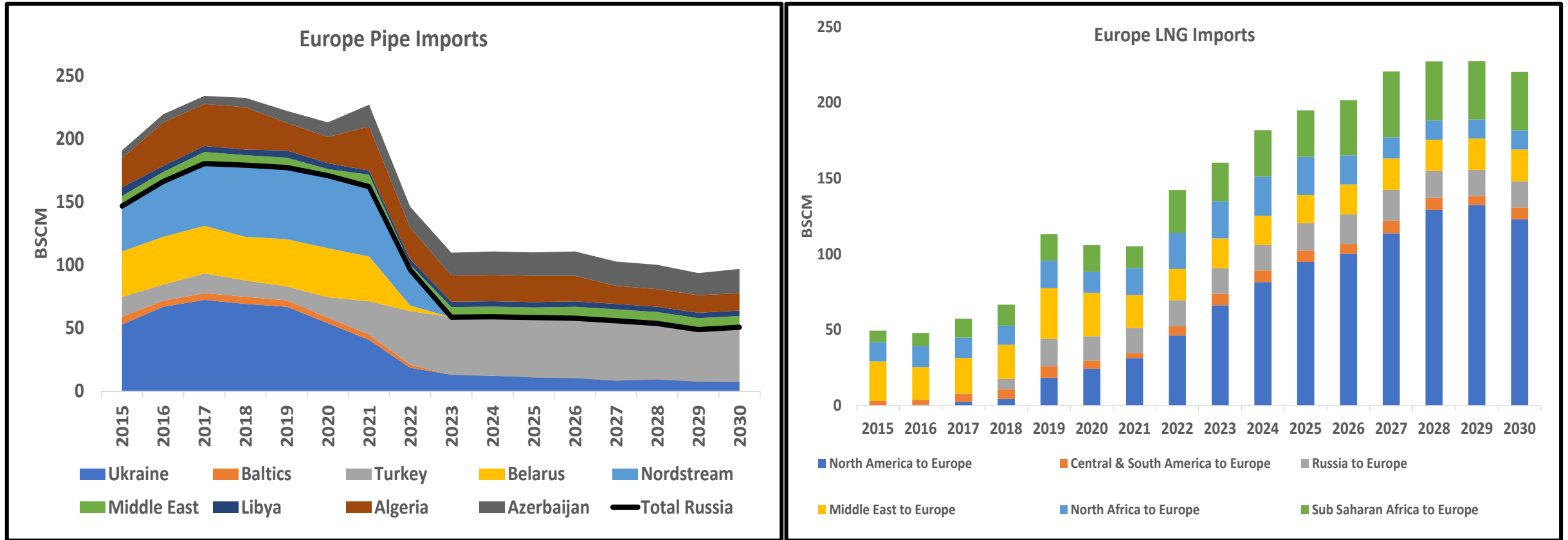


Demand fell in 2020 – less than thought earlier – but big bounce back in 2021
2022 demand declined sharply – milder weather and high prices
Gradual decline in residential demand – industry remains low
Gas demand benefits in the late 2020s from the coal plant closures

Source:
IEA
Nexant World Gas
Model
OIES Estimates



Europe LNG Imports



Pipe imports from Russia down by 120 bcm 2023 v 2021

Running well below TOP levels to EU

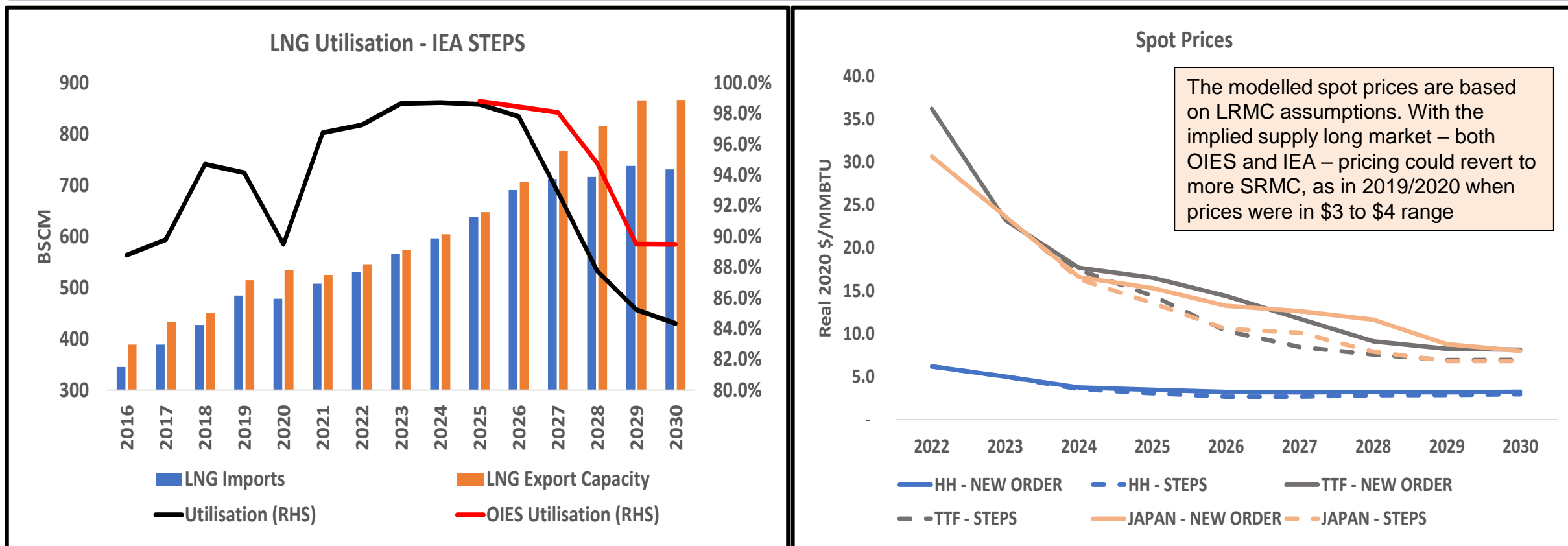
Europe LNG imports reach over 220 bcm by late 2020s compared to just over 100 bcm in 2020

One-third of the increase (almost 40 bcm) is into Germany, with Belgium and Netherlands accounting for another 20 bcm – flows intended largely for Germany

Source:
Nexant World Gas
Model
OIES Estimates



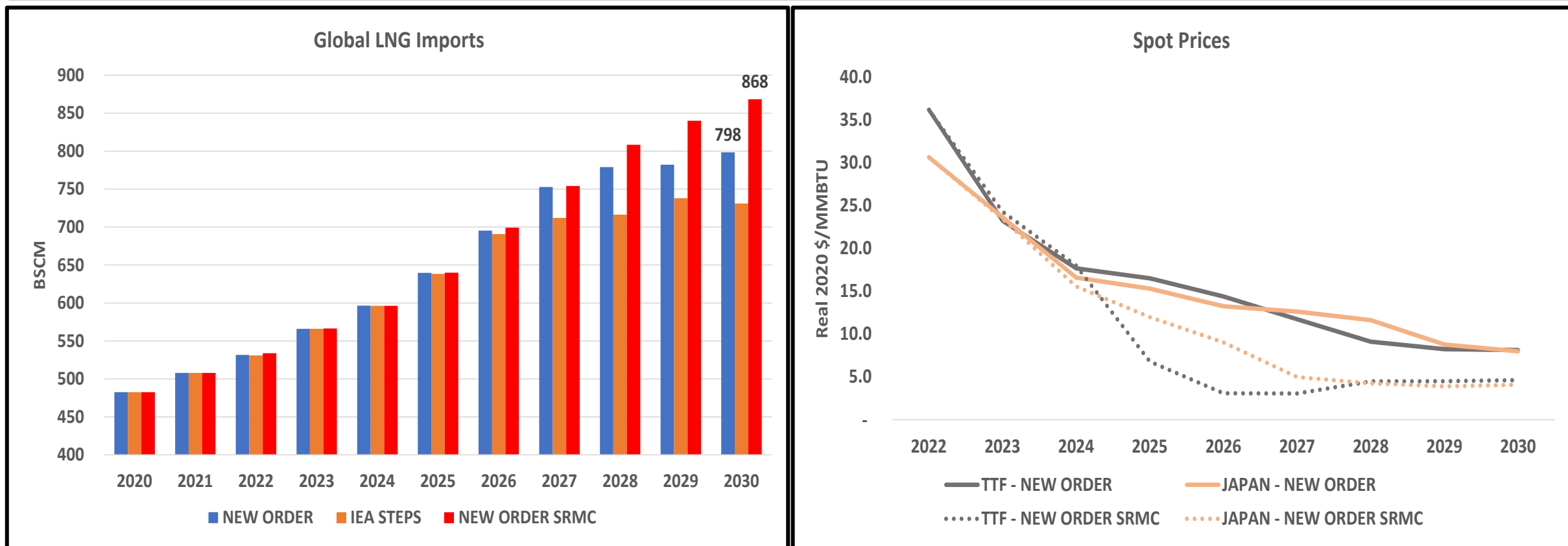
LNG Utilisation and Spot Prices – OIES/IEA Comparison



LNG imports flatten out in IEA STEPS post 2027 and despite lower LNG export capacity, utilisation falls sharply to below 85% by 2030, which would be an historic low. This much weaker supply-demand balance impacts spot prices in Europe and Asia, although Henry Hub only marginally impacted – higher domestic demand in IEA STEPS offsets lower LNG exports. Spot prices are impacted pre-2027 by the lower competing coal prices. By 2029/2030 Europe and Asia prices are in the \$6 range in IEA STEPS compared to slightly above \$8 in OIES New Order.



Short Run Marginal Cost Pricing



Under SRMC TTF and Japan prices drop to the \$4 per MMBtu range by 2027, compared to \$7 to \$8 under LRMC pricing. As a result there is a demand response adding some 70 bcm to global LNG trade – not all of this is necessarily additional demand but also partial displacement of pipeline imports. Europe and China account for much of the increase in LNG imports. In reality, pricing is unlikely to be either wholly LRMC or SRMC based, but a mixture, if there is an increase in unutilised LNG export capacity. Based on the assumptions in the modelling \$6 per MMBtu prices could be a likely outcome, in both Europe and Asia.



Thank You!

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