CLIMATE POLICY INSTITUTE

Forecast of European Winter (2023/2024) Natural Gas Market

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Sections

Conclusion and policy implications

The International Energy Agency has quantified this year's natural gas demand, leading to the assertion that Europe could potentially confront a supply-demand deficit of 30 billion cubic meters (bcm) during the pivotal summer interval dedicated to replenishing gas reserves in 2023. Presently, it is discernible that the gas reservoirs did not deplete over the winter months but rather stopped at 56%, nearly double the customary proportion. This above-average storage level during the winter signifies a substantial reserve, reducing the EU's summer gas requirement by nearly 30 billion cubic meters.

Within the scope of the European Union's gas supply framework, the linchpins are pipeline and LNG gas transportation. In terms of LNG, despite modest Asian demand, it appears implausible that the flow of gas to Europe will surge beyond 5-6 billion cubic meters in the current year. Nevertheless, Europe continues to grapple with lack of long-term gas procurement agreements. While China refrains from exercising its purchasing option, the tensions observed within the European markets aptly indicate that Europe can only entice exporters through elevated price incentives.

The major participants in pipeline gas transportation have already reached their upper capacity limit, and initial expectations regarding Algeria have proven excessively optimistic. Russia is expected to continue supplying Europe with 25 billion cubic meters of natural gas this year. The shortfall in this supply would be essentially irreplaceable under any weather scenario, necessitating the imposition of certain constraints. Hence, the continuation of cooperation with Russia remains pivotal, particularly within the Central European region.

As for weather forecasts, this domain remains the most uncertain facet of all prognostications. According to ECMWF and CFS climate models, the scenario with the lowest likelihood anticipates a notably colder winter than average. Should this unlikely scenario materialize, there could be an influx of additional LNG shipments, leading to an exceedingly high gas price environment. The TTF price may increase from the current 35-45 EUR/MWh to 100-200 EUR/MWh. Additionally, energy-intensive industries might face production constraints and an economic downturn at the EU level is also likely.

The moderately probable scenario, as envisaged by the IEA, postulates an averagely cold winter. In this context, a substantial drawdown of gas reservoirs can be anticipated, engendering tension within the gas market. This, in turn, would lead to more pronounced albeit not drastic price escalation, from the current 35-45 EUR/MWh TTF price to max. 50-60 EUR/MWh. Importantly, while supply would remain ensured, Europe would necessarily tap into its reserves.

As of now, the most likely scenario suggests a winter colder than the previous year's but somewhat warmer than average. In this scenario, the European Union's supply remains guaranteed as long as LNG exporters do not divert their shipments to Asia, or unforeseen events do not constrict the supply market.

Abstract

This study is based on the analysis titled „Never Too Early to Prepare for Next Winter: Europe's Gas Balance for 2023-2024" from the International Energy Agency. Since the publication of the analysis, we have been able to refine several previous assumptions. Utilizing descriptive analysis of natural gas transit data and trade statistics, along with simulations from the ECMWF and CFS climate models, and building upon the most probable scenario, this study aims to provide a more accurate forecast of the natural gas supply-demand dynamics characteristic of the heating season. This includes anticipating the resultant impact on natural gas prices based on the prevailing global atmospheric physics and atmospheric chemistry models at the time of study.

The energy crisis that erupted in 2021 and the Russian-Ukrainian conflict that escalated in late February 2022 propelled natural gas prices to unprecedented heights. Concurrently, European sanctions policies rendered the supply of Russian natural gas via pipelines increasingly uncertain. The cessation of the Jamal (which brings gas from Russia through Belarus and Poland to the European market) and Imata pipelines (which brings gas from Russia through Finland to the Scandinavian market), the capacity reduction of the Brotherhood pipeline (which brings gas from Russia through Ukraine to the European market), and sabotage on the Nord Stream-1 and Nord Stream-2 (direct gas pipelines from Russia to Germany) led to the disappearance of roughly 83,6 billion cubic meters of natural gas from the market. This shortfall was mitigated by Europe through increased greenhouse gas-emitting LNG imports, industrial production cutbacks, and reduced residential consumption.

In 2022, the EU's domestic natural gas demand decreased by 13.8% (56.9 billion cubic meters) compared to 2021, plummeting to 356 billion cubic meters. Such levels had only been observed once since the mid-1990s, specifically in 2014. During that year, both winter and summer were remarkably mild, resulting in subdued heating requirements in the early months and lower electricity consumption during summer. The consumption reduction, even by conservative estimates, is attributed to an industrial production decrease of 10-11 billion cubic meters, rather than efficiency improvements, alternative fuel usage, the mild winter, or residential savings.

To maintain a favorable supply-demand balance, it is imperative to have readily available mobilizable natural gas quantities, sufficient to meet Europe's needs until the commencement of the 2024 injection season, without relying on other global consumer demands. Quantity-wise, the supply is deemed ample, providing a surplus beyond the 2022 requirements for energy-intensive industrial players, accounting for less favorable weather shifts, and ensuring the energy security of Ukraine and Moldova in case of a halt in Russian deliveries. Quantitatively, this natural gas volume amounts to 395 billion cubic meters according to IEA calculations.

Introduction

In 2022, the domestic natural gas demand within the EU experienced a notable decrease of 13.8% (56.9 billion cubic meters) compared to 2021, plummeting to 356 billion cubic meters. When considering only the latter half of 2022, the decline becomes even more pronounced,

amounting to 17.0% compared to the equivalent period of the preceding year. During the first five months of 2023, spanning the heating season, a cumulative reduction of 11.9% in natural gas consumption was achieved compared to the same period in 2022. This reduction can be attributed to the combined impact of consumption-curbing national policies and favorable weather conditions. As of early December 2022, European gas storage levels remained above the five-year average.

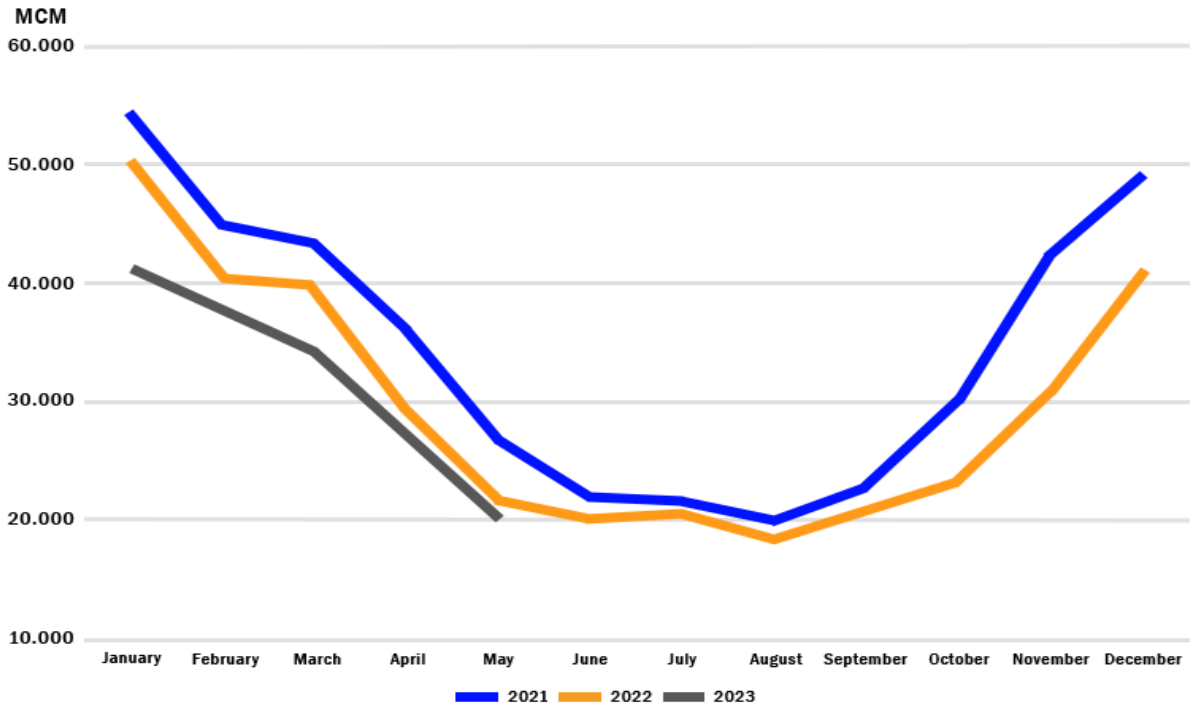

Figure 1. Natural Gas Consumption in Europe in Recent Years
Data Source: Eurostat, Supply, Transformation and Consumption of Gas - Monthly Data

In 2022, consumption increased only in Ireland (2.1%) and Malta (1.4%), while the most significant declines were observed in Finland (-47.2%), Sweden (-42.9%), and Latvia (-29.3%). During the first five months of 2023, Malta saw a substantial increase of 22.8% in natural gas consumption compared to the same period the previous year. Conversely, Estonia and Lithuania achieved the most substantial reduction in consumption (-27.5%), followed by Portugal (-23.5%) and Bulgaria (22.2%). On the whole, there is no reason to assume that natural gas conservation among consumers and efficiency improvements among industrial stakeholders would not continue this year. Nonetheless, it remains possible that a significantly lower natural gas price than last year will no longer restrain industrial production. Hence, the projected natural gas requirement of 10-11 billion cubic meters, as estimated by the IEA, remains a plausible scenario.

Steps Taken To Increase Natural Gas Production

In 2022, natural gas production within the EU witnessed a decline of 7.2% compared to 2021, leading to a reduction to 47 billion cubic meters. In the Netherlands, the Groningen field yielded 4.5 billion cubic meters in the 2021-22 gas year, which dwindled to 2.8 billion cubic meters in the 2022-23 gas year. Consequently, the Netherlands, the largest producer of natural gas in the EU, experienced a 32.1% decrease in gas production during the first half of 2023. As a result,

the EU faced a 16.0% decline in production during the first five months of 2023 compared to the same period in the preceding year. The expansion of supply is anticipated with the restart of Denmark's Tyra field, postponed to the 2023-24 winter season. Currently, this restart has not yet contributed to gas storage filling; it might only augment winter supply.

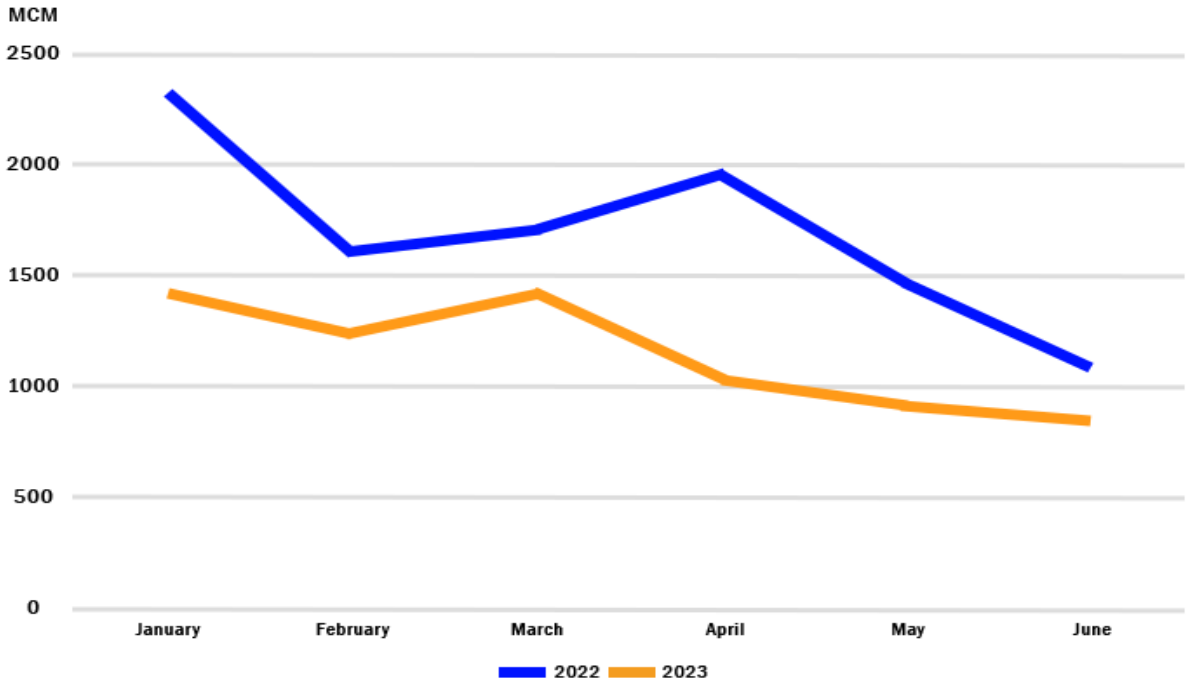

Figure 2. Dutch Natural Gas Production in the First Half of 2023
Data Source: Eurostat, Supply, Transformation and Consumption of Gas - Monthly Data

Following the Netherlands in production are Romania, Poland, Germany, and Italy. Romania's natural gas production has increased due to the Midia Gas Development project and the newly launched Doina and Ana offshore fields in June of last year. The initial estimation suggests an annual surplus extraction of half a billion cubic meters in 2023, a realistic projection based on the 246 million cubic meters increase in extraction achieved during the first five months of 2023. Preliminary reports indicate that production in the Black Sea's Neptun Deep gas field will commence only in 2027, requiring over three more years for Romania to surpass the Netherlands as the largest producer.

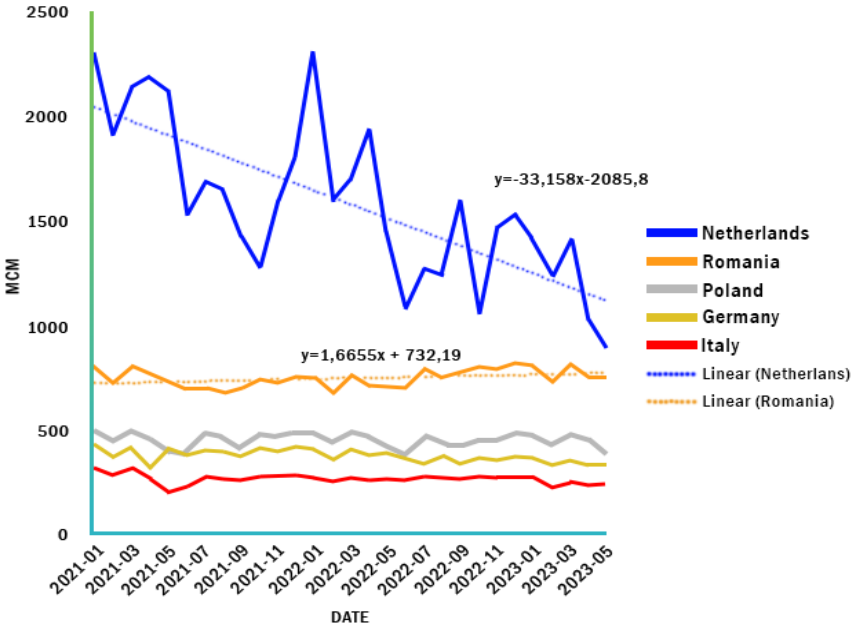

Figure 3. Dutch Natural Gas Production in the First Half of 2023
Data Source: Eurostat, Supply, Transformation and Consumption of Gas - Monthly Data

Europe has rediscovered biogas as an opportunity to reduce gas imports

The European Union rediscovered biogas as a result of the energy crisis and the war in Ukraine. The European Commission has doubled the annual biomethane production targets of Fit for 55%! in the new gas law package from 17 billion cubic meters to 35 billion cubic meters by 2030. In 2022 the production was 4 billion cubic meters. Achieving the increased target requires the construction of 5 billion m3 of new biomethane production capacity per year. According to expert estimates (link: https://gasforclimate2050.eu/news-item/new-study-on-biomethane-production-potentials-in-the-eu/), this fits well into the biomethane potential of the EU, according to which up to 41 billion cubic meters of biomethane could be produced in 2030 and 151 billion cubic meters in 2050.

Short and medium term options

Ifthe EU's measures to support biomethane production will be effective, in the short term we assume that production will increase linearly until 2030, and that the 150 biogas plants currently under construction (80% of them in France) will enter production in 2024. Thus, the amount of biomethane available in 2024 may be 5-6 billion cubic meters in 2024 and 10-11 billion cubic meters in 2025.

Long-term opportunities

According to the European Biogas Association (EBA), these new targets could cover around 10% of the EU's natural gas needs in 2030, and 30-40% by 2050. With this in mind, the association calls for the biomethane strategy to be included in the EU's renewable energy directive, which is currently being discussed by the European Parliament and EU member states.

It should be noted, however, that the issue of biogas production is controversial within the agricultural community, and there is considerable opposition. While some see it as an

opportunity to supplement income, others argue that it takes valuable resources such as manure and crop residues away from farms and soils. This is important because precisely because of the war and the energy crisis, the price of fertilizers increased by 142%, and energy and fertilizers account for 20% of farmers' production costs. It is therefore questionable whether the plan aimed at increasing biomethane production will fail precisely because of the farmers' resistance.

Trends in Natural Gas Transportation

Trends in Natural Gas Pipeline Transportation

While pipeline gas deliveries to Europe experienced a steep decline after the first quarter of 2022, a substantial 236.6 billion cubic meters of natural gas was still delivered, signifying an approximate 20% decrease compared to 2021. Despite the substantial 56% overall reduction in Russian deliveries, 67.4 billion cubic meters of natural gas were still transported in 2022.

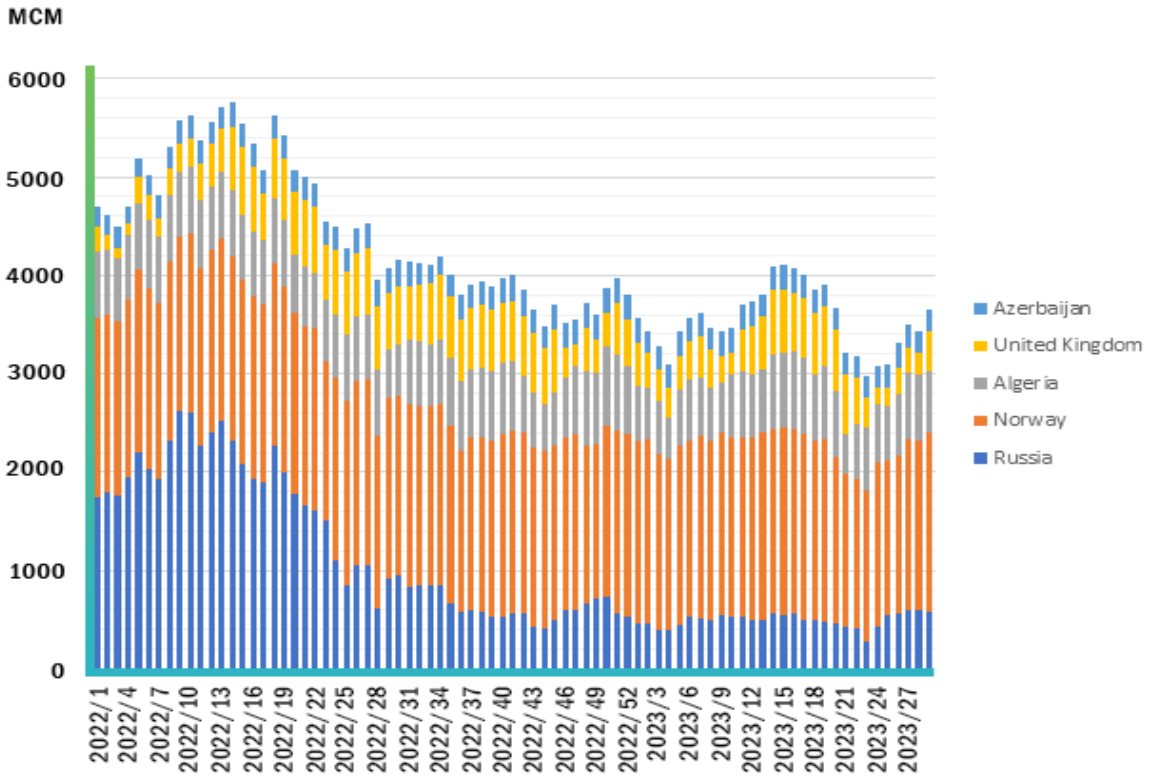

Figure 4. Weekly Breakdown of European Natural Gas Pipeline Transport
Data Source: https://www.bruegel.org/dataset/european-natural-gas-imports

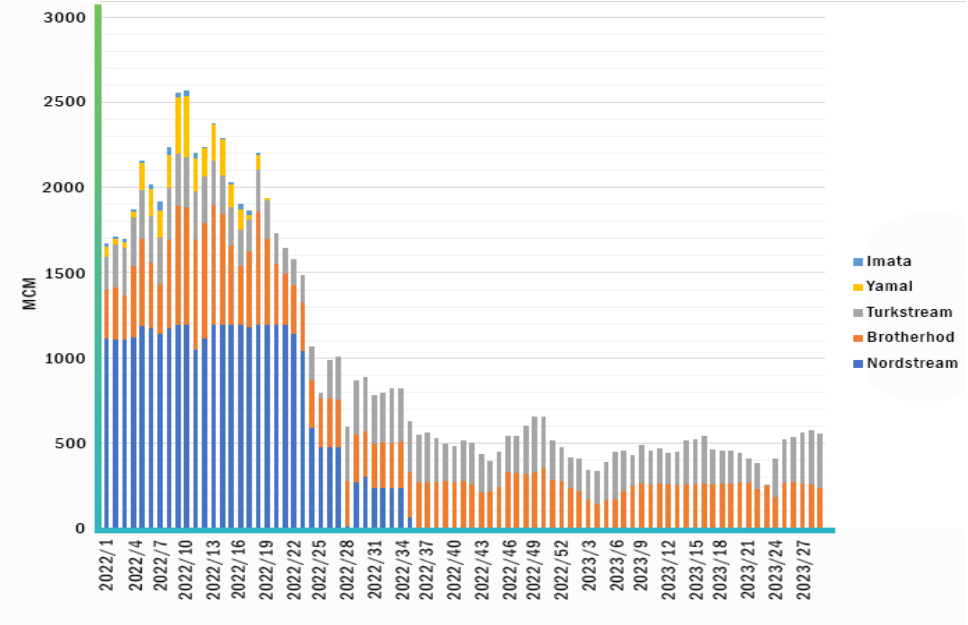

Figure 5. Weekly Breakdown of Russian Pipeline Gas Transit
Data Source: https://www.bruegel.org/dataset/european-natural-gas-imports

In the past year, both Azerbaijan (12 billion cubic meters) and Norway's exports (94 billion cubic meters) nearly reached their nominal capacity limits. Only Algeria, due to the anticipated development of gas fields in the Berkine Southern Basin, was expected to experience some growth, but instead, deliveries dwindled to 16 billion cubic meters in the first half. It remains highly unlikely that Russia will transport over 60 billion cubic meters of pipeline gas to Europe this year, yet a complete cessation of deliveries has also not materialized. During the first half of 2023, 12.5 billion cubic meters of natural gas flowed through pipelines towards Europe. Hence, IEA's estimate of 25 billion for the entire year seems to be a plausible projection. The Minister of Energy reaffirmed that the country will not negotiate the renewal of the Russian-Ukrainian gas transit agreement, expiring at the end of 2024, indicating a potential halving of Russian pipeline gas transportation from 2025 onward.

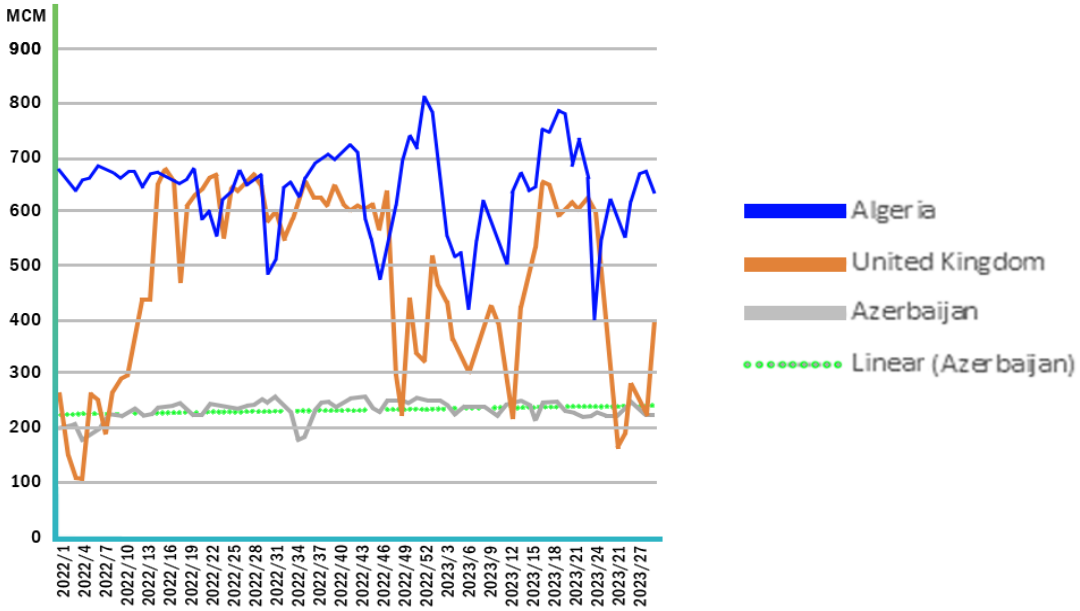

Figure 6. Weekly Data of Smaller Natural Gas Pipeline Exporters
Data Source: https://www.bruegel.org/dataset/european-natural-gas-imports

Potential Global LNG Imports

The International Energy Agency (IEA) forecasted a growth of 20 billion cubic meters in LNG supply for 2023. This increase can be primarily attributed to capacity expansions in the United States, including the Calcasieu Pass LNG facility, the Coral South LNG facility in Mozambique, and the return of the Freeport LNG facility.

According to the latest data from the Gas Exporting Countries Forum (GECF), global LNG exports reached 205.45 million tons in the first half of 2023, marking an annual growth of 4.1% (approximately 12 billion cubic meters). Weaker global performance could be attributed to low productivity from Russia, Egypt, Nigeria, Malaysia, Equatorial Guinea, Norway, and the United Arab Emirates.

The situation and prospects of U.S. LNG exports were evaluated in the context of the top seven facilities. Current data indicates that gas shipments abroad decreased from an average of 12.7 billion cubic feet per day in July to 12.3 billion cubic feet per day in August. This analysis underscores the United States' heightened efforts to become a global leader in liquefied natural gas transportation in 2023.

In 2022, around 69% of U.S. LNG exports, equivalent to 204 million cubic meters per day, were directed towards Europe due to higher prices that led suppliers to redirect shipments from Asia. Conversely, in 2021, when Asia experienced higher prices, only 35% of U.S. LNG exports, around 93 million cubic meters per day, were delivered to Europe.

Contrary to expectations this year, U.S. LNG exports to Asia did not exhibit growth, despite rising Asian gas prices. During the first half of the current year, only 19% of U.S. LNG exports, around 2.1 billion cubic feet per day, were sent to Asia, while 70%, or 227 million cubic meters per day, were directed towards Europe.

Turning to Asia, a significant demand factor is China, which solidified its position through long-term supply contracts in recent years. China's pre-purchase right for natural gas reached 100 billion cubic meters in 2023, an increase of 12 billion cubic meters from 2022. However, this large purchase option might not translate to actual LNG demand if China does not exercise it.

In 2022, China's LNG imports decreased by 19.5%, reaching 87.6 billion cubic meters, while Russian LNG deliveries increased by 5.4%. European sanctions have made Russian gas procurement favorable for China, which is why the use of liquefied natural gas and pipeline gas from Siberia has increased. This growth could potentially reach 22 billion cubic meters in 2023.

In 2022, China temporarily halted its transition from coal-fired power plants to gas-fired ones. More than 280 million tons of thermal coal mining capacity was added, equivalent to almost 200 billion cubic meters of gas, and an additional 500 million tons of capacity is under construction this year.

Despite the removal of the zero-COVID policy, China's industrial production only grew by 3.8% annually, which is disappointing. The manufacturing and retail sectors were unable to rescue the dismal industrial production figures, resulting in a GDP growth of only 5.5%.

Correspondingly, China's natural gas consumption grew by 5.6% annually in the first half of the year, reaching 194.1 billion cubic meters, mirroring GDP growth. Domestic production increased by 5.4% to 115.5 billion cubic meters, while total gas imports grew by 5.8% to 79.4 billion cubic meters, with 33.2 billion cubic meters arriving through pipelines and 46.2 billion cubic meters via sea.

China's current economic outlook, along with increasing Russian deliveries, does not support the IEA's prediction of China's LNG demand surging to 108 billion cubic meters. A more plausible scenario is a demand growth of 5-7%, aligned with GDP growth.

In 2022, the European Union imported 132 billion cubic meters of LNG, 52 billion cubic meters more than in 2021. During the first half of 2023, liquid gas imports expanded by 8.1% (5.1 billion cubic meters), although this growth slowed to 0.7% compared to the second half of 2022. It is highly likely that the LNG importation will not exceed 138 billion cubic meters annually.

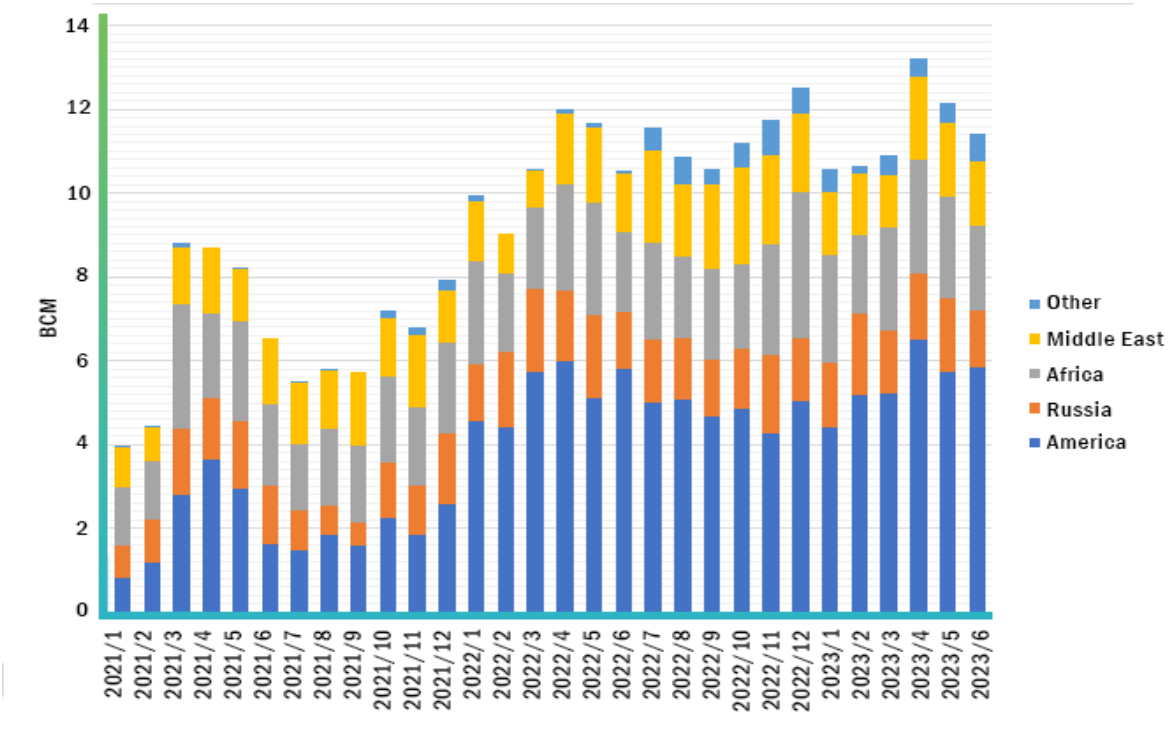

Figure 7. Europe's LNG Imports by Origin
Source of Data: https://www.bruegel.org/dataset/european-natural-gas-imports

America: United States of America and Trinidad & Tobago
Africa: Algeria, Angola, Nigeria, Egypt, Cameroon and Equatorial Guinea
Middle East: Qatar, Oman and United Arab Emirates

Other: Argentina, Australia, Brazil, China, Indonesia, Jamaica, Malaysia, Norway, Peru, Singapore, South Korea and the United Kingdom.

European Gas Storage Levels

It is noteworthy that in the summer of 2022, the commission proposed mandatory filling of European gas storages, a regulation that was published in late June. The result of this and the fear of gas shortages led to a significantly higher pace of gas storage last year than usual. By early August, the storage level was only 71%, which still exceeded the 2021 level by 13%.

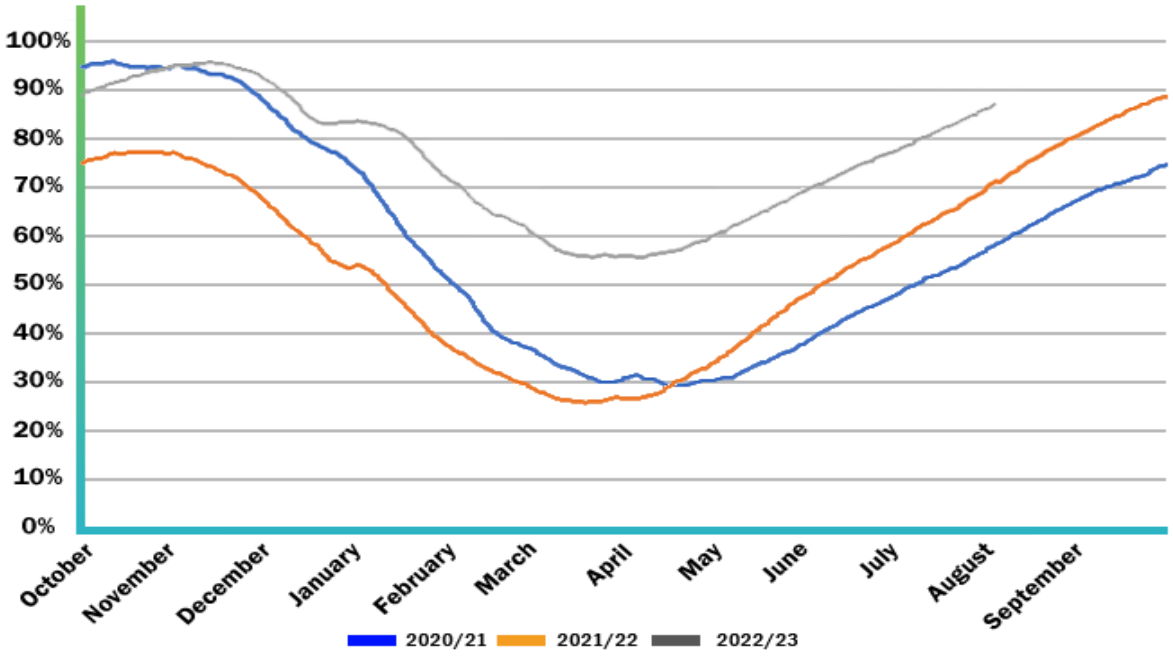

Figure 8. Filling Levels of European Union Gas Storages by Gas Years
Source of Data: https://agsi.gie.eu/data-overview/EU

This year, the European gas storages are at a record 87% filling level. The European Union has set a target of reaching a 90% filling level by November. Several member states, including Spain and the Netherlands, have already exceeded this level, while Germany and Italy are expected to do so in the coming weeks. Achieving this record required storage tanks to be only 56% depleted by April, well below the usual value of around 30%, and the refilling of the tanks began immediately. Nonetheless, the accelerated refilling of the tanks could lead to achieving a 95-96% filling level before November, reducing European LNG demand in autumn, which could have a favorable effect on prices. In addition to the European storages, Ukraine has made an additional 10 billion cubic meters of storage capacity available to the Union. The Czech EPH Group has already announced its intention to use this capacity, and the Slovak state-owned SPP is considering storage. The use of Ukrainian storages is justified by the fact that the European storage capacity of approximately 106 billion cubic meters covers about a quarter of the annual consumption, so a 10% expansion significantly increases supply security.

Assisting Ukraine and Moldova

According to the IEA's forecast, the European Union plays a crucial role in refilling Ukrainian gas storages and ensuring the supply to Moldova. Ukraine's gas storage level was 14.6 billion cubic meters at the start of the 2022-2023 heating season. In addition to their own production, Ukraine and Moldova need around 12 billion cubic meters of gas imports from the European Union by the summer of 2023 to fill their storage facilities by the start of the 2023-24 heating season.

Assessment of weather scenarios

It is very difficult to create highly precise weather scenarios for the entire continent of Europe. The main reason for this is that due to the continent's small size, it is simultaneously influenced by the Atlantic Ocean, the Arctic Ocean, Africa, the Mediterranean Sea, and Asia as landmasses. Four main action centers determine Europe's weather. These action centers are extensive areas of low or high pressure located over land (seasonal) or above the sea (permanent), which impact the climate of large regions through the cyclones and anticyclones forming above them, as well as the moving air masses within them.

There are four action centers significantly affecting Europe's weather:

- Icelandic Minimum: It has an equalizing role in both winter and summer
- Azores Maximum: It influences dry, clear weather in both winter and summer
- Siberian Maximum: It forms only in winter, causing clear, cold, frosty weather
- Pontic-Iranian Minimum: It affects Europe's weather in the summer (wet)

Due to climate change, it is increasingly observed that the warming of the ocean and the Mediterranean Sea, along with the undulating polar jet stream, lead to the dominance of the Icelandic Minimum and the Azores Maximum in winter. Additionally, changes in cyclone paths result in milder winters on the continent and an increased frequency of extremes. As a result, in Europe, the average temperature during the winter period of 1991-2020 was 1.4°C higher than the preceding thirty years. Among the months, the average temperature in January approaches 2°C, which is twice the global average. Nevertheless, there will continue to be winters and months within winter in which colder, frostier weather than the average is to be expected, as it is impossible in meteorology to provide accurate forecasts for such time frames due to the continuous variability of the atmospheric system.

Therefore, it is impossible to create approximate scenarios based on global macro-synoptic (large-scale) conditions.

From the current state of the atmospheric system, albeit with significant uncertainty, it can be inferred that the upcoming winter season (October-March) may be slightly milder (+0.1-+0.7°C) compared to the average of 1991-2020. One reason for this is the anticipated strong El Niño effect, which indirectly influences Europe's weather through the jet stream. While the ENSO's impact on Europe's weather is not likely to be significant this autumn, it might still affect the movement of the jet stream in winter with low probability, significantly influencing

Europe's winter weather. Research has found moderate correlation between El Niño and Europe's winter weather. Long-term observations indicate that there is no significant deviation from the average during the winter season on the continent. However, the momentary nature of macro-synoptic processes and the seasonal strength of different action centers can still be influential, especially in winter.

Based on simulations from the ECMWF (European Centre for Medium-Range Weather Forecasts) and the CFS (Climate Forecast System), the average temperature for the three winter months in Western and Northern Europe could exceed the period of 1991-2020 by almost 1°C. In December, a +1.5-2°C anomaly is not ruled out, considering the warming trend of the past 30 years and the retreat of Arctic Sea ice. Central and Eastern Europe's current model runs and simulations do not show significant deviations. It should be noted that these are monthly and seasonal average values, and anomalies significantly above or below average (with over 90% probability) are expected to occur for days or weeks.

According to the medium-probability scenario, the climate averages of 1991-2020 are expected to prevail on over two-thirds of the continent, with abundant precipitation and minimal deviations of ±0.5°C across most parts of the continent.

A low but increasingly realistic scenario is a much milder winter. The likelihood of this occurring is higher if the Atlantic Ocean and the Mediterranean Sea are much warmer in autumn than the 1991-2020 climate normal. This could result in strong zonality, bringing mild, humid air to much of the continent throughout most of the winter, similar to the previous year. Enhanced secondary cyclone activity in the Mediterranean Sea could lead to several short-lived snowfalls in Western and Central Europe, with multiple frontal flows. The probability of a much colder winter (at least -1.5-2°C negative anomaly) is currently below 10% (though not ruled out). Over the past 30 years, a systematic change has been observed in March and April. While the winter months are getting milder, the transitional months have seen an increase in the number of frosty days and winter days, suggesting an extended heating season.

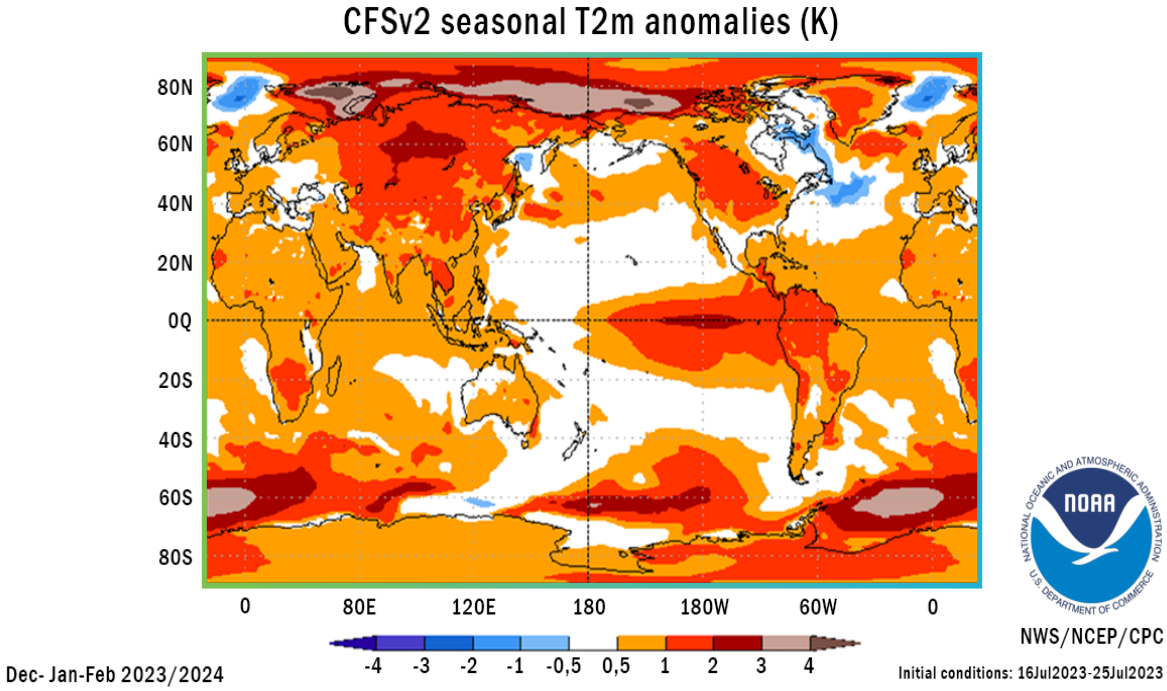

Figure 9. The expected global temperature anomaly (2m) for the winter of 2023/24 according to the CFS at the time of writing.
Source: https://www.cpc.ncep.noaa.gov/

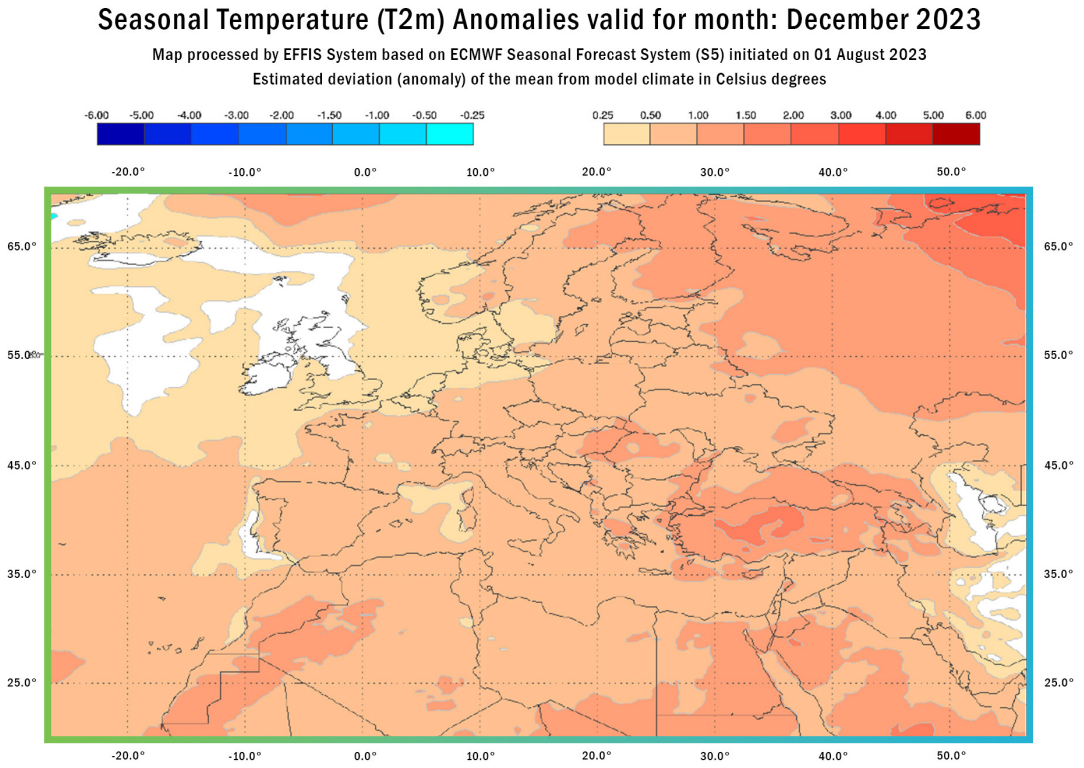

Figure 10. The expected temperature anomaly (Europe) in December 2023 (2m) according to the ECMWF at the time of writing.
Source: https://effis.jrc.ec.europa.eu/apps/effis.longterm.forecasts/

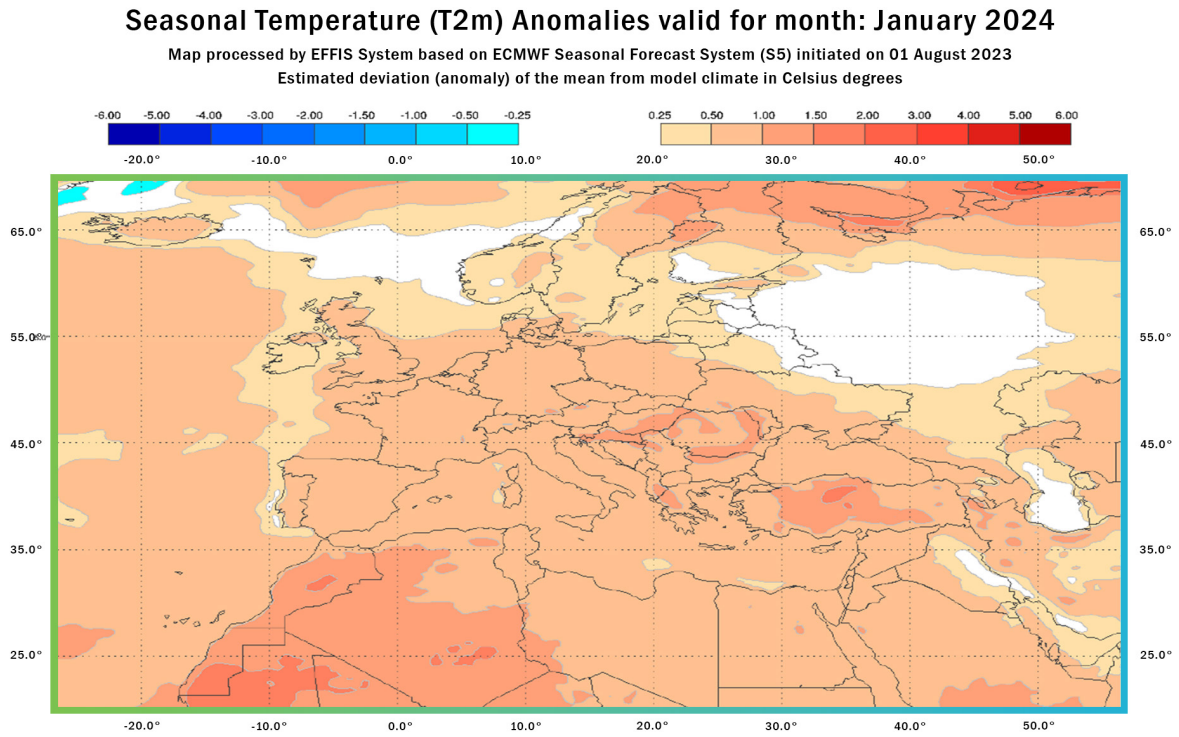

Figure 11. The expected temperature anomaly (Europe) in January 2024 (2m) according to the ECMWF at the time of writing.
Source:https://effis.jrc.ec.europa.eu/apps/effis.longterm.forecasts/

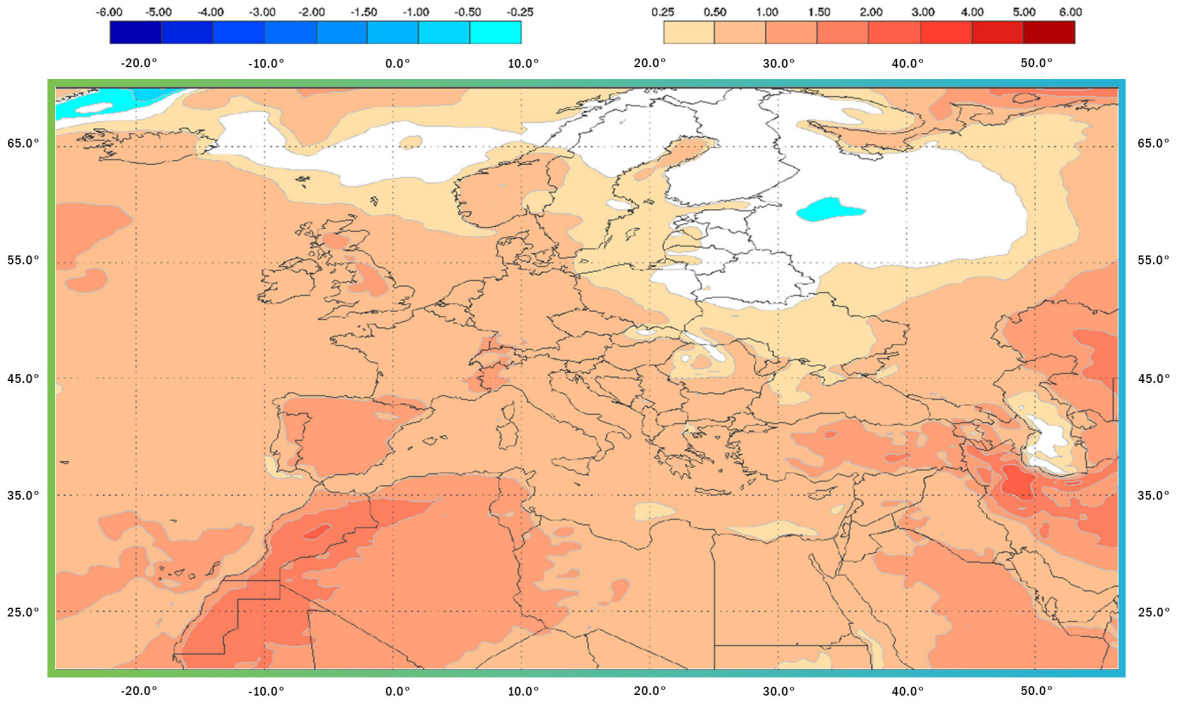

Figure 12. The expected temperature anomaly (Europe) in February 2024 (2m) according to the ECMWF at the time of writing.
Source: https://effis.jrc.ec.europa.eu/apps/effis.longterm.forecasts/

Analysis of European Winter Heating Degree Days and Associated Natural Gas Demand

According to data from the International Energy Agency (IEA), the average Heating Degree Days (HDD) in Europe between 2000 and 2021 amounted to 1083. In the exceptionally warm year of the previous year, this value decreased significantly to 795. The mild weather experienced in 2022 resulted in the HDD being approximately 26.5% lower than the average during the 2000-2021 period.

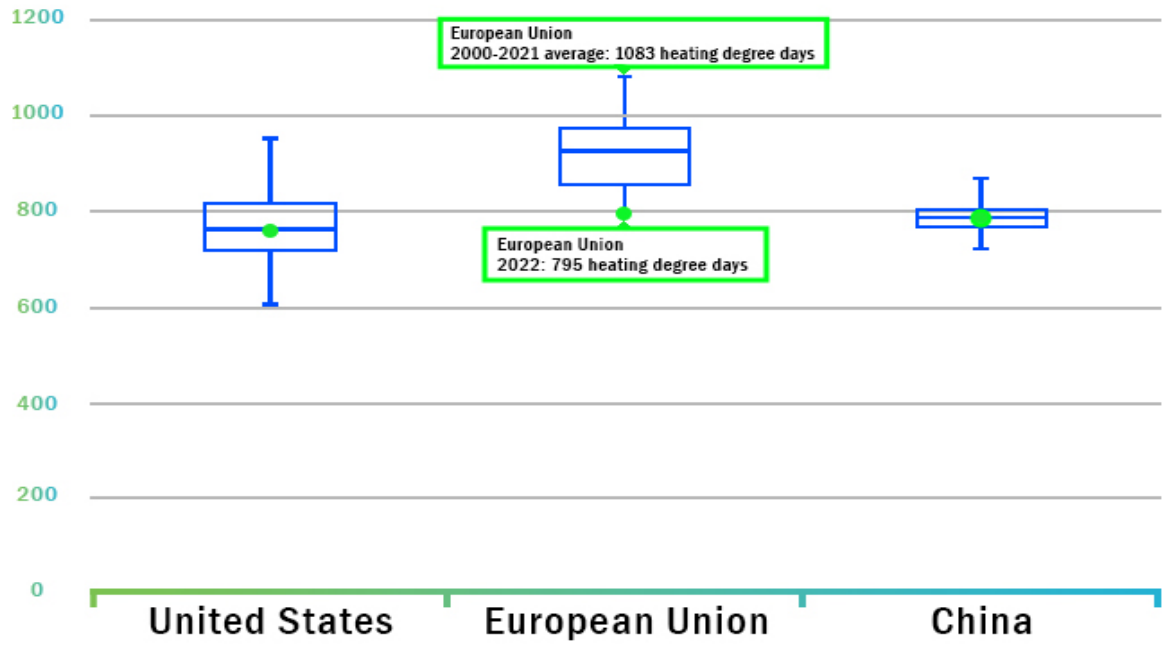

Figure 13. Heating Degree Days
Forrás: https://www.iea.org/data-and-statistics/charts/heating-degree-days-in-winter-months-for-selected-countries-and-regions-2000-2022

Projected according to the most plausible outlook, the count of Heating Degree Days is anticipated to fall within the range of 930 to 975 during the upcoming winter season. This deviation from the standard is poised to engender a reduction in natural gas requisition by an estimated 5 to 6 billion cubic meters when juxtaposed against the metrics offered by the IEA estimation. Should the Heating Degree Days for the year 2023 revert to the statistical mean of the 2000-2021 period, as outlined in the IEA's envisaged scenario – a projection that aligns with a moderately plausible supposition – this would herald an increment in consumption by approximately 11 billion cubic meters in comparison to the previous year. However, this augmentation would not incite any modifications to the IEA's appraised gauge of natural gas demand.

Per the less probable hypothesis that represents a wintry condition more frigid than the historical mean (characterized by a negative temperature anomaly of 2°C), a surge in natural gas demand within the range of 19 to 20 billion cubic meters is anticipated. In such an eventuality, consumption would exceed the projected figures by a margin of 8 to 9 billion cubic meters.

Significant fluctuations have been observed in the Dutch TTF natural gas pricing recently. During the 2013-2019 period, the energy commodity's price ranged roughly between 30 and 10 EUR/MWh, hitting its lowest point in spring 2020 with the onset of the COVID-19 pandemic. With the revival of the economy, gas prices gradually climbed back into the normal range. However, the surge in natural gas prices began in the summer of 2021 when LNG markets tightened for Europe, and Gazprom made limited efforts to meet the continent's demands.

The post-Russian invasion period saw price fluctuations driven by uncertainties surrounding winter gas supply, with normalization only being achieved by May 2023 when pricing once again dipped below 30 EUR/MWh. Since then, two price spikes have occurred—once in June 2023 due to unplanned outages at two Norwegian gas fields and a gas processing plant, and again in August due to strike threats at Chevron and Woodside Energy Group's Australian LNG facilities.

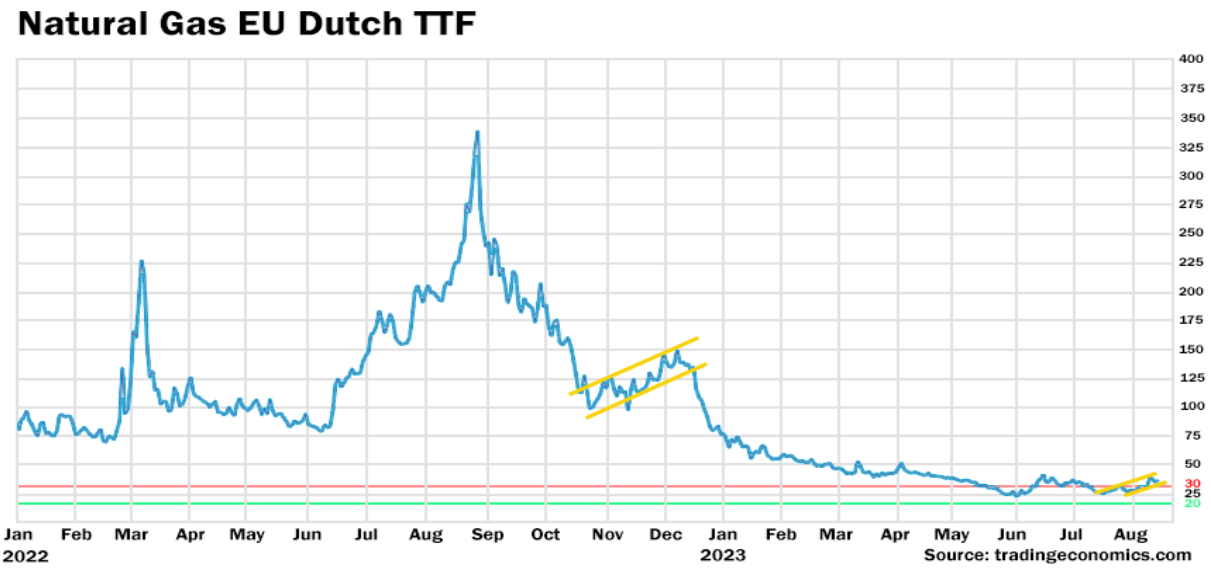

Figure 14. Natural Gas Duch TTF
Source: https://tradingeconomics.com/commodity/eu-natural-gas

While Europe does not directly import LNG from Australia, disruptions in Australian LNG exports can trigger spikes in Asian gas prices. In such cases, redirecting deliveries towards Europe becomes economically viable if European prices do not correlate. Presently, the likelihood of a prolonged and significant Australian work stoppage is minimal given current gas prices. Both labor unions and exporters acknowledge the significance of heightened autumnal LNG demand, emphasizing the avoidance of substantial losses.

Europe's gas supply is currently not under threat, with European gas storages being adequately replenished. Dutch TTF prices exceed pre-war average levels by 150-200%, and European companies pay approximately four times what their counterparts in the United States do.

Despite negatively impacting the continent's competitiveness, high gas prices sustain LNG deliveries.

However, recent months' price volatility serves as a reminder that uncertainty around winter supply persists. Although elevated gas prices hamper Europe's competitiveness, they do support LNG deliveries. Based on the most probable and moderately probable weather scenarios, from fall until the end of the year, there is no need to anticipate a significant surge in prices. One can anticipate a price level roughly corresponding to the demand-driven increase, in line with the consumption. The latter part of the heating season will be influenced by the degree of fill in natural gas storage. Essentially, the sole weather scenario that could alter this trajectory is a colder-than-average winter. If the storage facilities deplete rapidly at the onset of winter, it would induce considerable market tension.

Forecasting of Hungary's natural gas consumption in the winter of 2023-2024

Hungarian heating demand scenarios based on Heating Degree Days

In order to make the results comparable, we prepared climate and natural gas consumption forecasts that correspond to the methodology of IEA Never Too Early to Prepare for Next Winter: Europe's Gas Balance for 2023-2024, since our European analysis is based on this. For this reason, we used scenarios for either entire years or only the heating demand of the three winter months. The expected natural gas demand for the heating period of 2023-2024 was projected by taking the base period as the average of the heating degree days between 1991-2020, negative control period (extremely cold winter: December-January-February 2016-2017) and positive control (extremely warm vinter: December-January-February 2022-2023). To determine the natural gas demand, we have accurate natural gas consumption data (total and residential) for both the control and base periods, the origin of the data is the Hungarian Energy and Utilities Regulatory Office (MEKH).

At a given base temperature (15.5 °C), the Heating Degree Day (HDD) gives the temperature value proportional to the amount of energy required for a given day to heat the internal environment to a specified temperature, taking into account the daily minimum, maximum and average temperature (Spinoni et al. 2015). So the colder the weather, the more the air temperature deviates from the base temperature of 15.5 degrees, the more energy is required to heat the internal environment, and the higher the heating degree will be. By summing these degree day values for each day, we get the monthly or the annual heating degree day amount expressed in degrees Celsius for the entire heating period.

According to Bokros and Lakatos (2022), the annual amount of HDDs in Hungary was 2344°C based on the average of 1991-2020 climatic period. The lowest values can be found in the Southern part of the country, in the Southern Great Plain, between Maros and Körös, as well as in the southern regions of Transdanubia (2180-2260°C), which value is increasing towards the North-Eastern corner of the country with the increase of the continental climate effect up to 2500- values up to 2600°C. Average, maximum and minimum daily temperatures decrease with height above sea level, so the heating degree days increase. Accordingly, we experience higher

values in the landscapes of the Alpokalja, the Transdanubian and the Northern Central Mountains. Annual values of 310 °C also appear at the highest points of the country.

Overall, it can be said that due to climate change, the annual and monthly sums of heating degree days have decreased throughout the country since 1901, with the largest decrease in mountainous areas and Western Hungary. The decrease is statistically significant in all parts of the country since 1901. In the 2022-2023 heating season, the heating degree-day values were significantly lower than the average, so we chose December-January-February 2022-2023 as a positive control (extreme warm vinter).

The average of the HDDs between 1991-2020 was 450°C in December, 470°C in January, and 380°C in February, meaning a total of 1300°C, which is 55.46% of the HDDs of the entire heating season. In comparison, the HDD of December 2022 is 384.3°C (-65.7°C), January 2023 is 339.2°C (-130.8°C), and February 2023 is 299.5 (-80.5 °C), a total of 1023°C, which is 78.69% of the average for the years 1991-2020.

The cold weather of January 2017 was formed by large-scale atmospheric processes (macrosynoptic processes) that determine the circulation of the entire Northern hemisphere. However, the characteristic winter weather feature of the Carpathian Basin, the frequent appearance of a cold pillow (inversion) caused by settled cold air, also played a role in the existence of persistent cold. On January 1, 2017, the circulation of the Northern Hemisphere created a hemispheric air condition that was in line with the average winter, but slightly colder than in the last decade and a half. The cold period in the winter of 2017 does not match the trends of climate change, but in the opinion of climate scientists, this does not contradict the process of global warming. The chance of a cold winter like that of January 2017 is low (less than 10%, but cannot be ruled out), an event occurring once every 12 years in the Carpathian Basin as a whole. The observed trends will continue in the future and the average winter temperature will increase, which does not rule out that one month or season will be colder than the past average for many years.

Natural gas consumption scenarios for 2023-2024

We previously calculated that the number of typical HDDs of the extremely warm winter months of 2022-2023 was 1023°C in total, and that of the base period (average between 1991-2020) was 1300°C. Let's look at the data typical of the extremely cold winter (December-January-February 2016-2017). Based on the data of Bokros and Lakatos (2022), the heating degree in December 2016 was 530°C (+80°C), in January 2017 it was 670°C (+200°C), and in February 2017 it was 480°C (+100°C). This is a total of 1680°C, which is 129.23% of the average December, average January and average February between 1991 and 2020.
Let's see how the 29% increase in the number of HDDs affected the total natural gas demand, including residential one. Our total natural gas consumption was 9.6 billion m3 in 2016, including residential use of 3.08 billion m3 for the entire year. If we only look at the winter months (December, January, February), the total consumption comes to 5.32 billion m3, the residential consumption to 1.71 billion m3. While the structure of consumption did not change, total natural gas consumption in the winter of 2017 increased from 5.32 billion m3 to 5.7 billion m3, residential consumption from 1.71 billion m3 to 2.03 billion m3. Projected for the entire year 2017, total consumption increased by 0.69 billion m3 (from 9.6 billion m3 to 10.29 billion m3), most of which was residential use with an increase of 0.58 billion m3 (from 3.08 billion

m3 to 3.66 billion m3). In 2018, annual consumption fell to 9.8 billion m3, and residential consumption back to 3.3 billion m3.

Considering the extremely warm winter of 2022-23, the total natural gas consumption projected for the entire year can be estimated at 9.1 billion m3, and residential consumption at 3.2 billion m3. However, parallels cannot be drawn with the situation 5-6-7 years ago, because the income conditions of the population have changed significantly in the meantime, and this can significantly strengthen the increase in residental consumption. Nevertheless, in the short term, heating seasons and natural gas consumption trends similar to the extremely warm winter of 2022-2023 can be forecast until the commissioning of the new natural gas-fired power plant blocks in 2026-2027.

Summerizing our results, in a winter similar to the cold winter of 2016-2017, which has a roughly 10% chance of happening, our country's total natural gas consumption would increase by at least 0.69 billion m3, including residential consumption by at least 0.58 billion m3. This additional demand accounts for 10-11% of the capacity of our natural gas storage facilities (6.5 billion m3). Therefore, even such a cold winter could not endanger our country's natural gas supply. If the 4.5 billion m3 of gas delivered under the Russian-Hungarian long-term contract (2021-2036) arrives every year undisturbed, if the annual domestic production of 1.58 billion m3 increases according to the government's intentions, if the annually 0.6 billion m3 of LNG will arrive from Croatia according to the contract, if domestic biomethane production can be increased to 1.0-1.5 billion m3 per year, then only 2-3 billion m3 of gas would have to be procured on a market basis from the European markets. We have been able to solve this so far, and we will do it after this. But of course it doesn't matter at what price.

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