

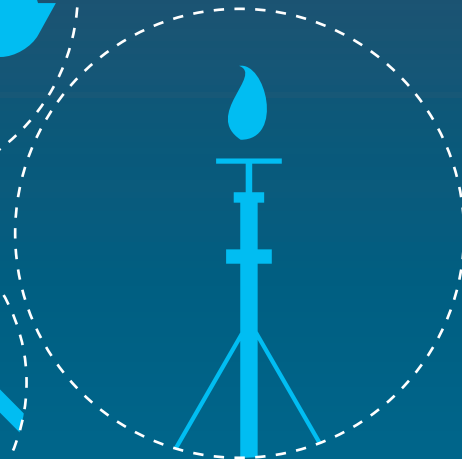
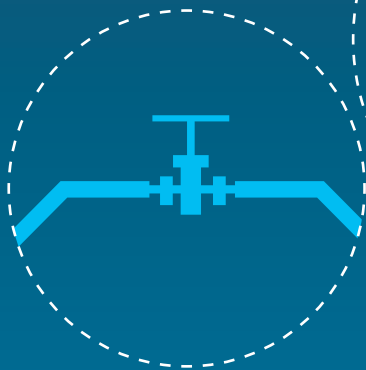


European
Commission

Quarterly report

On European gas markets

With focus on price developments in 2022



Market Observatory for Energy
DG Energy

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HIGHLIGHTS OF THE REPORT

- At the end of October and early November the **TTF spot** price temporarily fell to 30 €/MWh, as a number of LNG cargoes could not be unloaded at north-west European hubs, owing to high storage fullness and gas grid congestion in the region. It rebounded, peaked at approx. 150 €/MWh in early December and then **considerably decreased**, dropping to approx. 70 €/MWh at the end of December, and **continued on a downward trend until mid May 2023**.
- Throughout 2022 the European Commission and Member States put together a **comprehensive set of initiatives to fight the energy crisis**. This effort continued in the last quarter of 2022 with the adoption of several additional measures, including enhancing solidarity through better coordination of gas purchases, developing reliable price benchmarks for increased price transparency, establishing a market correction mechanism to address episodes of excessively high prices, creating a framework to accelerate the deployment of renewable energy, thereby speeding up substitution of gas in electricity production and heating. This framework has been supportive of the efforts to diversify supply. The expansion of regasification capacity, reduction of demand and storage filled ahead of the winter season all resulted in a **tangible improvement of the market situation in the fourth quarter of 2022** (and even more evidently, in the first quarter of 2023).
- After the cut of Nord Stream supply occurred in the third quarter, **Russian pipeline gas imports stabilised around 3 to 4 bcm per month**, down from 11-12 bcm per month in Q4 2021. Russian pipeline gas imports were down to approx. 15% in Q4 2022, more than 25 percentage points less than the same quarter in 2021. Russian pipeline gas has been replaced mostly by LNG import (+13 bcm, +70% year on year) as well as additional pipeline imports mainly from Norway and the UK.
- The **price premium** compared to the Asian markets that materialised in summer 2022 has **progressively decreased** in Q4 and fallen to approx. 10 €/MWh in late December, after reaching levels above 100 €/MWh at the peak of the crisis in August. Abundance of LNG in south-western Europe and the ease of grid congestion in north-western Europe resulted in a move towards a 'normalisation' of the discount in LNG import prices to the TTF and other continental benchmarks. In Q4 2022, the United States was the largest LNG supplier to the EU, ensuring 13.2 bcm (36% of the total EU LNG imports). In Q4 2022, the EU remained the biggest LNG importer in the world, ahead of Japan and China.
- **Average filling rates** in Europe in the fourth quarter stood at **91%, a year-on-year increase of 29%**. Storage injections were still strong. Faster storage replenishment was facilitated by significantly higher LNG inflows in the fourth quarter, surpassing by 13% an already record high import in the third quarter and aided by additional pipeline supply partially offsetting the rapidly falling pipeline gas imports from Russia, combined with significantly lower gas consumption. The peak was reached on 13 November (95.6%), almost a month later than usual, owing to mild weather and the delayed start of the heating season.
- **EU gas consumption in Q4 2022 fell by 21%**, (-25 bcm) year-on-year, amounting to 95.4 bcm. Gas use in power generation remained strong (133 TWh) and increased slightly, by 1.7%.
- **Gas traded volumes on the European hubs fell by 25%** in Q4 2022 year-on-year, following the downward trend already observed in previous quarters. The share of exchange-executed contracts increased slightly compared to Q3 2022 (67% vs 63%) but it was in line with the share in Q4 2021.
- **Retail gas prices for household customers in many EU capital cities significantly decreased throughout the 4Q 2022 for the first time since the beginning of the crisis**. That said, retail prices still rose in other capitals and the average rose in the fourth quarter at significantly lower rate (3%) than the previous quarter (when it rose 23%). The year-on-year increase was 71%, while it was 108% in Q3. The share of energy component in the price continued to increase and reached 69% in Q4, while it was 53% a year earlier, as Member States still kept reduced taxes and levies.

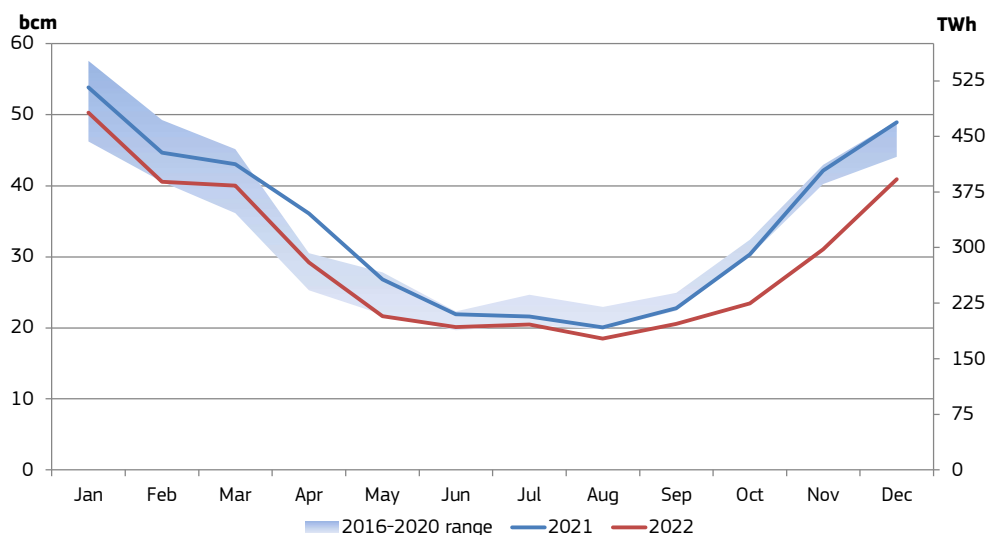
[Methodological note: the energy crisis has evidenced the importance of collecting information on energy markets accurately and timely. This is fundamental to inform the policy making process and address effectively issues arising in the markets. Against this background, the Commission is currently carrying out a comprehensive and systematic review of all the data sources related to gas markets. The scope of the review is to ensure a more harmonised and consistent treatment of different data sources. In the next quarterly report, once the review has been completed, the Commission will present the 2022 aggregated figures for all the key indicators.]

1. Gas market fundamentals

1.1 Consumption

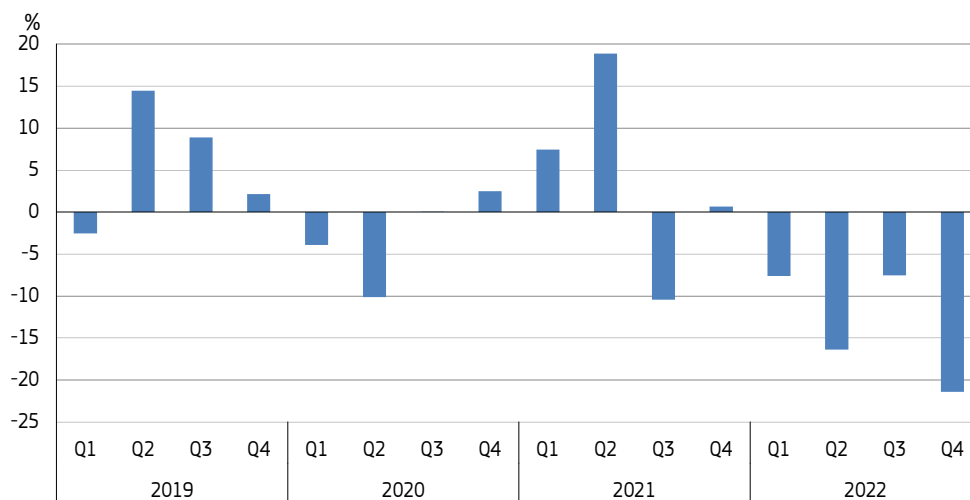
- EU gas consumption¹ in the fourth quarter of 2022 fell drastically further, by 21,4% (-25 bcm) in year-on-year comparison, after decreasing by 7,9 % in Q3 2022 and by 16,5% in Q2 2022. In absolute numbers, the quarterly gas consumption in Q4 2022 amounted to an estimated 95,4 bcm, down from 121,4 bcm in Q4 2021, but up from the consumption of the previous summer-quarter, Q3 2022 (59,5 bcm), a seasonally low heating season. Gas use in power generation remained strong (133,49 TWh) and increased slightly, by 1,7% (+2.18 TWh) from an already strong Q3 (131,31 TWh) and following historical trends in gas consumption during winter months.

Figure 1 - EU gas consumption



Source: Eurostat, 2022 from data series nrg_103m. In the next edition of this report numbers might change retrospectively.

Figure 2 - Year-on-year change in EU gas consumption in each quarter (%)

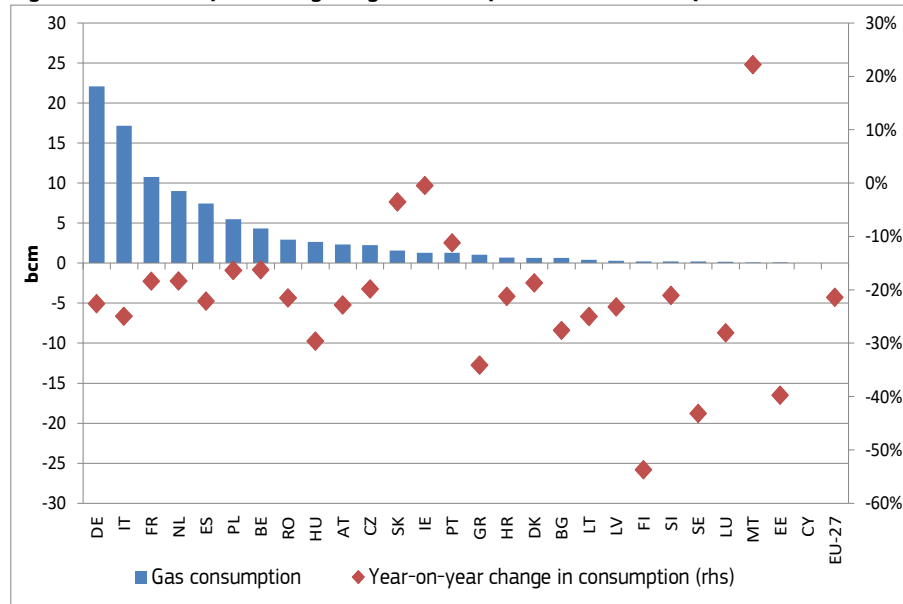


Source: Eurostat, 2022 from data series nrg_103m. In the next edition of this report numbers might change retrospectively

¹ EU aggregates, unless otherwise indicated, refer to EU-27, and in order to ensure comparability over time, values of earlier periods and year-on-year comparison indices also refer to EU aggregates without the United Kingdom. Therefore, in comparison to earlier editions, total EU aggregate numbers might differ in the current report.

- In the fourth quarter of 2022, in all EU Member States but Malta (+25%, +0.02 bcm)² gas consumption fell. In the order of percentage changes, gas consumption fell by the most in Finland (-53.7%, -0.24 bcm), Sweden (-43.2%, -0.19 bcm), Estonia (-39.7%, -0.09 bcm), Greece (34.1%, 1.06 bcm and Hungary (-29.6%, -2.64 bcm). In absolute terms, the biggest consumption reduction was registered in Germany (-6.45 bcm, 22.6%), Italy (-5.72 bcm, 25%), France (-2.43 bcm, 18.4%), Spain (-2.12 bcm, 22.1%) and the Netherlands (-2.02 bcm, 18.3%). In Q4 2022, Germany consumed the highest amount of gas (22.08 bcm), followed by Italy (17.19 bcm), France (10.76 bcm), the Netherlands (8.99 bcm), and Spain (7.46 bcm).

Figure 3 - Year-on-year change in gas consumption in the fourth quarter of 2022

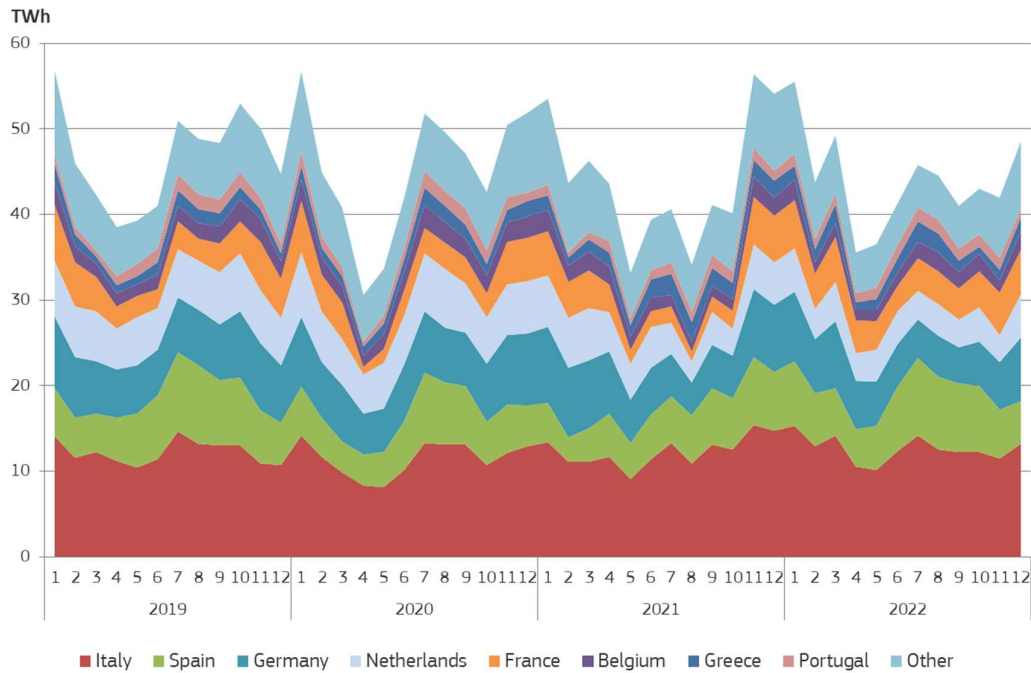


Source: Eurostat, 2022 from data series nrg_103m. In the next edition of this report numbers might change retrospectively

- Year-on-year gas-fired generation fell by 11% in Q4 2022 due to the high prices. However, after supporting gas-to-coal switch for most of 2022, the reduction of gas prices in October and at the end of Q4 2022, has closed the gap between coal- and gas-fired generation. The further decline in gas prices, combined with high carbon prices in Q1 2023, has supported gas-fired generation vis-à-vis coal-fired power plants. As a result gas-fired power generation rose by 2% (+2 TWh) compared to Q3 2022.

² There is no data for Cyprus.

Figure 4 - Gas-fired power generation in the EU

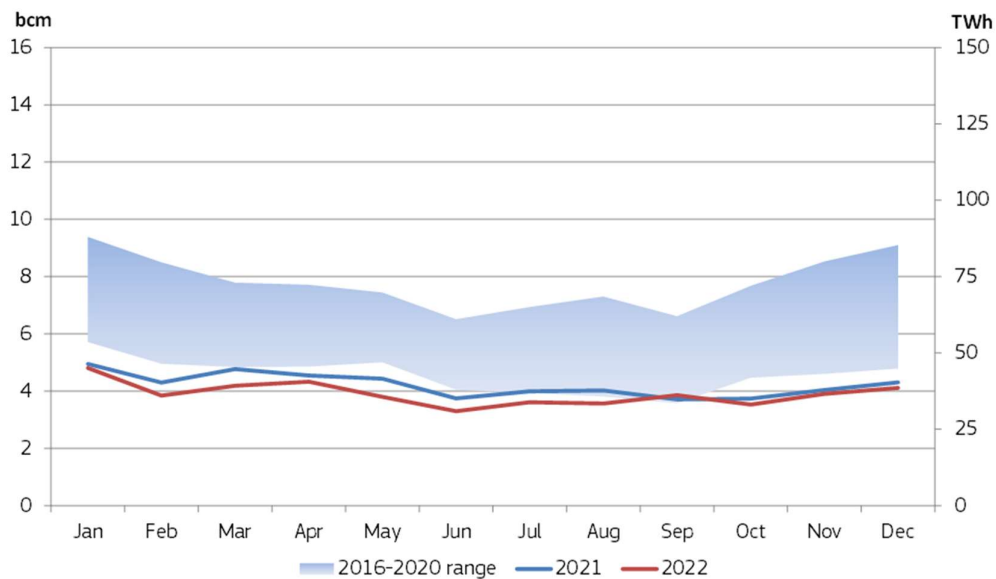


Source: Based on data from the ENTSO-E Transparency Platform and national data sources, 2022.

1.2 Production

- Despite sensible efforts in Member States to tap on their domestic resources, production has risen only slightly compared to the previous quarter (+ 3.6%). In the fourth quarter of 2022, EU natural gas production reached 10.5 bcm, falling year-on-year again, by 4%, (by 0.5 bcm), following a constant trend of decline in all previous years back to 2016 and beyond. In all three months of Q4, the actual quarterly production remained well below both the five-year range of 2016-2020 and 2021 figures.

Figure 5 – Gas production in the EU



Source: Eurostat, data as of 15 March 2023 from data series nrg_103m. In the next edition of this report numbers might change retrospectively.

- In the biggest gas producer Netherlands, the production remained at 4.2 bcm in the fourth quarter, the same amount as in the third quarter, but it fell significantly, by 12% (-0.6 bcm) year-on-year. In Romania, the second biggest gas producer in the EU, production stabilised at 0.8 bcm per month (2.4 bcm in Q4 overall), a slight increase of 3.7% from the third quarter. In Poland, the third largest domestic producer, production stabilised at 0.5 bcm and reached a total of 1.5 bcm, 13% higher than in the previous quarter (1.3 bcm). Germany slipped to the fourth place with a monthly production of 0.4 bcm that remained constant throughout 2022 and 2021. Italy came fifth with 0.9 bcm, increasing its production by 18.2% from the previous quarter. A similar 18% increase has been achieved in Denmark from the previous quarter amounting to an overall 0.43 bcm. Hungary increased its domestic production by 3.6% adding 0.4 bcm gas in the three last months of the year, while Ireland slightly reduced its production by 3.7% with 0.34 bcm gas produced in the fourth quarter of 2022.
- Even amid extreme high wholesale gas prices at the European hubs, domestic production in most of the European countries could not increase significantly, suggesting that there are technical and societal/environmental obstacles (e.g. depleted gas fields, significant resistance from the society for further gas production owing to damages in some countries, etc.) play more important role than economic profitability, which result in permanently dwindling production in the EU. Relatively long lead time to mobilise investment and develop economically viable and socially/environmentally acceptable projects in the densely populated European territory may also have contributed to the overall insignificant increase in domestic gas production.

1.3 Imports³

- According to Eurostat⁴, net gas imports in the EU decreased by 15.4% (14.8 bcm) in the fourth quarter of 2022 (year-on-year), amid decreasing gas consumption and further dwindling domestic production, which also facilitated the replenishment of storages. Net gas import also shrank from the third quarter by 4.5% (3.8 bcm) reflecting the effect of the gas demand reduction regulation⁵. Net imports in different EU countries showed a high variation in Q4 2022 in year-on-year comparison. In Denmark, in parallel with decreasing gas consumption, net imports fell to practically zero and in Latvia they fell by 52% (-0.4 bcm). In contrast, net gas import in Malta practically doubled (though increasing by a tiny 0.07 bcm), and in Hungary net imports rose by 58% (+1.1 bcm) year-on-year.
- Looking at the biggest LNG importers, in the largest importer France net imports rose by 124% (from 4.5 bcm to 10 bcm), in the second largest importer Spain, they went up 8.4% (+0.6 bcm), while in the Netherlands, in third place, imports went up by 78% (2.2 bcm). Italy was the fourth largest importer in Q4 of 2022 increasing its LNG purchase by 118% (2 bcm), while in Belgium the increase was an astonishing 148% (2.5 bcm). Portugal, Greece and Poland also imported significant amounts (1.3 bcm, 1 bcm and 2 bcm), while Lithuania, Croatia, Finland, Sweden and Malta also added to the EU import. Overall, the total LNG import amounted to 36.7 bcm in the 4Q of 2022, a 13% increase from the 3Q 2022 (32.4 bcm) and 66% increase year-on-year (from 22 bcm in 4Q 2021).
- According to ENTSO-G data, net imports amounted to 799 TWh in the fourth quarter down 3.8% from 837 TWh in the third quarter of 2022, of which 55% arrived through pipelines and around 45% through LNG terminals. For a first time since the beginning of ENTSO-G time series (January 2014) almost half of gas import arrived in the EU via LNG terminals. Pipeline gas imports from Russia saw a spectacularly steep fall of 85% year-on-year in Q4 2022, following an accelerating decline observable throughout the previous three quarters. Q2 was already characterised by 16.4% decline in Russian pipeline import compared to Q1, and this decline accelerated to 59% in Q3 and to 88% in Q4 of 2022. Import from Russia almost halved from Q3 to Q4 reflecting the impacts of various pipelines disruption events from July to September, including the complete halt of gas import through Nord Stream 1 and 2. Imports from Norway were down by 7% quarter-on-quarter, probably reflecting reduced demand in Europe following record high prices and the impact of the EU gas demand reduction act. Pipeline gas imports from Algeria showed a slight increase of 2.4% from the previous quarter but was virtually the same year-on-year (0.6% decrease compared to 2021 Q4). At the same time, pipeline gas imports from Libya increased significantly, by 47.3% quarter-on-quarter, and was up by 9% on a year-on-year basis as well; however, being a small quantity of around 1% of total EU import, this increase did not influence the overall downward trend in import. The real winner of the fourth quarter was LNG import, which reached 358 TWh in Q4 2022, the highest recorded LNG import ever. Gas inflows from the UK was 22% down compared to the previous quarter at 66 TWh (6 bcm), but still the third highest import amount in 2022, and significantly above historical averages.
- The share of Russian pipeline gas in the EU external gas imports fell to below 10% in Q4 2022, down from an already low 11.6% in Q3 2022. Year-on-year, the share of Russian pipeline imports fell significantly, by 29 percentage points⁶. In the fourth quarter of 2022, Russian pipeline gas ensured less than 10% of the EU gas imports in sharp contrast with a 35.2% share a year earlier in Q4 of 2021, and even more so in contrast with a 48.4% share in the same period of 2020.

³ The Commission is carrying out a thorough review of all data and sources related to import volumes as well as prices for 2022. Subject to this review, aggregated figures for the whole of 2022 will likely be presented in the next quarterly report.

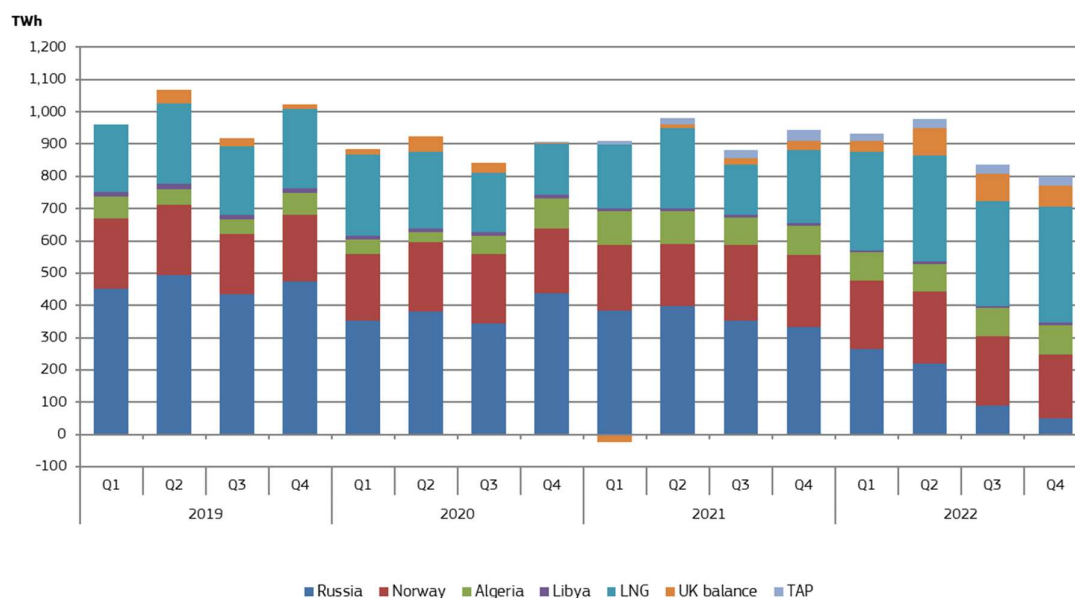
⁴ Net imports equal imports minus exports and do not account for stock changes.

⁵ Council Regulation (EU) 2022/1369 of 5 August 2022 on coordinated demand-reduction measures for gas, OJ L 206, 8.8.2022.

⁶ It is worth to note that Russia increased its importance in the EU LNG imports over the last few years, numbers presented in this section, with the exception of LNG or unless otherwise indicated, refer to pipeline imports.

- The share of pipeline gas imports from Norway was 25% in the fourth quarter of 2022, dropping slightly from 26% in the previous quarter but up by 1 percentage point compared to Q4 2021. The share of pipeline gas imports from Norway was more than four times higher than the share of pipeline imports from Russia. In the fourth quarter of 2022, Norwegian gas import amounted to 19 bcm (199 TWh), down 7% from the previous quarter and down 11% year-on-year.
- In the fourth quarter of 2022, pipeline gas imports from Algeria were up by 2.4% from the previous quarter but slightly down year-on-year; overall import share within the total extra-EU imports remained stable (rising slightly to 11% in Q4 2022). Imports from Libya increased by 47.3%, but its share remained marginal at 1% of the total EU gas imports.
- In Q4 2022, the share of LNG continued to rise and surpassed the previous record, reaching a historic high of 45% in the total EU gas imports, up by a 21 percentage points compared to Q4 2021 (when it was 24%), displacing Russian gas and taking its former market share of 2021 (35,2%) and 2020 (48.4%). European market diverted supply from the Asian markets, as fears of supply disruptions amid falling Russian imports increased European gas prices to record levels, and incentivised LNG cargo redirections towards Europe. In Q4 2022 the year-on-year 85% decrease in the share of Russian pipeline flows was compensated by a 59% increase in LNG imports partially displacing inflows from the UK and Norway, which registered small declines of 22% and 7%, respectively, whereas North Africa's contribution to the overall EU import supply did not change significantly.
- The Trans Adriatic Pipeline (TAP) ensured around 27 TWh gas imports in the EU in the fourth quarter of 2022, in line with the previous quarters, which represented around 3.4% of the EU total gas imports. TAP provides access to Azerbaijani gas resources via the Southern Gas Corridor, an important result of the EU security of gas supply policies.
- Looking at the evolution of daily gas inflows from different sources on Figure 7, the daily inflows from Russia continued to decrease in Q4 2022, and stabilised at very low levels in October and November, and further stepped down to a new low from mid-December. At the same time, the importance of LNG inflows have gradually gained ground. Inflows from other sources, such as Norway, North-Africa and the UK remained fairly stable over time, but with dwindling Russian imports their relative importance increased.

Figure 6 - EU imports of natural gas by source



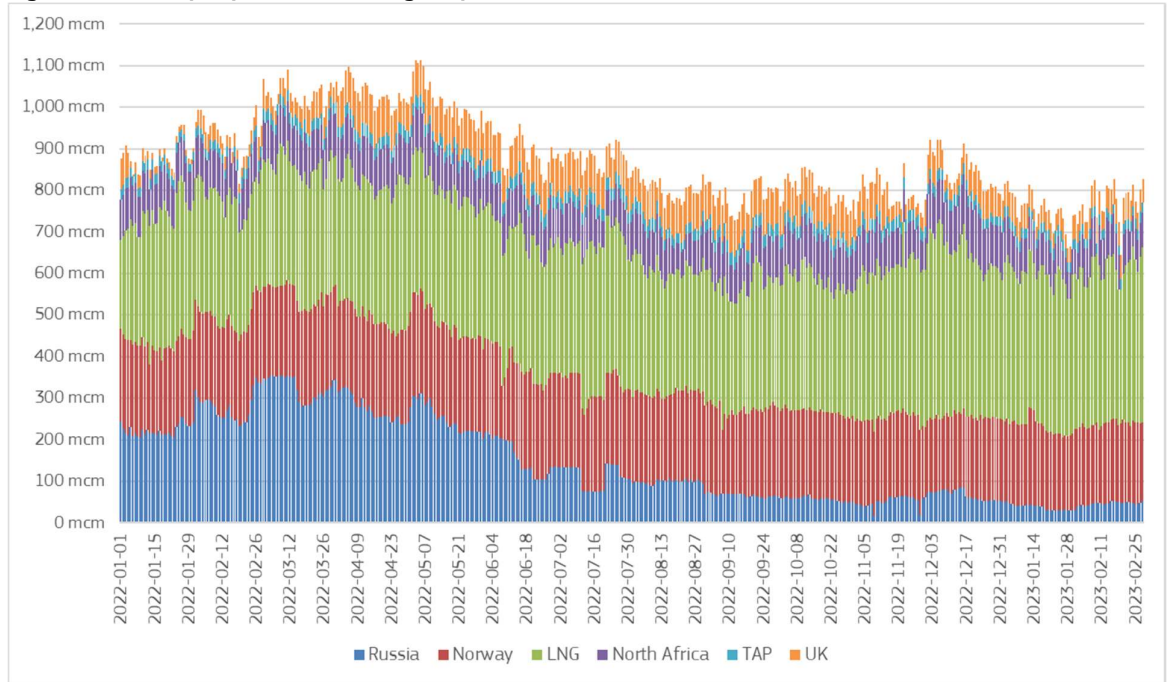
Source: Based on data from the ENTSO-G Transparency Platform, 2022.

Exports to the Baltic-states and Finland are not included in the chart owing to unavailability of reliable data

Russia, Norway, Algeria and Libya include pipeline imports only; LNG imports coming from these countries are reported in the LNG category.

A trade balance with the UK is estimated, reflecting that the UK is no longer part of the EU, and it is not easy to determine the origin of gas molecules arriving to the EU after going through the UK market (it can be UK production, imports from Norway of LNG imports from the UK, etc.). As of 2021, imports via the Trans Adriatic Pipeline (TAP) is also included.

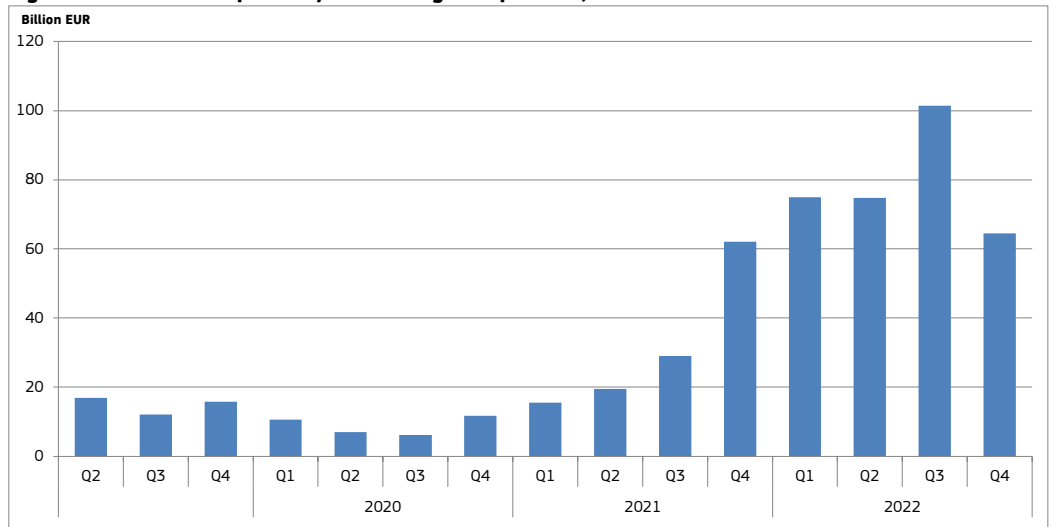
Figure 7 - EU daily imports of natural gas by source



Source: Based on data from the ENTSO-G Transparency Platform, 2022.

- In the fourth quarter of 2022 the estimated gas import bill amounted to €64.5 billion, a significant decrease from the €101.5 billion in the third quarter, coming back closer to the two previous quarters (€75 billion in both Q2 and Q1 of 2022). The bill was 3.8% higher year-on-year, i.e. compared to Q4 of 2021 (€62 billion), but still more than twice as much as in the third quarter of 2021, and more than triple of the import bill in Q2 (€19,6 billion) and Q1 (€ 15.5 billion) of 2021.
- Out of the import bill of €64.5 billion in Q4 2022, €32.5 billion was spent on LNG import; gas imported from Norway was around €17 billion, and imports from Russia amounted to €4.8 billion. North Africa (Algeria and Libya, €6.7 billion) overtook Russia, while the TAP import bill amounted to € 3.6 billion (reduced from €4.7 billion in Q3). The import bill for Russia was reduced by 73.3% in Q4 2022 year-on-year.

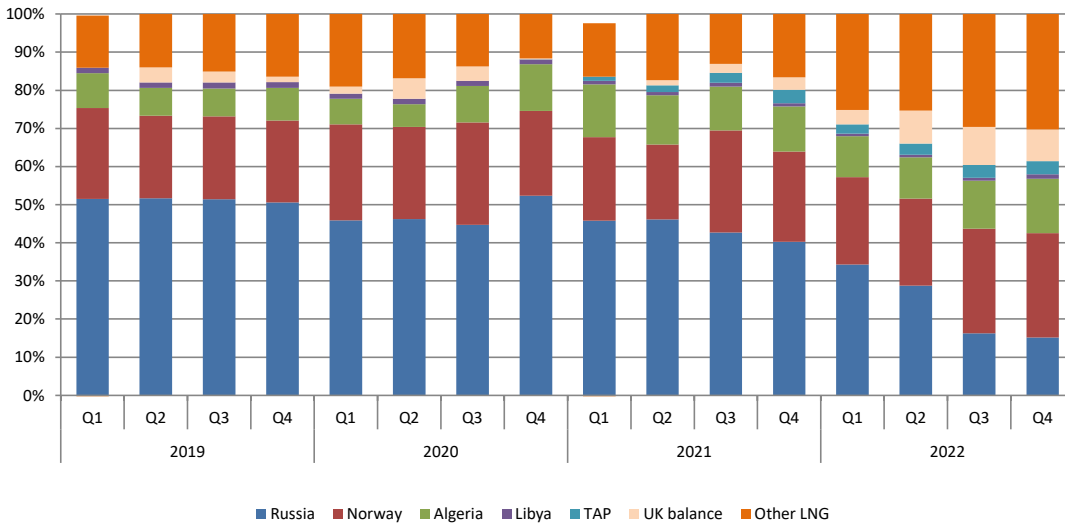
Figure 8 – Estimated quarterly extra-EU gas import bill, in billions of euros



Source: ENTSO-G, Eurostat and own data calculations for the EU weighted average of import gas prices

- As important pipeline gas source countries, such as Russia, Norway and Algeria are also active on the LNG market, this gas report also takes a look at the combined imports of pipeline gas and LNG from these countries and calculates the share of imports including all gas sources. The share of Russia imports to the EU (pipeline and LNG together) continued to fall from 16% in Q3 2022 to 15% in Q4 (the lowest over the last eight years). The combined share of pipeline and LNG gas of Russian origin fell by 25 percentage points in Q4 2022 year-on-year.
- The share of Norway was 27.5% within gas imports in Q4 2022 similar to the previous quarter 27.4%. The share of Algeria within the total extra-EU gas imports was 14.3, up from 12.6% in the A3. 11% only including pipeline gas), up by 1 percentage point year-on-year. The share of gas inflows from the UK was approx. 8.3%, down from 10% in the previous quarter. The lower import from Russia was mainly compensated by additional LNG import and pipeline gas from North Africa, while (pipeline) flows from Norway and Azerbaijan were stable.

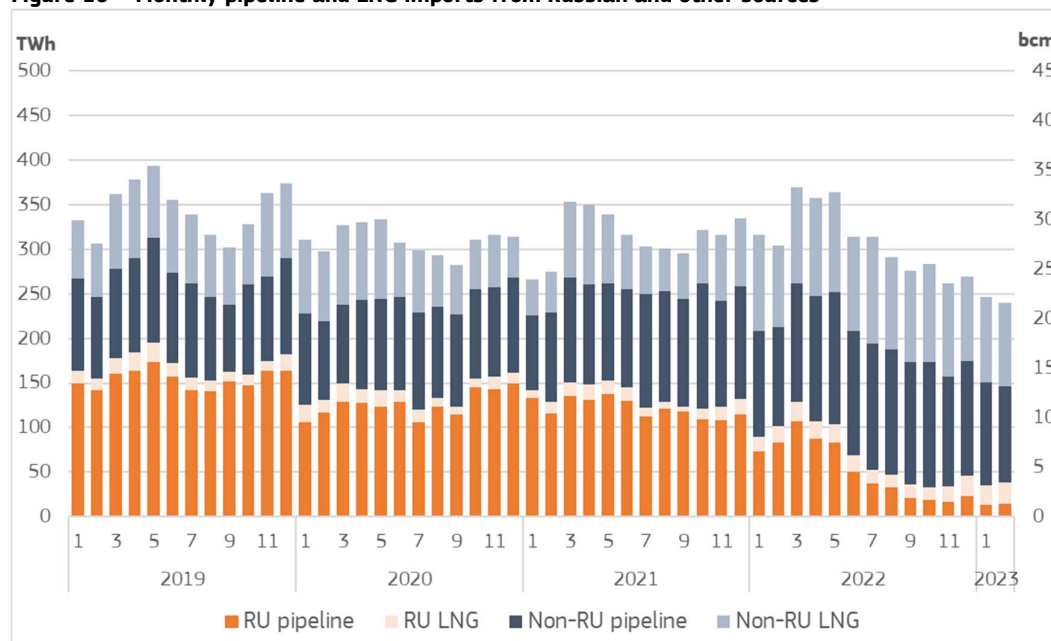
Figure 9 – The share of gas imports within the total, combining both pipeline and LNG imports



Source: Based on data from the ENTSO-G Transparency Platform

- Figure 10 shows how remarkably the role of Russian gas imports changed over the last couple of years. While in January 2021 Russia ensured (with pipeline and LNG supplies) around 53% of the total extra-EU gas imports, in Q3 and Q4 2022 this dropped to 16% and 15% a trend well aligned with the objective of the Repower EU plan to phase out fossil energy imports from Russia.

Figure 10 – Monthly pipeline and LNG imports from Russian and other sources



Source: Based on data from the ENTSO-G Transparency Platform and Refinitiv.

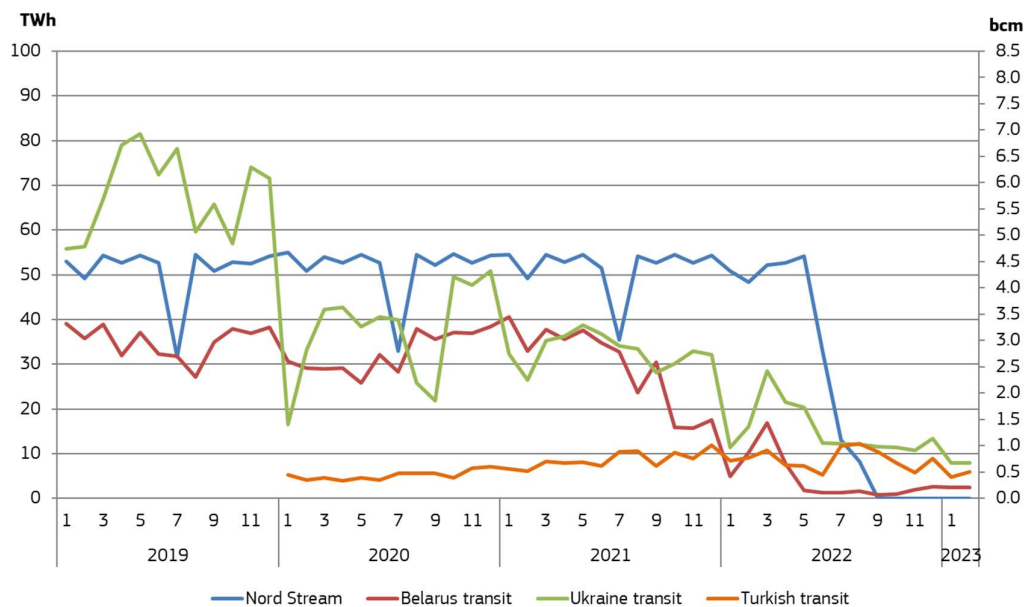
1.3.1. Pipeline imports from Russia

- Figure 11 shows the breakdown of EU gas imports from Russia on the four main pipeline supply routes: Ukraine (which includes the Brotherhood Pipeline and the - recently less important - Balkan route), Belarus (practically the Yamal pipeline), Nord Stream 1 and Turk Stream.
- In the fourth quarter of 2022, the volume of Russian imports fell significantly, by 81% compared with the same quarter of 2021. This year-on-year decline surpassed an already staggering decline of 73% year-on-year in the third quarter. On a quarterly basis, the decline in the fourth quarter was 33%, in the footstep of a 58% fall in the third quarter. In absolute terms, total Russian import was 6 bcm in the fourth quarter falling from 9 bcm in the third quarter and from 21 bcm in the second quarter of 2022. Compared to two years earlier, the quarterly decline was even more pronounced, 86% signalling a fall from 42 bcm in Q4 2020 to 6 bcm in Q4 2022.
- As shown on Figure 11 and Figure 12, gas transit through the route of Belarus contributed to that staggering decline by a 89% decrease in Russian export volumes on a yearly basis, which moderated somewhat compared to 96% fall in Q3 2022 year-on-year. In October, the average monthly flow through the Yamal pipeline was still below 0.1 bcm, slightly increasing to a range around 0.2 bcm in November and December. The total import via the Belarus pipeline was 0.5 bcm in the Q4 of 2022, a 52% increase compared to the 3Q, but way down from 5 bcm in the last quarter of 2021, and even more so from 10.5 bcm in the last quarter two years ago, in 2020.
- Gas flows transiting Ukraine were down again by 63% in comparison to Q4 2021, in the footstep of a similar 63% year-on-year decline in 3Q. On a quarter-on-quarter basis the decline slowed to 1% from the previous quarter, the flow stabilising at around 3.3 bcm in the last two quarters of the year. The monthly average transit through Ukraine remained 1.1 bcm, down from 3 bcm in Q4 2021, and 4.6 bcm in Q4 2020. The quarterly flow was about 76% lower than in the same period in 2020 and 85% lower than in the period of 2018-2019 (pre-Covid-19 and energy crisis years). In Q4 2022, the monthly transit volume through Ukraine with EU destinations was around 1 bcm.
- The biggest contributor to the fall in the Russian pipeline gas export was however the Nord Stream route, where flows halted altogether bringing the volume to zero in the fourth quarter of 2022. Gas import in Nord Stream stopped in September and has not resumed since. Nord Stream provided 62% of Russian pipeline export in Q2 and 58% in Q1 of 2022. Throughout 2021, pipeline gas share of Nord Stream was above 40%, and it was 48% in Q4 of 2021; it was responsible for around half of Russian pipeline gas supply to Europe. In July and August 2022, transited volumes through the Nord Stream fell respectively to 1.2 bcm and 0.8 bcm, much lower than the average monthly volume of Q2 2022 (4.4 bcm), impacted by a planned maintenance between 11 and 21 July and a three day long works at the end of August. As from early September transit fell to zero through Nord Stream 1 and at the

end of that month a sabotage action resulted in serious damages on the pair of pipelines, making unlikely the return of this transit route to operation. On quarterly average, transit through Nord Stream 1 was down by 85% in Q3 2022, year-on-year.

- The only transit route where volumes showed an increase in Q4 2022 was the Turk Stream, up by 24% compared to the last quarter of 2020 two years ago, but on a year-on-year and quarter-on-quarter basis, there was a decline of 27% and 34%, respectively. The monthly average flows was 0.7 bcm in Q4, a drop from the slightly above 1 bcm in Q3, due to increases in July and August. In October-November-December volumes dropped on this route (to 0.7 bcm, 0.5 bcm and 0.8 bcm, respectively), probably owing to the end of delivering additional gas volumes to Hungary at the final period of the storage filling season.
- In Q4 2022, the share of Nord Stream within Russian pipeline gas supply to Europe fell to zero, while the Ukraine transit route strengthened its first place with a 56% share, after securing 38% of the total Russian pipeline gas transit already in 3Q. The drastically falling overall Russian pipeline imports made it possible for the Belarus transit route to double its market share from 4% in Q3 to 8% in Q4, with only 0.17 bcm increase in flow from 0.33 to 0.5 bcm, while the share of Turk Stream remained at all time high with 36%, the same as in Q3 2022, even if actual volume fell by 34% from 3,1 bcm to 2.1 bcm.
- With the transit on Nord Stream dropping to zero and that via Belarus declining dramatically, the Ukraine and Turk routes became the largest routes of Russian pipeline gas into Europe with a share of respectively 56% and 36%.

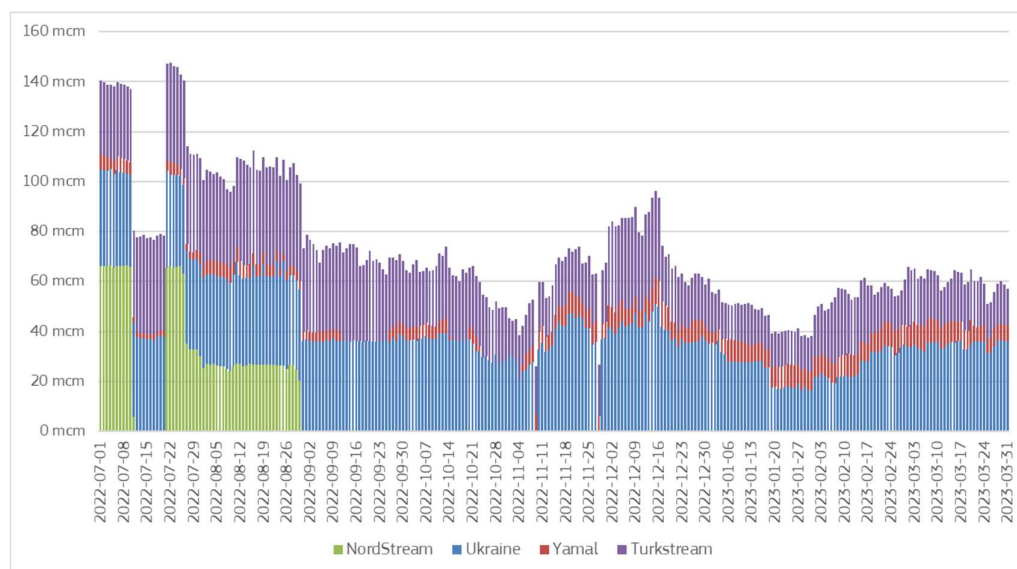
Figure 11 – Monthly EU imports of natural gas from Russia by supply route



Source: Based on data from the ENTSO-G Transparency Platform, 2022.

Deliveries to Estonia, Finland and Latvia are not included; transit volumes from Russia to the Republic of North Macedonia and Serbia are excluded. Since the inauguration of Turk Stream flows to Turkey via the Balkans are not significant.

Figure 12 – Daily EU imports of natural gas from Russia by supply route



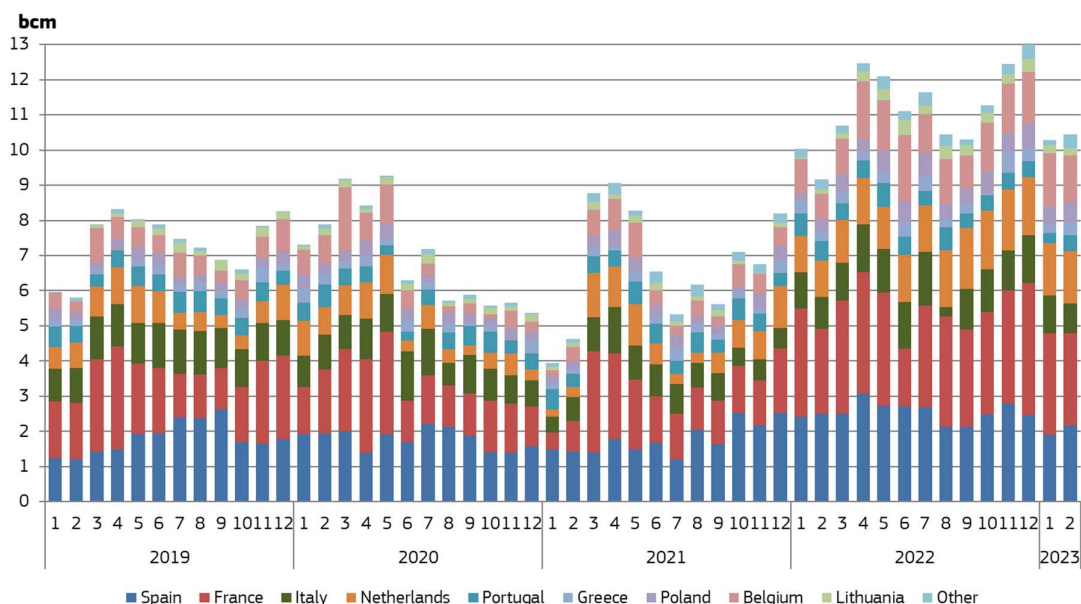
Source: Based on data from the ENTSO-G Transparency Platform, 2022.

1.3.2.LNG imports

- LNG imports⁷ in EU continued to grow in the fourth quarter of 2022 although with a moderating pace compared to the third quarter. Year-on-year growth registered an impressive 55% increase, somewhat down from the staggering 89% increase experienced in the previous quarter. Total LNG import was 34.2 bcm in Q4, 6% higher than in Q3.
- In Q4 2022, France remained the biggest LNG importer in the EU taking almost one third of LNG deliveries (29%), importing 9.88 bcm of liquefied natural gas, slightly ahead of Spain, where LNG imports amounted to 7.73 bcm representing 27% of EU imports. In year-on-year comparison, imports were up by 122% in France (after 134% in Q3), whereas in Spain they rose by 7% (after 43% in Q3) indicating that import growth slowed down somewhat but was still robust. LNG imports in the Netherlands, amounting to 5.1 bcm in Q4 2022 represented the third largest buyer position and was a 15% increase over Q3, a doubling of import year-on-year, following a four-fold increase (up by 299% from 1,17 bcm to 4,66 bcm) year-on-year in the previous quarter. Belgium was the fourth biggest importer, followed by Italy, Poland, Portugal, Sweden, Greece and Croatia.
- In Q4 2022, wholesale gas prices remained elevated, although came down from the record highs in August and September. Until mid-October, prices were still in the range of 150-170 €/MWh and kept in the 95-140 €/MWh range until the third week of December. Throughout this quarter and most of the days Europe offered a premium for LNG cargoes compared to Asia. At the end of October, in parallel with falling TTF spot prices amid cargo congestions in north-western Europe, prices switched to discount to Asia, however, from November, the premium returned and price in December have risen again to reach an average of 117 €/MWh (see Figure 27). Price premium during most of the time resulted in abundant LNG imports in the EU. In north-western and south-western Europe local LNG import benchmarks maintained the measurable discounts vis-à-vis the general gas benchmark TTF during most of Q4 2022.

⁷ In the report LNG imports are based on cargo tracking data from Refinitiv. Import numbers also include possible re-exports to third countries, implying that consumption of natural gas in the EU is less than these numbers would suggest. Actual consumption data is rather based on the send-out numbers of regasification terminals, provided by ENTSO-G

Figure 13 - LNG imports to the EU by Member States

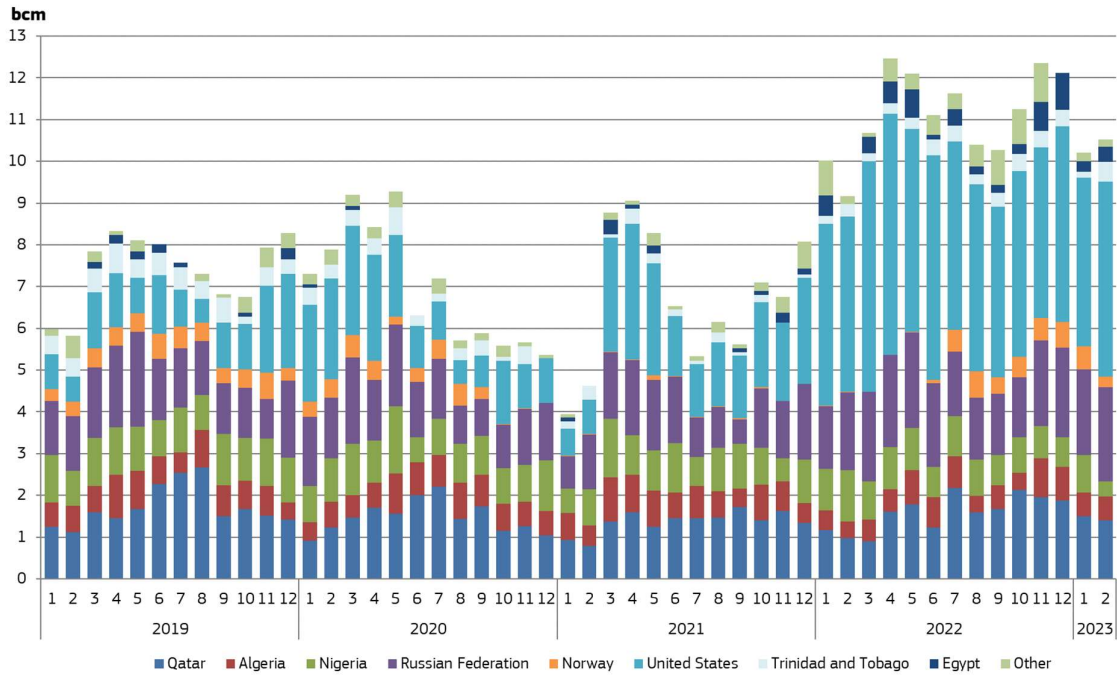


Source: Commission calculations based on tanker movements reported by Refinitiv. "Other" includes Finland, Malta and Croatia.

- Similarly to previous quarters, the United States was the largest LNG supplier of the EU in Q4, by a large margin to its competitors, ensuring 13,2 bcm of the EU LNG imports within a single quarter (for comparison: EU LNG imports from the US amounted to 22,3 bcm in 2021 as whole), representing around 36% of the total imports. Year-on-year, LNG imports from the US more than doubled, up by 105%. In 2022 the EU imported 56,4 bcm LNG from the US (153% up from 22,3 in 2021), implying that the objective of the March 2022 EU-US joint statement on energy security⁸, which foresaw an increase of 15 bcm compared to 2021, has by a large margin been exceeded.
- Qatar was the second biggest EU LNG import source in Q4 2022 (with an import share of 16% and imports amounting to 6 bcm, +37% year-on-year). Russia came to the third place, representing 15% of the total EU LNG imports (5.6 bcm, up by 37% year-on-year), followed by Nigeria, the import share of which has fallen by 9% from the Q3 to only 6.3% (- 2.3 bcm, falling also by 7% year-on-year) and coming close to lose its fourth place to Algeria. LNG imports from Algeria amounted to 2.1 bcm, increasing by 24% from the Q3 and up by 4% year-on-year. With these increases Algeria managed to grow its share in a growing LNG market from the previous quarter's 5% to 6% and came close to switch market position with Nigeria. Norway continued its renewed presence as an important LNG suppliers of the EU, increasing its supply by 5% quarter-on-quarter (1.6 bcm), but its share decreased to 4% in Q4 2022, as EU LNG imports expansion surpassed the growth in Norway shipments and other suppliers took market shares more aggressively.
- On the top of these, Trinidad and Tobago supplied 25% more LNG in Q4 reaching almost 2 bcm and keeping its 3% share in total EU LNG import (year-on-year increase was 366%), while Equatorial Guinea's shipments went up by 150% and that of Cameroon by 65% on a quarter-on-quarter basis. LNG import from Egypt rose significantly again in Q4 by 131% and close to four-fold, by 270% year-on-year, reaching 1.8 bcm, which catapulted it to the sixth place and ahead of Norway with a newly gained 5% share in the total EU imports (up from just 2% in the previous quarter) (See Figure 14). The fourth quarter saw a 150% increase of LNG imports from Equatorial Guinea and 65% increase from Cameroon, together supplying 1.2 bcm, while Angola reduced shipment by 29%. Year-on-year, these new African import sources grew their supply significantly to Europe (Equatorial Guinea by 292%, Angola by 16%, while Cameroon from zero as it started shipments only in the Q2 of 2022).

⁸ See more in Quarterly Report on European Gas Markets, first quarter of 2022 (Vol 15, issue 1).

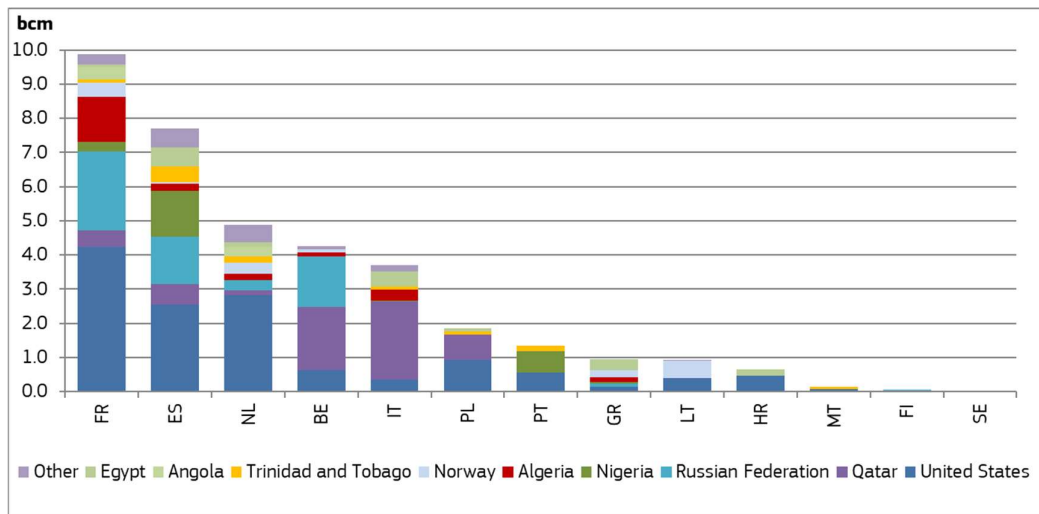
Figure 14 - LNG imports in the EU by supplier country



Source: Commission calculations based on tanker movements reported by Refinitiv
 Imports coming from other EU Member States (re-exports) are excluded
 "Other" includes Angola, Brazil, the Dominican Republic, Equatorial Guinea, Oman, Peru, Singapore, the United Arab Emirates and Yemen

- In the fourth quarter of 2022, the United States as the biggest LNG exporter to Europe sent supplies to 11 Member States. The three most important EU destinations of the US LNG exports remained France (4.2 bcm), the Netherlands (2.8 bcm) and Spain (2.5 bcm). Russia was the second biggest LNG supplier of Belgium (35%), France (23.3%), Spain (18%) and Sweden 40.3%. Nigeria supplied six Member States (PT, ES, GR, FR, IT, LT). Similarly, Algeria exported to six Member States (GR, FR, IT, NL, ES, BE). Norway supplied seven Member States (SE, LT, GR, NL, FR, FI, ES). Trinidad and Tobago shipped LNG to seven Member States (MT, PT, ES, PL, NL, IT, FR).

Figure 15 – LNG imports in the EU Member States from different sources in the fourth quarter of 2022



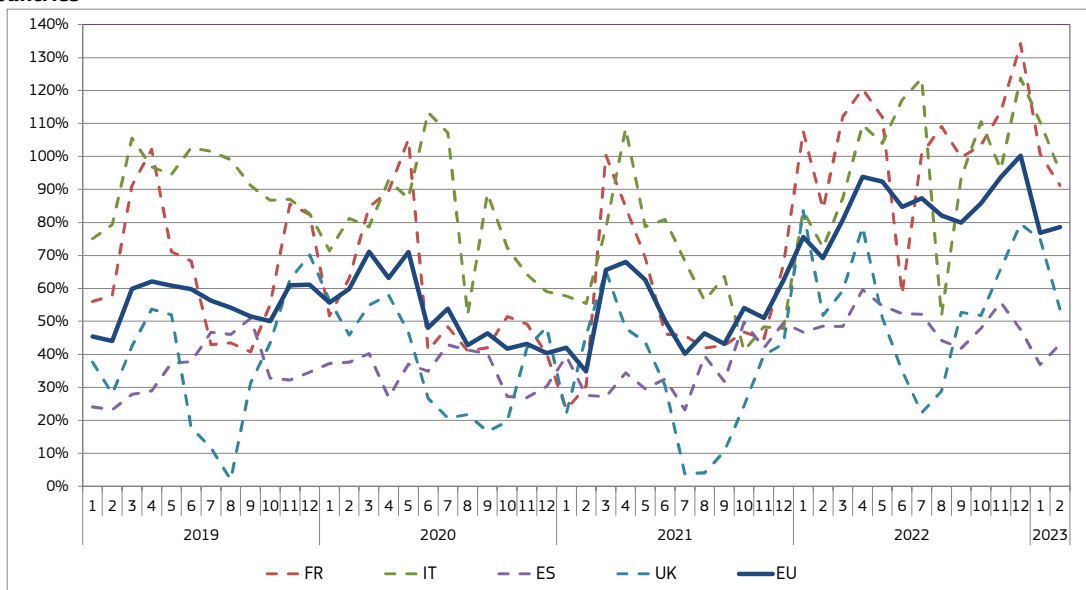
Source: Commission calculations based on tanker movements reported by Refinitiv
 Imports coming from other EU Member States (re-exports) are excluded
 "Other" includes Brazil, the Dominican Republic, Oman, Singapore, the United Arab Emirates and Yemen

- The average EU LNG terminal utilisation rate, which stood at 77% in June, rose to 81% in July, then fell back to 73% in August and to 71% in September, rebounded to 78% in October, further increased in November to 86% and jumped to 92% in December. The

quarterly average utilisation rate was 14% higher in the fourth quarter of 2022 compared to the previous quarter matching a 13% quarter-on-quarter increase in LNG imports. At individual terminal or country level, monthly utilisation rates can be quite volatile, depending on the arrival of cargoes and the hourly regasification capacities.

- In France, Belgium, the Netherlands and Poland the utilisation rate was above 100% based on annual nameplate capacities in all three months of the fourth quarter from November to December. In Italy, Greece and Croatia utilisations rates went up above 100% in one of the three months of the quarter.

Figure 16 – Average monthly regasification terminal utilisation rates in the EU and in some significant LNG importer countries



Source: Commission calculations for LNG imports based on tanker movements reported by Refinitiv. Regasification capacities are based on data from International Group of Liquefied Natural Gas Importers (GIINGL) and Gas Infrastructures Europe (GIE)

1.4 Policy developments and gas infrastructure

- In the fourth quarter of 2022, the European Commission has come up with additional proposals to continue the work laid out in the RepowerEU Plan in May 2022, and to ensure security of energy supply at affordable prices during the forthcoming winter of 2022/2023 and beyond.
- In the last quarter of 2022, further measures were adopted to address high gas prices in the EU and ensure security of supply this winter:⁹ (i) the aggregation of EU demand and joint gas purchasing to negotiate better prices and reduce the risk of Member States outbidding each other on the global market; (ii) a price correction mechanism to establish a dynamic price limit for gas derivatives linked to the European gas exchanges; and (iii) default solidarity rules between Member States in case of supply shortages.

1.5 Storage

- Figure 17 shows EU gas stock levels as the percentage of storage capacity in gas years¹⁰ 2021 and 2022, compared to the 5-year range of gas years 2015-2019. According to figures published by Gas Infrastructure Europe (GIE), operational EU storage capacity amounts to 1,148 TWh (roughly 106 bcm) as of July 2021¹¹.
- Storage levels were historically low at the beginning of 2022 following historically high prices already in the last quarter of 2021, and thus caught Europe relatively unprepared to the security of supply crisis unfolding after Russia's invasion of Ukraine on 24 February 2022. The EU actions taken in response aimed to ensure that storages were filled sufficiently to weather the 2022/2023 winter and ensure sufficient heating for citizens and continuity for essential businesses and the EU economy. The gas storage regulation, adopted in June 2022 by the Council foresaw a minimum filling rate of 80% by 1 November 2022 for most of the

⁹ <https://www.consilium.europa.eu/en/meetings/tte/2022/12/19/>

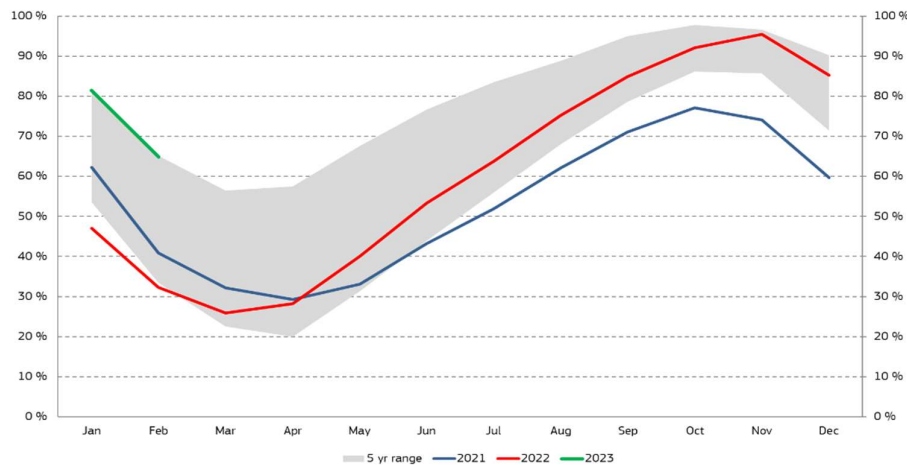
¹⁰ Gas year always starts on the 1 October of a given year, for example, gas year 2021 started on 1 October 2021 and will end on 30 September 2022

¹¹ <https://www.gie.eu/transparency/databases/storage-database/>

Member States. At EU level this was practically reached by the end of August 2022, two months before the deadline. The differential between quarter-ahead and two quarters-ahead prices to spot contracts continued to be favourable during most of the Q4 of 2022, giving a strong incentive to refill storages. Backwardation, when spot prices were higher than the TTF quarter-ahead and TTF two quarters-ahead prices appeared only for a short period between 7 and 15 December 2022.

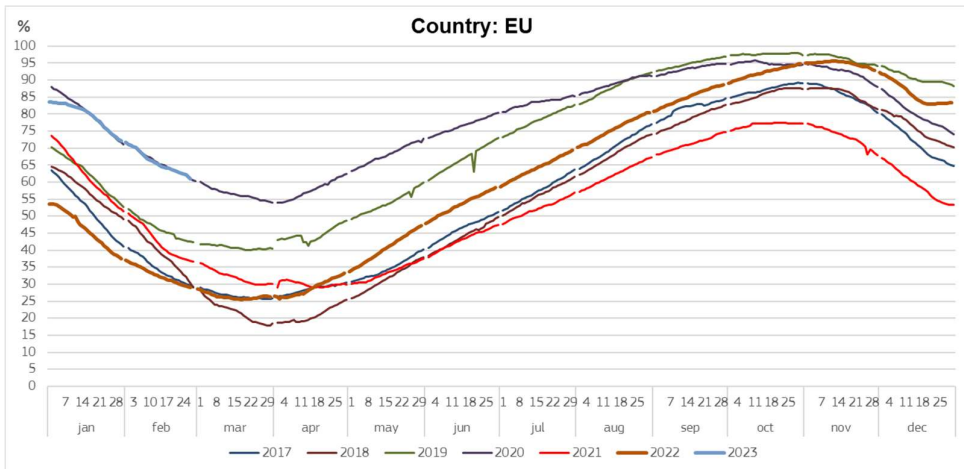
- Average filling rates in the fourth quarter stood at 91%, a year-on-year increase of 29%. In a monthly perspective, storage levels were comfortably above 90% in October and November and in the upper band of the five-year average, and still stood at above 85% in December, 43% higher than in the same time in the previous year. In the Q4 of 2022, storage injections were still strong and surpassed the very high filling rate of September in six Member States (AT, BG, CZ, ES, HR, PT). Faster storage replenishment was facilitated by significantly higher LNG inflows in the fourth quarter, surpassing by 13% an already record high import in the third quarter and aided by additional pipeline supply partially off-setting the rapidly dwindling pipeline gas imports from Russia, combined with significantly lower gas consumption. The peak was reached on 13 November (95.6%), almost a month later than usually, owing to mild weather and the delayed start of the heating season.
- Since the start of the storage filling season until the spring of 2021, storages operated by Gazprom in the EU could be characterised by much lower filling rates compared to other facilities, which resulted in lower than usual overall filling rates on EU averages during the 2021/22 winter heating season. During spring 2022, formerly Gazprom managed storages (the facilities of Bergermeer in the Netherlands, Rehden and Katharina in Germany, Haidach in Austria and Damboricein in Czechia were practically requisitioned, partly or totally, by the national governments upon the 'use it or lose it' principles of gas security of supply regulations). In consequence, storage filling rates in formerly Gazprom managed facilities started to catch up rapidly. On 30 June 2022, storages formerly operated by Gazprom had an average filling rate of 25.7%, whereas other EU storages had a filling rate 61.7%. By 30 September this gap of 36 percent fell to 9 percent, and by 2 November both 'Gazprom' and 'non-Gazprom' related storage filling rates rose to 95%. During November and December the gap between the two groups disappeared and was reversed, as Figure 19 shows.

Figure 17 - Gas storage levels as percentage of maximum gas storage capacity in the EU in the middle of the month



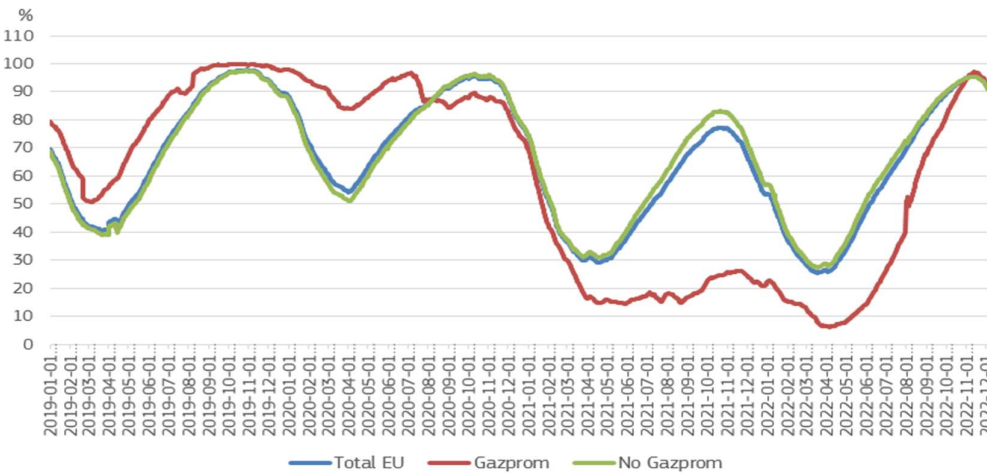
Source: Gas Storage Europe AGSI+ Aggregated Gas Storage Inventory, 2022. See explanations on data coverage at <https://agsi.gie.eu/#/faq>. The 5-year range reflects stock levels in years 2015-2019. The graph shows stock levels on the 15th day of the given month.

Figure 18 – Daily gas storage levels in the EU on average in per cent of total available storage capacities



Source: Gas Storage Europe AGSI+ Aggregated Gas Storage Inventory. See explanations on data coverage at <https://agsi.gie.eu/#/faq>.

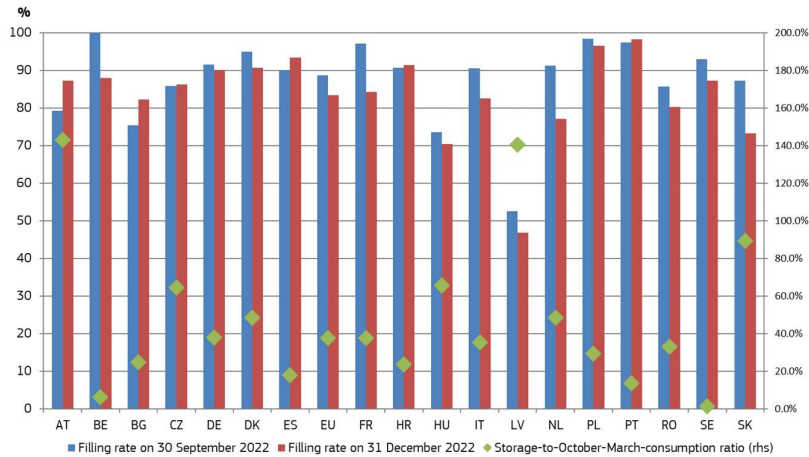
Figure 19 – Difference in the filling rates of 'Gazprom-controlled' storages and other storages



Source: JRC calculations, based on Gas Storage Europe AGSI+ data

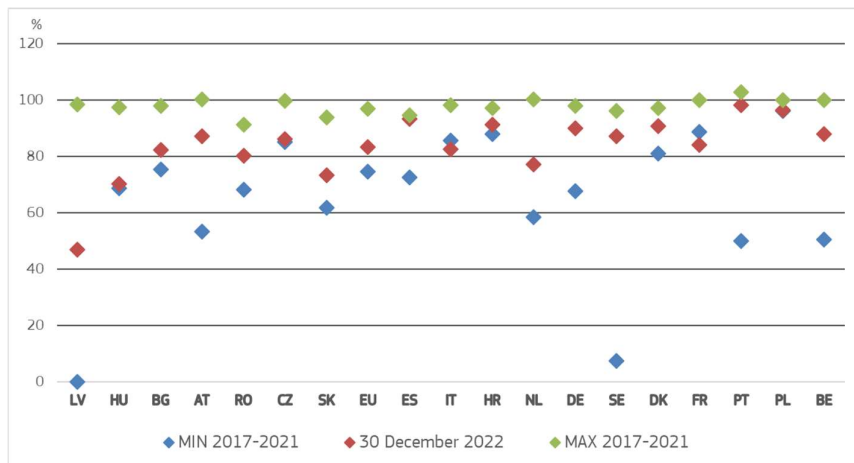
- On 31 December 2022, the EU average filling rate was 83.3% with the lowest filling rates in Latvia (46.7%). This level passed as exceptionally low in the situation at that time as in the group of closest lows were Hungary, the Netherlands and Slovakia, all above the 70% filling rate (HU: 70.4%, SK: 73.3%, NL: 77.1%). Most countries managed to get their filling rate above 80% starting with Romania (80.2%) with the lowest value and ending with Belgium (88%) at the highest point. Germany (90.1%), Denmark (90.7%) and Poland (96.6%) had the highest fullness rates at the end of December 2022.

Figure 20 - Gas storage levels as percentage of maximum gas storage capacity at the end of September and December 2022, and the share of winter consumption covered by gas stored on 31 December, by Member State



Source: Gas Storage Europe AGSI+ Aggregated Gas Storage Inventory, 2022. See explanations on data coverage at <https://aqsi.gie.eu/#/faq>. Injection level data in Sweden changed significantly for the first time since the first data reporting period in March 2017. Nevertheless, the Swedish storage facility has a limited capacity (10 mcm), mainly used for LNG storage.

Figure 21 – Gas storage levels on 31 December 2022, compared with five-year minimums and maximums



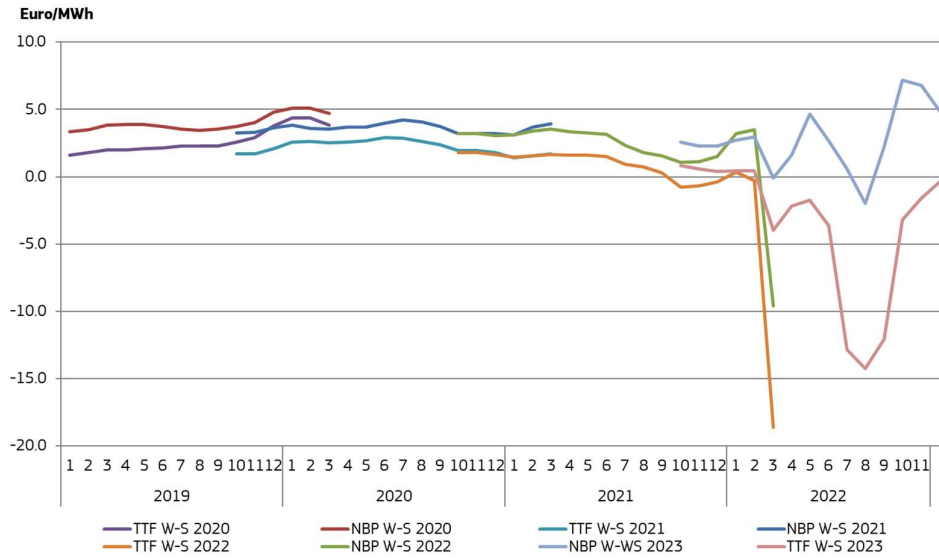
Source: Gas Storage Europe AGSI+ Aggregated Gas Storage Inventory, extracted on 31 December 2022

- The next two charts (Figure 22 and Figure 23) show the winter-summer spreads, (difference in the winter and summer contracts for given years). Difference between winter and summer contracts, if positive, give incentive to gas storage operators to inject gas during the injection (summer) season, as winter contract prices are higher, so the storage activity is profitable. In the case of negative winter summer spreads there is a lack of such incentive, implying that storing gas is not profitable, assuming all other factors unchanged. Figure 24 also shows the difference between the spot prices and quarter-ahead and two quarters-ahead contracts, which on the short run can also be a good metric for assessing incentives to refill gas storages for the next heating season.
- After deeply negative winter-summer spreads in Q3 2022 falling to a range of -12-14 €/MWh, reflecting that high spot and front-curve prices in August and September also impacted contracts of summer 2023 and winter 2023/24, the spreads came back from low levels but remained in the negative range around - 3-1 €/MWh until mid-December, when the spread finally turned positive. However, taking the monthly averages, winter-summer spread remained negative throughout the last three months of Q4 2022, indicating the market expected lower prices ahead in 2023.
- Looking at the difference between the spot TTF prices and quarter-ahead and two quarters-ahead contracts, they rose to very high levels during October in parallel with the sudden drop in spot prices from mid-October through the first week of November (at least compared to prices in July and September, where they were mostly close to 200 €/MWh and significantly above 200 €/MWh in most of August) indicating strong incentives on the market to fill up gas storages. This was promptly reflected in the faster refilling rate in October and November compared to the previous quarter and significantly above the refilling rate in the same period a year before). However, the spreads decreased significantly starting in the second week of October and continued their descent into the first week of December, when they turned negative between 6 and 20 December in parallel with spot prices raising significantly

above 100 €/MWh. Just before Christmas and until the end of December, the spreads were positive again reflecting spot prices coming down below 100 €/MWh in the range of 74-94 €/MWh.

- Expressed in quarterly averages, the spread of TTF price with quarter-ahead contracts was 3.6 times higher and with two quarters-ahead contracts almost 5 times higher in Q4 than in Q3 of 2022. Looking at the whole year of 2022, the spreads with quarter-ahead and two quarters-ahead contracts started from negative values (- 3,3 €/MWh and - 5 €/MWh, respectively) in Q1; they turned positive (with average values of 3,5 €/MWh and 5,2 €/MWh) in Q2, then increased more than three fold (+252%) and one and half fold (+46%), respectively (10.96 €/MWh and 7.61 €/MWh) in Q3 and ended up with close to quadrupling (+266%) and quintupling (+391) in Q4 (reaching average values of 40.12 €/MWh and 37.33 €/MWh, respectively). The steady rise in the average quarterly spreads over 2022 mirrors the extrem volatility experienced that year in both upside and downside directions, but with a clearly dominating upward price movement.
- At the same time, the seasonal spread on the NBP remained mostly in the positive range in October and November (hovering around values close to 6-8 €/MWh in October and 7-11 €/MWh, respectively), turning negative in December only.

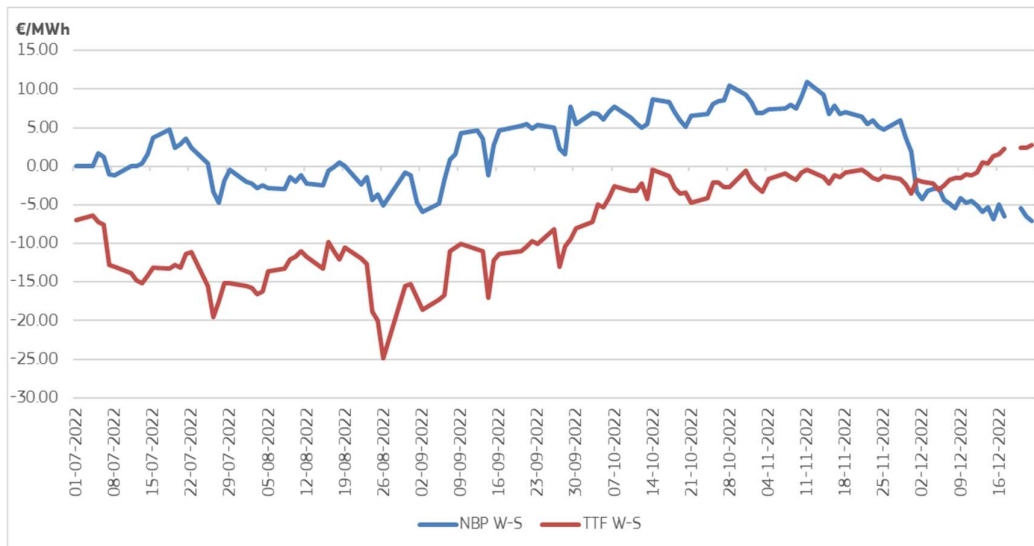
Figure 22 - Winter-summer spreads on the Dutch and British gas hubs



Source: S&P Global Platts

W-S 2020 refers to the premium of the winter 2020-21 contract over the summer 2020 price, W-S 2021 refers to the premium of winter 2021-22 contract over the summer 2021 price, and W-S 2022 refers to the premium of the winter period of 2022/23 over the price in the summer period of 2022 price, W-S 2023 refers to the premium of the winter period of 2023/24 over the price in the summer period of 2023.

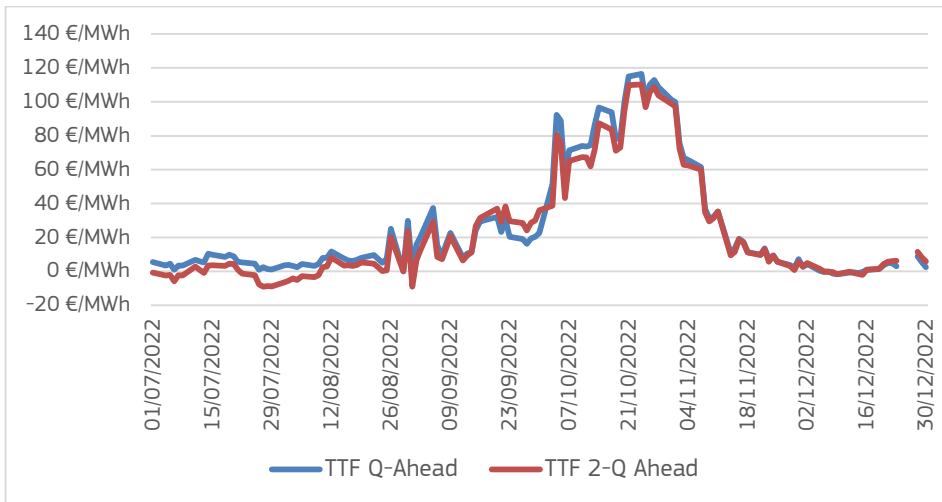
Figure 23 – Daily winter-summer spread on the Dutch TTF hub



Source: S&P Global Platts

W-5 refers to W-5 2023.

Figure 24 – Spot TTF prices compared with quarter-ahead and two quarters-ahead contracts



Source: S&P Global Platts

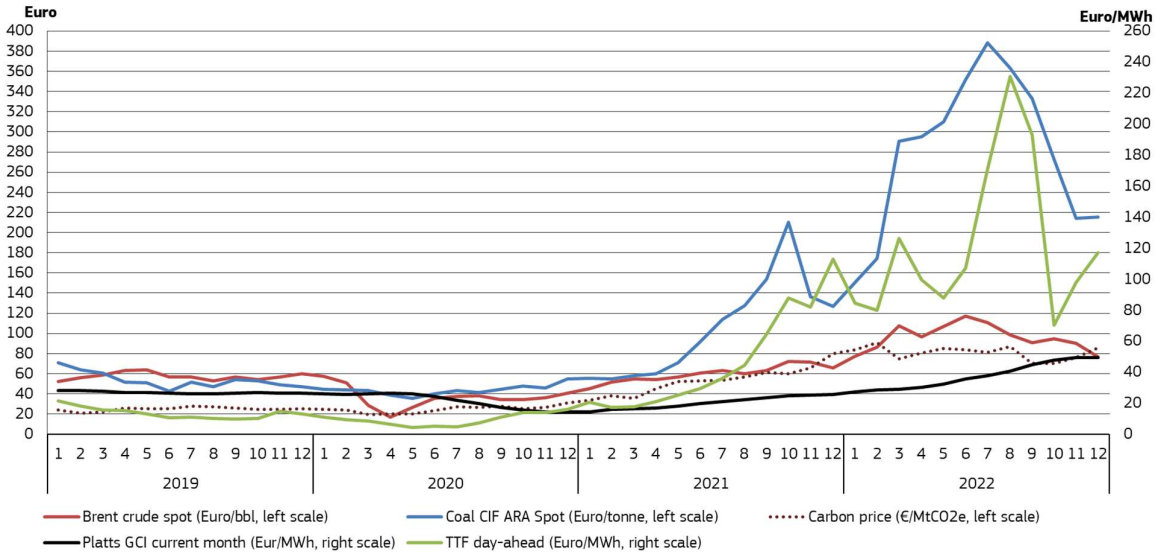
2. Wholesale gas markets

2.1 EU energy commodity markets

- In the fourth quarter of 2022, gas prices started to normalise after the supply disruption in the summer and the complete halt of two pipelines (Nord Stream 1 and Yamal) in early September, which caused the TTF day-ahead price to rise significantly, from 146 €/MWh early July to an all-time high, 320 €/MWh on 26 August, falling back to 165 €/MWh by the end of September. As a result of the EU's quick policy intervention on demand reduction adopted in August and further EU legislative acts in November to address excessive energy prices and increase price transparency, the average price in October decreased to 133 €/MWh from 203 €/MWh in September, decreased again in November to 119 €/MWh and eased to 118 €/MWh in December 2022. TTF day-ahead gas prices fell below 100 €/MWh for a short time in October as LNG cargoes could not unload their gas shipments in north-west European terminals, resulting in a local congestion. In November with the onset of colder weather TTF day-ahead gas prices rose again and were in the range of 130-140 €/MWh in the first half of December, declining rather abruptly in the last week reaching a low of 75 €/MWh on 30 December.
- Platt's North West Europe Gas Contract Indicator (GCI), a theoretical index showing a gas price linked 100% to oil, continued its upturn in Q4 2022 from an increase already seen in Q3, mirroring the steady increase of crude oil prices in the first six months of 2022. Typically, crude oil price changes appear in the oil-indexed contracts with a time lag of 6 months. GCI contracts rose from 45 €/MWh in September 2022 to 48 €/MWh in October, to 50 €/MWh in November 2022 (the highest in more than a decade), but stayed at that level in December (and even showing an almost imperceptible decline from 49.65 €/MWh to 49.31 €/MWh), indicating that the peak has been reached and the GCI contracts will follow the decline in crude oil prices that started in July with a level of 117 USD/bbl and ended 77 USD/bbl in December. Decreasing crude oil prices in autumn and winter of 2022 are expected to filter in oil-indexed gas contracts beginning of 2023.
- Spot coal prices (CIF ARA) decreased from their peak reached around an average of 388 €/Mt in July 2022 and came back below 300 €/Mt in October. In November and December their average was 214 €/Mt-215 €/Mt showing a range of above 230-260 €/Mt during the second part of November and the first part of December, but falling to 172-117 €/Mt in the last week of December. The August 2022 import ban of Russian coal was anticipated already in July pushing up prices above 400 €/Mt, but the peak of 418 €/Mt was reached only on 22 August, when the ban entered into force in the EU. During the autumn and winter months of 2022 the movement of coal prices slightly anticipated that of gas prices, as Figure 26 shows.
- Carbon prices in the fourth quarter have shown a steady upward trend. After descending in September reaching 65 €/MtCO_{2e}, the lowest in 2022, they started to recover in October by moving to above 60 €/MtCO_{2e} price range, increasing above 70 €/MtCO_{2e} in November and above 80 €/MtCO_{2e} in December. Average prices were 70 €/MtCO_{2e}, 76 €/MtCO_{2e} and 85 €/MtCO_{2e} in October, November, December, respectively. Looking at the whole year of 2022, carbon prices were high, above 80-90 €/MtCO_{2e} in the first two months of the year, coming down to 75 €/MtCO_{2e} in March and going up again to the 80-90 €/MtCO_{2e} range from May to August and going back to the 70-76 €/MtCO_{2e} range in September-November reaching again price levels above 80 €/MtCO_{2e} in

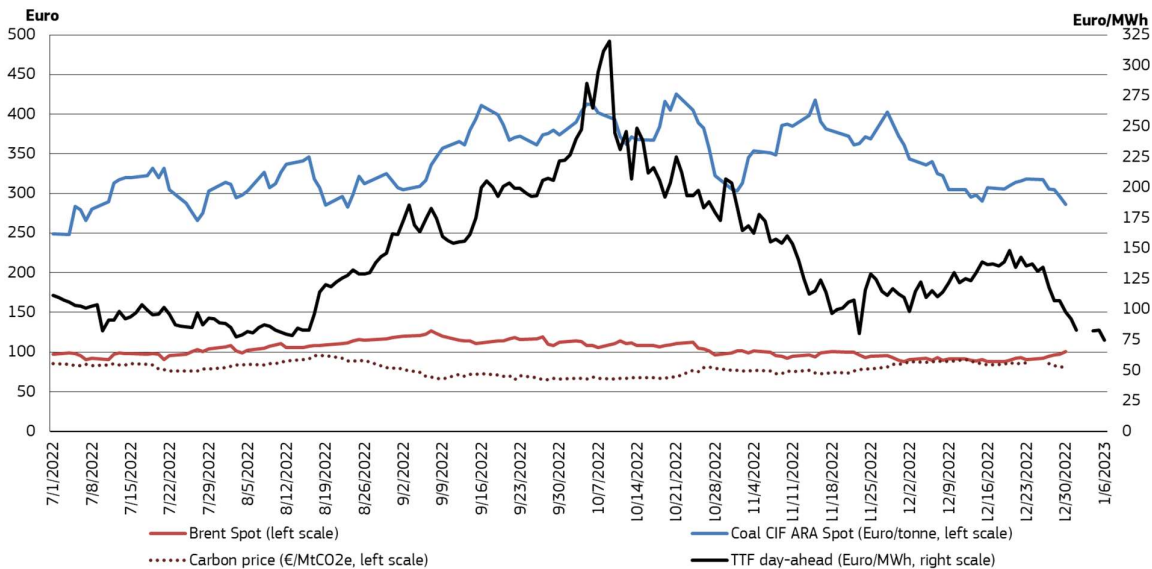
December 2022. There were two peaks in that year, one on 8 February being (96,4 €/MtCO₂e the absolut highest) and 18-19 August (95.6 €/MtCO₂e).

Figure 25 – Monthly spot prices of oil, coal and gas in the EU



Source: S&P Global Platts

Figure 26 - Monthly spot prices of oil, coal and gas in the EU



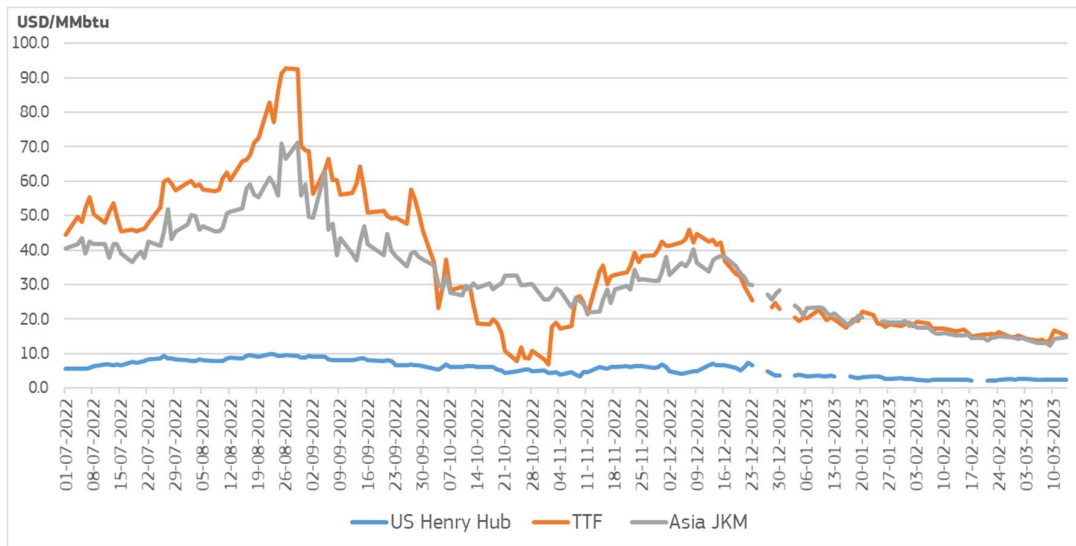
Source: S&P Global Platts

2.2 LNG and international gas markets

- Figure 27 displays the international comparison of wholesale gas prices, including the US Henry Hub, the Asian JKM and the Dutch TTF. In the Q4 of 2022, the Henry Hub spot prices came down from their fourteen-year high in August 2022 (8.8 USD/mmbtu on average) and returned to an average of 5.5 USD/mmbtu, similar to price levels a year earlier, in the last quarter of 2021. An abundant and more diversified supply of LNG brought down LNG import prices in Europe putting a downward pressure on the selling price including for LNG shipments from the US. As around half of LNG exports from the US were sent to Europe, so the European gas market had increasing importance in shaping US domestic wholesale gas prices.
- In the fourth quarter of 2022, TTF averaged at 28.6 USD/mmbtu (95 €/MWh), down from 58.5 USD/mmbtu (198 €/MWh) in Q3 2022, a significant decrease after the all time highs in Q3 although it still showed considerable volatility. Asian JKM also followed a

downward trend as TTF but was much less volatile. After being above the JKM throughout the summer, in October the TTF premium turned to discount vis-à-vis the Asian markets, owing to LNG cargo congestion at the shores of North-Western Europe as result of very high underground storage filling rates, which made it difficult to absorb additional LNG volumes. In November as spot TTF prices rose, the TTF premium to Asia returned.

Figure 27 – Daily average prices on the TTF (Dutch), the US Henry hub and the JKM Asian reference index



Sources: S&P Global Platts

Figure 28 – The difference of the daily JKM and TTF spots



Sources: S&P Global Platts

- Similarly to JKM, LNG prices were relatively more stable than TTF, moving in the range between 70 €/MWh and 110 €/MWh. In the second half of October, LNG was priced at a significant premium compared to TTF. The situation was reserved in November and early December when TTF spiked well above (prox. +30 €/MWh) the LNG prices.

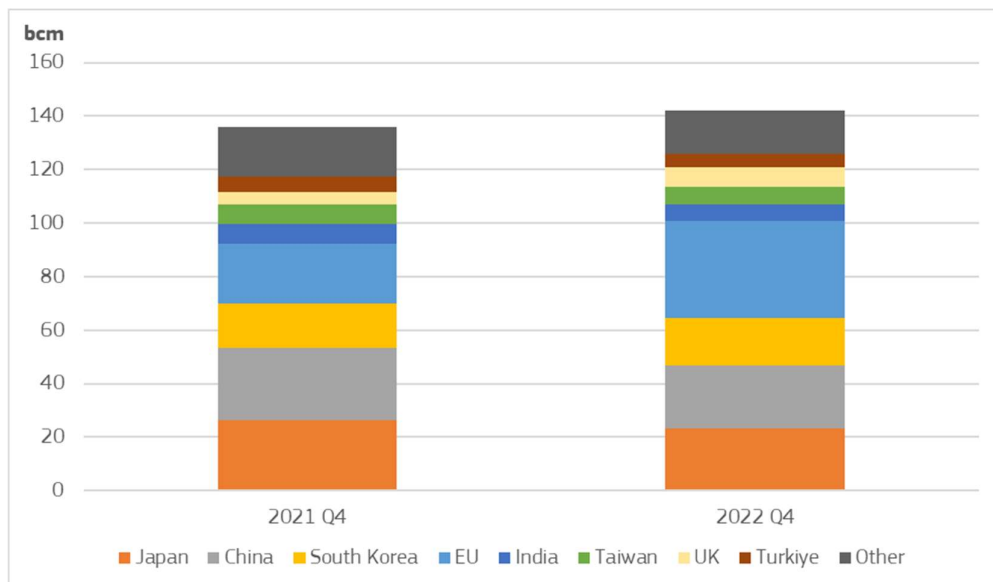
Figure 29 – LNG import benchmarks on north-western and south-western Europe compared with TTF



Sources: S&P Global Platts

- The next two charts show the key actors of global LNG trade on importer (consumer) and exporter (producer) side. In the fourth quarter of 2022, the EU remained the largest LNG importer in the world (with an import of 34.2 bcm), owing to favourable sales prices in Europe, whereas China took the second place, with imports of 23.5 bcm, followed by Japan (23.3 bcm), the UK (7.3 bcm), South Korea (17.6 bcm), Taiwan (6.5 bcm), India (6.2 bcm), and Turkey (5.0 bcm). Other importers together amounted to 16 bcm. The total global LNG market could be estimated at 142 bcm in Q4, a 6% increase from 134 bcm in Q3 2022, and 4% up from 136 bcm in Q4 2021. Looking at the entire year, in 2022, the three biggest LNG importer were: the EU (134.6 bcm), Japan (100,7 bcm) and China (86 bcm).

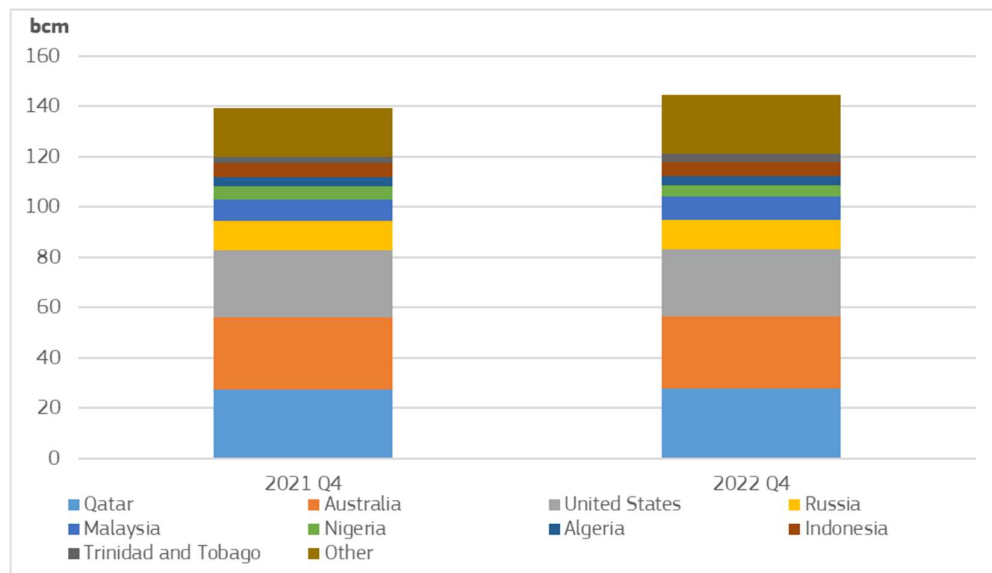
Figure 30 – LNG imports in the main consumer markets in the fourth quarters of 2021 and 2022



Source: Refinitiv tracking of LNG vessels. Import data are based on cargo arrival dates, therefore total amount of global imports might differ from global export numbers

- On the exporter side globally, in Q4 2022 Australia was the biggest exporter with 28.7 bcm, followed by Qatar with 27,8 and the United States (26.8 bcm). The fourth biggest LNG exporter was Russia (11.7 bcm), followed by Malaysia (9.2 bcm), Indonesia (5.8 bcm), Nigeria (4.2 bcm), Algeria (3.7 bcm) and Trinidad and Tobago (3.2 bcm). Looking at year-on-year changes, LNG exports rose by 23% in Trinidad and Tobago (+0.6 bcm), in Indonesia by 10% (0.5 bcm), in Malaysia (by 8%, +0.7 bcm), in Qatar (by 2%, + 0.6 bcm) and United States (by 1%, + 0.2 bcm). Russia exported almost the exact same amount in the Q4 of 2022 as in Q4 2021 (by +0.2%, -0.03 bcm). Export fell substantially in Nigeria (by 20%, -1.1 bcm). Algeria reduced its export by 2% (0.08 bcm) and Australia by 1% (-0.25 bcm). Looking at the entire year, in 2022, the three biggest LNG exporters performed almost equally: the biggest exporter remained Australia (110.6 bcm) while the United States (108 bcm), and Qatar (108.5 bcm) were in a close tie. The fourth biggest LNG exporter remained Russia with less than half of export volume compared to the leading three exporters (44.7 bcm), followed by Malaysia in the fifth place (37,1 bcm).

Figure 31 – LNG exports from the main gas producers in the fourth quarters of 2021 and 2022



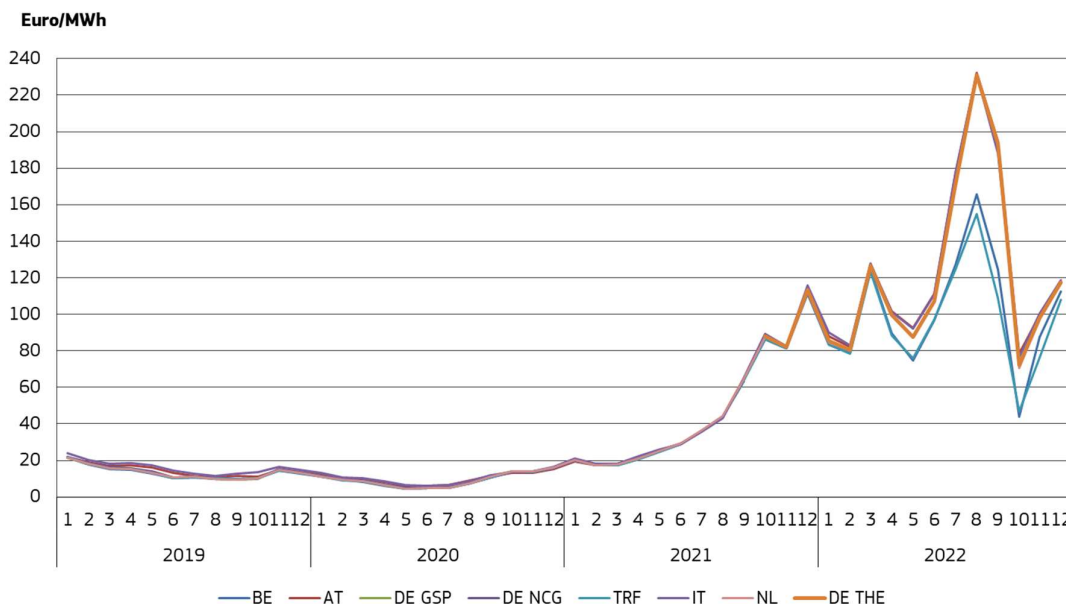
Source: Refinitiv tracking of LNG vessels. Export data are based on cargo departure dates, therefore total amount of global exports might differ from global import numbers

2.3 European gas markets

2.3.2 Wholesale price developments in the EU

- In the fourth quarter, prices across European hubs fell from the all time highs in July and September of 2022. In October, prices more than halved from the levels they stood at in September. For example, in the Dutch hub, the price fell from 193 €/MWh in September (it was at 231 €/MWh in August) to 70 €/MWh in October. Similar sharp decreases were experienced in other European hubs. In Belgium, the spot hub prices dropped from 125 €/MWh in September to 44 €/MWh in October; in Austria from 195 €/MWh to 79 €/MWh; in Germany from 193 €/MWh to 72 €/MWh and in Italy from 188 €/MWh to 76 €/MWh. In October 2022, the European hub prices had an average level of 64 €/MWh, a 59% decrease from 154 €/MWh in August. On a quarterly basis, prices dropped 52% in the Dutch and German hubs, 51% in Austria and Italy, 42% in Belgium, 40% in France and 37% in Spain, while in the UK the drop was 41%.
- Looking closer into price developments in the European hubs in the fourth quarter, in November prices started to rise again and continued rising in December. While the range between the minimum and maximum prices was 44 €/MWh (BE) and 78 €/MWh (AT) in October, this range has risen to a minimum-maximum of 76 €/MWh (BE) and 100 €/MWh (IT) in November and to 108 €/MWh (FR) and 119 €/MWh (IT) in December. On a year-on-year basis, the Q4 average prices were down 12% in Belgium, 17% in France, 27% in UK and 6% in Spain; while they were higher by 4% in Austria, 2% in Germany, 3% in Italy and 1% in The Netherlands.
- In the fourth quarter of 2022, better than expected storage filling rates and warmer than usual weather, resulting in a drop of seasonal gas demand, exerted a lowering pressure on spot gas hub prices in combination with the impacts of policy measures, in particular the significant reduction of demand reduction following the entry into force in early August of Council Regulation (EU) 2022/1369. The large October drop in prices was also caused by the sudden influx of cargoes attracted to Europe by the excessively high gas prices in August and July and the saturated LNG terminal capacity to unload them.

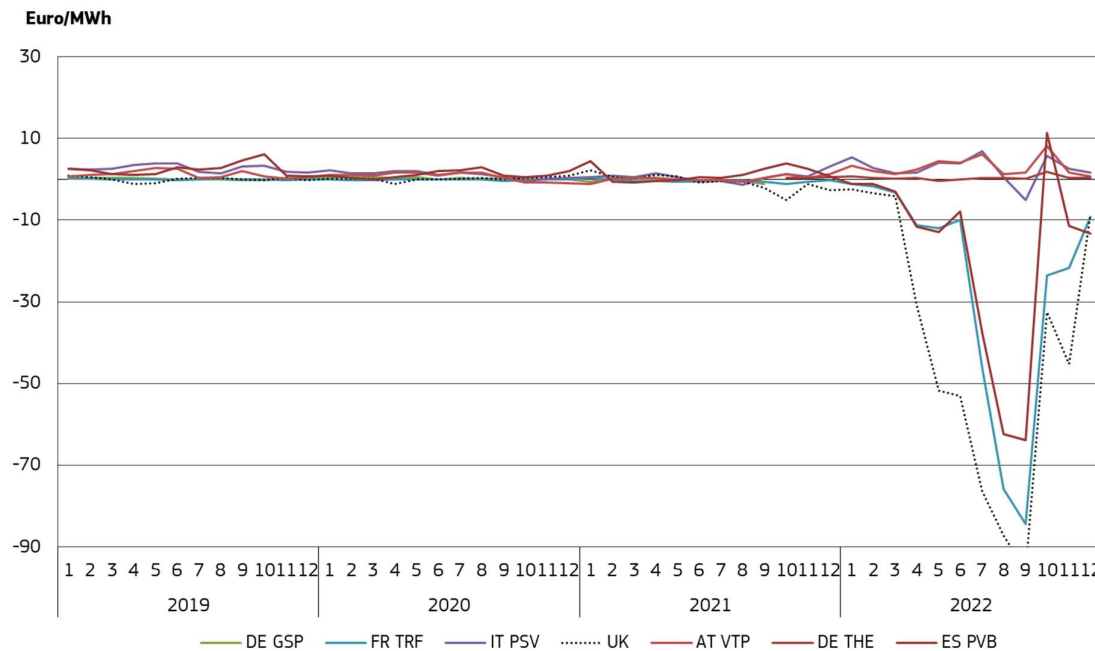
Figure 32 - Wholesale day-ahead gas prices on gas hubs in the EU



Source: S&P Global Platts

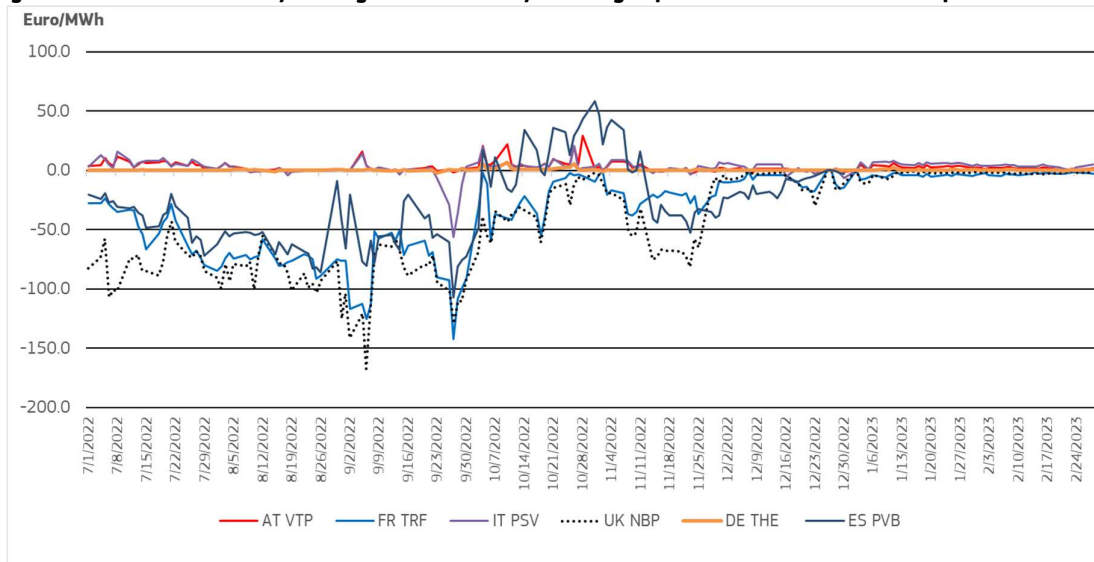
- As Figure 33 and Figure 34 show, the deep discount experienced in the UK, French TRF, Belgium and Spain's PVB markets during Q3 2022, started to reduce significantly in October and November, while still remaining large compared to historic values. In December, the peak differentials of September were further reduced but still remained significant. The highest discount, 95.8 €/MWh in the UK in September, was reduced to 8,54 €/MWh, a still significant price difference, even after an eleven fold reduction of the previous record discount values. The second highest discount of 84.4 €/MWh in France in September fell to 9.11 €/MWh, a nine fold decrease, but still French discount levels were the highest amongst European hubs in December. The discount in Belgium fell more than fourteen fold from the peak of 68 €/MWh in September to 4.8 €/MWh, while a similar peak discount of 63.8 €/MWh in Spain in September shrank to 13.2 €/MWh in December. The quarter-on-quarter discount reduction was 77% in Belgium, 74% in France and 67% in UK. In Spain, the deep discount of 63.8 €/MWh turned into a premium of 11.4 €/MWh in October and then turned again into a deep discount of 11.4 €/MWh and 13.2 €/MWh in November and December, respectively. The negative price differentials displayed a decreasing trends but they remained significantly above historic values. The Q4 2021 discount on the hubs of Belgium and Italy was just -1 €/MWh, and it was -3 €/MWh in the UK. Price premium was 1 €/MWh in Austria, and 2 €/MWh in Italy and Spain in the 4Q of the previous year.
- Compared to other western European benchmarks, the German THE market remained the closest aligned with the TTF in Q4 2022, except for October, when it has shown a bigger premium of 1.9 €/MWh, and had the smallest premium over the Dutch hub, principally owing to less direct access to LNG. The Austrian and Italian hubs have shown an increasing price premium in Q4 compared to Q3, but within the fourth quarter the initial high premiums of 8.1 €/MWh in Austria and 5.7 €/MWh in Italy reduced to more moderate values of 0.75 €/MWh (Austria) and 1.7 €/MWh (Italy). In the DE THE, the peak premium of 1.9 €/MWh in October decreased to 0.3 €/MWh in November, but increased again to 0.35 €/MWh in December. Quarter-on-quarter, the reduction of differentials were impacted by good storage filling rates, and high capacity utilisation rates on most LNG terminals in Europe ..
- The hubs in Belgium, France and UK remained at discount to the TTF through the entire Q4. Spain was at premium to the TTF in most of October and the first half of November, but turned into discount in mid-October and from mid-November until the end of December. On a monthly average basis, the hub in Austria remained at premium; however, there were twelve days mostly on November and a few in December, when the hub was at discount to the TTF market.

- **Figure 33 - Premium of monthly average wholesale day-ahead gas prices at selected hubs compared to TTF**



Source: S&P Global Platts, European Commission computations

Figure 34 - Premium of daily average wholesale day-ahead gas prices at selected hubs compared to TTF

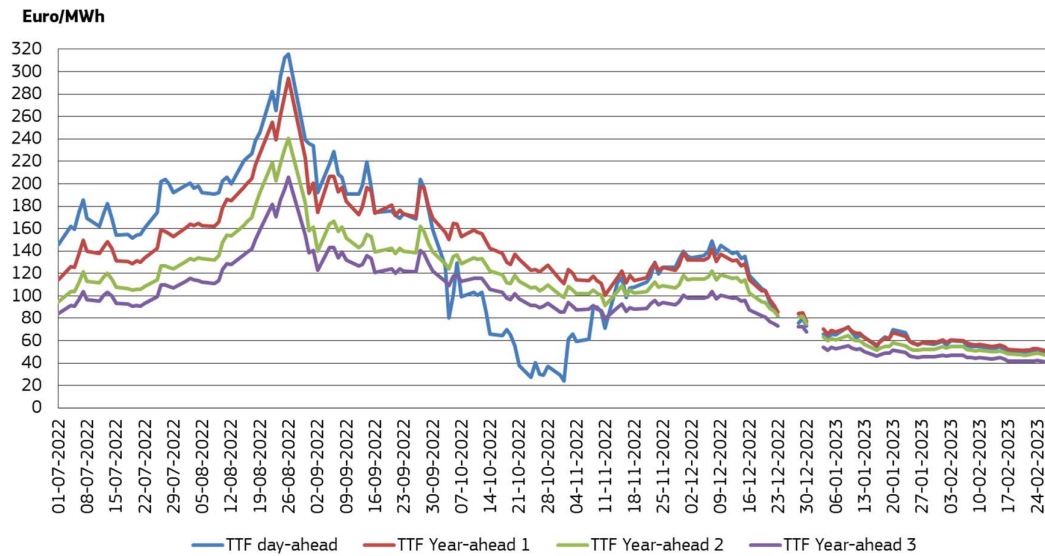


Source: S&P Global Platts, European Commission computations

- Figure 35 looks at the development of forward prices of one-year, two-year and three-year ahead contracts in comparison to the development of the day-ahead price on the Dutch TTF.
- Daily spot prices on the TTF hub kept being volatile over Q4 2022 with values ranging between 27,5 €/MWh and 129,5 €/MWh in October and between 23,7 €/MWh and 140 €/MWh in November. In October, at the beginning of Q4, the spot daily average stood at 70 €/MWh, the lowest in this quarter, while year-ahead, two years-ahead, and three years-ahead contracts were at significant premium at 140 €/MWh, 120 €/MWh and 103 €/MWh, respectively. This reflected the sudden fall of spot prices in October from the high of 316 €/MWh on 26 August and still above 200 €/MWh as late as 27 September and anticipated a rebound in prices. In November, when the average spot price rose to 98 €/MWh, the year-ahead and two years-ahead contracts were still at premium, even if decreased to 119 €/MWh and 105 €/MWh, respectively, while the three years-ahead contract has shown a discount at

90 €/MWh. In December, the spot price rose further to 117 €/MWh, while all three types of forward contracts fell to discount territory with the one year-ahead contract at 115 €/MWh, the two years-ahead contract at 103 €/MWh and three years-ahead contracts at 88 €/MWh, all anticipating gas price reduction ahead.

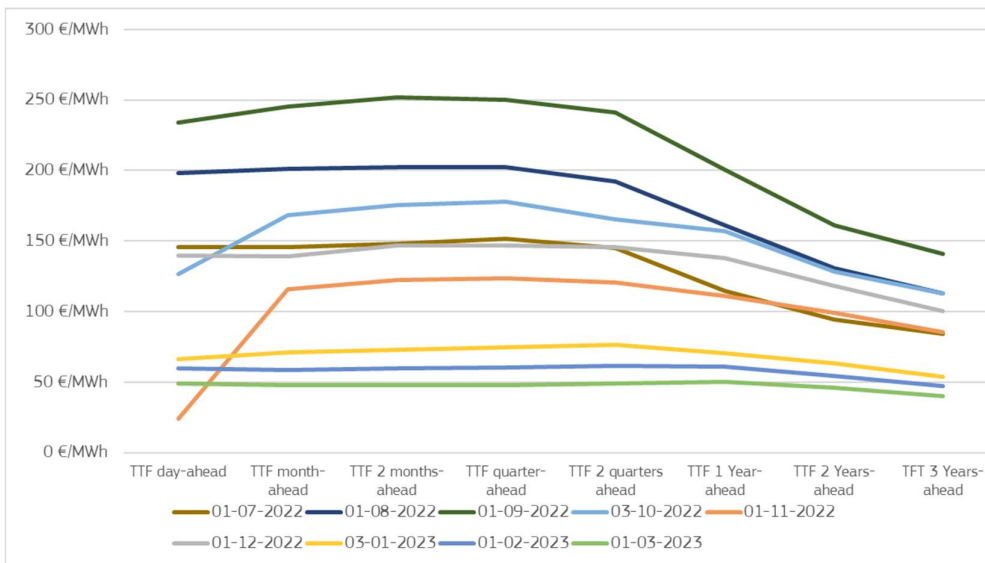
Figure 35 - Forward gas prices on the TTF hub



Source: S&P Global Platts

This expectation on ongoing high prices can also be followed on Figure 36, showing the forward price curves on the TTF market at the beginning of each month. In October and November with lower spot prices the forward curves shifted downward but anticipated higher prices in year ahead and two years ahead, while in December, the curve anticipated prices decreases already in the year ahead time frame.

Figure 36 - Forward price curves on the first trading day of each month on the TTF wholesale gas market



Source: S&P Global Platts

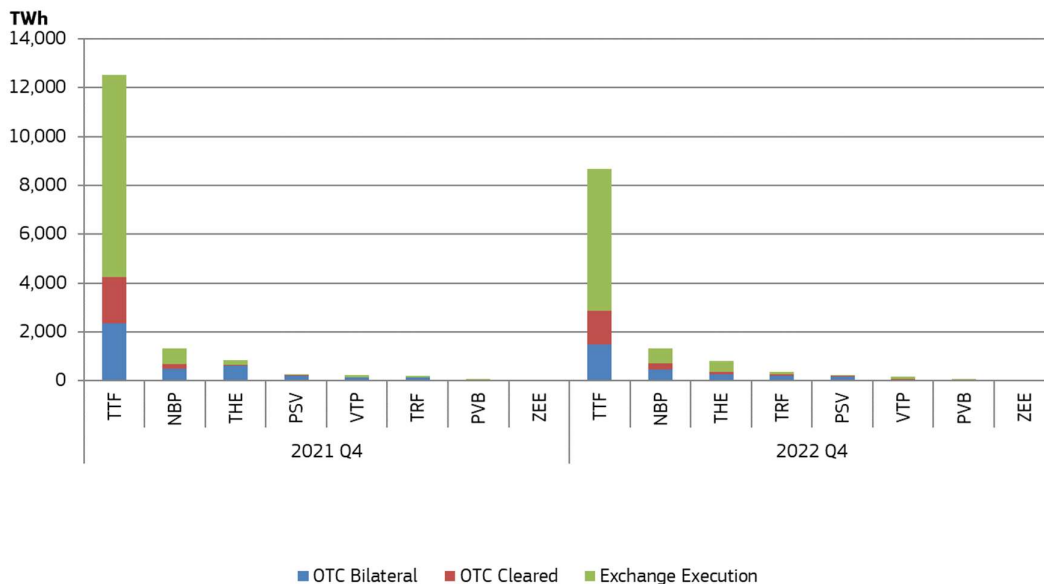
2.3.4. Gas trade on the EU hubs

- As Figure 37 shows, liquidity fell by 19% on the main European gas hubs in the fourth quarter of 2022 year-on-year (by approx. 900 TWh), after a fall of 26% in Q3 2022 and by 17% in Q2 2022. The total traded volume in Q4 2022 amounted to around 11 500 TWh (equivalent to around 1 070 bcm). Comparing to the EU as a whole, traded volume in Q4 2022 represented 10 times the total EU-27 gas consumption in this period.
- Observed hubs in Europe showed a mixed picture regarding the year-on-year evolution of traded volumes in Q4 2022. Volumes on the largest and most liquid TTF hub fell by a staggering 31% year-on-year. Similarly to TTF, volumes on the Italian PSV and the Austrian VTP showed a double-digit percentage decrease (by 16% and 25% respectively). In contrast, traded volumes on the French TRF hub increased by 43% , whereas on the Spanish and German hubs traded volumes fell by 6%. Traded volumes on the Belgian Zeebrugge hub fell (from a very low base value anyway) by 33% in Q4 2022 year-on-year.

In Q4 2022, TTF represented around 75% in the total European gas trade (incl. the UK NBP), down from 81% in Q4 2021. Other markets had lower shares: the UK NBP accounted for 11% of the trade in Europe, the German THE had a share of 7%, followed by the French TRF with 3%, PSV (1.6%) and VTP (1.4%), while the Spanish PVB and the Belgian Zeebrugge had only minor shares of respectively 0.4% and 0.1%.

- The share of exchange executed contracts on the Dutch TTF hub was 67% in Q4 2022, which was the highest among the observed countries, and was up by 1 percentage points compared to Q4 2021. On the NBP market, the share of exchange executed contracts was 48%. On the Austrian VTP, the share of exchange executed contracts was 60% followed by the THE German hub (57%).
- On the European hubs as whole, in Q4 2022 22% of the total trade was OTC bilateral, 16% was OTC cleared, and the share of exchange-executed contracts was 61% (from 58% in Q3 2022). The share of exchange-executed contracts remained practically stable year-on-year in Q4 2022.

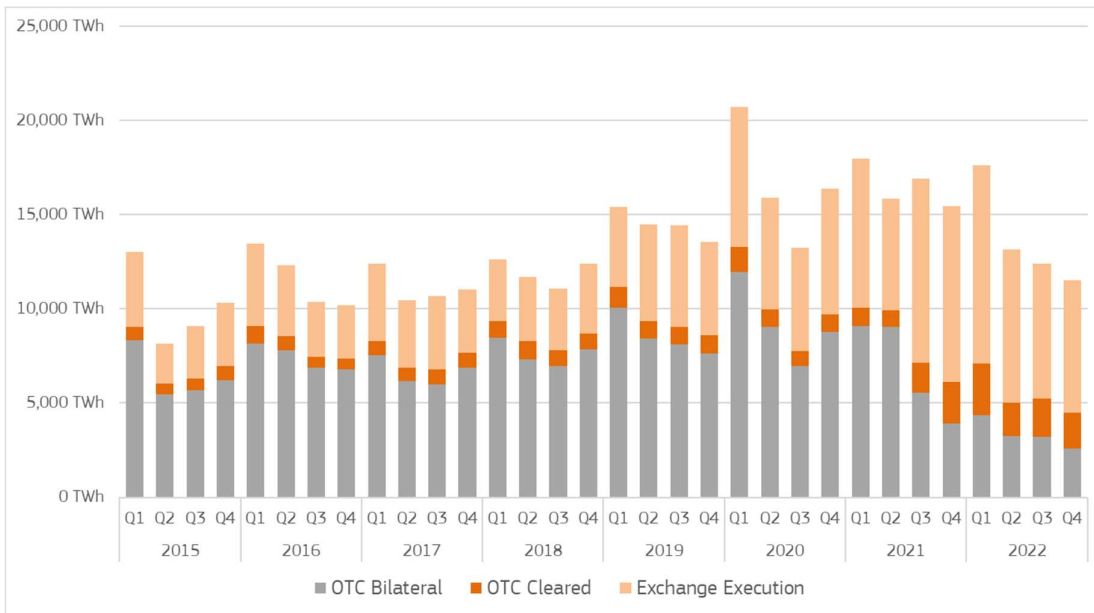
Figure 37 - Traded volumes on the main European gas hubs in the fourth quarters of 2021 and 2022



The chart covers the following trading hubs: Netherlands: TTF (Title Transfer Facility); Germany: THE (Trading Hub Europe); France: TRF (Trading Region France); Italy: PSV (Punto di Scambio Virtuale); Spain: PVB (Virtual Balancing Point); Austria: VTP (Virtual Trading Point); Belgium: Zeebrugge beach; UK: NBP (National Balancing Point)

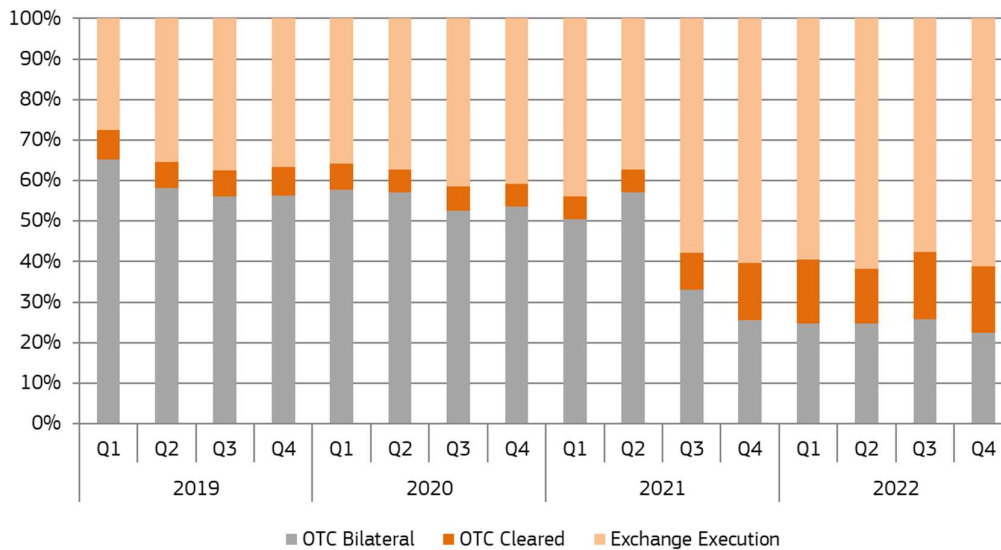
Source: Trayport Euro Commodities Market Dynamics Report

Figure 38 – Over the counter (OTC – bilateral and cleared) and exchange executed trade on the EU gas hubs



The chart covers the following trading hubs: Netherlands: TTF (Title Transfer Facility); Germany: THE (Trading Hub Europe); France: PEG (Point d'Echange Gaz); Italy: PSV (Punto di Scambio Virtuale); Spain: PVB (Virtual Balancing Point); Belgium: Zeebrugge beach, Austria: Virtual Trading Point (VTP); UK: NBP (National Balancing Point).
Source: Trayport Euro Commodities Market Dynamics Report

Figure 39 - Share of traded volumes on the main European gas hubs



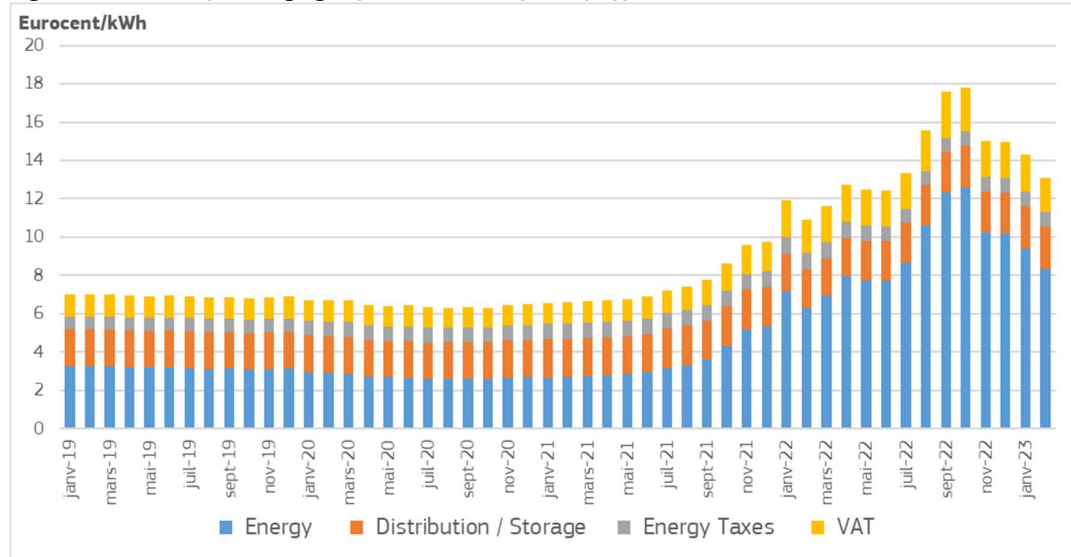
The chart covers the following trading hubs: Netherlands: TTF (Title Transfer Facility); Germany: THE (Trading Hub Europe); France: PEG (Point d'Echange Gaz); Italy: PSV (Punto di Scambio Virtuale); Spain: PVB (Virtual Balancing Point); Belgium: Zeebrugge beach, Austria: Virtual Trading Point (VTP); UK: NBP (National Balancing Point).
Source: Trayport Euro Commodities Market Dynamics Report

3. Retail gas markets in the EU and outside Europe

3.1 Recent developments on EU retail gas markets

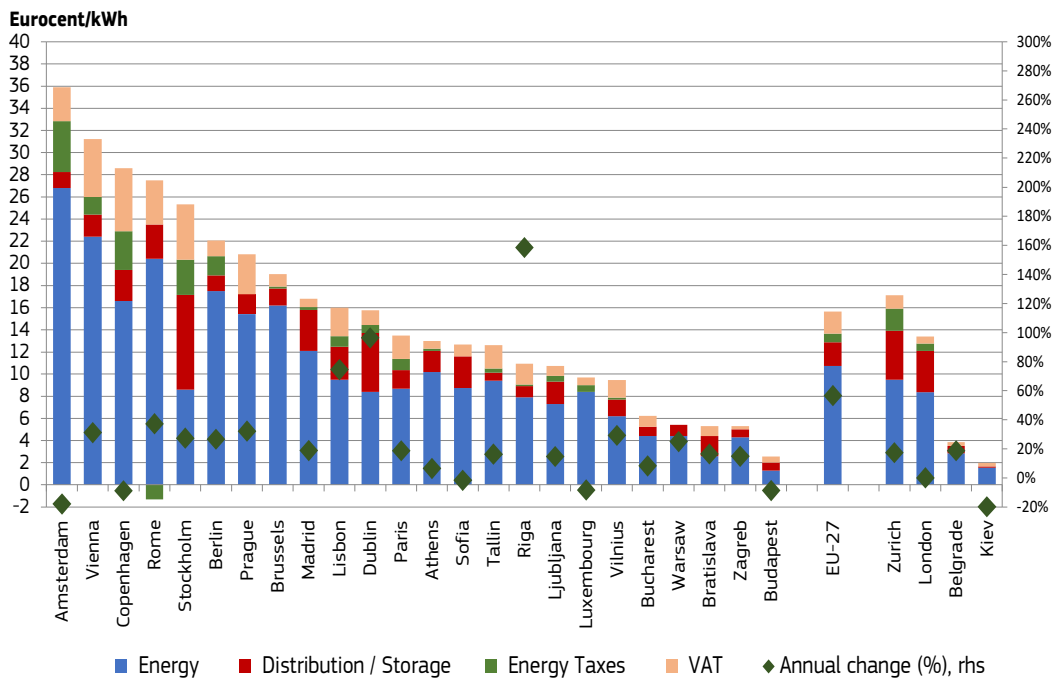
- For household consumers the estimated average quarterly retail prices in Q4 2022 in the EU (including all taxes) continued to rise although the pace of increase slowed from 23% (38% year-on-year) in the third quarter to 3% in the fourth quarter. The average price went up to 16 Eurocents/KWh from 15 Eurocents/KWh in Q3. Year-on-year the increase was 71%, somewhat lower than in Q3, when it was 108% year-on-year. Prices more than doubled from 7 Eurocents/KWh in 3Q 2021 to 16 Eurocents/KWh in 4Q 2022.
- In the fourth quarter, the biggest component of the price was energy reaching a share of 69% from 68% in the third quarter and from 53% in the same period of the previous year. Year-on-year the energy component grew 122%, the network component rose by 3% and the share of VAT increased by 36%, while the tax component shrank by 6%. Quarter-on-quarter, the tax component registered a rise of 8%, followed by a rise of 4% in the energy component and 2% in the network component, while VAT charges declined by 6%. The overall decrease of the direct and indirect tax elements reflect strategies by many Member States to mitigate excessively high energy prices with reduced rates of taxes and levies.
- In the fourth quarter of 2022, the significant differences in retail gas prices across the EU already seen in Q3 persisted, although the countries falling in the highest and lowest price levels partially changed. The lowest estimated household prices in the Q4 could be observed in Hungary (2.40 Eurocents/kWh), followed by Croatia (5.20 Eurocents/kWh), Slovakia (5.30 Eurocents/KWh), Poland (5.40 Eurocents/KWh), and Romania (6.30 Eurocents/KWh). On the other end, the Netherlands took the first place as the Member State with the highest price (35.80 Eurocents/KWh), followed by Austria (31.20 Eurocents/KWh), Denmark (28.50 Eurocents/KWh), Italy (26.2 Eurocents/kWh) and Sweden (21.9 Eurocents/kWh). Changes in prices have shown great variations among Member States depending on whether and at what pace price increases and decreases in the wholesale market have been let to influence retail prices. While great decreases during the quarter from October to December could be observed in Austria (from 35 Eurocents/KWh to 28,70 Eurocents/KWh), Italy (30,60 Eurocents/KWh to 21,10 Eurocents/KWh) and Denmark (41 Eurocents/KWh to 22,60 Eurocents/KWh) and the Netherlands (42,70 Eurocents/KWh to 30,70 Eurocents/KWh), significant upward movement took place in Germany (19,90 Eurocents/KWh to 22,90 Eurocents/KWh) and Sweden (22,80 Eurocents/KWh to 29,70 Eurocents/KWh). Retail prices remained unchanged throughout the period in Latvia, Lithuania, Slovakia and France (reflecting regulated prices), while in several Member States prices changed little (Poland, Romania, Slovenia, Ireland, Bulgaria, Belgium and Portugal).
- Figure 40 shows the monthly evolution of the EU average residential end-user retail gas prices over the last few years and Figure 41 shows the levels and breakdown of prices paid by typical households in the European capitals in the fourth quarter of 2022, and the change in percentages compared to a year earlier. The monthly evolution appears to follow wholesale gas prices, which peaked at the end of August and remained still very high in September 2022 on the EU gas hubs. In 2022 so far, as higher wholesale gas prices measurably appeared in the retail contracts, the share of the energy component within final consumer prices showed a significant increase. On average, 69% of the retail price could be assigned to the energy component in the fourth quarter (slightly up from 68% in Q3), while distribution/storage costs constituted 13%, energy taxes 5% and VAT 13%.
- As Figure 49 shows, there were significant differences in the fourth quarter of 2022 in the share of energy costs, distribution costs and taxes within the total prices across Member States. The share of energy costs ranged from 34% (Stockholm) and 50% (Bratislava) to 87% (Luxembourg), 82% (Zagreb) and 81% (Warsaw). The share of distribution/storage costs ranged from 0% (Luxembourg) 4% (The Hague) and 6% (Vienna and Tallinn) and to 37% () and 34% (Bratislava, Dublin and Stockholm). As regards the share of energy taxes, seven Member States (CZ, BG, HU, HR, PL, SK, RO) reduced it to zero, while two (BE, ES) kept it at 1%, and two Member States (GR, LT) at 2%. All but three Member States (SE, NL, DK) kept taxes above 10, and Italy introduced a -5% tax rate. The highest tax rates were 13% (NL) and 12% (DK, SE). VAT content in the total gas price also varied a lot across the EU – from 5% in Zagreb, Athens and Madrid to 21% in Budapest and 20% in Stockholm and Copenhagen.

Figure 40 – Monthly average gas price in the EU, paid by typical household customers.



Source: VaasaETT

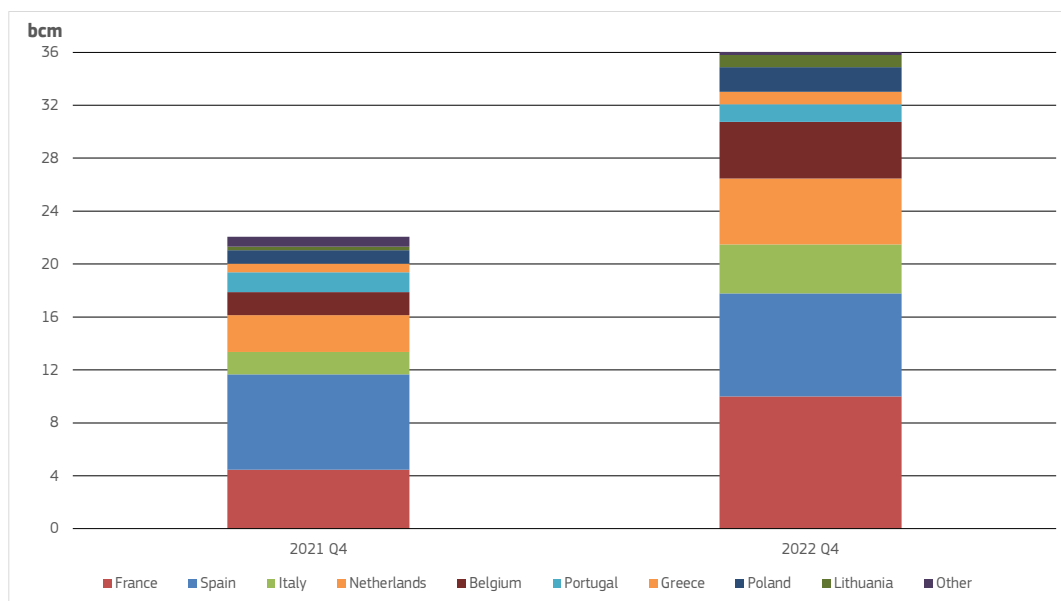
Figure 41 - Breakdown of gas price paid by typical household customers in European capitals and annual change in prices, Q4 2022



Source: VaasaETT. EU-27 represents an aggregate average of the 27 capital cities

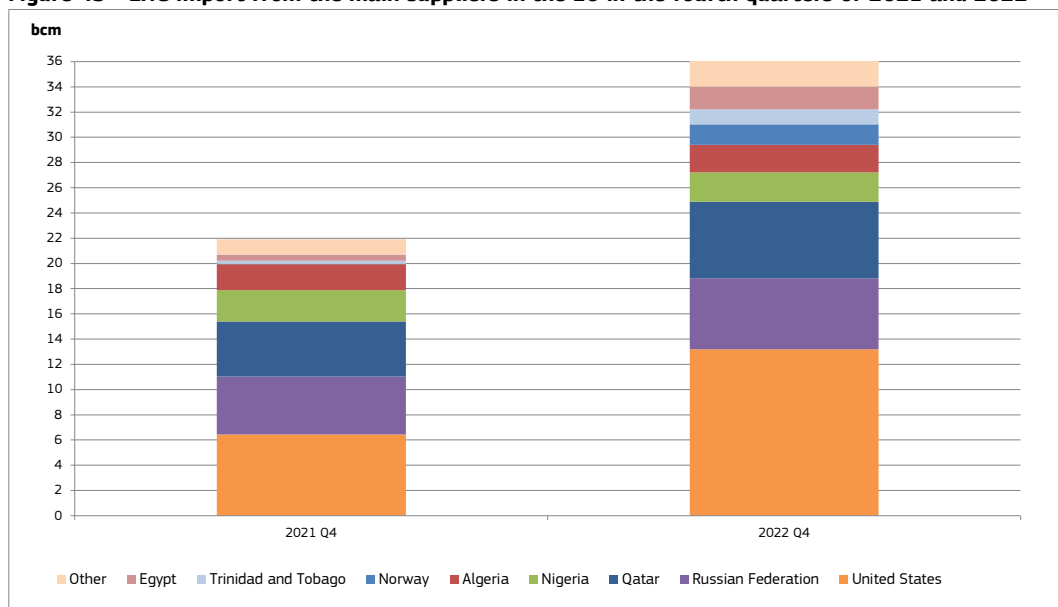
4. Appendix – charts providing further details on market developments¹²

Figure 42 – LNG imports in the EU Member States, fourth quarters of 2021 and 2022



Source: Refinitiv

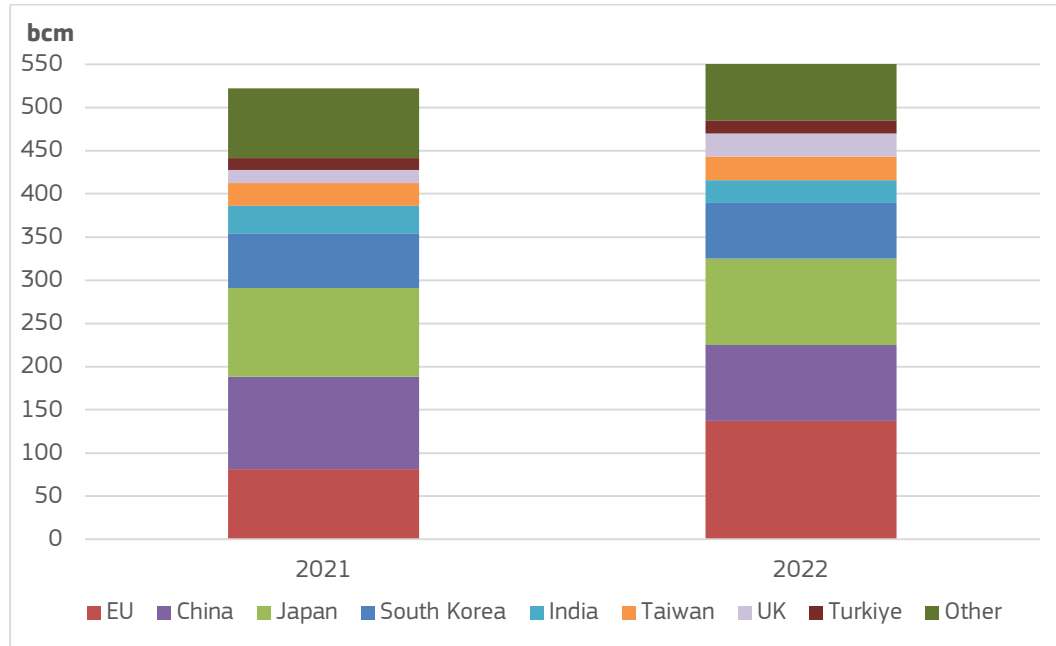
Figure 43 - LNG import from the main suppliers in the EU in the fourth quarters of 2021 and 2022



Source: Refinitiv

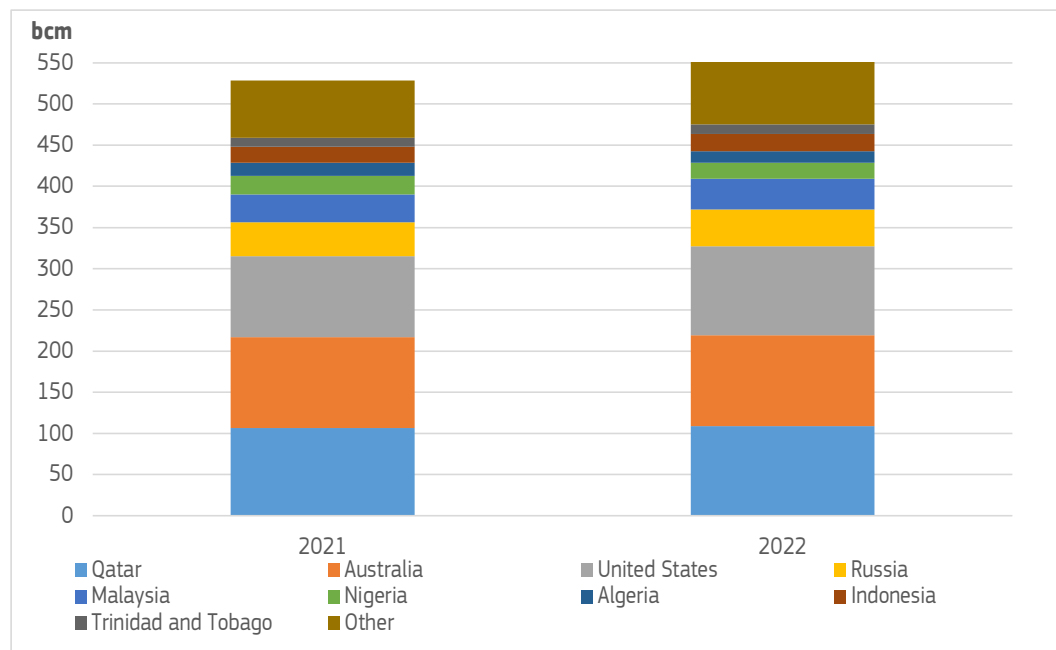
¹² These charts provide additional information on the main market developments, without textual comments and/or further detailed analysis

Figure 44 – LNG imports in the main consumer markets in January–December of 2021 and 2022



Source: Refinitiv

Figure 45 - LNG exports from the main gas producers in January–December of 2021 and 2022



Source: Refinitiv

5. Glossary

Backwardation occurs when the closer-to-maturity contract is priced higher than the contract which matures at a later stage.

Clean dark spreads are defined as the average difference between the price of coal and carbon emission, and the equivalent price of electricity. Dark spreads are reported as indicative prices giving the average difference between the cost of coal delivered ex-ship and the power price. As such, they do not include operation, maintenance or transport costs. Spreads are defined for a coal-fired plant with 35 % efficiency. Dark spreads are given for UK and Germany, with the coal and power reference price as reported by S&P Global Platts.

Clean spark spreads are defined as the average difference between the cost of gas and emissions, and the equivalent price of electricity. Spark spreads are indicative prices showing the average difference between the cost of gas delivered on the gas transmission system and the power price. As such, they do not include operation, maintenance or transport costs. The spark spreads are calculated for gas-fired plants with standard efficiencies of 50% and 60%. This report uses the 50% efficiency. Spreads are quoted for the UK, German and Benelux markets.

Contango: A situation of contango arises in the when the closer to maturity contract has a lower price than the contract which is longer to maturity on the forward curve.

Cooling degree days (CDDs) are defined in a similar manner as Heating Degree Days (HDDs); the higher the outdoor temperature is, the higher is the number of CDDs. On those days, when the daily average outdoor temperature is higher than 21°C, CDD values are in the range of positive numbers, otherwise CDD equals zero.

Flow against price differentials (FAPDs): By combining daily price and flow data, Flow Against Price Differentials (FAPDs) are designed to give a measure of the consistency of economic decisions of market participants in the context of close to real time operation of natural gas systems. With the closure of the day-ahead markets (D-1), the price for delivering gas in a given hub on day D is known by market participants. Based on price information for adjacent areas, market participants can establish price differentials. Later in D-1, market participants also nominate commercial schedules for day D. An event labelled as an FAPD occurs when commercial nominations for cross border capacities are such that gas is set to flow from a higher price area to a lower price area. The FAPD event is defined by the minimum threshold of price difference under which no FAPD is recorded. The minimum threshold for gas is set at 0.5 €/MWh. After the day ahead market closes, market participants still have the opportunity to level off their positions on the balancing market. That is why a high level of FAPD does not necessarily equate to irrational behaviour. In addition, it should be noted that close-to real time transactions represent only a fractional amount of the total trade on gas contracts.

Heating degree days (HDDs) express the severity of a meteorological condition for a given area and in a specific time period. HDDs are defined relative to the outdoor temperature and to what is considered as comfortable room temperature. The colder is the weather, the higher is the number of HDDs. These quantitative indices are designed to reflect the demand for energy needed to heat a building.

LNG sendout expresses the amount of gas flowing out of LNG terminals into pipelines.

Long-term average for HDD and CDD comparisons: In the case of both cooling and heating degree days, actual temperature conditions are expressed as the deviation from the long-term temperature values (average of 1978-2018) in a given period.

Monthly estimated retail gas prices: Twice-yearly Eurostat retail gas price data and the gas component of the monthly Harmonised Index for Consumer Prices (HICP) for each EU Member States to estimate monthly retail gas prices for each consumption band. The estimated quarterly average retail gas prices on the maps for households and industrial customers are computed as the simple arithmetic mean of the three months in each quarter.

Relative standard deviation is the ratio of standard deviation (measuring the dispersion within a statistical set of values from the mean) and the mean (statistical average) of the given set of values. It measures in percentage how the data points of the dataset are close to the mean (the higher is the standard deviation, the higher is the dispersion). Relative standard deviation enables to compare the dispersion of values of different magnitudes, as by dividing the standard deviation by the average the impact of absolute values is eliminated, making possible the comparison of different time series on a single chart.

Retail prices paid by households include all taxes, levies, fees and charges. Prices paid by industrial customers exclude VAT and recoverable taxes. Monthly retail electricity prices are estimated by using Harmonised Consumer Price Indices (HICP) based on bi-annual retail energy price data from Eurostat.