BBVA Research

Natural Gas in Europe

December, 2022

Creating Opportunities

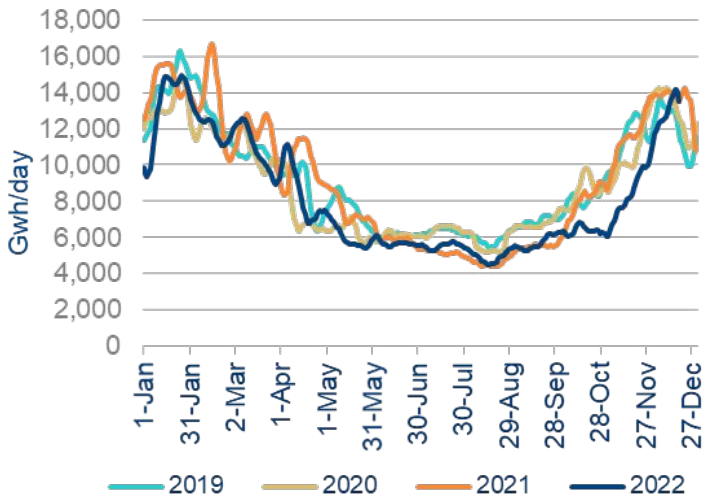
Key messages

- Europe's gas consumption in 2022 remains below that of the previous three years (-9% YTD) and reserves are higher (83% of total capacity). However, last week gas consumption jumped (7% above last 3-yrs) as temperatures normalized and Germany and France's wind generation was low
- The International Energy Agency analized EU's gas challenge (see), assuming temperatures back to normal, no pipeline supply from Russia, and proposes to cover the estimated 57 bcm supply-demand gap in 2023 with renewable and short-term actions to boost efficiency
- As compared to the IEA scenario, our November baseline estimates for the year ahead assume some supply from Russia through pipelines, but are more conservative on nuclear supply in France (which we review in this presentation) and hydropower output. Thanks to higher solar, wind power and more LNG imports, we expect no shortages this winter but have more doubts for the winter of 2023-24 (see).
- We also look at China's recovery and its demand for gas, which could absorb some of the LNG supply and push up prices. We estimate a rebound in 2023 of total China's gas demand to levels above 2021 but expect China's LNG imports will increase moderately to below 2021 levels. The risk scenario is that LNG imports could return to 2021 level, taking most of the expected increase in LNG liquefaction capacity in 2023 if prices are not stressed.
- European prices keep falling on milder weather and, healthy storage and supply. In order to avoid these future price tensions, EU countries agreed on a "dynamic" gas price cap at €180 MWh.

Despite the rebound in the last week, consumption over the last 4 weeks remained below 3-year average (-7%), keeping storage at optimal levels (83%)

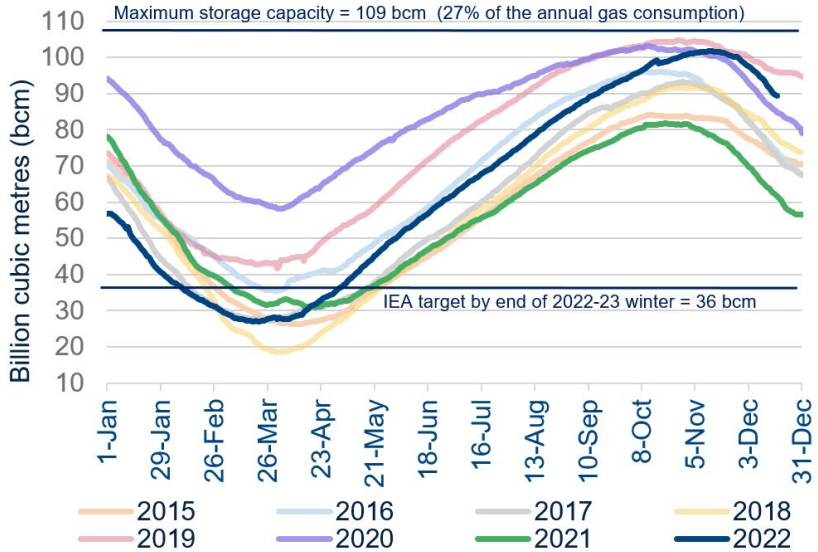
EUROPEAN GAS CONSUMPTION TREND (YoY) AND PROXY* (GWH/DAY)

Country	Period	Last week	Last 4 weeks	YTD
EU	2022 vs 2021	0%	-11%	-10%
	2022 vs average last 3 years	7%	-7%	-9%



*Total sum of the 7-day moving average of Germany, France, Italy, Spain, Netherland, Belgium and Poland as of 10th of December. Source: BBVA Research based on Refinitiv data.

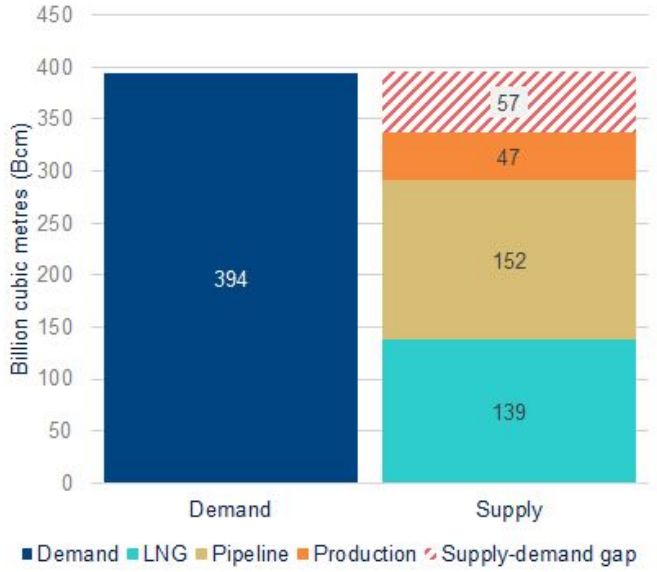
EU GAS RESERVES AS OF 19TH OF DECEMBER (BCM)



Source: BBVA Research based on GIE (Gas Infrastructure Europe)

The International Energy Agency (IEA) gave an overview of EU actions to address the 57 Bcm gap in 2023

IEA ASSESSMENT OF THE NATURAL GAS BALANCE OF THE EU IN 2023 (BCM)

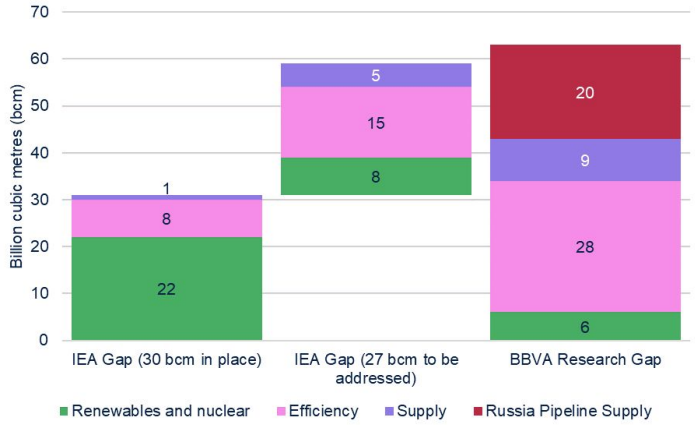


- The IEA estimates that demand will rise to 394 bcm (361 bcm 2022), assuming a return to cooler temperatures, to industry recovery and the need to export gas to Ukraine
- On the supply side, the see not much room for increase, adding to the 2022 LNG imports (132 bcm): 7 bcm of new capacity (plant upgrades and new floating LNG plants) and 1 bcm from Algeria's new gas field
- IEA assumes that Russian pipeline gas will cease completely to flow, Chinese LNG imports will recover 2021 levels (+20 bcm) and EU gas storage will be at 1/3 by end of this winter

Source: BBVA Research based on EIA data ("How to Avoid Gas Shortages in the European Union in 2023" report)

The IEA advises that of these 57 bcm gap, 30 bcm correspond to actions already in place and 27 bcm to actions to be addressed in the short term

IEA ACTIONS NEEDED TO CLOSE THE GAS GAP IN THE EU IN 2023, COMPARED TO OUR ESTIMATES (BCM)



IEA suggested measures to cover gap already in place (30 bcm): renewables and nuclear (solar and wind 12 bcm, nuclear and hydro 10 bcm), efficiency (fuel switching 5 bcm, building efficiency 2 bcm, heat pumps 1 bcm), supply (Biomethane 1 bcm)

IEA suggested measure to cover gap still needed (27 bcm): renewables (solar and wind 8 bcm), efficiency (industry 2 bcm, building 6 bcm, behaviour changes 5 bcm, electrify cheat 2 bcm), supply (flaring and methane 4 bcm, biomethane 1 bcm)

BBVA Research Nov-estimated gap (63 bcm) and potential coverage: renewables (solar and wind 30 bcm, nuclear and hydro -24 bcm), efficiency (reduction of industry and household gas consumptions 28 bcm), supply (coal 9 bcm), Russia (Ukraine-Soyouz and Turkstream pipelines, 20 bcm)

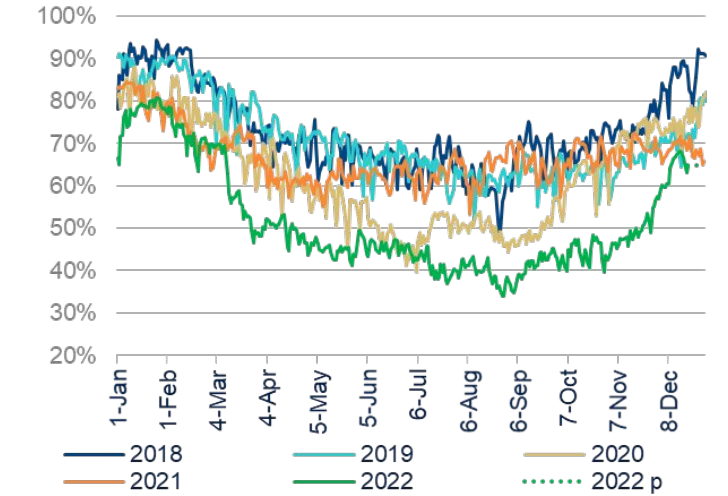
Source: BBVA Research based on EIA data ("How to Avoid Gas Shortages in the European Union in 2023" report)

- The main difference between our November assessment of the 2023 outlook and the IEA is the assumption of how much gas will the EU receive from Russia (via Turkstream pipeline). We assume it will continue to flow (8 bcm) while the IEA assumes it will be cut off. We assume also 12 bcm coming from Russian LNG
- The other difference is in our more pessimistic scenario for nuclear and hydroelectric generation (additional 10 bcm IEA vs -24 bcm BBVA)
- The IEA suggested actions aim to minimize tensions in the gas market and industry destruction and meeting climate objectives. That is why the IEA considers biomethane supply while we assume some coal supply in 2023

France nuclear reactors are operating at 66% of capacity. EDF estimates 23 bcm equivalent of generation in 2022 (-6 bcm below 2021)

FRANCE NUCLEAR GENERATION TREND (YoY) AND **NUCLEAR EVOLUTION** (% OF TOTAL NUCLEAR CAPACITY)

Country	Period	Last week	Last 4 weeks	YTD
France	2022 vs 2021	-6%	-11%	-23%
	2022 vs average last 3 years	-15%	-17%	-25%

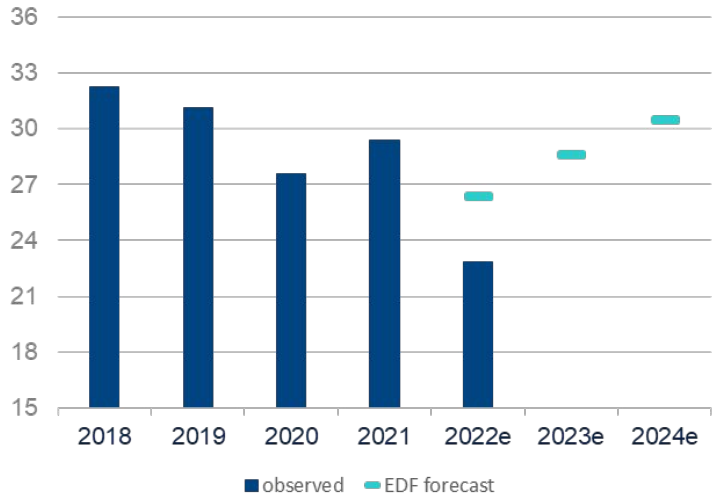


- 70% of France's power comes from nuclear reactors; ~10% gas, hydro and wind each one
- France has 56 nuclear reactors but 16 of them are under maintenance. Currently nuclear reactors are operating at 66% of capacity with ~20% of power generated below previous years
- In 2022 France's nuclear plants are expected to have generated the equivalent to 23 bcm of energy, 6 bcm less than in 2021. This is slightly above our November forecast (20 bcm in 2022)
- France government is struggling to repair all reactor by mid 2023

Source: BBVA Research based on RTE

France nuclear power could return to 21 levels in 2023 according to EDF; however, plant outages may be a handicap during the first half of 2023

FRANCE NUCLEAR POWER GENERATION AND EDF NUCLEAR POWER FORECAST
(BCM)



- France's main nuclear operator (EDF) expects all nuclear reactors to be repaired by mid-2023 and forecasts an equivalent to 29 bcm in 2023 and 30 bcm in 2024 from nuclear generation
- Nuclear supply problems stem from the fact that all its plants are relatively old; so there is a risk that they will need frequent maintenance
- The assumptions incorporated in our November projections are therefore more conservative and foresee that France nuclear energy will continue to under-contribute to the energy balance (20 bcm), especially in the first half of 2023

Source: BBVA Research based on RTE and EDF

Gas demand in China declined in 2022, mainly by LNG imports fall (-21 bcm). LNG could increase 7bcm to reach demand in 2023

NATURAL GAS BALANCE OF CHINA (2015-2023)
(BCM)

Pipelines (70 bcm): +7 bcm over 2022 signed with Russia for 2023; an extension of the Turkmenistan pipeline was agreed but is not expected to open in 2023

LNG (94 bcm): +7 bcm over 2022 on contracts starting in 2023 with Qatar and US as main partners. China is a price-sensitive market, thus LNG purchase may be lower in a tight market

Production (223 bcm): +10 bcm, +5% over 2022, in line with linear trend of previous years

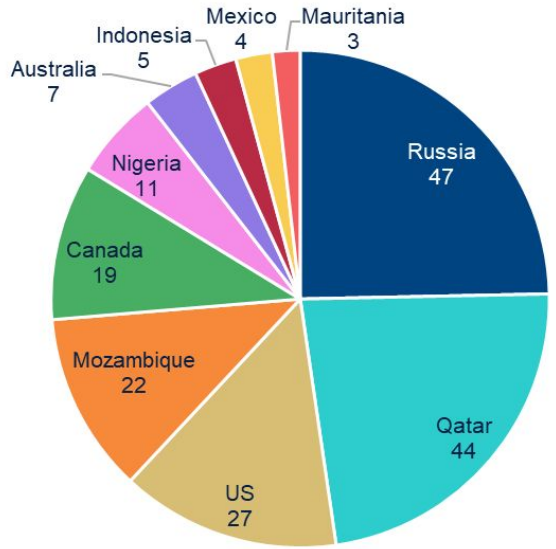
Demand (381 bcm): +15-20 bcm on gradual opening of the economy that would lead demand to rebound and exceed the 2021´s levels, especially after first quarter of 2023. On the other hand, demand may be lower as the economy might come under pressure from downturn in real estate market and weak exports

Source: BBVA Research based on China's General Administration of Customs

- China's gas demand (372 bcm 2021) is similar to the EU's. In 2022, demand fell to 363 bcm (-9bcm) due to high LNG prices and the covid-zero policy. If these two drivers ease in 2023, demand could increase by around 15-20 bcm
- China's production represents 56% of its consumption. In 2023 production could increase by 10 bcm in 2023, similar than in 2022
- Gas pipeline imports increased by 5 bcm in 2022 and are expected to rise by 7 bcm in 2023 to 69bcm, driven by more gas flowing from Russia
- LNG imports declined by 21bcm in 2022 and we estimate will increase by 7 bcm to 94bcm based on contracts signed up to date for 2023

Tensions in LNG markets could emerge in 2023 if China's LNG demand returns to '21 levels. Global liquefaction capacity expected to rise by 15 bcm in '22

GLOBAL APPROVED LIQUEFACTION CAPACITY BY COUNTRY 2023-2026 (BCM, DATA END OF APRIL 22)

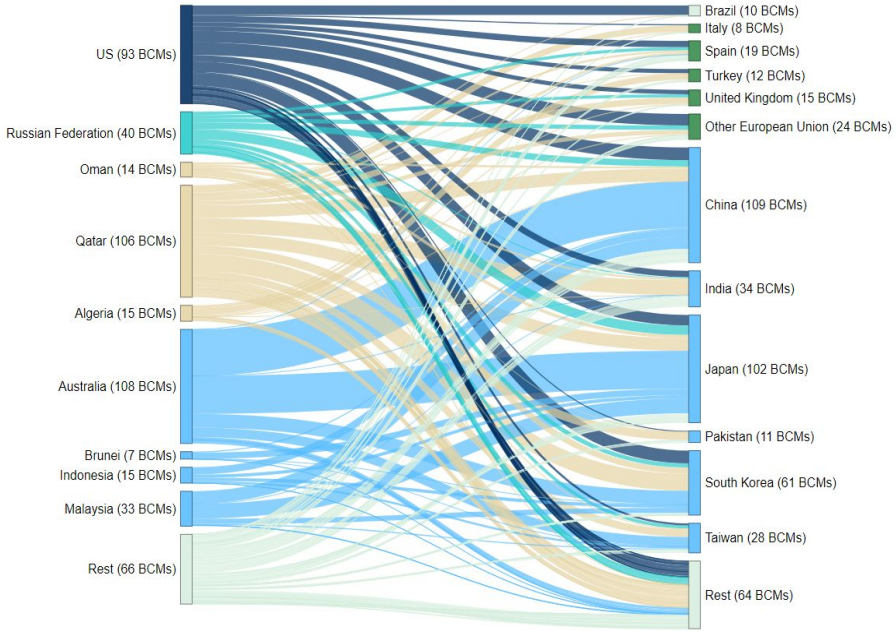


- China signed 34 LNG contracts (63 bcm) over 2023-2027 (9 contracts 2023). The main LNG partners for that period are USA (15 contracts, 29 bcm) and Qatar (5 contracts, 16 bcm)
- There is a risk that China's LNG could return to 2021 levels in 2023 (+21 bcm from 2022) so it could take most of the expected increase in LNG liquefaction capacity in 2023 (+23 bcm)
- Pressure on LNG could moderate from 2024 onwards as liquefaction capacity is expected to increase by 174 bcm (127bcm excluding Russia), most of them from 2025 onwards

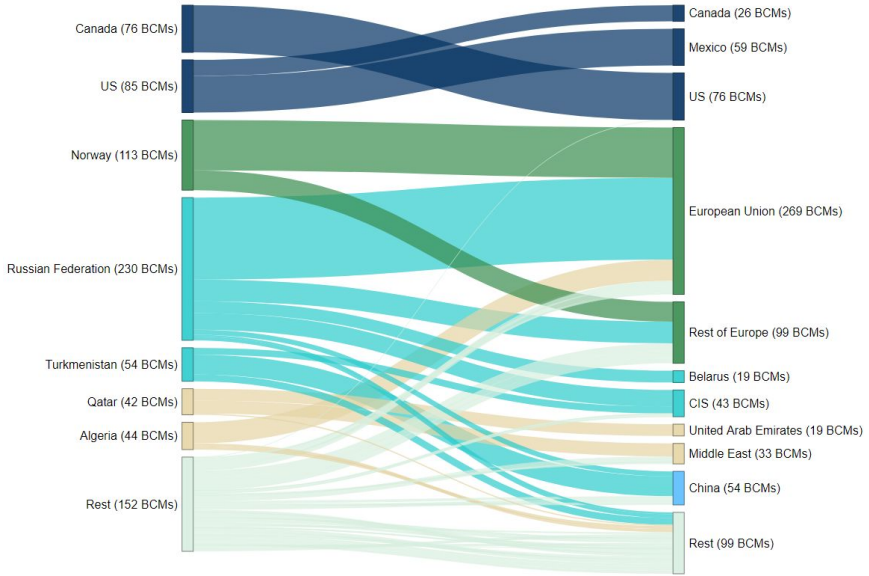
Source: BBVA Research based on IGU World LNG Report 2022

China's LNG imports are expected to pivot from Australia to Qatar and US, while assuring via pipeline more flows from Russia and Turkmenistan ('23-27)

WORLD LNG TRADE IN 2021 (BCM)



WORLD PIPELINE TRADE IN 2021 (BCM)



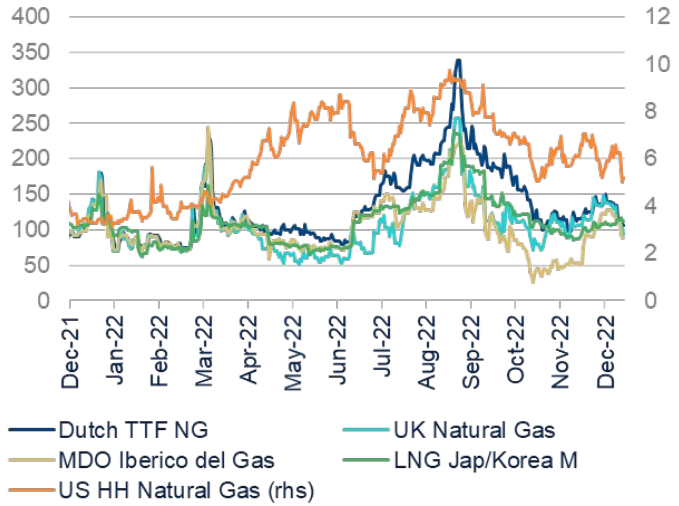
Source: BBVA Research based on 2022 bp Statistical Review of World Energy

December's news include EU countries agreement on a “dynamic” gas price cap at €180 MWh and, Germany first floating LNG terminal opening

- EU member states agreed on gas price cap proposal:
  - Cap Dutch TTF natural gas prices at €180 MWh, for one year from February 15. This cap will only take effect if the price difference with global liquefied natural gas prices is greater than €35 MWH and if prices stay above both ceilings for three days.
  - The mechanism can be automatically deactivated if gas supply is insufficient to meet the demand or the gas demand increases 15% in a month or 10% in two month
  - Main risks from price cap: i) Disincentive gas consumption saving; ii) Supply disruptions as gas export could be redirected to countries with higher prices. Because of these two issues, there are safeguard clauses that deactivate the mechanism in case of disruptions in supply and demand
- Germany opens its first LNG terminal, floating off the North Sea coast, which was built under 10 months. This terminal is slated to feed an estimated 6% of Germany´s gas demand into the energy grid each year. The country also completed the nationalization of Uniper, a natural gas trader

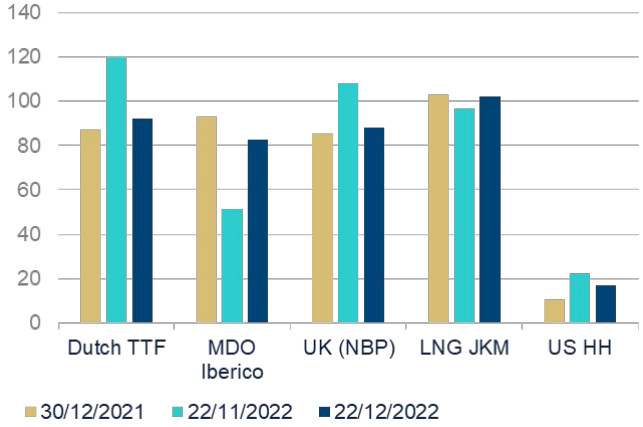
European gas prices were dragged by the EU price cap agreement, milder weather and healthy storage and supply. Asia´s LNG prices inched up

NATURAL GAS PRICES FUTURE IN SELECTED MARKETS
(First future EUR/MWH*)



Conversion 1 MWH equal to 34.09511 thn or 3,412 MMBtu

NATURAL GAS FUTURE PRICES IN SELECTED MARKETS
(First future EUR/MWH)



	Dutch TTF	MDO Iberico	UK (NBP)	LNG JKM	US HH
1M Change	-23%	61%	-19%	5%	-25%
YTD	6%	-11%	3%	-1%	57%

Full market names: Dutch TTF gas; Iberian market; UK Natural Gas; LNG Japan/Korea Marker; US Henry Hub natural gas

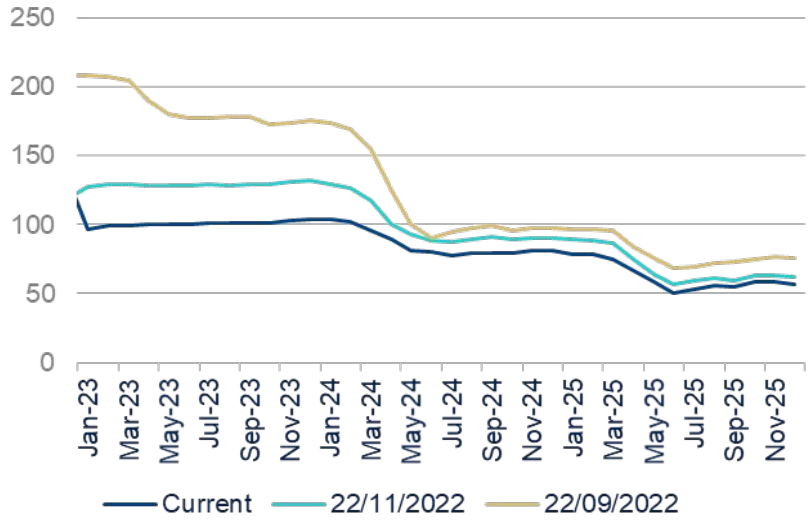
Source: BBVA Research based on Refinitv

BBVA Research

Update of recent news and figures

European gas futures suggests gas prices will remain around €100 MWH during 2023 and in early 2024, while they will decline to €80 in 2H24.

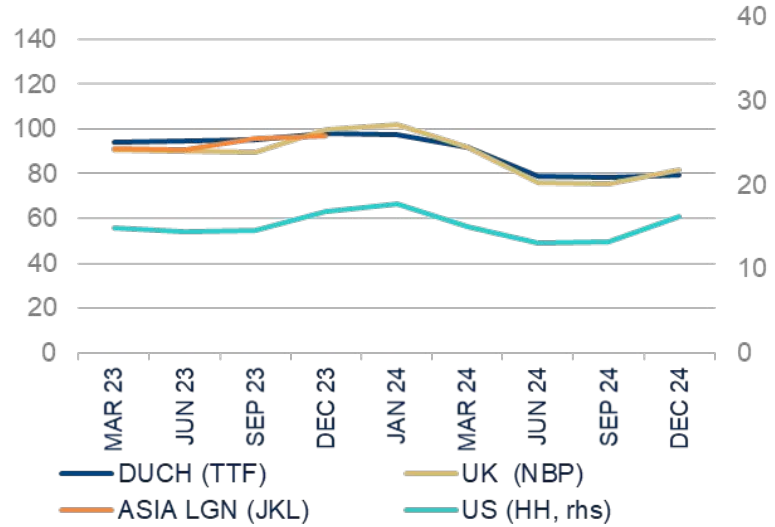
DUTCH TTF NATURAL GAS FUTURES
EUR/MWH*)



*Conversion 1 MWH equal to 34.09511 thn or 3,412 MMBtu

Source: BBVA Research based on ICE and MIDGAS

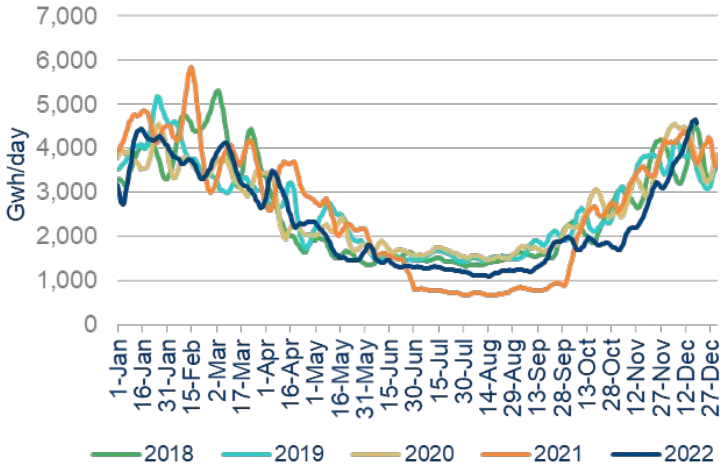
NATURAL GAS FUTURES IN SELECTED MARKETS
(EUR/MWH*)



Dutch TTF gas; Iberian market; UK Natural Gas; LNG Japan/Korea Marker; US Henry Hub natural gas

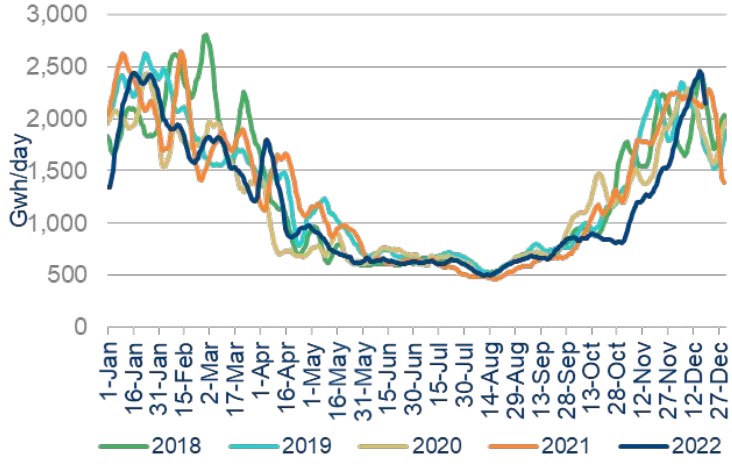
Gas consumption surged in France and Germany on cold weather and lower wind power. German authorities pushes for 20% target gas saving

GERMANY: GAS CONSUMPTION (GWh/day - MA7)



Country	Period	Last week	Last 4 weeks	YTD
Germany	2022 vs 2021	26%	-5%	-9%
	2022 vs average last 3 years	19%	-2%	-9%

FRANCE: GAS CONSUMPTION (GWh/day - MA7)

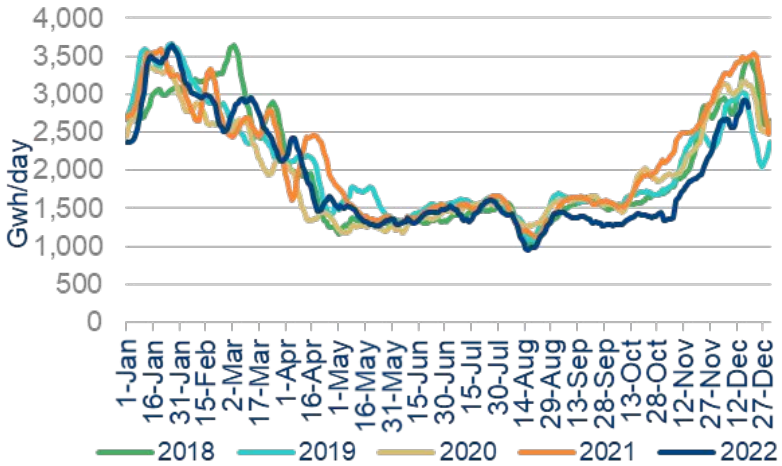


Country	Period	Last week	Last 4 weeks	YTD
France	2022 vs 2021	-1%	-8%	-9%
	2022 vs average last 3 years	8%	-2%	-7%

Source: BBVA Research; based on Refinitiv

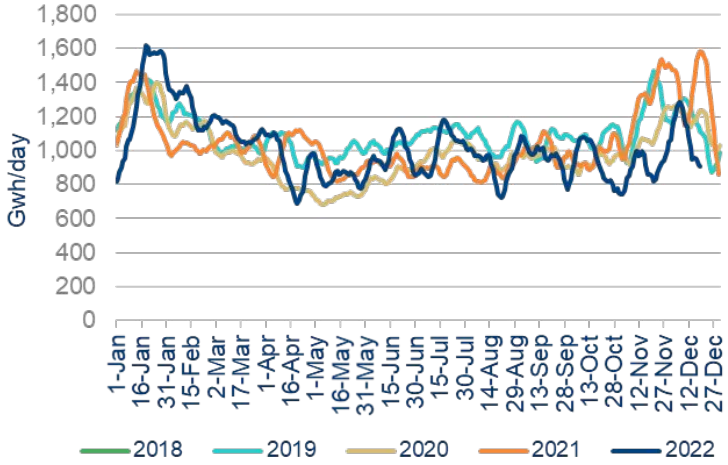
High wind power kept gas consumption below previous 3 years in Italy (-6% YTD) and in Spain (-2% YTD)

ITALY: GAS CONSUMPTION (GWh/day - MA7)



Country	Period	Last week	Last 4 weeks	YTD
Italy	2022 vs 2021	-19%	-20%	-9%
	2022 vs average last 3 years	-12%	-13%	-6%

SPAIN: GAS CONSUMPTION (GWh/day - MA7)

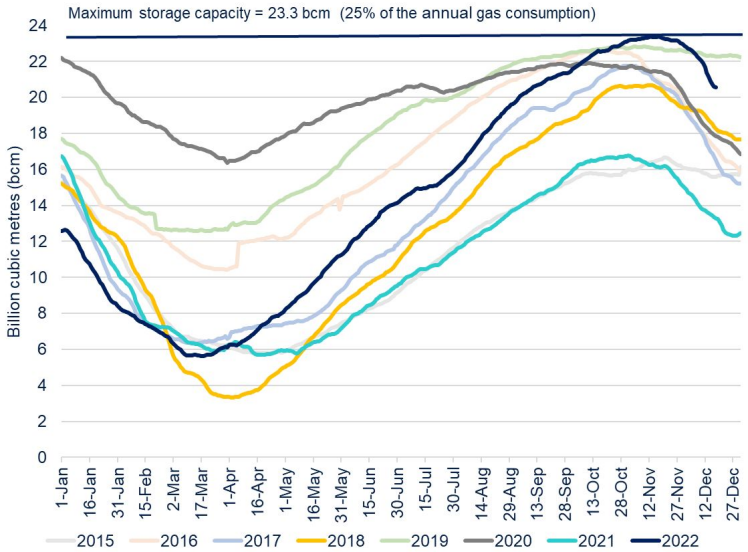


Country	Period	Last week	Last 4 weeks	YTD
Spain	2022 vs 2021	-43%	-26%	-2%
	2022 vs average last 3 years	-31%	-18%	-2%

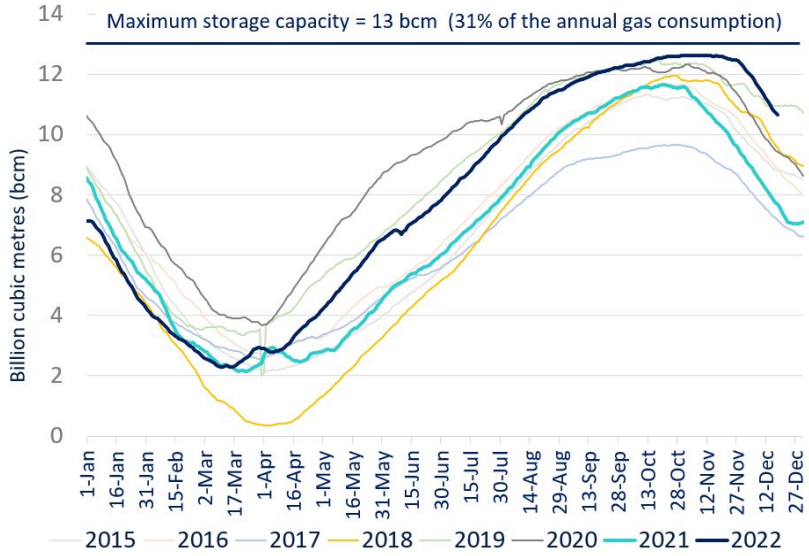
Source: BBVA Research based on Refinitiv

Gas reserves in Germany and France fell sharply in the last week in line with higher consumption on lower wind power

GERMANY GAS RESERVES AS OF 18TH OF DECEMBER (BCM)



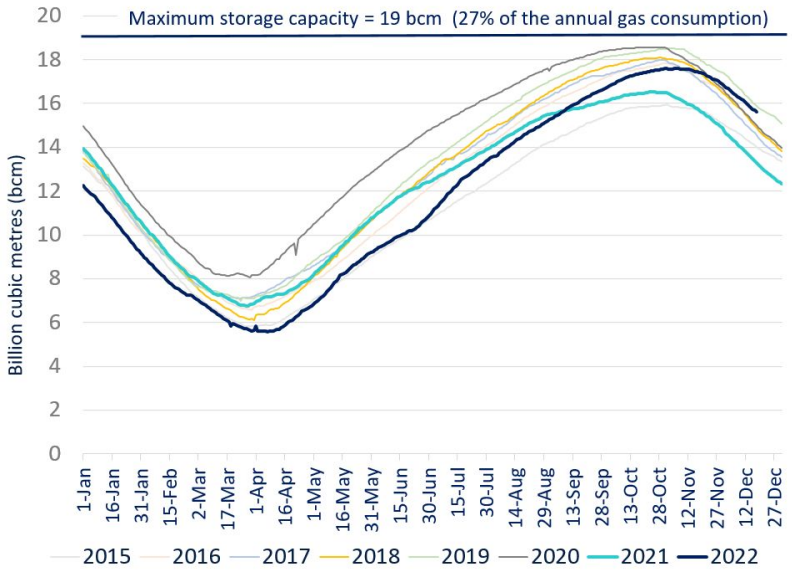
FRANCE GAS RESERVES AS OF 18TH OF DECEMBER (BCM)



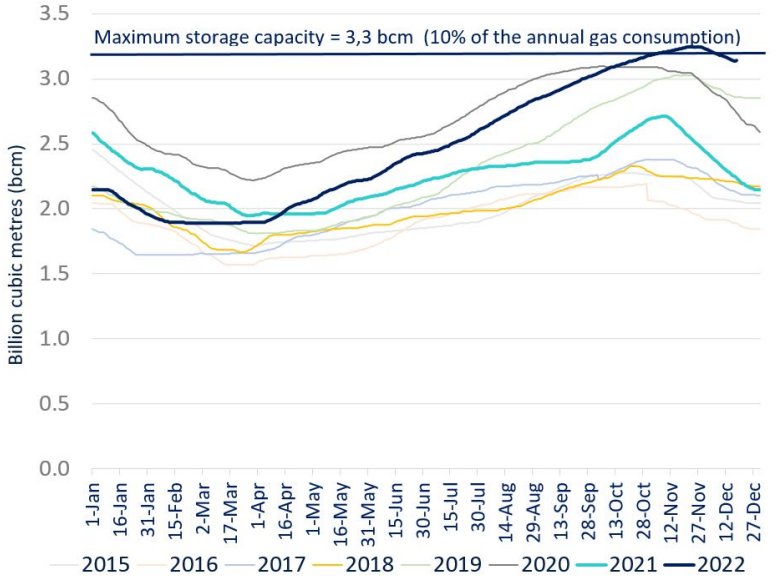
Source: BBVA Research, Bruegel, EUROSTAT, ENTSOG (European Network of Transmission System Operators for Gas), GIE (Gas Infrastructure Europe)

Italy and Spain fell slightly thanks to a higher wind generation

ITALY GAS RESERVES AS OF 18TH OF DECEMBER (BCM)



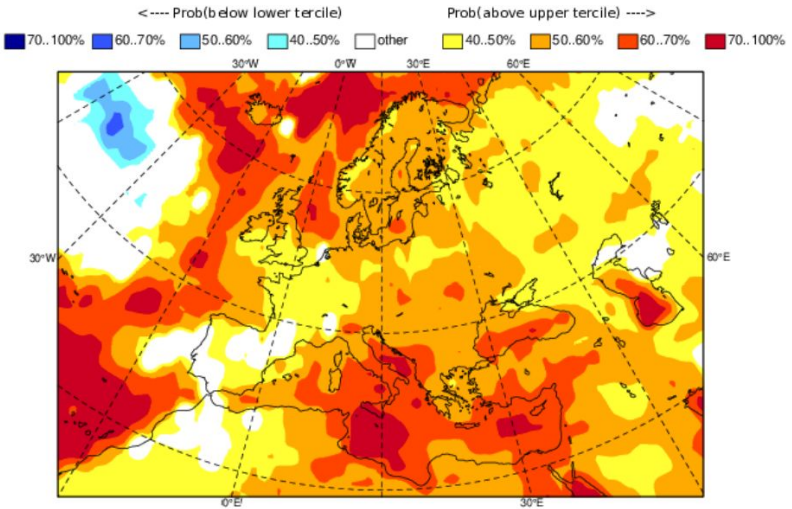
SPAIN GAS RESERVES AS OF 18TH OF DECEMBER (BCM)



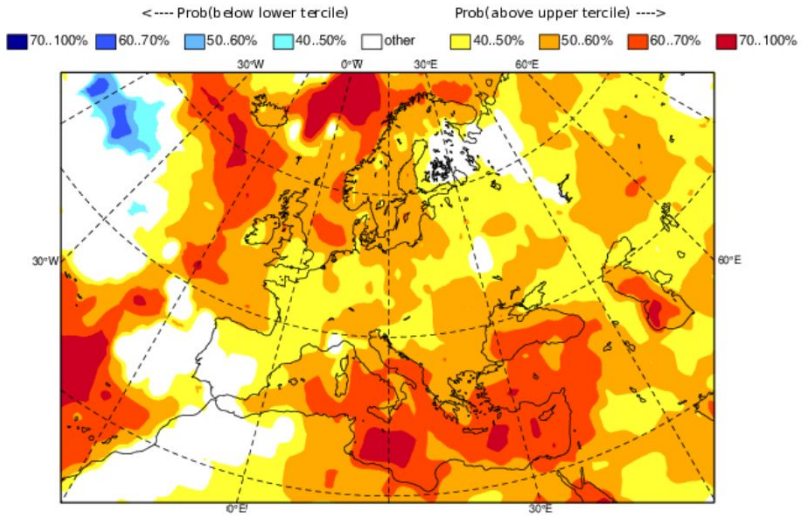
Source: BBVA Research, Bruegel, EUROSTAT, ENTSOG (European Network of Transmission System Operators for Gas), GIE (Gas Infrastructure Europe)

Weather: forecasts show a ~50% probability of temperatures in Europe in January in the upper tercile of the period 1993-2016

EUROPE: TEMPERATURE FORECAST FOR JAN 23 (RELATIVE TO THE OBSERVED CLIMATE FOR 1993-2016) **AS OF DEC 22**



EUROPE: TEMPERATURE FORECAST FOR FEB 23 (RELATIVE TO THE OBSERVED CLIMATE FOR 1993-2016) **AS OF DEC 22**

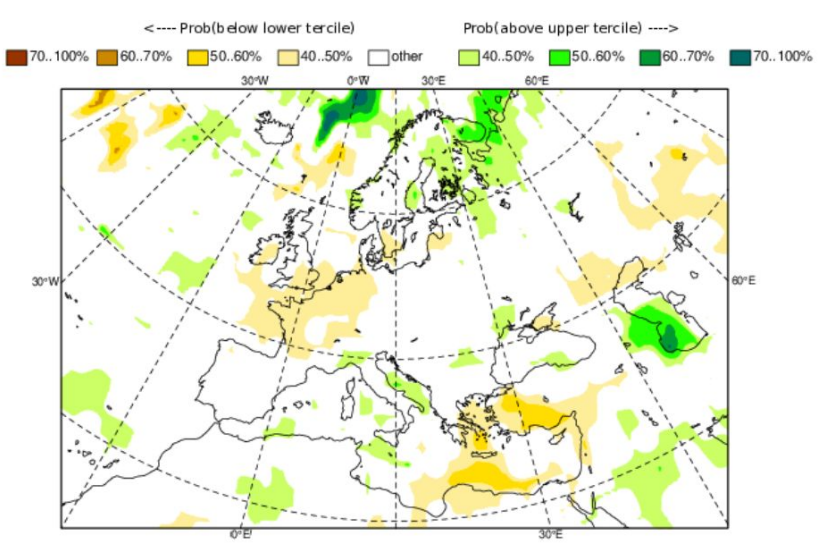


- The graphs shows the probability of the temperature being above/below the lower/upper tercile for the period 1993-2016

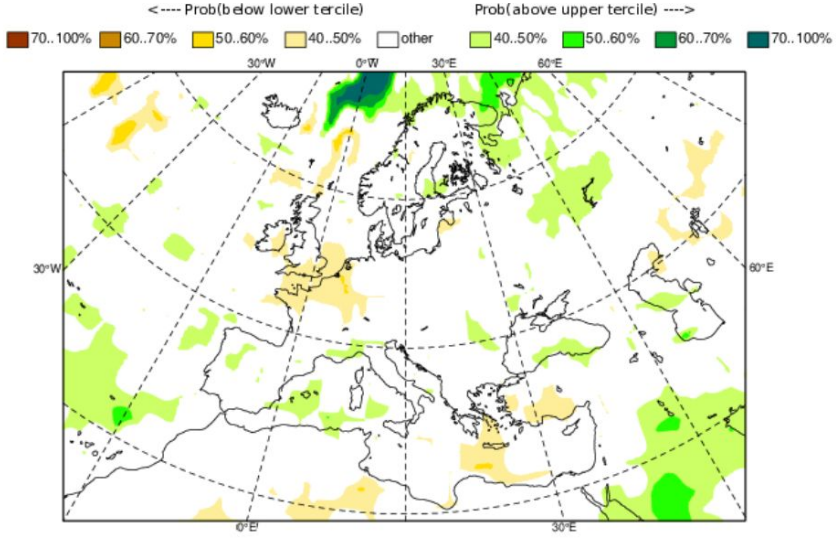
Source: BBVA Research, ECMWF (European Centre for Medium-range Weather Forecasts)

Weather: there are indications that in Northern Europe would rain less in January and February

EUROPE: PRECIPITATION FORECAST FOR JAN 23(RELATIVE TO THE OBSERVED CLIMATE FOR 1993-2016) **AS OF DEC 22**



EUROPE: PRECIPITATION FORECAST FOR FEB 23 (RELATIVE TO THE OBSERVED CLIMATE FOR 1993-2016) **AS OF DEC 22**

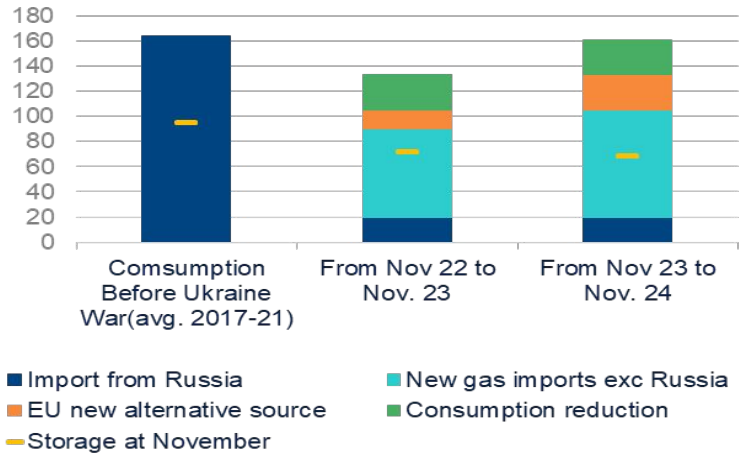


- The graphs shows the probability of the precipitation being above/below the lower/upper tercil for 1993-2016

Source: BBVA Research, ECMWF (European Centre for Medium-range Weather Forecasts)

BBVA November scenario for 2023 gas markets: high reserves, saving measures and flows from alternative sources will prevent shortages in 2023

CHANGE IN EUROPEAN ENERGY CONSUMPTION BY TYPE OF SOURCE AND GAS STORAGE (BCM)



Assuming Russia's flows continues through Türkiye pipeline (8bcn) and a LNG reduction to 12bn from current 20bcm
New gas imports: Norway's, Algeria and Azerbaijan's pipelines (10bcm) and LNG (60bcm in 2023 and 75bcm in 2024). World LNG production capacity will increase 15bcm in 2023, mainly in US (12bcm); and 50bcm in 2024 (Europe will attract the 9% of new production)
EU new alternative energy sources: Solar and wind will increase capacity by 30bcm and 43bcm above 2021 levels respectively in 2023 and 2024, offsetting the decline in nuclear (-9bcm due to reactors reparation) and hydro (-15bcm)
Reduction in EU gas consumption: 7% below 17-21, in line with reduccion observed from Jan to Sept 2022

- Baseline scenario: gas prices to settle below record highs though higher than current levels,
- No gas shortages in 23, but more risks in 24:
  - Flows from other sources, inventories and current consumption savings likely to offset supply cuts if Russian cuts current provision (40 bcm/yr) to 20 from now on.
  - In that case, Nov/23 and Nov/24 inventories would fall to 71bcm and 68bcm, respectively (vs 94 in 2017-21 and 102 bcm currently). However, inventories could decline to 15bcm in winter 24
- If Russia cuts all exports to zero, those inventories could fall to below 50bcm in Nov/23, but in winter 24 reserves would be negative. However, the 20 bcm scenario (LNG) is more probable as much of this Russian gas would likely enter global LNG markets, and Europe could find new supplies elsewhere.

BBVA Research

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December, 2022

Creating Opportunities