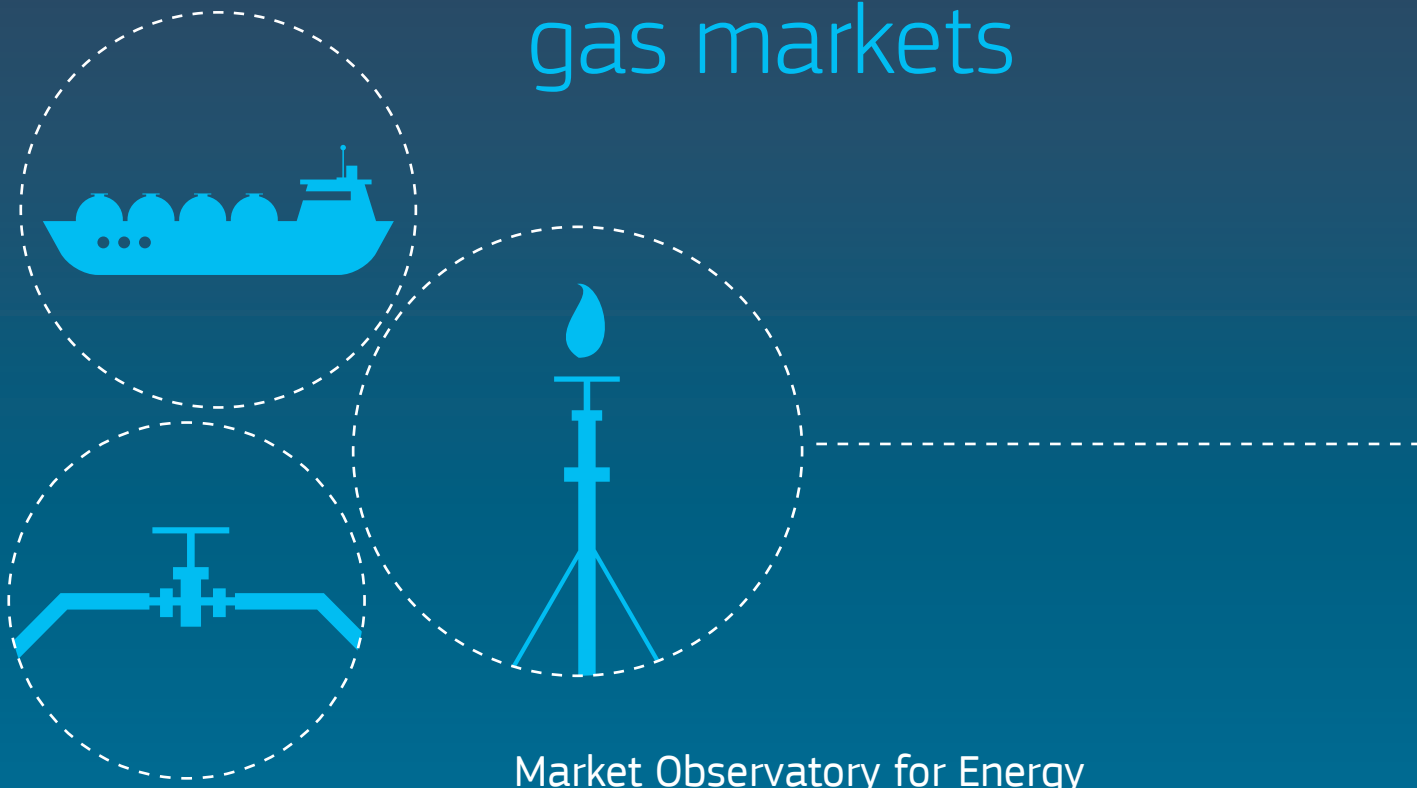
European Commission

Quarterly report

On European gas markets



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CONTENT

HIGHLIGHTS OF THE REPORT

- **As on 24 February 2022 Russia launched an unprovoked invasion against Ukraine, geopolitical tensions already perceivable during the preceding months, and the underlying uncertainty around the European security of gas supply, reinforced the price volatility on the European gas markets. The daily TTF spot, which started the year around 85 €/MWh, reacted with measurable swings on relevant news even before the invasion in January and February, but on 7 March it rose as high as 212 €/MWh, breaking the previous record set in December 2021. Since then the market has mainly been driven by announcements impacting the availability of gas supplies from Russia and by policy responses from the EU and its Member States. Russian pipeline gas supplier Gazprom started to curb supply to many EU countries, referring to different grounds, be either payments or technical reasons.**

- **The broader energy complex** has also been impacted by geopolitical tensions and the ongoing invasion in Ukraine. Crude oil prices in early March 2022 rose to the highest (138 USD/bbl) since the summer of 2008, as many western countries imposed sanctions on buying crude oil and oil products from Russian sources. On the top of the sanctions, many oil consumers voluntarily decided to buy no longer oil from Russia on reputational ground, which sparked market tightness and fears of security of oil product supply. Coal prices also rose to record highs early March, reaching 360 €/Mt and remaining at high levels over the last couple of months. Carbon prices also proved to be volatile, but contrarily to fossil fuels, they temporarily fell in the first week of March 2022 on fears that high energy prices would lead to energy demand destruction, also reducing demand for emission allowances.

- **Policy measures had a fundamental impact on gas market developments** in the first quarter of 2022 and beyond. On 22 February Germany announced the end of the certification process of the Nord Stream 2 pipeline, which practically meant a definitive abandoning of the project. After the start of the Russian invasion, the European Union has adopted a series of sanctions also having relevance on the energy sector, mainly concerning the Russian coal and oil trade with the EU and investments, even though having so far limited impact on the gas sector. A Russian presidential decree has changed the way European customers need to fulfil their payments for natural gas shipments, and the country has also adopted measures banning the supply of Russian gas to given European economic entities. The EU has also adopted its 'RePowerEU communication', and later the underlying plan, outlining measures to phase out fossil fuel imports from Russia, to increase security of energy supply and to support green transition.

- **EU net gas imports rose by 10% year-on-year** (by 8.4 bcm) in Q1 2022. Russian pipeline supplies saw a steep fall, by 31% year-on-year, and for the first time since time series are available, lost their principal position in EU gas supply, ensuring only 28% of the total extra-EU gas imports. At the same time, 34% of the total extra-EU gas imports arrived in the form of LNG, becoming the most important import supply source. Pipeline imports from Norway were up by 5%, and ensured 22% of the total extra-EU gas imports, whereas pipeline imports from both Algeria and Libya fell (respectively by 17% and 44%). Net gas imports in the EU amounted to 88 bcm in Q1 2022. The EU spent an estimated €78 billion on gas imports in Q1 2022 (of which €27 billion on Russian gas imports), up from €16 billion in Q1 2021, principally owing to higher import prices and volumes.

- **Russian gas imports continued to fall abruptly through both the Belarus and Ukrainian transit routes** (respectively by 71% and 41% year-on-year in Q1 2022), whereas through the Nord Stream 1 they only decreased slightly (4%) and through Turk Stream they rose by 34%. In Q1 2022 the share of Nord Stream in Russian gas imports rose to record high, 57%, followed by the Ukrainian transit (21%), the Belarus route (falling as low as 12%) and the Turk Stream (11%). By May 2022 flows via the Belarus route fell close to zero and in early June flows through Nord Stream were cut back in two steps by 60%. In January-May 2022, 41 bcm gas arrived from Russia through pipelines, 10 bcm in the form of LNG, implying that total gas imports were down by 18 bcm, compared to the same period of 2021. This indicates the probability of significant drop in Russian gas imports for 2022 in the EU, bearing in mind the recent announcements from Russia, resulting in decreasing gas supplies.

- EU **LNG imports were up by 72% in Q1 2022 year-on-year**, amounting to 30 bcm. In the first few months of 2022, European gas hub prices developed a premium compared to the Asian markets, giving strong incentives to send LNG cargoes to Europe. Abundance of LNG in south-western and north-western Europe resulted in discounts in LNG import prices to the TTF and other continental benchmarks. In Q1 2022, France was the biggest LNG importer in the EU, importing 8.7 bcm, ahead of Spain (7.4 bcm) and the Netherlands (3.3 bcm). The United States were by large margins the principal LNG supplier of the EU, ensuring 14 bcm (47% of the total EU LNG imports), followed by Russia (5.5 bcm) and Nigeria (3.1 bcm). The EU represented 45% of the total US LNG exports in Q1 2022, becoming a principal export destination and a strong competitor of Asia. The EU as block of 27 countries became the biggest LNG importer in Q1 2022 in the world, ahead of Japan and China.

- **Gas storage withdrawals were less intensive in Q1 2022** than in the first quarter of 2021, as on 31 March 2022 the average EU storage filling rate was 26%, around 4 percentage points lower than a year before, whereas at the beginning of 2022 this gap was 21 percentage points. Compared to the average of 2016-2020, at the end of Q1 2022 the EU average storage-filling rate was lower by 8 percentage points, but higher than in 2017 and 2018 at this time of the year. As of mid-April 2022, the average EU filling rate has been higher than in 2021. Decreasing gas consumption, owing to relatively mild weather and production cuts in gas intensive industries must have played a role in less reliance on storage withdrawals amid high wholesale gas prices. Storages managed by Gazprom had filling rates around 20 percentage points lower than the EU average at the end of Q1 2022; in Germany measures have been taken in order to incentivise refilling these installations. Winter-summer gas contract spreads remained negative at the TTF hub in Q1 2022, falling to -18 €/MWh in March 2022 amid high front-curve prices, however, as of April-May

quarter-ahead and two quarters-ahead contracts developed a premium over spot prices, giving incentives on the market to refill storages.

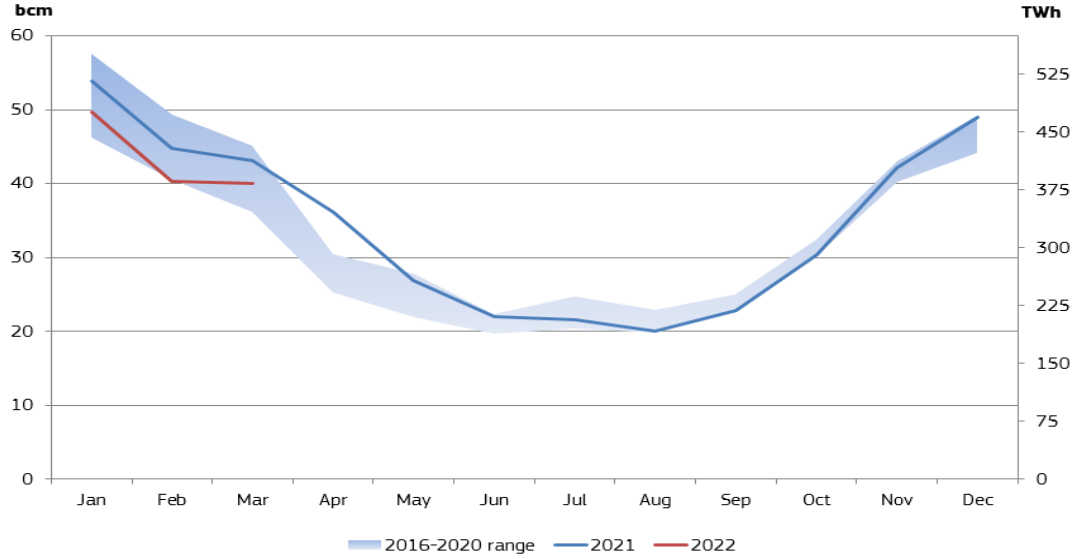
- **EU gas consumption in Q1 2022 fell by 8%** (-11.6 bcm) year-on-year, amounting to 130 bcm. Even amid high wholesale prices, gas demand in electricity generation rose by 4% (5.5 TWh) compared to Q1 2021. On the other hand, increasing gas prices have led to decreasing demand for gas in energy intensive industries. Milder than usual weather in the heating season resulted in less gas demand in the residential sector. Indigenous **gas production in the EU amounted to 12.8 bcm in Q1 2022, falling by 9%** (1.2 bcm) compared to Q1 2021. The Dutch government made its final decision on the production limit (4.5 bcm) for the current gas year on the Groningen field in April 2022.
- **Gas traded volumes on the European hubs were down again, by 2% (383 TWh)** in Q1 2022 year-on-year. This was mainly due to the significant fall in the over-the-counter (OTC) trade (by 29% year-on-year), whereas exchange executed trade rose by 33%. The share of exchange-executed contracts within the total trade was 60%. Smaller traders, having lower financial coverage against default risk, were moving from OTC to exchange markets amid high and volatile wholesale gas prices.
- **Spot prices on the European gas hubs remained high and volatile in Q1 2022,** in the range of 95-100 €/MWh, around five times higher than in Q1 2021. The discount of year-ahead contracts to the spot market widened over Q1 2022, reaching 40 €/MWh at the end of March, implying that the market anticipates a correction in high spot prices in the future. However, high and increasing forward curve price suggest that wholesale gas price levels seen in the last decade (15-25 €/MWh) will not return in the near future.
- **Retail gas prices for household customers in EU capital cities were up by an estimated 84% in May 2022 year-on-year.** With the exception of two countries, gas prices for households in European capital cities were higher in May 2022 compared to the same month of 2021, and in twelve capital cities prices more than doubled. Recent price increases on wholesale gas markets might already have been priced in the retail contracts. Retail gas prices for industrial customers also showed significant increases, up by an estimated 116% year-on-year in Q1 2022, for consumers with median annual consumption. Industrial retail gas prices in the EU were higher compared to many of the global competitors, implying cost disadvantages for energy intensive industries.
- **Hydrogen costs-based assessments** showed that in the Netherlands **production costs of hydrogen** (capital expenditure costs included) with alkaline electrolyser technology amounted to 467 €/MWh in March 2022, whereas with polymer electrolate fuel cells (PEM) the cost was assessed at 565 €/MWh, and with steam methane forming (SMR) at around 242 €/MWh in the same month. Price assessments followed the volatile gas and electricity market dynamics, reaching two-to-three times higher levels vis-à-vis wholesale gas and electricity prices.

1. Gas market fundamentals

1.1 Consumption

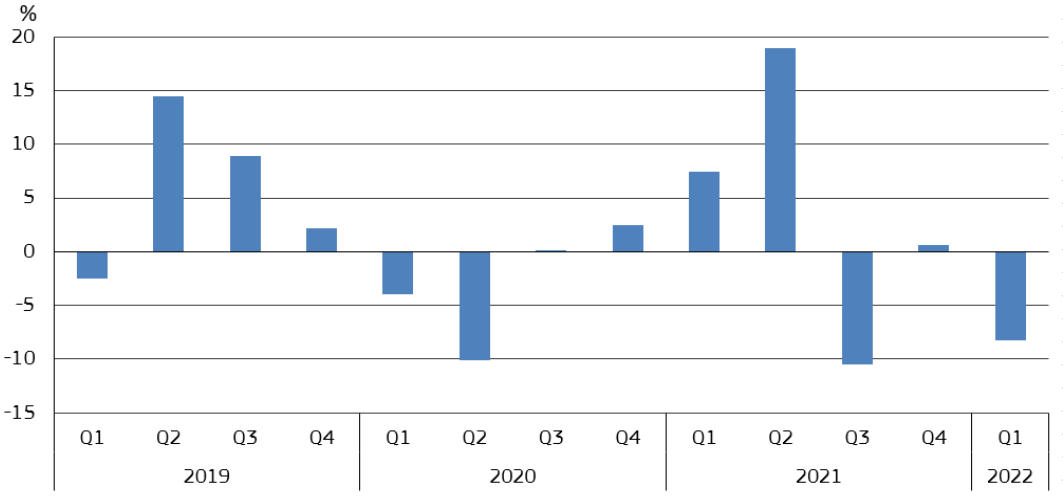
- EU gas consumption[1] in the first quarter of 2022 fell by 8.2% (-11.6 bcm) in year-on-year comparison, after practically stagnating in Q4 2021 (+0.6%) and a significant fall in Q3 2021 (-10%). In absolute numbers, the quarterly gas consumption in Q1 2022 amounted to an estimated 130 bcm, down from 141.6 bcm in Q1 2021, but up from 1214 bcm in Q4 2021, as gas consumption rose at the height of the heating season. Even if gas use in power generation was up by 4% (+5.5 TWh) year-on-year, other factors pointed to decrease in gas demand in Q1 2022. High wholesale gas prices must also have had negative impact on gas demand in energy intensive industries, leading to reduction in production, which could also be observed in the previous quarter. In January and February 2022 the weather in Europe was milder than usual, reducing heating related gas demand. As Figure 1 below shows, in the first quarter (specifically in January and February of 2022) gas consumption in the EU was close to the lower end of the range of the last five years.

Figure 1 - EU gas consumption



Source: Eurostat, data as of 12 June 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 (%)

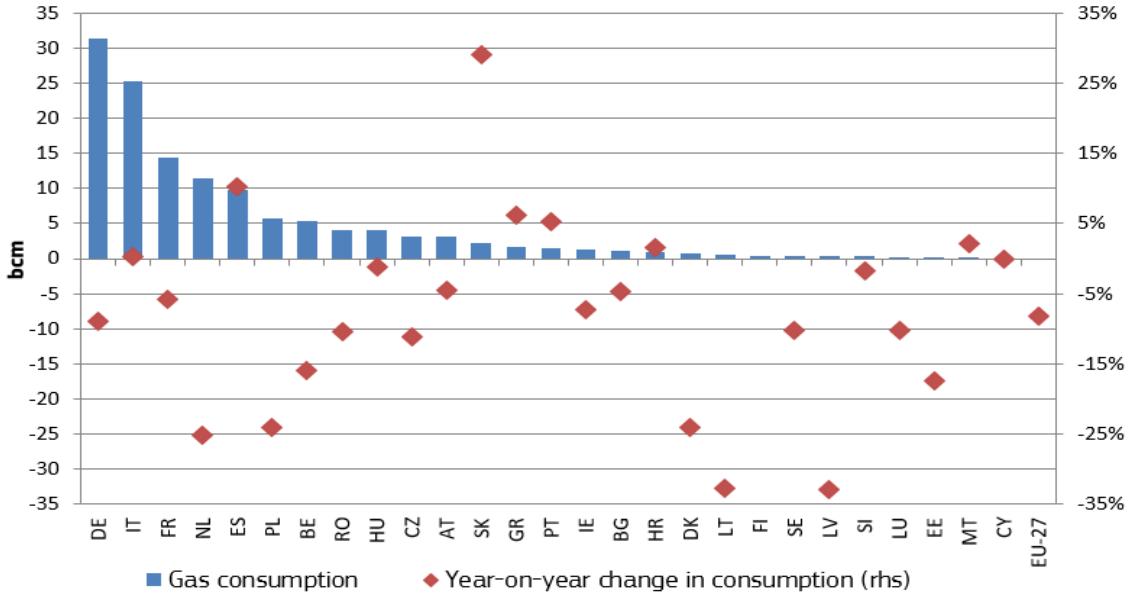


Source: Eurostat, data as of 12 June 2022 from data series nrg_103m. In the next edition of this report numbers might change retrospectively

[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 first quarter of 2022, gas consumption increased only in 7 EU Member States year-on-year, whereas in the other 19 countries (there is no data for Cyprus) it decreased. Gas consumption, in the order of percentage changes, rose by the most in Slovakia, by 29% (+0.5 bcm), in Spain, by 10% (+0.9 bcm), and in Greece, by 6% (+0.1 bcm), whereas it fell the most in Finland, by 57%, (-0.6 bcm), and in Latvia and Lithuania, both by 33% (respectively by -0.2 bcm and -0.3 bcm). Among the five biggest gas consumer countries, consumption fell by in the Netherlands by 25% (-3.9 bcm), in Germany by 9% (-3.1 bcm) and in France by 6% (-0.9 bcm), whereas it rose in Spain by 10% (+0.9 bcm) and in Italy by 0.4% (+0.1 bcm). In twelve Member States, year-on-year changes were less than 10% (increase or decrease).
- In Q1 2022, Germany consumed the highest amount of gas (31.4 bcm), followed by Italy (25.2 bcm), France (14.4 bcm), Spain (9.8 bcm) and Poland (5.8 bcm).

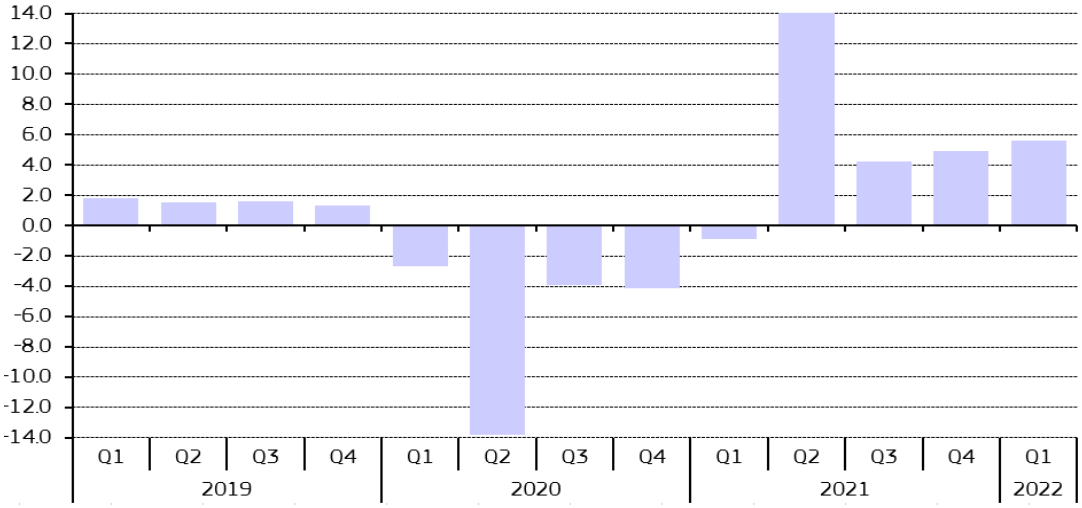
Figure 3 - Year-on-year change in gas consumption in the first quarter of 2022



Source: Eurostat, data as of 12 June 2022 from data series nrg_103m. In the next edition of this report numbers might change retrospectively

- In the first quarter of 2022, GDP in the EU-27 was up by 5.6% in year-on-year comparison, showing an acceleration to the previous two quarters. At the same time, GDP was up by 2.8% quarter-on-quarter, however, increase in the general economic activity did not really result in increasing gas consumption in the EU, as high wholesale gas prices prompted decreasing use of gas in energy intensive sectors, which might have acted counterintuitively for the economic growth in the EU countries.

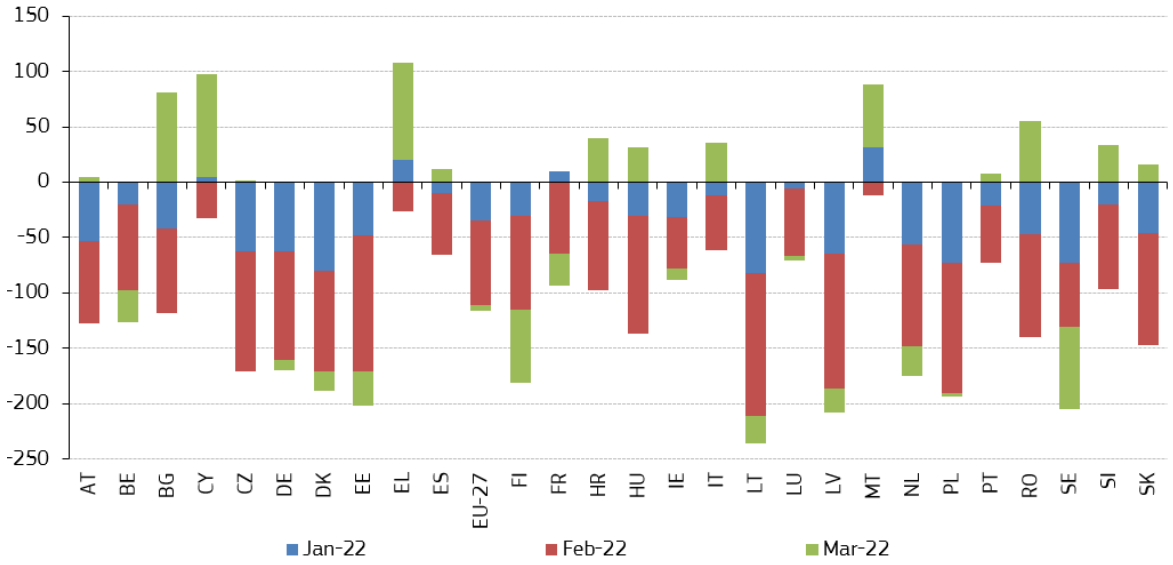
Figure 4 - Change in EU27 GDP, in year-on-year comparison (%)



Source: Eurostat, data as of 9 June 2022 from data series namq_10_gdp - Seasonally and calendar adjusted data

- Figure 5 shows the deviation of actual heating degree days (HDDs) from the long-term average[2] in individual EU Member States in the first quarter of 2022. January and February 2022 were generally milder than usual in most of the EU countries, implying less heating needs in the residential sector, which might also have contributed to decreasing gas consumption. It has also contributed to lower withdrawal rates of gas storages compared to the previous winter. In March 2022 warmer than usual temperatures kept on, however, mainly in the southern and south-eastern EU countries the weather turned colder than usual. Nevertheless, market prices in Q1 2022 were mostly impacted by geopolitical events and security of gas supply concerns, rather than weather.

Figure 5 – Deviation of actual heating degree days (HDDs) from the long-term average in the first quarter of 2022



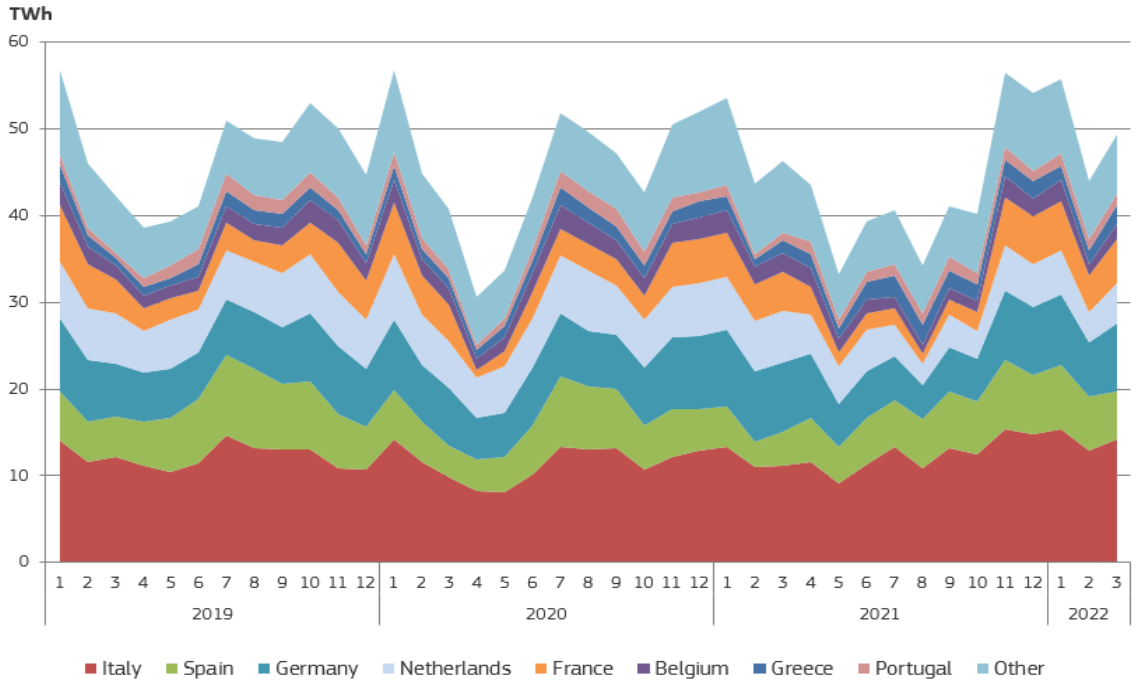
Source: Joint Research Centre (JRC), European Commission

- Based on data from ENTSO-E, gas-fired power generation showed an increase of 3.8% (+5.5 TWh) year-on-year in Q1 2022, continuing the rebound of the previous quarter, as Figure 6 shows. In Q1 2022 gas wholesale prices were quite volatile and reached levels not seen before on most of the EU gas hubs in the early days of March 2022, which was not favourable to generation costs and profitability of gas-fired generation. In fact, even with further increasing carbon prices, high gas prices gave incentives to the comeback of coal to power mixes in many EU countries, however, coal prices also soared in this period.
- In year-on-year comparison, the share of renewables in the EU power generation mix[3], remained stable in Q1 2022, as wind, solar, biomass and hydro together represented around 38% of the EU power mix, similarly to Q1 2021. However, within renewables, the share of hydro fell by 4 percentage points owing to dry periods in many parts of the EU, whereas the share of wind power went up by 3 percentage points and that of solar by 1 point. Electricity generation from nuclear fell by 9% year-on-year, largely owing capacities taken offline in France, Germany and other countries, and its share was down by 2 percentage points, reaching 23% in Q1 2022.
- Even amid record high prices, the share of gas remained practically unchanged year-on-year, and amounted to 20% in Q1 2022. The share of power generation from solid fuels rose slightly in Q1 2022, reaching 16% (up from 14% a year before) as coal and lignite-fired generation together rose significantly, by 11% in Q1 2022 year-on-year. Carbon prices practically stabilized at high levels (75-90 €/tCO2e during most of Q1 2022), but it had smaller impact on the power mix, as gas prices showed a sharp increase over the same period (from 85 €/MWh early January to 208 €/MWh on 7 March 2022, then falling back to 125 €/MWh by the end of March, and remaining volatile afterwards). At the same time, coal prices rose from 119 €/Mt early January to 366€/Mt on 8 March, falling back to 252 €/Mt by the end of March and stabilising at these levels until the end of May. The profitability of gas-fired generation comparatively decreased vis-à-vis coal and lignite, however, it was not always possible to replace gas by coal given the scarcity of coal-fired capacities still in operation, after significant decommissioning over the last few years.
- In Q1 2022, the amount of electricity generated from gas fell by 27% in the Netherlands in year-on-year comparison, and in Germany it also went down by 11%. At the same time, it rose significantly, by 70% in Spain, by 32% in Greece, by 19% in Italy and by 10% in France.
- Besides demand side factors, the share of gas was impacted by changes in the local power generation mixes in each country. In the Netherlands, the decrease in gas-fired generation was partially compensated by increasing wind, solar and coal-fired generation,

[2] Long term average temperatures, heating and cooling degree days refer to the period between 1978 and 2018
[3] See more information in Quarterly Report on the European Electricity Markets, Vol. 15, Issue 1

though the overall power production fell by 7% in Q1 2022 year-on-year. In Germany, the decrease in gas-fired generation, accompanied with the even deeper fall in nuclear, was compensated by increasing solid fuels, but mainly by soaring wind and solar generation. In Spain, rapidly increasing gas-fired generation was needed to compensate falling hydro and wind generation, also helped by increasing coal and solar power. In Greece, increasing gas-fired and solar generation compensated for falling hydro, oil and lignite. In Italy, increasing gas, coal and lignite-fired generation replaced the falling availability hydro and other sources. In France, the increase in gas-fired generation and other sources, such as coal and solar power, could only partially compensate the impact of falling nuclear hydro availability, which resulted in a 7% fall of the overall electricity generation in the country in Q1 2022, year-on-year.

Figure 6 - Gas-fired power generation in the EU



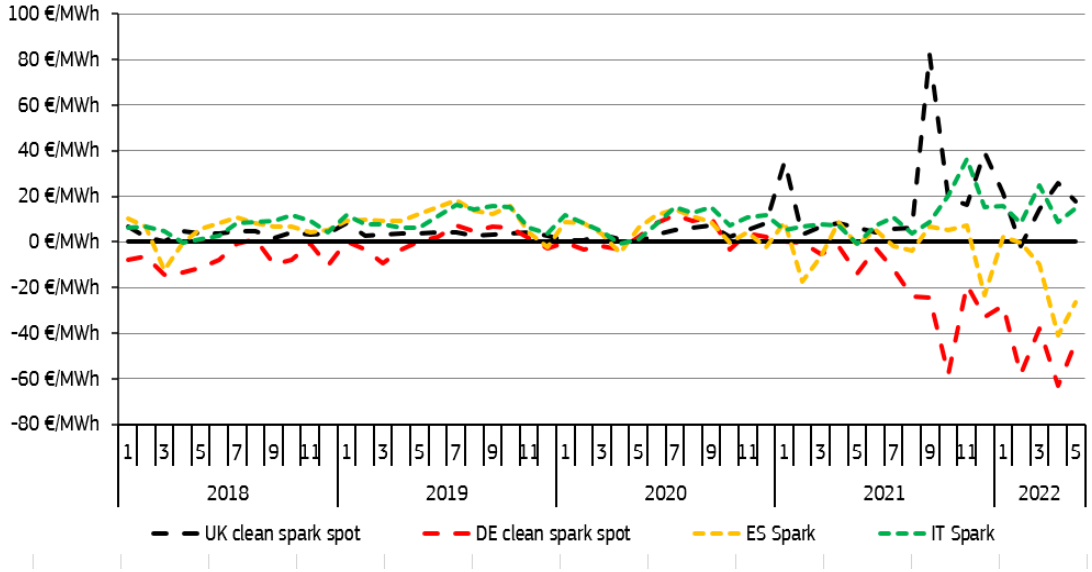
Source: Based on data from the ENTSO-E Transparency Platform and national data sources, data as of 11 June 2022.

- Clean spark spreads – measuring the profitability of gas-fired generation by taking into account variable costs – reached respectively -41.3 €/MWh, -2.6 €/MWh and 16.4 €/MWh in Germany, Spain and Italy in Q1 2022 on average, showing a mixed picture in comparison to the previous quarter, as in Germany and in Italy spreads decreased (from -36.5 €/MWh and 24 €/MWh in Q4 2021, respectively), whereas in Spain they rose from -3.5 €/MWh measured in Q4 2021. In Q1 2021 the three spreads respectively were: -1.8 €/MWh, -4.9 €/MWh, 6.7 €/MWh. The decrease in the clean spark spreads implied decreasing profitability of gas-fired generation[4] in Germany and Spain in Q1 2022 compared to the previous quarter, and improving profitability in Italy (See Figure 7[5]). Year-on-year profitability of gas-fired generation fell dramatically in Germany, as gas prices rose much more than electricity wholesale prices, whereas both in Italy and Spain spreads showed improvement, as wholesale electricity prices were higher in these countries than in Germany. In April and May the profitability of gas in the power sector fell further in Germany and Spain.

- In the United Kingdom, having relevance for the European gas market, clean spark spreads averaged at 11.3 €/MWh in Q1 2022, down from 25 €/MWh in Q4 2021 and from 15.3 €/MWh in Q1 2021. In the UK, wholesale electricity prices were much higher than in continental Europe, resulting in higher profitability of gas-fired generation. However, electricity generated from gas was down by 15% year-on-year in Q1 2022, and the share of gas-fired generation was 37% in the same period, down from 42% measured in Q1 2021.

[4] Assuming an average gas power plant efficiency, see more in the Glossary
[5] Charts of clean spark spreads can also be found in the Quarterly Report of European Electricity Markets (Vol. 15, Issue 1). Data on the share of gas in electricity generation come from the database of ENTSO-E

Figure 7 - Clean spark spreads in Germany, Spain, Italy and the United Kingdom



Source: Bloomberg

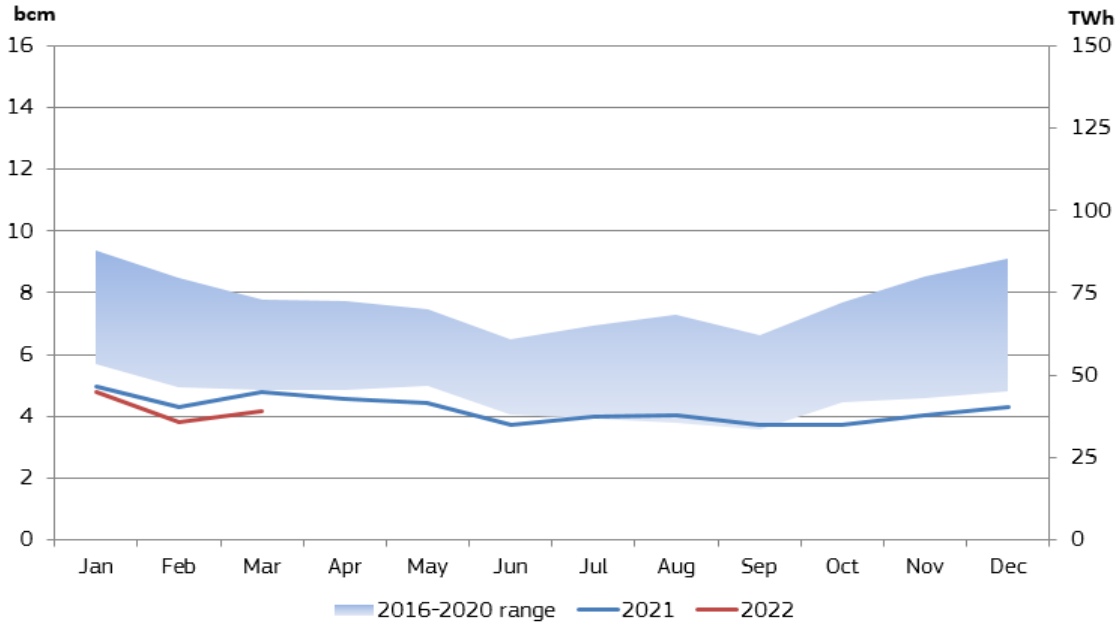
1.2 Production

- In the first quarter of 2022, EU natural gas production reached approximately 12.8 bcm[6], falling year-on-year again by 9%, (1.2 bcm - See Figure 8). In Q1 2022 the actual quarterly production remained well below both the range of 2016-2020 and 2021 figures as well, reflecting the long-term dwindling trend of domestic gas production in the EU. Compared to the previous quarter, production grew by 0.7 bcm in Q1 2021, following the increase in seasonal consumption during wintertime.
- In the biggest gas producer Netherlands, the production fell by 12% (by 0.8 bcm), amounting to 5.6 bcm. In Romania, the second biggest gas producer in the EU, production decreased by 6% (-0.2 bcm) and reached 2.2 bcm in Q1 2022. At the same time, gas production fell in Poland by 2% (-0.1 bcm), whereas in Germany it decreased by 4% (-0.04 bcm). Gas production in Italy fell by 13% (-0.1 bcm), and by 7% in Hungary and by 13% in Ireland (changing less than 0.1 bcm in both countries). In Denmark, the production was down by 5% (-0.02 bcm).
- Although at the beginning of January 2022 the Dutch government foresaw to increase the amount of gas it allows to be produced from the Groningen gas field to up to 7.6 bcm (from an earlier target of 3.9 bcm), at the beginning of April 2022 it was announced that during gas year 2021 (running from 1 October 2021 to 30 September 2022) the production limit was to be set at 4.5 bcm[7]. Although there have been some speculations on, as last resort option, allowing the ramp up the production at the Groningen field in the wake of security of gas supply concerns amid the war in Ukraine, the government decided to definitely phase out the field by 2023.
- Gas production in Norway increased by 6% year-on year, from 29.1 bcm in Q1 2021 to 30.9 bcm in Q1 2022. In the United Kingdom, gas production amounted to 9.4 bcm in Q1 2022, up from 8.9 bcm a year before (+5.1%, year-on-year).

[6] Given that in some countries data for some periods are based on estimation, this number might retrospectively change

[7] https://www.rijksoverheid.nl/onderwerpen/gaswinning-in-groningen/nieuws/2022/04/01/sluiting-groningenveld-in-2023-blijft-in-zicht-met-huidige-gaswinning

Figure 8 - Monthly gas production in the EU



Source: Eurostat, data as of 12 June 2022 from data series nrg_103m. In the next edition of this report numbers might change retrospectively.

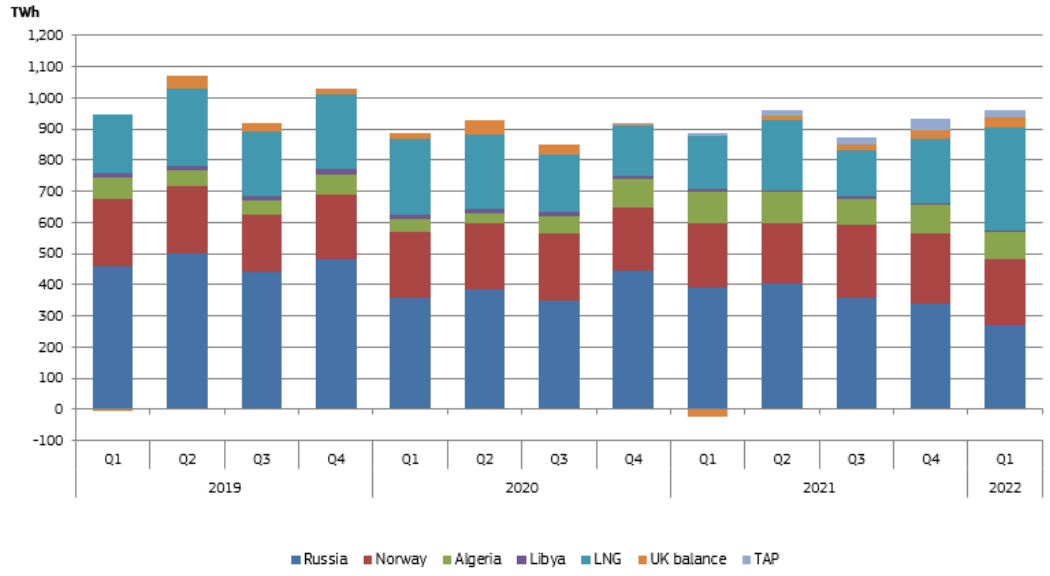
1.3 Imports

- According to Eurostat[8], net gas imports in the EU increased by 10% (8.4 bcm) in the first quarter of 2022 (year-on-year), amid decreasing gas consumption and further falling domestic production, implying much less reliance on withdrawals from storages. Net imports in different EU countries showed a high variation in Q1 2022. In Slovakia they rose from practically 0 to 1.1 bcm year-on-year, while in Austria the balance switched from 1.6 bcm net exports in Q1 2021 to 1.1 bcm net imports in Q1 2022. On the other hand, in Finland net imports dropped by 56% (-0.6 bcm) and in Lithuania by 27% (-0.3 bcm) year-on-year.
- Looking at the biggest importers, in the Netherlands net imports rose by a remarkable 258% (+2.8 bcm from low base value), in Spain they went up by 11% (+0.9 bcm), in Germany and France by 9% (respectively +2 bcm and +0.8 bcm) and in Italy by 4% (+0.6 bcm). On the other hand, net imports decreased by 25% (-1.2 bcm) in Poland and by 17% (-1.1 bcm) in Belgium and in Germany by 3% (0.7 bcm). The biggest net importers in the EU were Germany (24 bcm), Italy (18 bcm), France (11 bcm), Spain (9 bcm), Belgium (5 bcm), the Netherlands and Poland (both 4 bcm). These seven countries altogether imported 74 bcm out of the total gas imports of 88 bcm in Q1 2022 (the total up from 79.6 bcm in Q1 2021).
- According to ENTSO-G data, net imports amounted to 962 TWh in the first quarter of 2022, of which 66% arrived through pipelines and around 34% through LNG terminals, which latter was the highest share in the last eight years. Pipeline gas imports from Russia saw a steep fall of 31% in year-on-year comparison, especially in January and February 2022. At the same time, imports from Norway were up by 5% in Q1 2022. Pipeline gas imports from Algeria showed a decrease of 17% year-on-year. Pipeline gas imports from Libya fell again dramatically, by 44% year-on-year. At the same time, LNG imports reached 328 TWh in Q1 2022, the highest quarterly amount in the last eight years.
- For the first time since the beginning of available ENTSO-G data series, over the last eight years, Russian pipeline gas lost its top supplier position of the EU in Q1 2022, and ensured only 28% of the EU external gas supply. Year-on-year, the share of Russian pipeline imports fell significantly, by 17 percentage points[9].
- The share of pipeline gas imports from Norway was 22% in the first quarter of 2022, slightly down from both the previous quarter and Q1 2021 (24%), as the increase in imports from Norway was lower than the overall increase in gas imports in the EU. Competitive gas imports from Norway could only by small part replace dwindling Russian inflows. In the first quarter of 2022, Norwegian gas production[10] amounted to 31 bcm, up by 6% year-on-year.

[8] Net imports equal imports minus exports and do not account for stock changes.
[9] It is worth to note that Russia increased its importance in the EU LNG imports as well over the last few years, numbers presented in this section, with the exception of LNG or unless otherwise indicated, refer to pipeline imports. Taking into account the LNG imports, Russia was still the biggest external gas supplier of the EU in Q1 2022.
[10] https://www.npd.no/en/facts/news/Production-figures/2020/production-figures-march-2020/

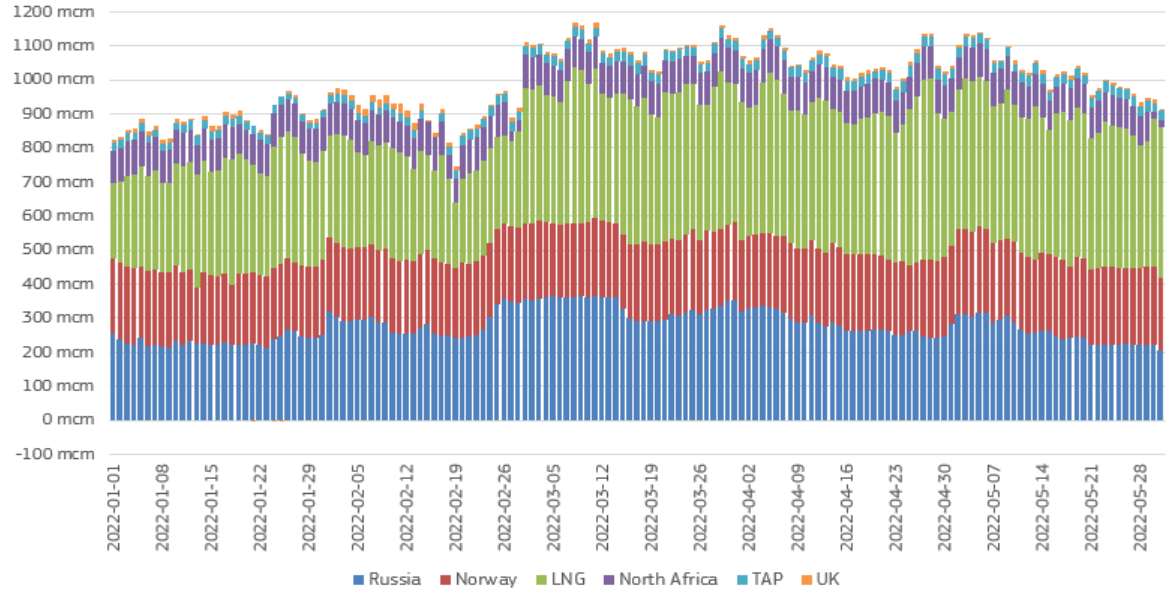
- In the first quarter of 2022, pipeline gas imports from Algeria were down by 17% year-on-year, which resulted in a decreasing share within the total extra-EU imports (falling to 9% in Q1 2022). Although oil-indexed contracts gas contracts with Algeria were quite competitively priced in Q1 2022, the impact of the termination of gas transport through the GME pipeline through Morocco in Q4 2021, which used to supply the Iberian peninsula by gas, can be tracked on import numbers, falling by 34% in Q1 2022 year-on-year, as only the Medgaz pipeline remained in operation, even with increased capacity. However, pipeline gas supply from Algeria to Italy was also down, by 5% year-on-year, probably owing to less demand and/or infrastructure outages. Imports from Libya continued to fall and its share fell to the lowest in eight year, 0.5% in the total EU gas imports, down 1.1% in Q1 2021, which also had to do with some infrastructure bottlenecks to supply Italy.
- In Q1 2022, the share of LNG rose to 34% in the total EU gas imports, by a staggering 14 percentage points compared to Q1 2021, prompting LNG as individual supply source to the top positon of EU gas imports. Increasing LNG imports were principally owing to the price premium in Europe to the Asian markets, which used to be a quite rare phenomenon in the past, but fears on supply risks amid falling Russian imports helped to elevate European gas hub prices to record levels, which incentivised LNG cargo redirections towards Europe and increasing LNG send-out to the European gas grid. It seems that in Q1 2022 the year-on-year decrease in the share of Russian pipeline flows was compensated by increasing LNG and rising inflows from the UK (which is indeed unusual during wintertime, also incentivised by high continental hub prices), whereas the share of Algeria and Norway also decreased.
- The Trans Adriatic Pipeline (TAP) ensured around 24 TWh gas imports in the EU in the first quarter of 2022, up from 10 TWh in the Q1 2021 (+136% year-on-year), which represented around 2.5% 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 10, it is obvious that daily inflows from Russia reached the peak in early days of March 2022, and since then its shows a dwindling trend until the end of May (and probably beyond), whereas the importance of LNG inflows have gradually gained ground. The importance of other sources, such as Norway, North-Africa and the UK remained fairly stable over time.

Figure 9 - EU imports of natural gas by source



Source: Based on data from the ENTSO-G Transparency Platform, data as of 3 June 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.

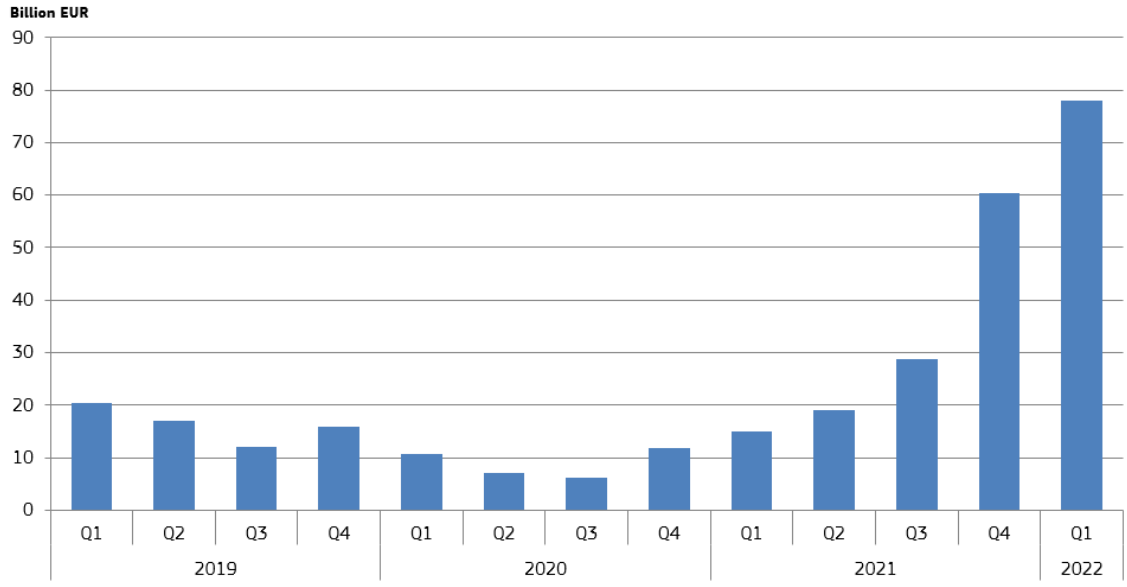
Figure 10 - EU daily imports of natural gas by source



Source: Based on data from the ENTSO-G Transparency Platform, data as of 3 June 2022.

- As average import prices increased significantly year-on-year (showing a nearly four-fold growth compared to Q1 2021), in the first quarter of 2022, the estimated gas import bill amounted to nearly €78 billion, which was the highest in the last eight years, and in comparison to €15.1 billion in Q1 2021, it rose by 409% year-on-year. However, it should be noted here that the estimation of the gas import bill is based on the mixture of sources on import prices (spot wholesale prices, foreign trade data, etc.), which might not give a fully accurate calculation on the actual gas import prices, rising by an estimated 399% in Q1 2022 year-on-year. Bearing this in mind, the quarterly gas import bill was up in Q1 2022 compared to the previous quarter (€60.5 billion in Q4 2021). Out of these the estimated amount, gas imported from Russia on pipelines was around €20 billion, followed by Norway (€19 billion), North Africa (Algeria and Libya, €3.2 billion) and the TAP (€2.1 billion). In the form of LNG, the EU imported gas in a value of €33 billion in Q1 2022. If LNG imports from Russia, Norway and North Africa accounted to the source of origin, the total gas import bill from Russia amounted to €26.5 billion, that of Norway to €19.2 billion and that of North Africa to €5.4 billion.

Figure 11 – Estimated quarterly extra-EU gas import bill, in billions of euros



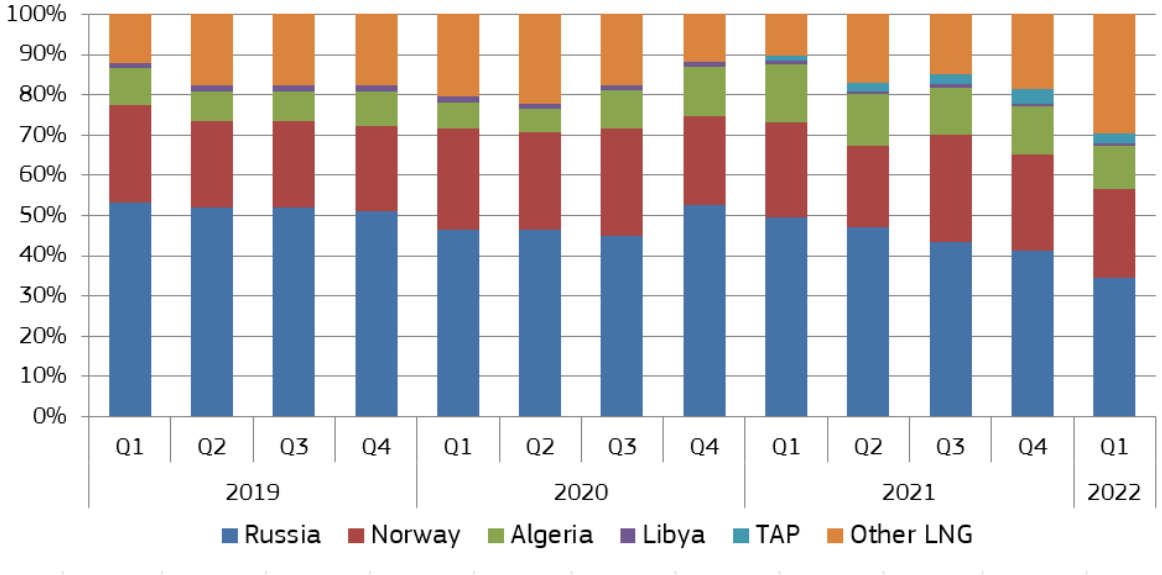
Source: ENTSO-G, Eurostat and own data calculations for the EU weighted average of import gas prices

- As important pipeline gas source countries, such as Russia, Norway and Algeria are also active on the LNG market, the quarterly gas report also takes a look at the combined imports of pipeline gas and LNG from these countries and attempts to calculate the share of imports including all gas sources. As Figure 12 shows, the share of Russia within total extra-EU gas imports (pipeline and

LNG together) amounted to 34% in Q1 2022 (the lowest over the last eight years), split by 28% of pipeline imports and 6% of LNG. Russia is also an important participant in European LNG market, not only in the traditional pipeline gas supply, but increasing LNG exports to the EU could not counter-balance its market losses in the pipeline segment in Q1 2022. The combined share of pipeline and LNG gas of Russian origin fell by 15 percentage points in Q1 2022 year-on-year.

- The share of Norway within gas imports was 22% in Q1 2022 (practically the same share as the Norwegian pipeline imports, owing to ongoing repair and maintenance works on the country's sole LNG plant). The share of Algeria within the total extra-EU gas imports was 10.6% with LNG (as opposed to 9% only including pipeline gas), down by almost 4 percentage points year-on-year. The share of LNG was 29.7% in Q1 2022, (on the top of LNG accounted in shipments from Russia, Norway and Algeria), up from 10.2% in Q1 2021 and from 18.6% in the previous quarter. The decreasing share of imports from Russia (and from Algeria) between the first quarters of 2021 and 2022 was mainly compensated by the increasing shares of LNG, whereas the share of TAP pipeline (from Azerbaijan) and that of Norway changed only slightly.

Figure 12 – The share of gas imports within the total, combining both pipeline and LNG imports



Source: Based on data from the ENTSO-G Transparency Platform, data as of 3 June 2022.

1.3.1. Pipeline imports from Russia and EU supply to Ukraine

- Figure 13 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 first quarter of 2022, the volume of Russian imports fell significantly, by 31%, if compared with the same quarter of 2021. As shown on Figure 13 and Figure 14, gas transit through the route of Belarus fell by a staggering 71% in Q1 2022 year-on-year. Especially in January 2022 were the flows very low through the Yamal pipeline (less than 0.5 bcm, as opposed to 3.8 bcm a year earlier); on some days having flows in reverse direction, from west to the east (from Germany and Poland in practice). In February and March flows slightly picked up again, respectively reaching 1.6 bcm and 0.7 bcm. However, by May 2022 gas flows through the Belarus transit practically fell to zero, as Russia imposed sanctions on Yamal Europe pipeline, not allowing Gazprom to transit gas via this route.

- Gas flows transiting via Ukraine were down by 41% in comparison to Q1 2021, as in Q1 2022 Gazprom continued to be reluctant to book additional capacities and beyond the long term contracted volumes less and less gas flows arrived. During Q1 2022, a monthly average of 1.7 bcm of gas of Russian origin was transited through Ukraine, down from the monthly average of 2.9 bcm in Q1 2021. In April-May 2022 the monthly transit volume through Ukraine with EU destinations was around 2 bcm.

- In contrast to the Belarus route and Ukraine, transited volumes through the Nord Stream remained relatively intact in Q1 2022 as they only fell by 4% year-on-year (reaching 4.7 bcm, on monthly average), and April-May 2022 flows were still strong (5 bcm on monthly average). However, as of early June Gazprom started to refer to technical problems and reduced daily transit through Nord Stream 1 by 60% in two steps.

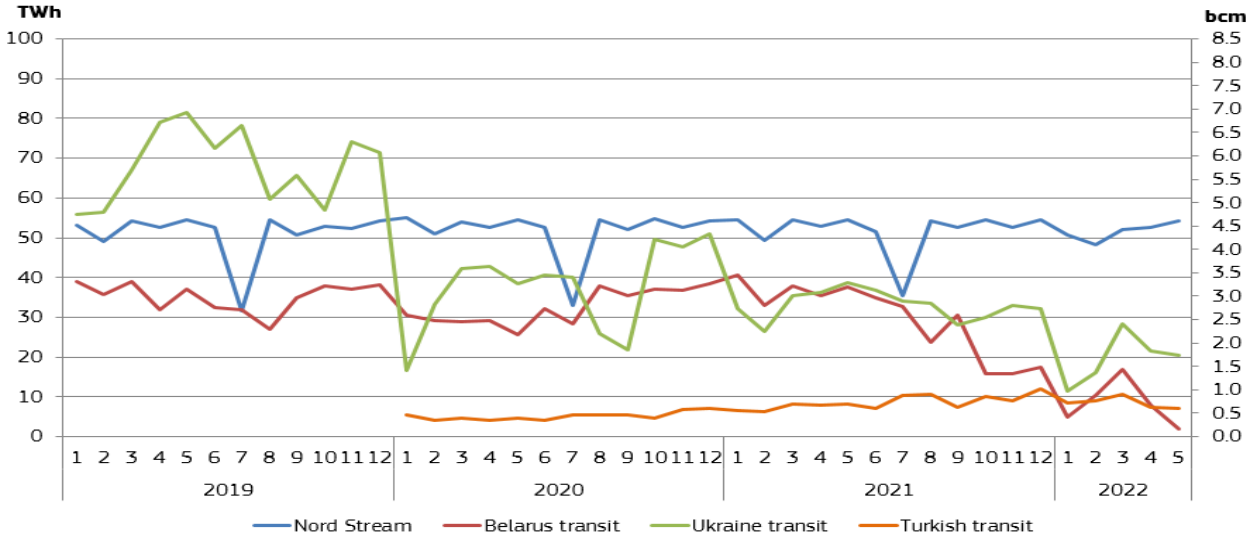
- Transited volumes through the Turk Stream were up by 34% year-on-year in Q1 2022, and the monthly average was 0.9 bcm in the quarter. In April and May 2022 transited volumes via the Turk Stream fell back to 0.7 bcm per month.

- As a result, in Q1 2022 the share of Nord Stream within Russian pipeline gas supply to Europe rose to the highest ever, 57%, up by 8 percentage points compared to Q4 2021 and by 16 points compared to Q1 2021. The Ukraine transit route came to the second place, ensuring 21% of the total Russian pipeline gas transit, which was the lowest over the last few years and was down from 24% a year earlier. The share of the Belarus transit route fell drastically, representing only 12% of the total Russian pipeline imports in Q1 2022, down from 29% in Q1 2021. The share of Turk Stream was 11% in Q1 2022, doubling from 5% in Q1 2021.

- In Q1 2022 Nord Stream represented 16% (14 bcm) in the total net extra-EU gas imports, the Ukrainian transit had a share of 6% (5 bcm), whereas the Belarus transit route ensured 3% (3 bcm). At the same time, the Turk Stream had a share of 3%, with around 3 bcm gas transit within the total net extra-EU gas imports in Q1 2022.

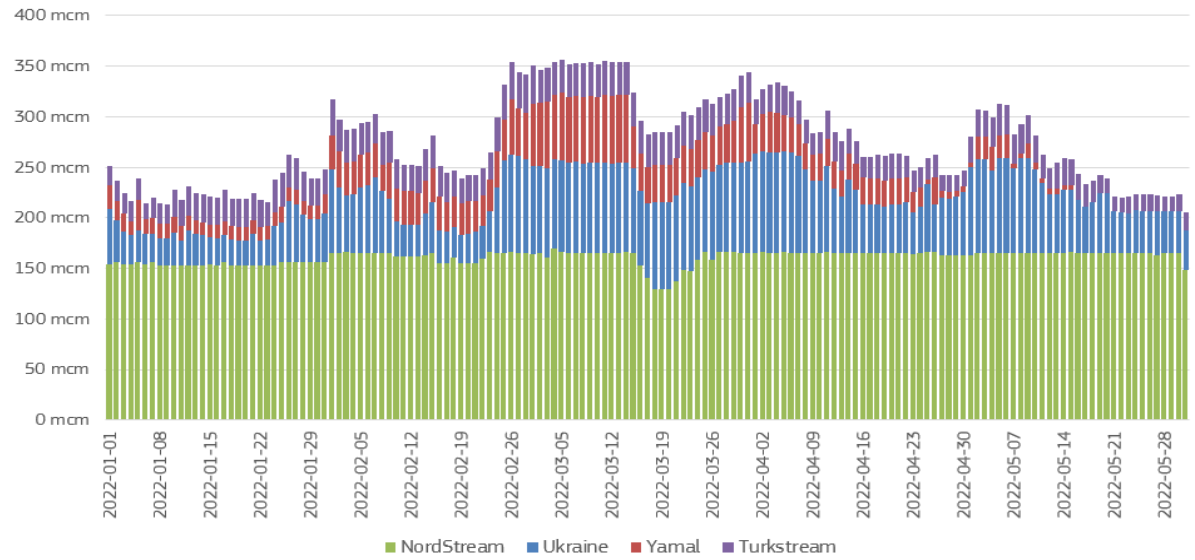
- If the total transit through Ukraine (without Moldova) is counted, in January-May 2022 around 10 bcm gas arrived from Russia via this route (to compare with the 40 bcm total transit for 2022 in the EU-Ukraine-Russia trilateral agreement in force), whereas Nord-Stream 1 transited 24 bcm. Via the Turk Stream (with all destinations) around 5 bcm arrived, and the via the Belarus transit only 4 bcm was shipped in January-May 2022.

Figure 13 – Monthly EU imports of natural gas from Russia by supply route



Source: Based on data from the ENTSO-G Transparency Platform, data as of 3 June 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 14 – Daily EU imports of natural gas from Russia by supply route



Source: Based on data from the ENTSO-G Transparency Platform, data as of 3 June 2022.

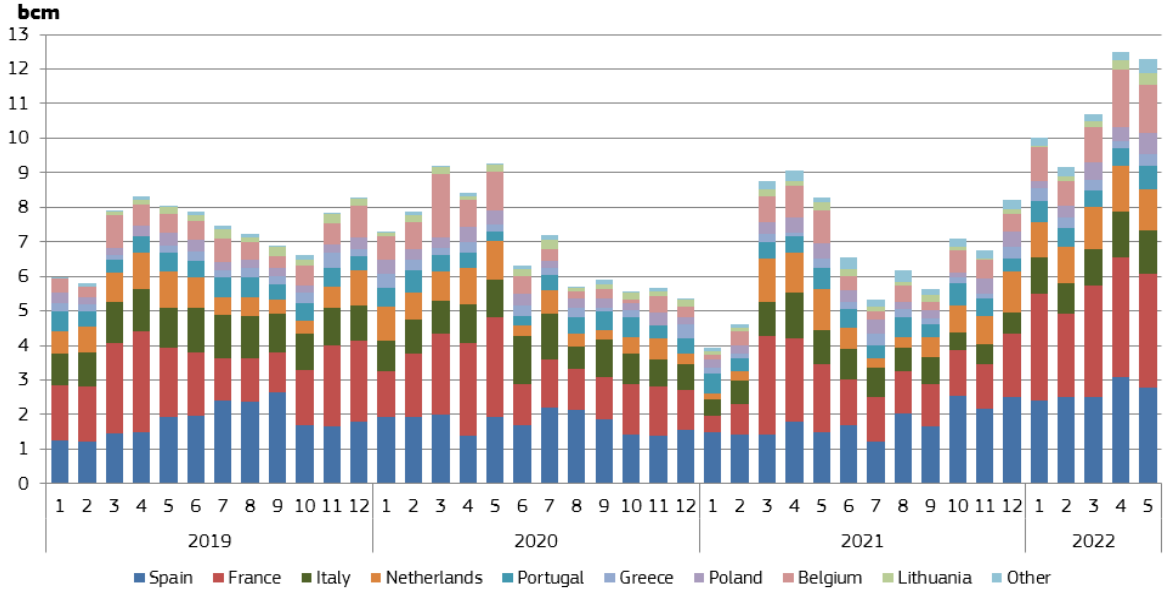
- According to some experts, Gazprom's gas exports to Europe could fall by around a third this year due to the crisis in Ukraine, rivalry with liquefied natural gas, and plans to switch to rouble payments[11]. In 2021 around 140 bcm of pipeline gas arrived in the EU from Russia, and based on the take-or-pay clauses of the long-term contracts in force, the minimum volume should be around 75-80 bcm in 2022.
- The war in Ukraine has dramatically changed the role Ukrainian gas storages played over the last few years in the EU security of gas supply, as European storage operators also used Ukrainian capacities to balance gas demand in the EU. Now Ukraine has to find ways to import gas to secure its own needs at an elevated price environment. The number of displaced persons and the destruction of significant industrial potential both point to decreasing demand for gas in the country. Ukraine's state-owned Naftogaz Ukrainy is investigating ways of importing an estimated 6 billion cubic metres of gas before the end of October 2022 to boost reserves in underground storage ahead high consumption over winter[12].

1.3.2. LNG imports

- LNG imports in the EU grew significantly, by 72% in Q1 2022 in year-on-year comparison, after growing by 33% in the previous quarter. This was the biggest quarterly growth since Q3 2019. Looking at the three months of the quarter, EU LNG imports were up by 154% in January, by 98% in February and by 22% in March, compared to the same months of 2021. In April and May 2022 EU LNG imports respectively grew by 38% and 48%, largely owing to European wholesale gas premiums to Asia during most of the time in 2022 so far. The quarterly LNG imports in Q1 2022 in the EU were 29.9 bcm, up from 22.1 bcm in the previous quarter and up from 17.3 bcm in Q1 2021, as Figure 15 shows. The total number of LNG cargoes arrived in the EU was 372 in Q1 2022, up from 303 in Q4 2021, and from 239 in Q1 2021.
- In Q1 2022, France was the biggest LNG importer in the EU, importing 8.7 bcm of LNG, ahead of Spain, where LNG imports amounted to 7.4 bcm. In year-on-year comparison, imports were up by 107% in France whereas in Spain they rose by 72%. LNG imports in the Netherlands, amounting to 3.3 bcm in Q1 2022, were up by 88% year-on-year. Italy and Belgium were the fourth and fifth biggest importers, (respectively with 3 bcm and 2.7 bcm, imports up by 42% and 108% year-on-year). Portugal came to the sixth place, importing 1.6 bcm (+15% year-on-year), followed by Poland (1.1 bcm, +39% year-on-year). Croatia had a quarterly import of 0.5 bcm in Q1 2022, 75% more than a year before. The total EU LNG imports amounted to an estimated €32.6 billion in Q1 2022, up from €3.5 billion a year before, principally owing to the impact of sharply increasing wholesale gas prices (rising to more than five-fold) year-on-year, and also to the significant increase in imported volumes (72%).
- LNG imports in the United Kingdom in Q1 2022, amounting to 7.7 bcm, were significantly up year-on-year (+50%, rising from 5.1 bcm in Q1 2021). The number of cargoes berthed in the country picked up, and reached 76, as opposed to 48 in Q1 2021.
- In Q1 2022 wholesale gas prices remained volatile in the EU, however, the usual price premium of Asian markets switched to discount during most of the time, further persisting in most part of April and May 2022 (see Figure 29 and Figure 30), which resulted in abundant LNG imports in the EU. In north-western and south-western Europe local LNG import benchmarks developed measurable discounts vis-à-vis the general gas benchmark TTF during some periods of 2022 so far.

[11] https://www.reuters.com/business/energy/gazprom-may-lose-third-its-gas-exports-europe-2022-analysts-2022-04-22/
[12] https://www.upstreamonline.com/production/ukraine-seeks-to-replenish-natural-gas-storage-through-higher-imports/2-1-1233821

Figure 15 - LNG imports to the EU by Member States

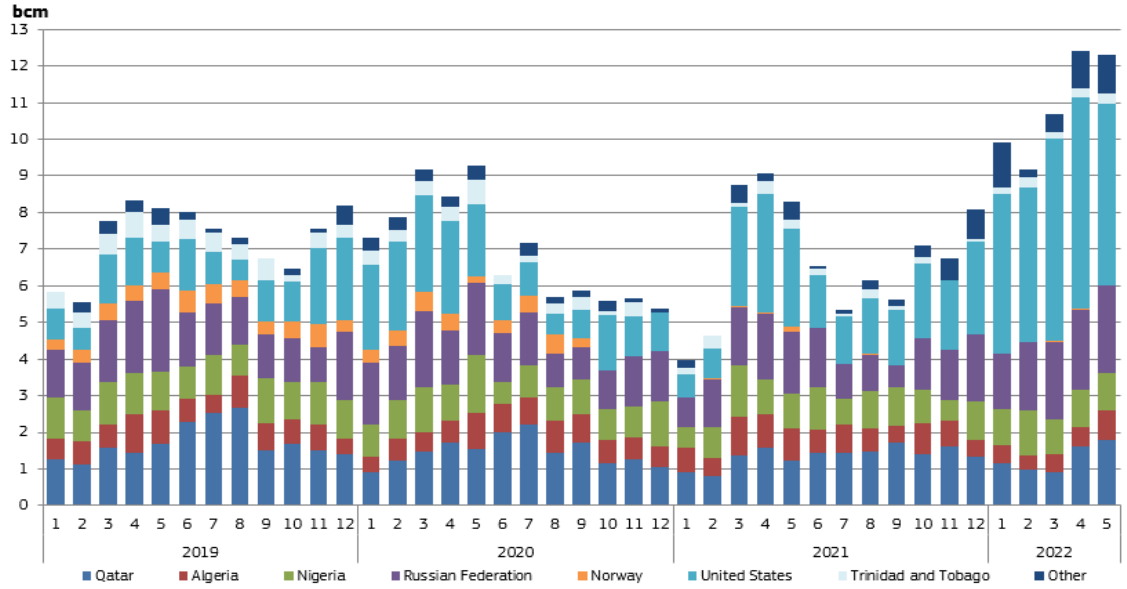


Source: Commission calculations based on tanker movements reported by Refinitiv "Other" includes Finland, Malta and Croatia

- In the first quarter of 2022, the United States proved to be the biggest LNG supplier of the EU, by a large margin to its competitors, ensuring 14 bcm of the EU LNG imports within a single quarter (for comparison: EU LNG imports from the US amounted to 22 bcm in 2021 as whole), representing around 47% of the total imports. Year-on-year, LNG imports from the US were up by 235%, and the share of the US in total EU LNG imports rose by 23 percentage points.
- In spite of ongoing geopolitical tensions, Russia came to the second place in EU LNG supply, representing 19% (5.5 bcm, up by 49% year-on-year). Nigeria became the third most important EU LNG source (with an import share of 11% and imports amounting to 3.1 bcm, +11%), followed by Qatar falling to the fourth place (with an import share of only 10% - 3 bcm, -2%). LNG imports from Algeria amounted to 1.4 bcm, falling by 37% year-on-year and representing only 5% of the total imports. Within other sources, LNG imports from Egypt doubled year-on-year and reached 0.9 bcm (3% of the total), while those from Trinidad and Tobago amounted to 0.7 bcm and ensured around 2% of the total EU LNG imports – See Figure 16.
- In Q1 2022, Norway still had a very low share (less than 0.1%) in total EU LNG imports, similarly to the previous quarter. This decrease can be explained by the ongoing outage of the Hammerfest LNG plant due to a fire incident[13] in September 2020, which, requires repair and maintenance works. However, in the second quarter of 2022 the liquefaction plant came online, so we can expect LNG imports to pick up from Norway as of early summer 2022.

[13] See more in the Quarterly Report on European Gas Markets, fourth quarter of 2020 (Vol 13, issue 4).

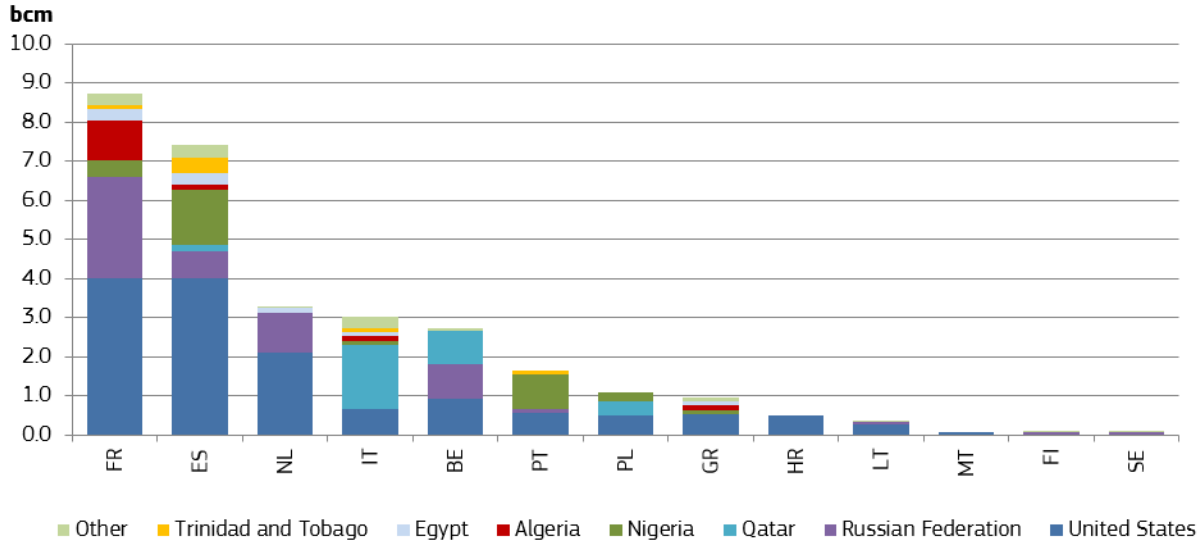
Figure 16 - LNG imports in the EU by supplier country



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, Egypt, Equatorial Guinea, Oman, Peru, Singapore, the United Arab Emirates and Yemen

- In the first quarter of 2022, the United States were the sole LNG supplier of Croatia and Malta, and were a key supplier in the Netherlands (representing 64% of the total LNG imports), Greece (55%), Spain (54%), Poland (47%), France (46%) and Belgium (34%), and it came to the second place in Italy (22%). Russia ensured 97% of LNG imports in Finland and 87% of than in Sweden, while it was the second biggest supplier in the Netherlands (32%), France (30%), Belgium (32%) and in Lithuania (19%). Over the last few years Russian LNG has had increasing importance in the EU, especially in north-western Europe, not independently from the dwindling domestic gas production in the Netherlands. It seems that self-restriction of western European energy consumers, perceivable on the oil market, did not manifest yet in LNG imports from Russia.
- Nigeria was the biggest supplier in Portugal (54%), and ensured 19% of the LNG imports in both Spain and Poland. Qatar was the biggest supplier in Italy (55% of the country's total LNG imports), second biggest in Poland (34%) and the third biggest in Belgium (32%). Algeria ensured more than 10% of the French and Greek LNG imports in Q1 2022, and Egypt had a share higher than 10% in Greece. Spain and Italy had 8 different supply sources, France had of 7, whereas Croatia and Malta had to rely on a single supplier in Q1 2022.
- In the first quarter of 2022, 151 LNG cargoes arrived in the EU from the US (up from 78 in Q4 2021, and from 44 in Q1 2021). LNG imports from the US amounted to 14.1 bcm in Q1 2022, up from 6.4 bcm in Q4 2021 and from in 4.2 bcm Q1 2021. The estimated market value of LNG imports from the US was around €15.6 billion in Q1 2022. In April-May 2022 LNG imports from the US continued at high pace, and 116 cargoes arrived, with 10.7 bcm of LNG, in a value of €11.2 billion. LNG imports from the United States became of particular importance in the EU, as geopolitical tensions mounted over the last few months, putting gas supply from the East under security risk.
- LNG exports to Europe represented 45% of the total US exports in Q1 2022, making Europe a market of principal interest for US LNG shipments. A year before, in Q1 2021 the share of the EU in US LNG exports was barely 18%. In April-May 2022, the share of the EU as export destination was even higher, around 58%.
- In the first quarter of 2022, the three most important EU destinations of the US LNG exports were Spain and France (both close to 4 bcm) and the Netherlands (2.1 bcm). The United Kingdom imported 4.5 bcm of US LNG in Q2 2022.

Figure 17 – LNG imports in the EU Member States from different sources in the first quarter of 2022

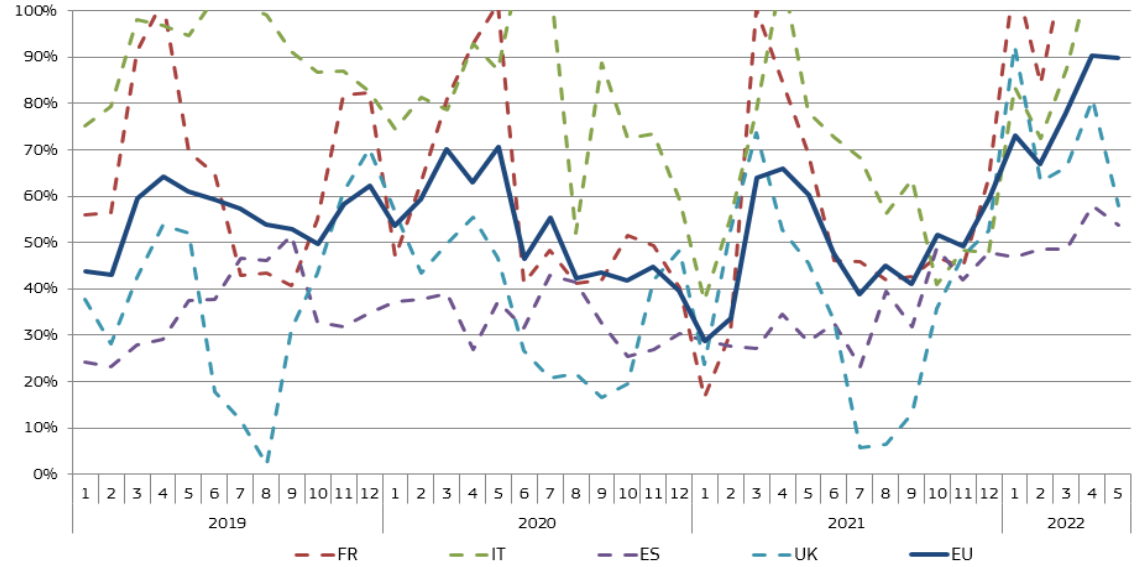


Source: Commission calculations based on tanker movements reported by Refinitiv
Imports coming from other EU Member States (re-exports) are excluded
"Other" includes Angola, Brazil, the Dominican Republic, Oman, Singapore, the United Arab Emirates and Yemen

- The average monthly LNG terminal utilisation rates can be followed on Figure 18, for some EU countries, the EU on average, and the UK. The average EU utilisation rate, which stood at 59% in December 2021, rose significantly in Q1 2022 and it reached 78% in March 2022, further rising to 90% in April and May, the highest ever since the beginning of the available time series, practically meaning full utilisation in these latter two months. 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, the utilisation rate turned up in Q1 2022; based on annual nameplate capacities the French average utilisation rate was above 100% in January 2022, which also was the case in the period of March-May. In Italy, also having higher utilisation rate than the EU average, it rose from 47% in December 2021 to 87% in March 2022, and well above 100% in April-May. Utilisation rates in Spain remained stable between December 2021 and March 2022, around 48%, rising above 50% in April and May, which was below the EU average. In the UK utilisation the average utilisation rate rose above 90% in January 2022, and was quite volatile afterwards, in February it was impacted by storms putting an obstacle in the way of cargo berthing in the UK ports.

Figure 18 – 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

- During the first quarter of 2022, in contrast to the continuous developments over the last few years, the Nord Stream 2 pipeline project seemed to arrive to a definitive abandoning. At the end of January, the promoters still communicated the creation of a German subsidiary of the Switzerland based Nord Stream 2 AG, in order to comply with the requirements of the German regulator (Bundesnetzagentur). However, on 22 February (two days before the start of the Russian invasion in Ukraine on 24 February) German chancellor Olaf Scholz has announced the termination of the certification process[14], referring to the significant change in the geopolitical situation after the Russian declaration on formally recognising two break-away regions in eastern Ukraine. On 23 February, the United States welcomed this move from Germany, recalling its long-standing opposition to a geopolitical project that would have been reinforced Europe's reliance on Russian gas, and lifted the waiver relating to the sanctions on Nord Stream 2, its CEO and corporate officers[15].

- The pipeline was developed and was to be operated by Nord Stream 2 AG, a subsidiary of Gazprom. However, it was co-financed by several other European companies including Germany's Uniper, chemical company BASF's subsidiary Wintershall, as well as Engie, OMV and Shell. Amid the mass withdrawal of western businesses from Russia, the energy companies involved in Nord Stream 2 were practically forced to accept big losses on the project. Wintershall announced in early March 2022 that it would write off its 1 billion euro financing in the pipeline as have OMV and Uniper too[16]. Shell has also withdrawn from the project.

- On infrastructure developments, at the end of January 2022 the Bulgarian Chiren underground gas storage expansion project has been secured 78 million euros under the Connecting Europe Facility (CEF)[17]. The project envisages an increase in the active gas volume, up to 1 bcm. The availability of sufficient storage capacity in the region is of key importance for alternative natural gas suppliers. Chiren expansion is in synergy with the LNG terminal project near Alexandroupolis, where the Chiren promoter Bulgartransgaz participates with 20 per cent of the share capital and with other company projects that aim at improving interconnectivity with neighbouring countries. At the same time, the final investment decision (FID) on the Greek Alexandroupolis floating, storage and regasification unit (FSRU) was made by utility company Gastrade[18]. It will allow to deliver re-gasified LNG to the markets of Greece, Bulgaria and the wider region ranging from Romania, Serbia and North Macedonia to Moldova and Ukraine. Expected to be operational by the end of 2023, the terminal's contracted regasification capacity is already reaching up to 50% of its technical capacity of 5.5 bcm per year. Back in June 2021, the European Commission approved a grant of €167 million for the project.

- On 8 March, in the wake of the unprovoked Russian invasion in Ukraine, the Commission has proposed an outline of a plan ("RePowerEU communication") to make Europe independent from Russian fossil fuels well before 2030[19]. This plan also outlines a series of measures to respond to rising energy prices in Europe. RePowerEU will seek to diversify gas supplies, speed up the roll-out of renewable gases, replace gas in heating and power generation and boosting energy efficiency measures. This could reduce EU demand for Russian gas by two thirds before the end of 2022. In the communication there is guidance on regulating energy prices in exceptional circumstances, and on the redistribution of the energy sector's profits. Furthermore, additional proposals were presented on the electricity market design, curbing the impact of high gas prices on wholesale electricity prices, mandatory requirement on the filling rate of underground gas storages, etc.

- On 11 March, the European Council has agreed in the Versailles declaration[20] on phasing out the dependency on Russian gas, oil and coal imports as soon as possible, by accelerating the reduction of the EU's overall reliance on fossil fuels, taking into account national circumstances and Member States' choice of their energy mix. This will be done amongst others via diversification of the gas supplies and routes, including through the use of LNG and the development of biogas, further development of the EU hydrogen market, speeding up the development of renewables, completing the interconnection of electricity and gas networks, and improving energy efficiency and the management of energy consumption.

- Following the aforementioned communication on RePowerEU, on 23 March the Commission has presented its proposal on mandatory filling of underground gas storages[21]. According to this proposal, each Member State shall ensure that the given filling target for the aggregated capacity of all storage facilities in their territory is reached by 1 November each year. For 2022, the filling target should be set at 80% of the capacity of all storage facilities on the territory of the respective Member States. Member States shall take the necessary measures to fulfil the intermediary targets (for 2022, intermediary targets shall only be set for August, September and October, while as of 2023 the intermediary targets are set for February, May, July and September). In May 2022, Member States agreed on the negotiation mandate for the proposal in the Council.

[14] http://www.energyconnects.com/news/oil-and-gas/2022/february/germany-halts-nord-stream-2-project/
[15] https://www.state.gov/sanctioning-ns2ag-matthias-warnig-and-ns2ags-corporate-officers/
[16] https://www.cnbc.com/2022/03/31/the-nord-stream-2-pipeline-lies-abandoned-after-russia-invaded-ukraine.html
[17] https://ceenergynews.com/oil-gas/chiren-ugs-expansion-project-to-receive-78-million-euros-under-cef/#:~:text=Chiren%20UGS%20expansion%20project%20to%20receive%2078%20million%20euros%20under%20CEF.-By%20Newsroom&text=Chiren%20underground%20gas%20storage%20expansion,Connecting%20Europe%20Facility%20(CEF)
[18] https://www.nsenergybusiness.com/news/gastrade-alexandroupolis-lng-terminal-greece/#:~:text=Utility%20company%20Gastrade%20has%20taken,in%20line%20with%20its%20schedule
[19] https://ec.europa.eu/commission/presscorner/detail/en/IP_22_1511
[20] https://www.consilium.europa.eu/media/54773/20220311-versailles-declaration-en.pdf
[21] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0135&qid=1649254861786

- On 25 March, a joint statement[22] between the European Commission and the United States was issued on European energy security. According to this, the United States will strive to ensure, including working with international partners, additional LNG volumes for the EU market of at least 15 bcm in 2022, with expected increases going forward. Furthermore, the European Commission will work with EU Member States toward ensuring stable demand for additional U.S. LNG until at least 2030 of approximately 50 bcm per year. The applied price formula of LNG supplies to the EU should reflect long-term market fundamentals, and stability of the cooperation of the demand and supply side, and that this growth is consistent with the shared net zero goals. In particular, price formula should include consideration of Henry Hub natural gas spot price and other stabilising factors.

- Since the start of the Russian invasion on 24 February, the European Union has adopted six packages of sanctions, also impacting energy relations[23] with Russia. Imports of Russian natural gas has not been generally sanctioned so far, however, some of these measures impacted the gas sector as well. For example, in the second package, adopted on 25 February, the EU prohibited the sale, supply, transfer or export to Russia of specific goods and technologies in oil refining and also banned the provision of related services, which was later (on 8 April) extended to natural gas liquefaction technologies, too. As part of the fourth package of sanctions adopted on 15 March, the EU introduced a far-reaching ban on new investment across the Russian energy sector, as well a comprehensive export restriction on equipment, technology and services for the energy industry, however, investments necessary for transport of natural gas between the EU and Russia have been exempted.

- On 31 March a Russian presidential decree was issued, substantially amending the legal framework for the execution of supply contracts concluded between Russian gas suppliers and EU companies, adding new obligations for each EU company[24]. The Decree introduces a new payment procedure, whereby the deposition of euros or dollars on the supplier's account is no longer considered as fulfilment of the contractual obligations. Instead, euros or dollars received by EU companies need to be converted into roubles under the Decree, and EU companies are only deemed to have fulfilled their contractual obligations once the conversion process from euros or dollars has been successfully completed, and the payment has been made in roubles. Although many of Gazprom's EU customers complied with the decree, over the last two months Gazprom started to announce stopping gas supply to several Member States, and Russia has also introduced sanctions on economic entities in the EU, which Gazprom can no longer deliver gas shipments to. This has increased security of gas supply concerns in the EU.

- On 7 April 2022, the EU Energy Platform[25] was established at a first meeting with EU countries, to secure the EU's energy supply at affordable prices in the current geopolitical context and to phase out dependency on Russian gas. The platform will play a key role in pooling demand, coordinating infrastructure use, negotiating with the international partners and preparing for joint gas and hydrogen purchases. It was first proposed by the RePowerEU communication on 8 March and was endorsed by the Heads of States and Government still in March 2022. The platform will build on existing EU policy initiatives and cooperate with EU countries, transmission system operators, associations and market players. The platform became operational in June 2022.

1.5 Storage

- Figure 19 shows EU gas stock levels as the percentage of storage capacity in gas years[26] 2020 and 2021, compared to the 5-year range of gas years 2015-2019. According to figures published by Gas Infrastructure Europe, operational EU storage capacity amounts to 1,148 TWh (roughly 102 bcm) as of July 2021[27].

- The first quarter of the year is traditionally the peak period of the heating season, with intensive reliance on storage withdrawals and depleting storages, reaching their lows at the end of March, early April in most of the EU countries. Amid increasing security of supply concerns and rising geopolitical tensions during the winter of 2021/22, the daily evolution of storage levels have been in the focus of the gas market attention over the last few months. Even if the winter was milder than usual, as of February and March market participants started to look at the refilling period ahead of the next winter (2022/23), as concerns around gas flows from Russia grew, especially after the launch of the invasion late February.

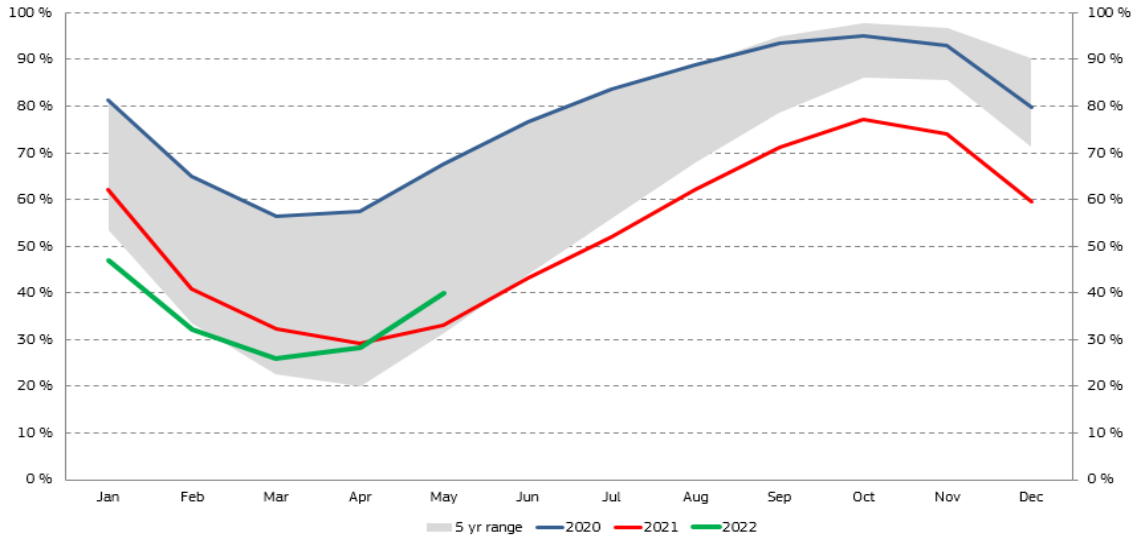
- On 31 December 2021, the average EU storage filling rate was 21 percentage points lower than on the final day of 2020 (53.5% vs. 74%), and was around 19 percentage points lower than the average of the last five years (2016-2020) on this day. On 31 March 2022 however, the average filling rate fell to 26.2%, which was only lower by 4 percentage points compared to 31 March 2021 (30.2%), implying that storage withdrawals were less intensive in Q1 2022 than a year before (quarterly decrease of 27 percentage points in 2022 vs. a decrease of 44 percentage points a year earlier). Less reliance on storage withdrawals might have been related to milder temperatures, and to the decreasing gas consumption in industry and power generation, owing to high spot

[22] https://ec.europa.eu/commission/presscorner/detail/en/statement_22_2041
[23] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02014R0833-20220316&from=EN
[24] https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/faqs-sanctions-russia-imports-purchase-goods_en.pdf
[25] https://energy.ec.europa.eu/topics/energy-security/eu-energy-platform_en
[26] 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
[27] https://www.gie.eu/wp-content/uploads/filr/1410/2021_Storage_DB_final.xlsx

prices. On 31 March 2022, the EU average filling rate (26.2%) was only 8 percentage points lower than the average of years 2016-2020, and it was higher than on the same day in 2017 and 2018. Further in April and May, since 17 April 2022 the average EU filling rate has been higher than on the same days in 2021, however, at the end of May 2022 the average EU filling rate was still 4-5 percentage points lower than the average of 2016-2020. In April-May 2022 the weather was milder than the same cold period in 2021, enabling quicker replenishment of the underground gas storages in the EU.

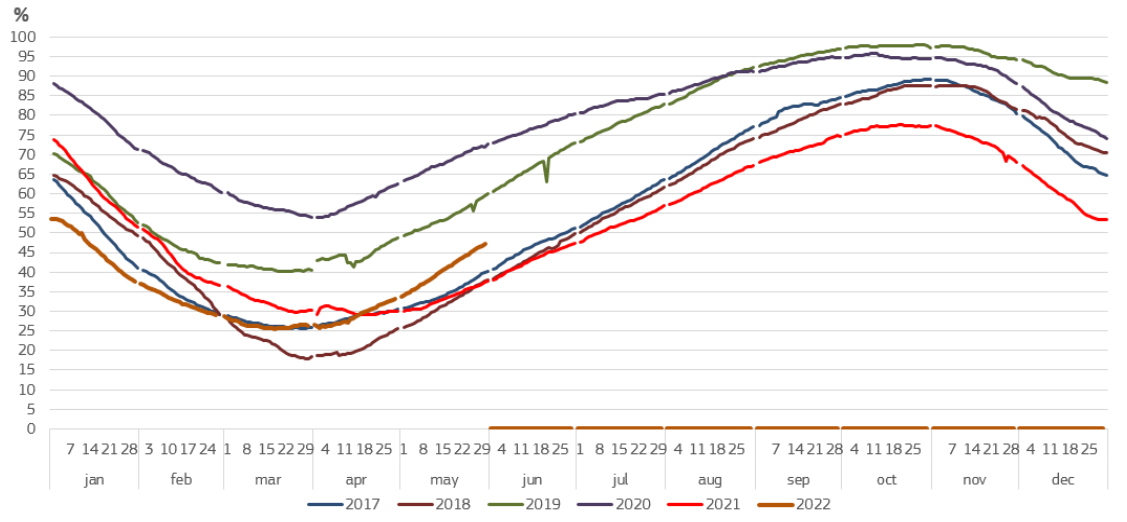
- Storages operated by Gazprom could be characterised by much lower filling rates compared to the EU average in Q1 2022, continuing the trend of the previous quarters. While the EU average filling rate was more than 53.5% on 31 December, storages controlled by Gazprom was barely 23% full, and on 31 March 2022 still significant differences could be observed (26% vs. 7%). In April and May some EU countries, e.g. Germany made legal steps to force refilling of Gazprom controlled storages on their soil[28], however, Russia has made steps to block gas deliveries to a number of economic entities on EU territory. In mid-June 2022, Gazprom controlled storages were filled at 21%, still far below the EU average of 54-55%.

Figure 19 - 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, extracted on 2 June 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.

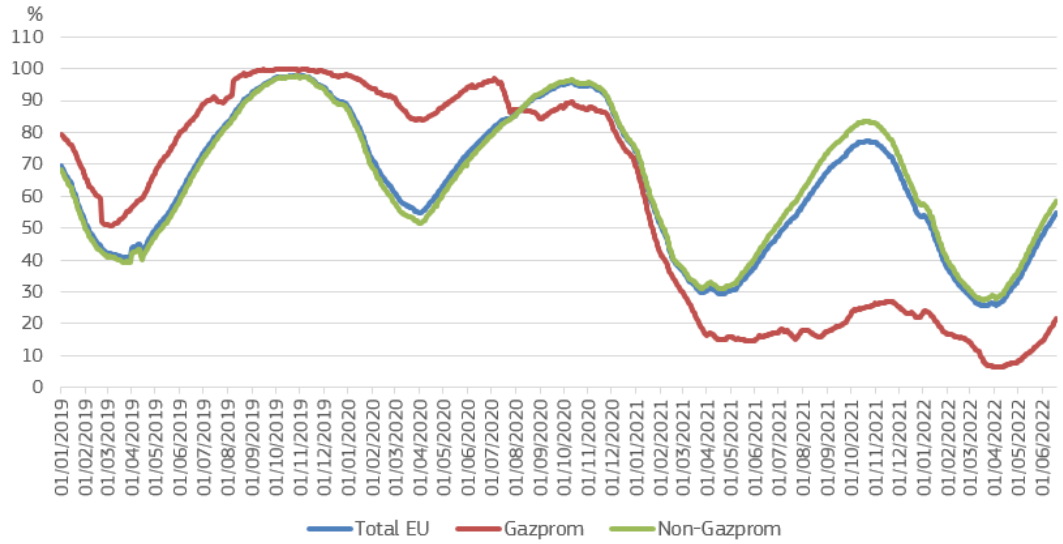
Figure 20 – Daily gas storage levels in the EU on average in per cent of total available storage capacities



Source: Gas Storage Europe AGSI+ Aggregated Gas Storage Inventory, extracted on 2 June 2022. See explanations on data coverage at https://agsi.gie.eu/#/faq.

[28] https://www.euractiv.com/section/energy/news/berlin-forces-storage-in-gazprom-facilities-on-german-soil-by-decree/

Figure 21 – Difference in the filling rates of Gazprom controlled storages and other storages



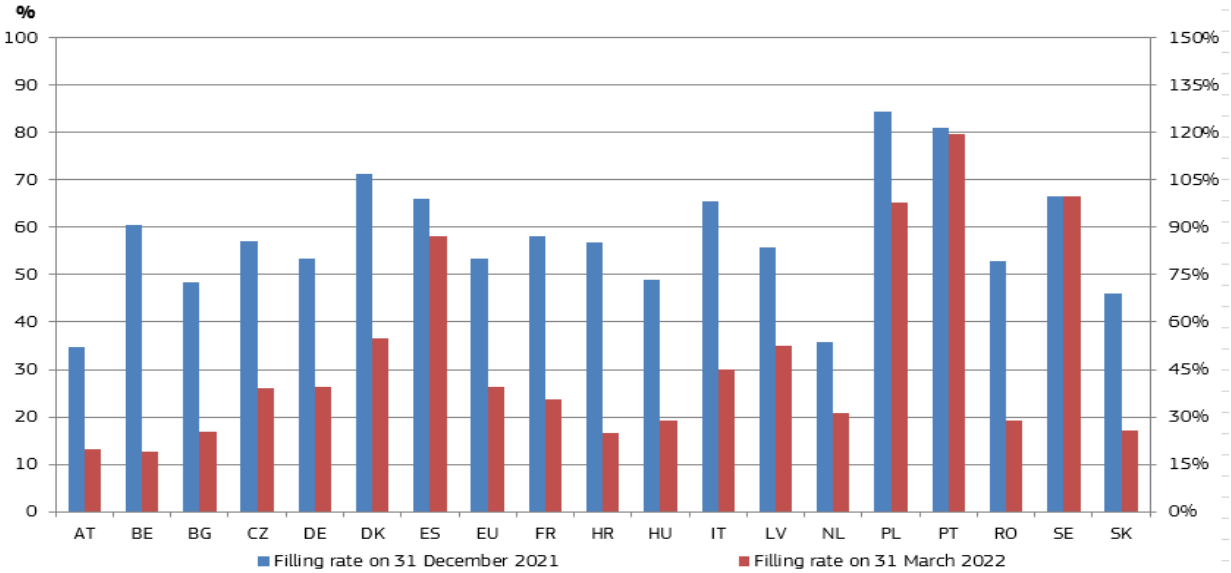
Source: JRC calculations, based on Gas Storage Europe AGSI+ data

- On 31 December 2021, the EU average filling rate was 53.5% with the lowest filling rates in Austria (35%) and the Netherlands, (36%) and Slovakia (46%), whereas the highest fullness rates could be observed in Poland (84%), Portugal (81%) and Denmark (71%). On 31 March 2022, the average rate was 26%, with the lowest filling rates measured in Belgium and Austria (both 13%) and in Croatia and Slovakia (both 17%), whereas the highest rates could be observed in Sweden (66%), Poland (65%) and Spain (58%).

- Looking at the average filling rates on 31 March 2022, with the exception of Austria, Hungary and Italy (falling to the lowest in the last five years), they were in the range of minimum and maximum value of the five year period of 2017-2021. The lowest value in this period typically meant those in 2017 or 2018, whereas the highest was in 2020.

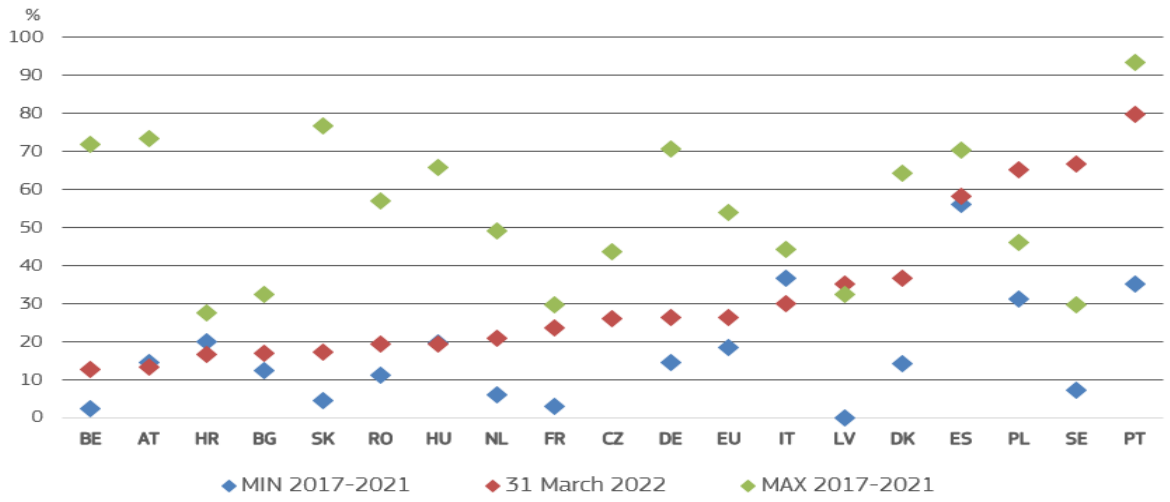
- The highest withdrawal rates between 31 December 2021 and 31 March 2022 could be observed in Belgium (48 percentage points), Croatia (40 percentage points) and Italy (36 percentage points), whereas in Portugal, Spain and the Netherlands filling rates only decreased respectively by 1, 8 and 15 percentage points, and in Sweden (though having minimal storage capacities) filling rates even increased slightly (+0.2 percentage points) in Q1 2022.

Figure 22 - Gas storage levels as percentage of maximum gas storage capacity at the end of December 2021 and March 2022 by Member State



Source: Gas Storage Europe AGSI+ Aggregated Gas Storage Inventory, extracted on 2 June 2022. See explanations on data coverage at https://agsi.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 23 – Gas storage levels on 31 March 2022, compared with five-year minimums and maximums



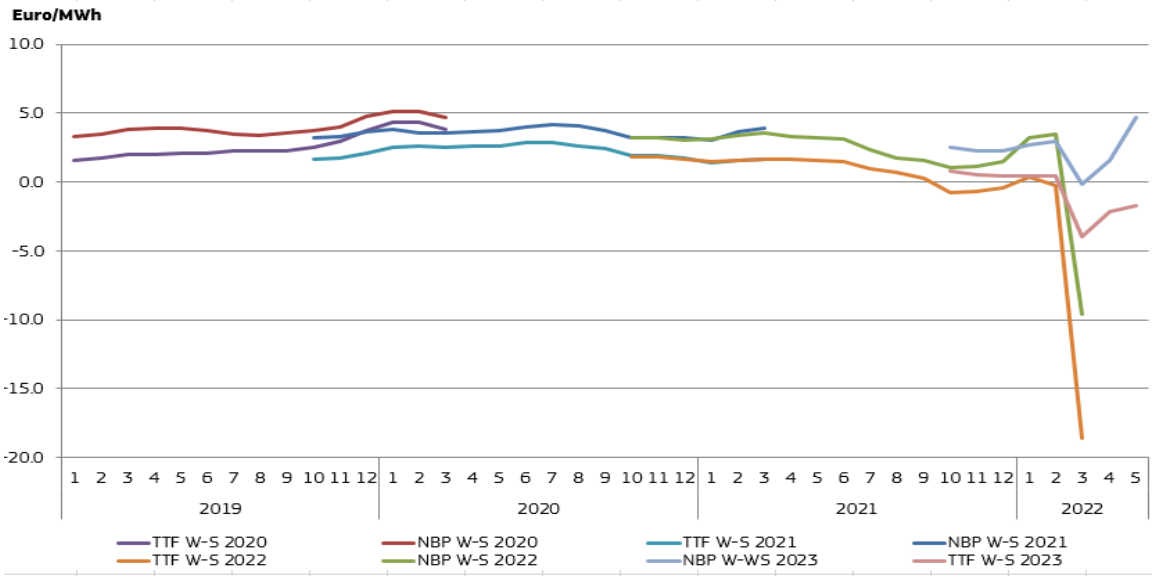
Source: Gas Storage Europe AGSI+ Aggregated Gas Storage Inventory, extracted on 2 June 2022

- The next two charts (Figure 24 and Figure 25) 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.

- On the TTF, 2022 seasonal spreads were at 0.3 €/MWh in January 2022, reverting to negative ranges in February (-0.3 €/MWh). In March 2022, as markets tightness and fears of supply disruptions resulted in a price spike on the near-end of the gas forward curve, the TTF summer-winter spread fell deeply in the negative range, reaching -18 €/MWh on average. On some trading days (7-8 March), the spread fell as low as -40-50 €/MWh. As of 1 April, the 2023 spread replaced the outgoing 2022 spread contracts, and it remained mostly in the negative range in April and May 2022. However, at the same time quarter-ahead and two quarters ahead contracts developed a premium to spot gas prices, giving incentives to refill storages in the second and third quarters of 2022.

- At the same time, the seasonal spread on the NBP remained in the positive range in January and February 2022 (respectively reaching 3.2 €/MWh and 3.5 €/MWh on average), but in March it fell to -9.5 €/MWh, and recovered later with falling spot prices on the NBP hub. Due to abundant LNG influx, the NBP spot prices did not soar as high as the TTF, implying higher winter-summer price spreads.

Figure 24 - 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.

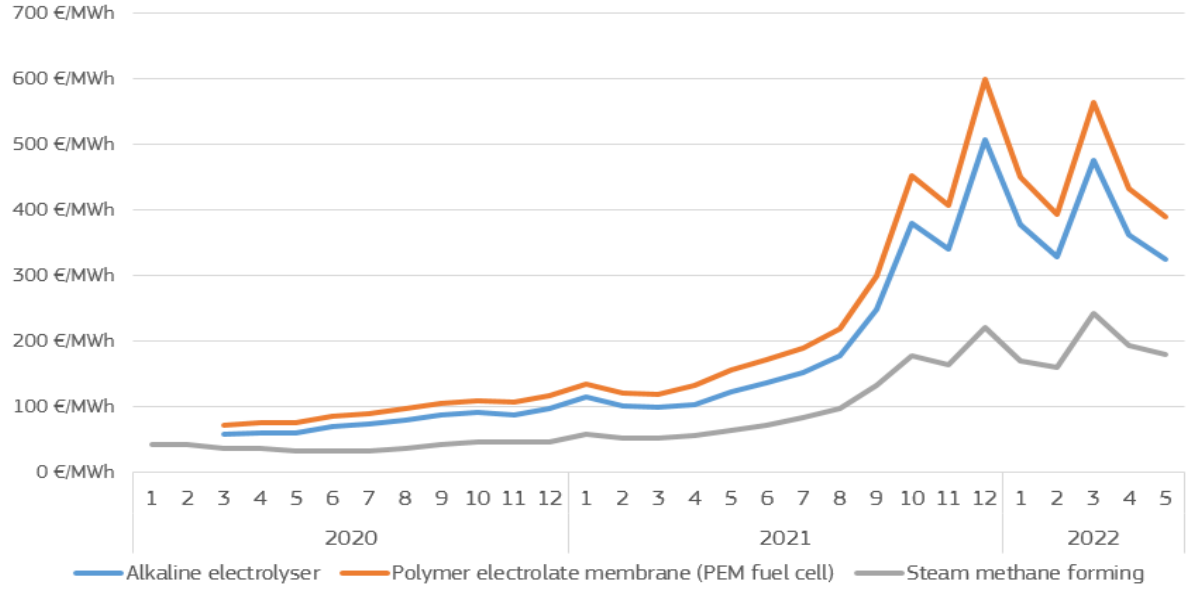
Figure 25 – Daily winter-summer spread on the Dutch TTF hub

Source: S&P Global Platts
Before 1 April 2022, W-S refers to W-S 2022, after it is W-S 2023.

1.6 Hydrogen market developments

- The next chart shows the production cost-based estimated prices for hydrogen, generated by three different technologies. Alkaline water electrolysis is a type of electrolyser that is characterised by having two electrodes operating in a liquid alkaline electrolyte solution of potassium hydroxide (KOH) or sodium hydroxide (NaOH). A fuel cell is an electrochemical device that directly converts the chemical energy of reactants (a fuel and an oxidant) into electricity. Polymer electrolyte membrane (PEM) electrolysis is the electrolysis of water in a cell equipped with a solid polymer electrolyte that is responsible for the conduction of protons, separation of product gases, and electrical insulation of the electrodes. Steam methane forming (SMR) refers to a technology for producing hydrogen from natural gas; in the case on the chart below it includes the costs of Carbon Capture and Storage (CCS) as well.

Figure 26 - Production cost based hydrogen price assessments for different technologies (including CAPEX)



Source: S&P Platts. The calculated prices reflect both the commodity production cost and the capital expenditure associated with building a hydrogen facility.

- Whereas alkaline electrolysis and PEM technology costs predominantly depend on the electricity price, the costs of SMR technology is driven by the cost of natural gas used for producing hydrogen. Alkaline and PEM are related to green power (hydrogen generation cost assessment is practically based on green power costs, adding EU wind guarantee of origin prices to wholesale electricity prices), whereas costs of SMR hydrogen generation is based on costs of natural gas (by adding CCS costs).
- In January 2022, the TTF spot gas hub prices averaged at 85 €/MWh, falling to 80 €/MWh in February and rebounding to 126 €/MWh in March. At the same time, the Pan-European Electricity wholesale price was around 166 €/MWh in January 2022, falling to 148 €/MWh in February and bouncing back to 243 €/MWh in March. In April and May 2022 both wholesale gas and electricity prices in the EU markets fell back compared to the March 2022 peaks. High and volatile wholesale gas and electricity prices over the last few months also resulted in large movements in hydrogen price assessments.
- Cost-based assessment price for alkaline technologies was down from 507 €/MWh in December 2021 to 476 €/MWh in March 2022 (in January and February it was below 400 €/MWh) and fell as low as 324 €/MWh in May 2022, with CAPEX costs, whereas prices of PEM fuel cell technology based generation fell from 600 €/MWh to 565 €/MWh in Q1 2022 (falling below 400 €/MWh in May 2022). These cost assessments were more than twice to three times as high as wholesale electricity prices. At the same time, SMR technology based costs assessments rose from 221 €/MWh in December 2021 to 242 €/MWh in March 2022 (receding to 180-190 €/MWh in April-May 2022), being around twice the wholesale natural gas price in each month.
- On recent project initiatives, in February 2022 RWE and Neptune Energy announced that they have signed a Joint Development Agreement to develop the offshore green hydrogen demonstration project "H2opZee" ahead of 2030[29]. H2opZee is a demonstration project which aims at building 300 to 500 megawatts (MW) electrolyser capacity far out in the Dutch North Sea, in order to produce green hydrogen by using offshore wind. The hydrogen will then be transported to land through an existing pipeline. The pipeline has a capacity of 10 to 12 gigawatts (GW), so it is already suitable for the further roll-out of green hydrogen production to gigawatt scale in the North Sea.

[29] https://www.rwe.com/en/press/rwe-renewables/2022-02-15-rwe-and-neptune-energy-join-forces-to-accelerate-green-hydrogen-production-in-dutch-north-sea

- H2opZee consists of two phases: In the first phase, a feasibility study will be carried out and an accessible knowledge platform set up. The objective of this is to start the roll-out of hydrogen at sea in the Netherlands. In the second phase, the project will actually be implemented. For that phase, a tender methodology has yet to be defined.

2. Wholesale gas markets

2.1 EU energy commodity markets

- In the first two months of 2022, the dated Brent crude oil price showed a gradual increase, starting the year at 79 USD/bbl (70 €/bbl), and reaching 103 USD/bbl (92 €/bbl) by the end of February after the start of the Russian invasion in Ukraine. Since the beginning of March 2022, the dated Brent has been practically above 100 USD/bbl nearly all the time. A number of companies terminated buying crude oil and oil products of Russian origin, which resulted in a market tightness, helping to keep prices at high levels. On 8 March 2022, the Brent dated crude reached 138 USD/bbl (126 €/bbl), being the highest since summer of 2008. Policy measures (e.g. sanctions already announced by the US, UK and other western countries on gradual banning of oil imports from Russia, which the EU also embarked on at the end of May), also added to the tight market supply. The OPEC+ maintained its monthly increase of 0.4 mbpd production limit, which was followed by a bigger increase (more than 0.6 mbpd in June), however, high prices indicate that the market does not anticipate a rapid ramp up in global production, and easing of supply concerns, even if oil products stocks were released in most of the IEA countries. Contrarily the usual negative correlation between oil prices and the USD, the dollar has appreciated vis-à-vis the euro, not providing the usual cushioning impact for oil product consumers in the EU. The discount of year-ahead contracts vis-à-vis the spot contract widened over Q1 2022, up from 4 USD/bbl (3.5 €/bbl) early January to 18 USD/bbl (16 €/bbl) by the end of March 2022, signaling a market expectation for correction of the spot price increase.

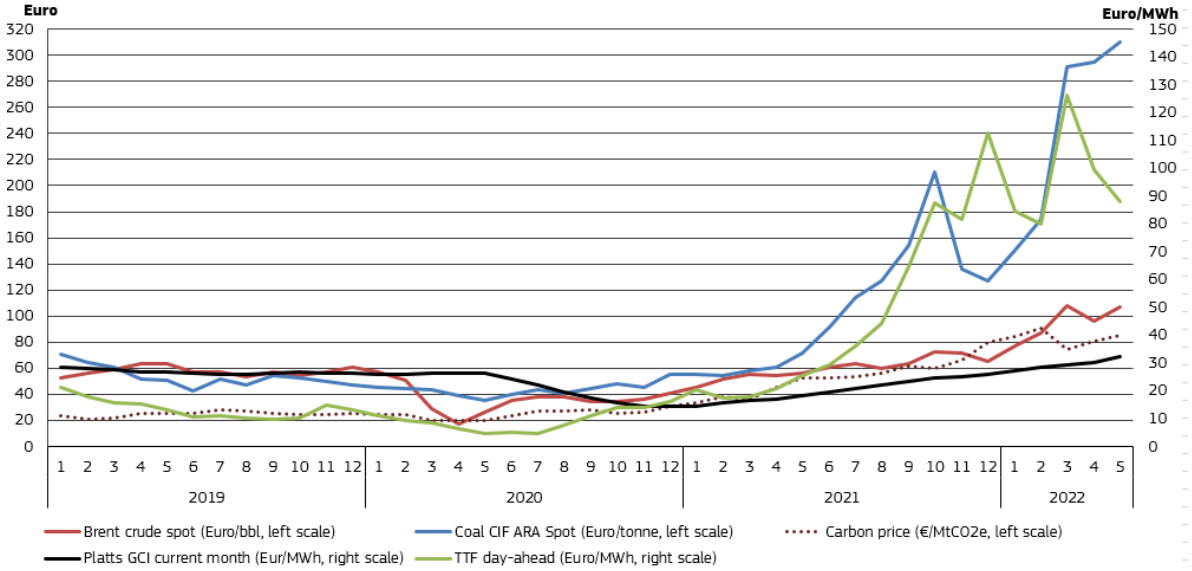
- Following the significant upturn and correction in late December 2021, the Dutch TTF spot gas price moved in a range of 70-100 €/MWh during most of the time in January and February 2022. After 24 February, the beginning of the Russian invasion in Ukraine, the spot prices turned up sharply again, on 7 March the TTF reached a new high of 212 €/MWh on average, which was even higher than the previous peak set before Christmas 2021 (183 €/MWh). This high price level was mainly due to market tensions and concerns about future gas inflows from Russia, a key supplier of natural gas of the EU, amid combat events on territory crossed by key pipeline infrastructure in Ukraine. However, in March Russian inflows did not show sudden declines, but the overall Russian inflows were down year-on-year. The abandoning of the Nord Steam 2 project by the German government in the wake of the geopolitical situation (See Chapter 1.4) also added to market tightness. Later in April and May 2022, the gas market was still driven by policy announcements (e.g. Russian decree on payments in rubles - see Chapter 1.4, terminating gas supply to certain countries or reducing supply through given pipeline routes). The discount of the year-ahead price contracts to the spot TTF widened from 19 €/MWh to 30 €/MWh over Q1 2022, though during the early March peak it was even 90 €/MWh.

- Platt's North West Europe Gas Contract Indicator (GCI), a theoretical index showing a gas price linked 100% to oil, continued to increase in Q1 2022, mirroring the increase of crude oil prices in the second half of 2021. Typically, crude oil price changes appear in the oil-indexed contracts with a time lag of 6 months. GCI contracts rose from 26 €/MWh in December 2021 to 29 €/MWh in March 2022 (and rose slightly further to 32 €/MWh in May 2022). Recent decade-high oil prices are expected to be reflected in GCI contracts in the third quarter of 2022. Amid current high gas wholesale prices, oil-indexed gas contracts offer a competitive opportunity for gas imports in the EU.

- Spot coal prices (CIF ARA) in the first two months of 2022, mirroring the broader energy complex, rose from 120 €/Mt to 200€/MWh until the end of February, then in the first week of March they soared, reaching an all-time high of 360 €/MWh, and slightly falling back in the following weeks. In April and May 2022, coal prices remained at very high levels (200-300 €/MWh), reflecting the impact of demand for thermal coal in the EU power generation as high gas prices resulted in improving competitiveness of coal fired generation. In the forthcoming quarters, if gas security of supply demonstrates, more coal and lignite generation capacities can come online to free up gas for other sectors.

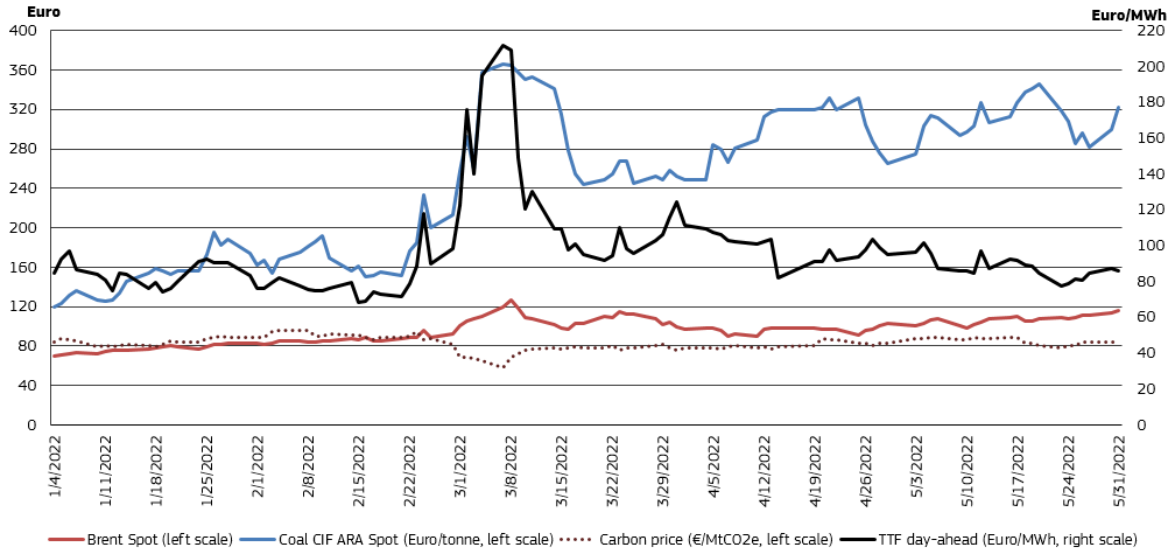
- Carbon prices in January-February 2022 moved in a range of 80-90 €/MtCO2e during most of the time. However, in sharp contrast to the sharp turn-up of other energy prices, carbon prices fell in the first week of March 2022, as low as 68 €/MtCO2e on 8 March, mostly owing to expectations on energy demand destruction amid extremely high energy prices. In April-May 2022, the carbon price returned to the range of 80-90 €/MtCO2e.

Figure 27 – Monthly spot prices of oil, coal and gas in the EU



Source: S&P Global Platts

Figure 28 - Monthly spot prices of oil, coal and gas in the EU



Source: S&P Global Platts

2.2 LNG and international gas markets

- Figure 28 displays the international comparison of wholesale gas prices, including hub, LNG landed and pipeline import gas prices. After the seven year high peak reached in October 2021, the Henry Hub fell back in November and December, however, as from the beginning of January 2022 it started to rise again, growing by the end of March close to levels of early October 2021. Increasing demand for LNG shipments from the US has impacted wholesale gas prices in the country, as Europe provided for a profitable destination for LNG to sell. In May 2022, the US Henry Hub spot price rose to 8 USD/mmbtu, higher than in any month since 2010 on average. Meanwhile, Asian contracts showed a slightly decreasing trend in January and February, then turned up sharply in early March. The TTF followed a similar pattern, and many times in Q1 2022 and further in April and May, it was in discount to the JKM, providing for good opportunity to lure LNG cargoes to Europe.

- The quarterly average Japanese LNG price was 31.5 USD/mmbtu in Q1 2022, down from 36.1 USD/mmbtu in Q4 2021, but up from 9.3 USD/mmbtu in Q1 2021. The Japanese price turned to discount to Dutch TTF hub (-0.3 USD/mmbtu in Q1 2022), as opposed to 4.2 USD/mmbtu in Q4 2021. LNG import prices in China were comparable with their Japanese peers (31.6 USD/mmbtu in Q1 2022). The quarterly price differentials might mask specific periods when price volatility resulted in quick switches between premiums and discounts between JKM and the TTF (e.g. first two weeks of March 2022).

- Chinese pipeline gas imports, presumably mostly based on oil-indexed contracts, were at 6.9 USD/mmbtu in Q1 2022, slightly higher than in Q4 2021 (6.5 USD/mmbtu), having a significant price advantage vis-à-vis LNG imports (with the aforementioned quarterly average price of 31.6 USD/mmbtu in Q1 2022). High demand for LNG in East Asia is likely to ensure the competitiveness of oil-indexed contracts in the forthcoming months, even if recent price increases on the oil market are still to be priced in during the forthcoming couple of quarters.

- The Henry Hub price remained practically stable in Q1 2022 (4.6 USD/mmbtu vs. 4.7 USD/mmbtu in Q4 2021) from 4.2 USD/mmbtu, however, in the second quarter of 2022 it rose again. As Figure 29 shows, both TTF and JKM continued to show measurable premiums vis-à-vis Henry Hub. Specifically in mid-January 2022 and after mid-March, TTF developed a premium to JKM, as Figure 30 shows, which resulted in LNG cargo redirection to Europe in these periods. On quarterly average, TTF had a premium of 27 USD/mmbtu to Henry hub, similarly to JKM. The euro slightly depreciated against the USD in Q1 2022 (in December 2021 the exchange rate was 1.13, while in March 2022 it fell to 1.10), but this did not really contribute to the increasing divergence between the TTF and the Henry Hub.

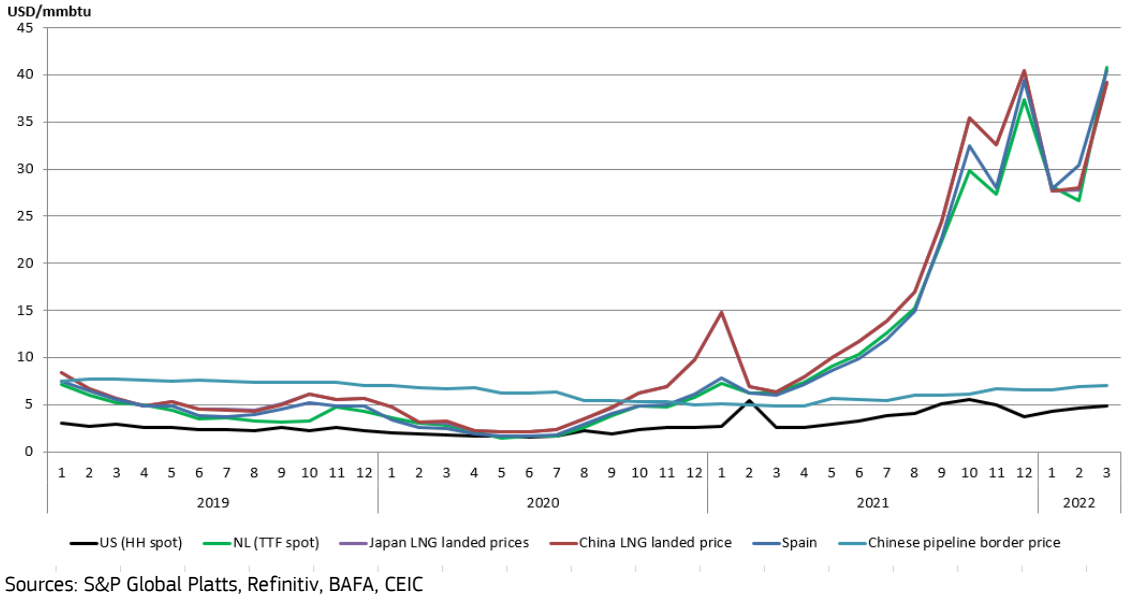
- In the first quarter of 2022, the average TTF/Henry Hub ratio was 6.9, slightly up from 6.7 in Q4 2021. The ratio of the Japanese LNG price and US Henry Hub was 6.8, down from 7.6 in Q4 2021, whereas the average price ratio of the Japanese LNG prices and the TTF fell to 1.0 in Q1 2022, down from 1.2 in Q4 2021. Similarly to the price differentials, the ratios underline the trend of co-movement between TTF and JKM and their significant premium vis-à-vis Henry Hub.

- In the first quarter of 2022, TTF averaged at 31.8 USD/mmbtu (97 €/MWh), up from 31.5 USD/mmbtu (94 €/MWh) in Q4 2021 and from 6.6 USD/mmbtu (19 €/MWh) in Q1 2021. The average German border price in Q1 2022 was lower than the TTF (16.6 USD/mmbtu or 51 €/MWh), showing that the impact of high spot prices in the long term contracts in the German gas import mix, either still oil-indexed or hub indexed, will appear only with a few months' time lag, resulting in less volatility compared to the European hub spot prices.

- In Q1 2022, the Spanish LNG landed price was 32.9 USD/mmbtu on average, having a premium to the Dutch TTF spot (31.8 USD/mmbtu), however, as of March north-western and south-western LNG import prices started to develop a discount to TTF, which became visible especially in April and May 2022 (see Figure 32).

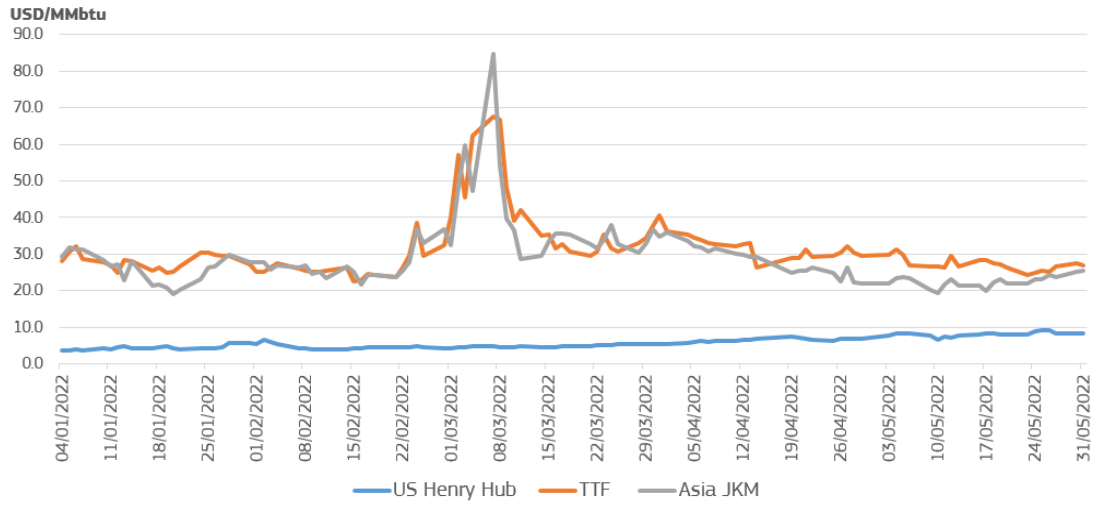
- Average LNG landed prices in China and Japan reached 31.5 USD/mmbtu and 31.6 USD/mmbtu, respectively. The JCC (Japanese Crude Cocktail) contracts reached 14.9 USD/mmbtu in the first quarter of 2022 on average, up from 13.5 USD/mmbtu in Q4 2021, but were significantly lower than both the Japanese LNG import price (31.5 USD/mmbtu), and the TTF (31.8 USD/mmbtu).

Figure 29 - International comparison of wholesale gas prices



Sources: S&P Global Platts, Refinitiv, BAFA, CEIC

Figure 30 – Daily average prices on the TTF (Dutch), the US Henry hub and the JKM Asian reference index

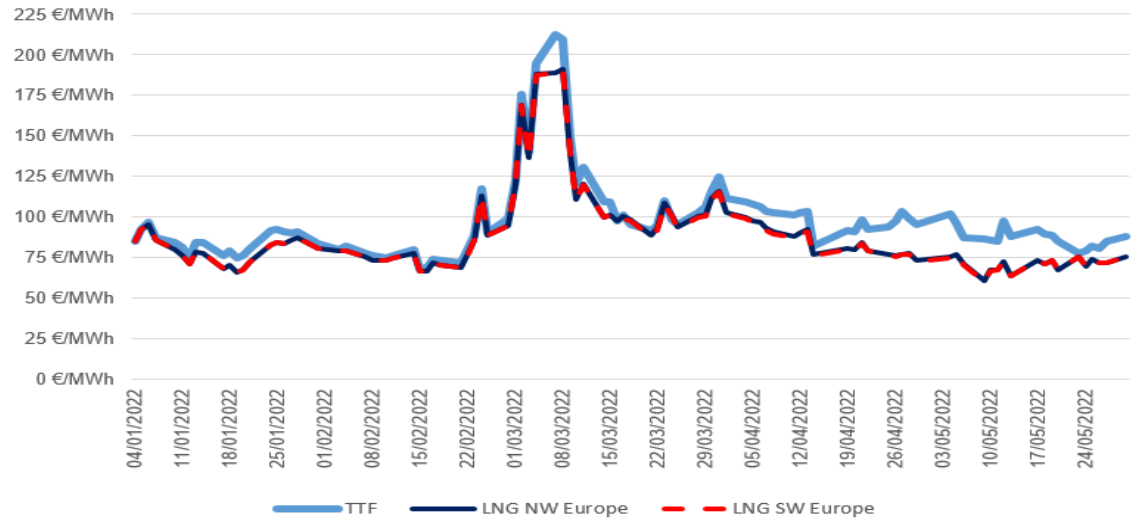


Sources: S&P Global Platts

Figure 31 – The difference of the daily JKM and TTF spots

Sources: S&P Global Platts

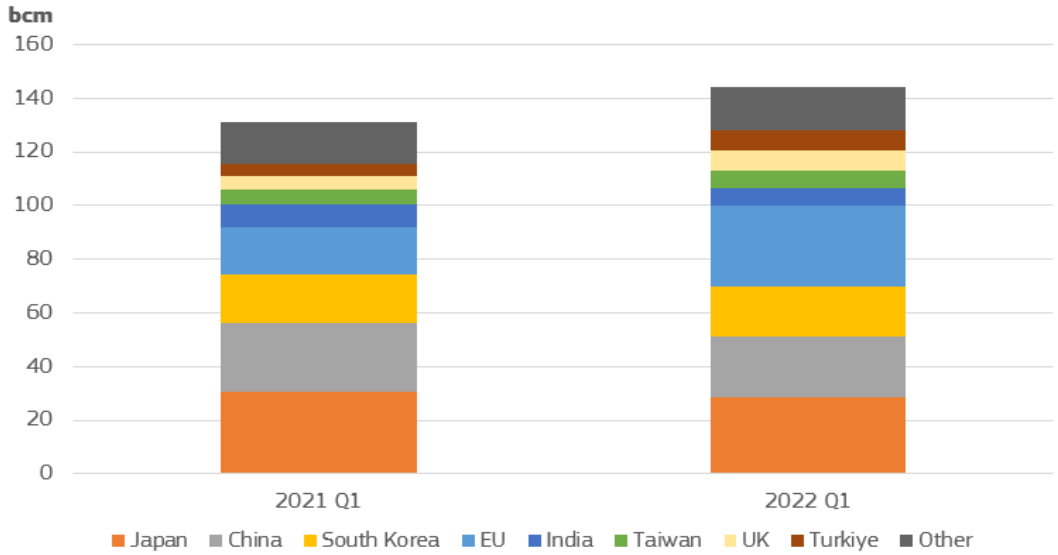
Figure 32 – LNG import benchmarks on north-western and south-western Europe compared with TTF



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 first quarter of 2022, the EU as a bloc of 27 countries became the largest LNG importer in the world (with an import of 30 bcm), owing to favourable sales prices in Europe, whereas China fell back to the third place (22.7 bcm) behind Japan (28.5 bcm). South Korea remained the fourth biggest LNG importer, with an amount of 18.5 bcm, followed by the UK, Turkiye, Taiwan and India (all of them around 6-8 bcm). The total LNG global LNG market could be estimated at 144 bcm in Q1 2022, up from 131 bcm in Q1 2021. Compared to the first quarter of 2021, a significant increase could be observed in in the EU as total (74%, +13 bcm), Turkiye (72%, by 3 bcm), the UK (51%, +2.5 bcm), Taiwan (18%, +1bcm), whereas in India imports fell by 25% (-2.2 bcm), along with those in Japan (by 6%, -1.8 bcm).

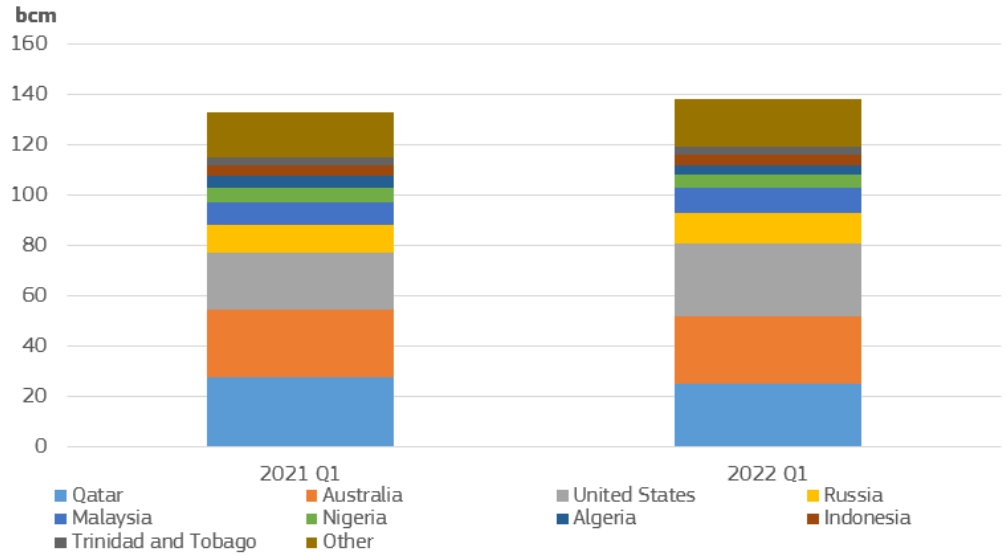
Figure 33 – LNG imports in the main consumer markets in the first quarters of 2021 and 2022



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, in Q1 2022 the United States became the biggest exporter, with almost 29 bcm of LNG exports. Australia exported 27 bcm, whereas Qatar came to the third place, exporting 25 bcm of LNG in Q1 2022, followed by Russia (12 bcm), Malaysia (10 bcm), Nigeria (5.5 bcm), Indonesia (4.5 bcm), Algeria and Trinidad and Tobago (both 3 bcm). Looking at year-on-year changes, LNG exports rose by 25% in the US (25, +6 bcm) and in Russia (13%, +1.4 bcm), whereas it fell substantially in Algeria (20%, -0.9 bcm), Trinidad and Tobago (13%, -0.4 bcm), and Qatar (8%, -2 bcm).

Figure 34 – LNG exports from the main gas producers in the first 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

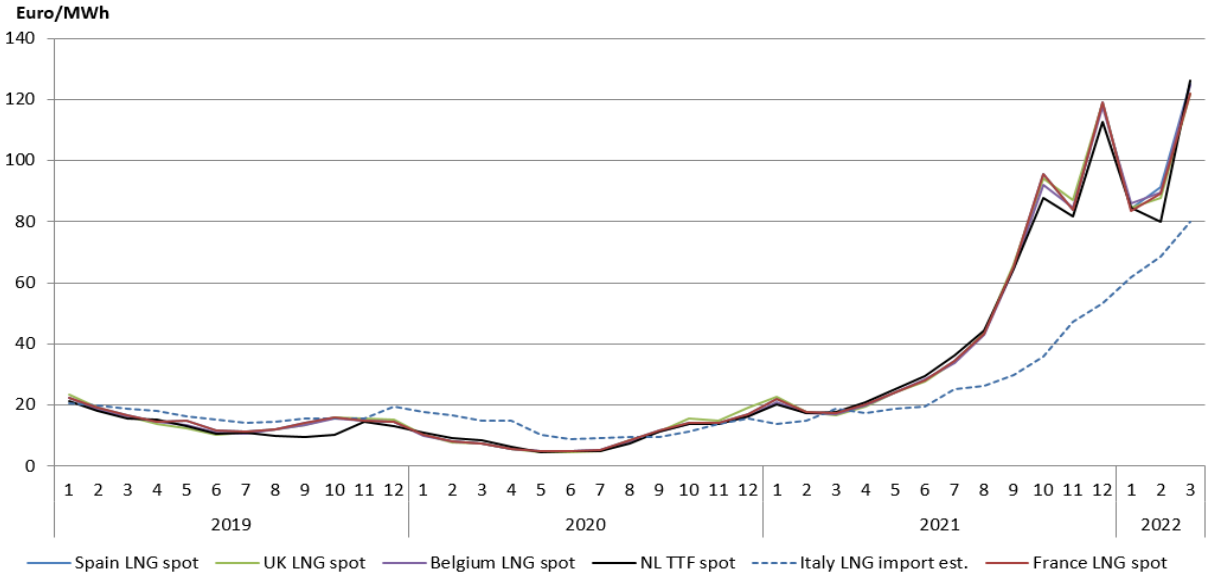
2.3.1 LNG contracts in Europe

- Figure 35 displays the evolution of spot LNG prices paid in the UK, Spain, France, Belgium and Italy, compared with the TTF spot benchmark. With the exception of Italy, where LNG prices are estimated from commercial statistics (Eurostat COMEXT), using the imported values and volumes of LNG, other markets represent landed prices based on vessel movements (from Refinitiv data).

- In the first quarter of 2022, hub prices and hub-based import price contracts in western-Europe first fell back in January 2022 from highs measured in the previous December, however, by March 2022 they rose to new highs amid geopolitical tensions. Looking merely the hub based contracts, they remained relatively well converged, and differentials in March 2022 amounted to 4.5 €/MWh. However, if we take into account the Italian COMEXT derived average price, the difference was more than 46 €/MWh (a bit down from December 2021, when it reached 65 €/MWh), implying that LNG import contracts in Italy are either not fully linked to spot prices or there is a time lag impact, which will be only observable in the following periods. All in all, even in that contact we can observe a measurable increase compared to earlier periods.

- The Q1 2022 quarterly average hub-based prices remained practically at similar levels to the previous quarter (though on monthly basis were quite volatile). In year-on-year comparison, most contracts showed more than five-fold increases. The estimated price increase for LNG import contracts in Italy showed an upturn of 54% quarter-on-quarter, while year-on-year it went up by 343%. If compared to Q1 2020, hub-based prices showed eight-to-ten-fold increases, implying that current prices are significantly higher even compared to 'normal' times.

Figure 35 - Price developments of LNG imports in the UK, Belgium, Spain and Italy, compared to the TTF benchmark



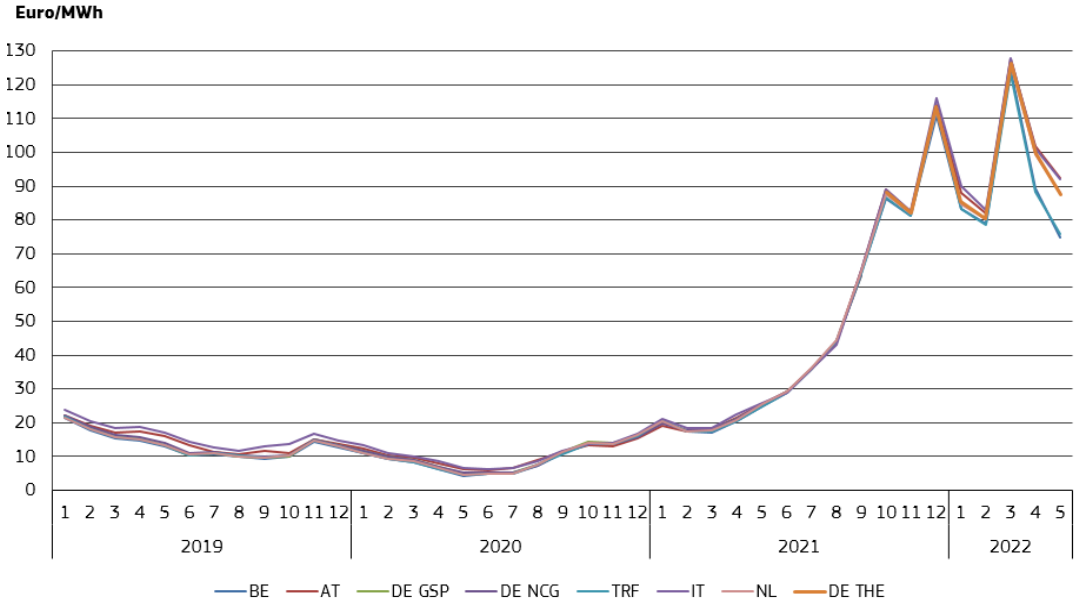
Note: Landed prices for LNG. Source: S&P Global Platts, Refinitiv, European Commission estimates based on Eurostat COMEXT data, retrieved on 10 June 2022.

2.3.2 Wholesale price developments in the EU

- European hub prices, though rising to record highs in March 2022 again, on quarterly average reached 95-100 €/MWh and were only slightly higher than in the previous quarter, Q4 2021 (93-96 €/MWh), reflecting the volatility of monthly prices within Q1 2022. Hub prices in year-on-year comparison showed a five-fold increase, compared to the price range in Q1 2021 (17.9-19.8 €/MWh). The average TTF hub price was 97 €/MWh in Q1 2022, significantly up from 18.6 €/MWh measured in Q1 2021.

- In the first quarter of 2022, though the weather was milder than usual, implying less reliance on storage withdrawals during the heating season and thus diminishing gap of storage levels compared to the previous years, and on the supply side, abundant LNG send-outs to the EU grid, geopolitical tensions and the escalation of the Ukraine-Russia conflict, leading to a military conflict, resulted in security of supply concerns on the EU wholesale gas markets, and record high prices, especially at the beginning of March 2022.

Figure 36 - Wholesale day-ahead gas prices on gas hubs in the EU



Source: S&P Global Platts

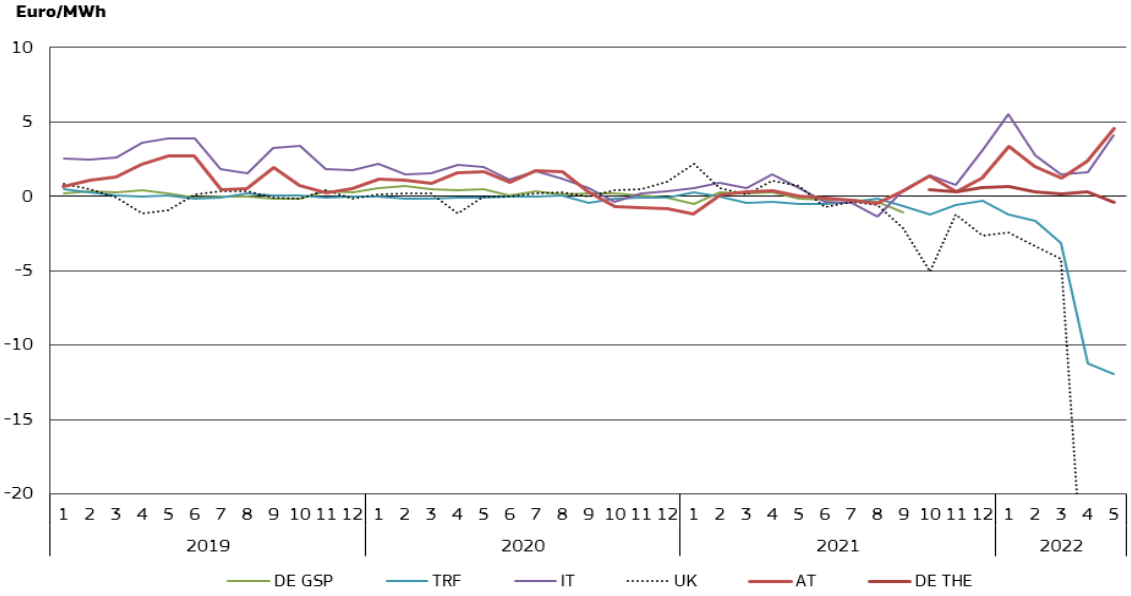
- As Figure 37 and Figure 38 show, the French TRF market was in discount to the TTF during most of the time in Q1 2022, principally owing to abundant LNG supply arriving to the country. Although nuclear availability was lower than usual in many times during Q1 2022 in France, and in February a Norwegian pipeline outage also impacted regional gas supply, milder than usual weather reduced demand for gas. In April and May 2022, with record number of cargoes arriving, the TRF discount to TTF widened and TTF remained closer to other continental hubs. The situation was similar in Spain, the Spanish PVB, amid abundant LNG imports, were in discounts to the TRF (and to the TTF) many times in Q1 2022.

- Compared to other western European benchmarks, the German THE market remained closely aligned with the TTF, owing to less direct access to LNG (though bookings for import gas via Netherlands increased as supply from the east became uncertain) during Q1 2022. The low level of gas storages, inflows at Mallnow interconnection point from Poland (gas of Russian origin), and in the first half of February 2022 outage on the infrastructure at the Troll gas field in Norway all added to market volatility.

- In Italy, the PSV hub showed a measurable premium to the TTF hub in January and February 2022, principally owing to the cold weather induced heating demand for natural gas, low storage levels, and an unplanned gas supply cut from Libya in early days of February. In early March 2022, another infrastructure outage in Libya contributed to the wholesale gas market volatility in Italy, resulting in increasing gas imports from north-western Europe. TAP prices became competitive in this period, bound by long-term contracts being lower than spot gas prices. Even with uncertainties of Russian gas security of supply, Austrian hub prices were in discount to Italy practically during the whole Q1 2022, as flows from the east were relatively stable during this period and the weather was less seasonally cold.

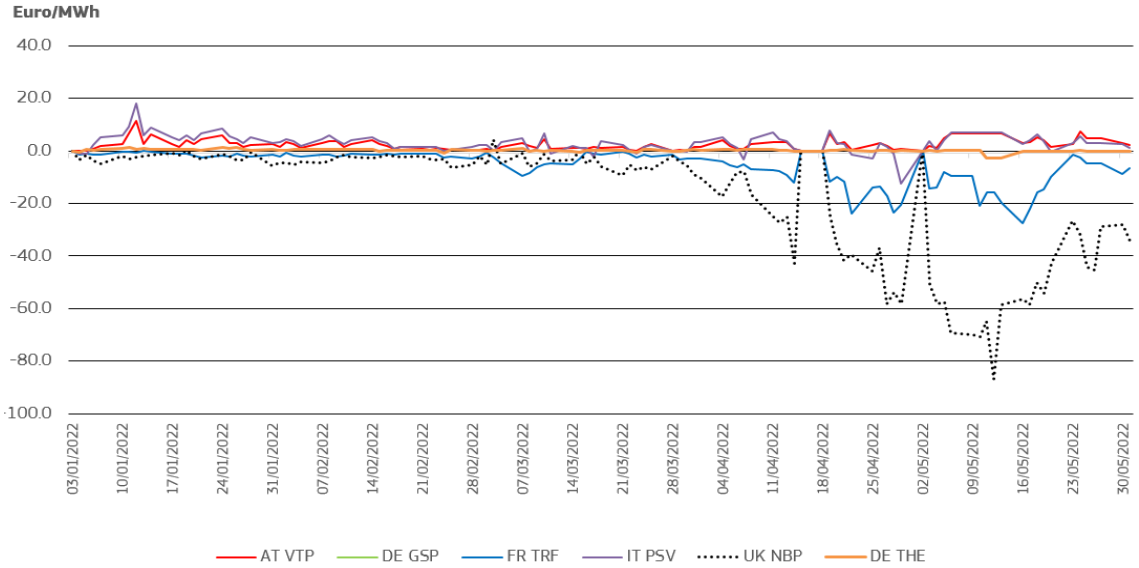
- During the first quarter of 2022, and in April and May beyond, the NBP hub developed a significant discount to the TTF, principally owing to abundant LNG shipments to the United Kingdom. In February and March infrastructure outages in Norway, stormy weather putting an obstacle to LNG cargo berthing, and the Russian invasion in Ukraine have all resulted in temporary spikes, however, NBP practically decoupled from the TTF, as the latter was impacted by infrastructure bottlenecks in the continent for LNG shipments towards the east. Unusually during wintertime, the UK exported gas to the continent, as consequence of the abundant LNG influx in the British grid.

Figure 37 - Premium of monthly average wholesale day-ahead gas prices at selected hubs compared to TTF



Source: S&P Global Platts, European Commission computations

Figure 38 - Premium of daily average wholesale day-ahead gas prices at selected hubs compared to TTF

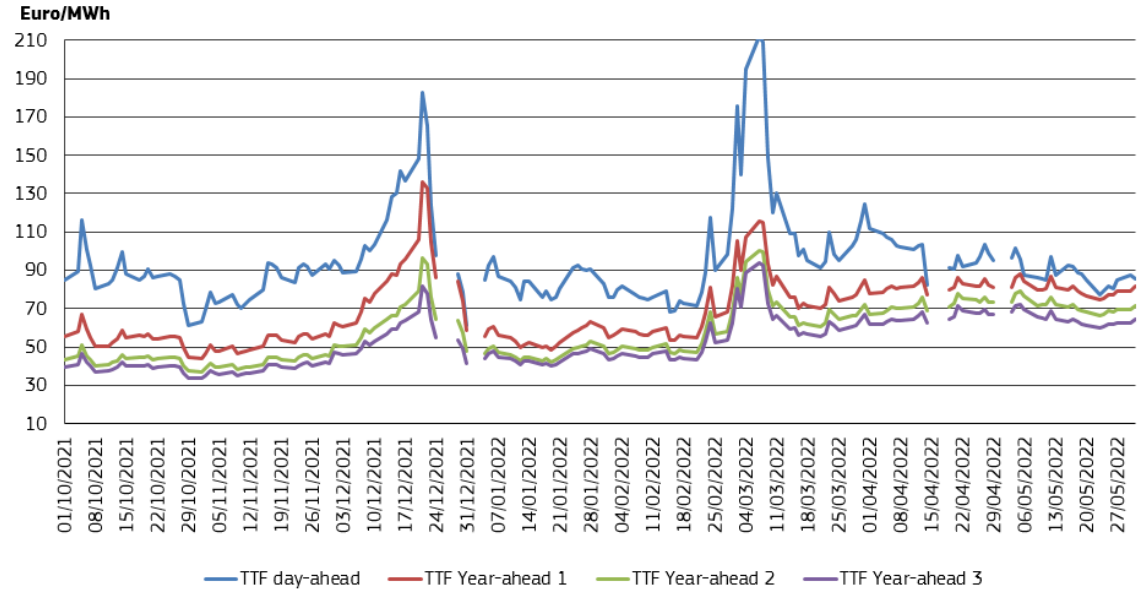


Source: S&P Global Platts, European Commission computations

- Figure 39 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, starting the quarter at 85 €/MWh, proved to be quite volatile over Q1 2022. At the beginning of 2022, year-ahead, two years-ahead, and three years ahead contracts respectively were 56 €/MWh, 46 €/MWh and 44 €/MWh. On 7 March, as daily spot prices reached a historical peak of 212 €/MWh, the discount of the year-ahead contract amounted to 96 €/MWh (as compared to 29 €/MWh at the beginning of January 2022). By the end of March the spot-year-ahead discount amounted to 40 €/MWh. It is worth to recall that forward curve prices also showed a significant turnup in Q1 2022, implying that the market does not anticipate a quick return to lower price levels. At the end of May 2022, the three forward contracts were in the range of 64-81 €/MWh, as opposed to the 'normal' 20-25 €/MWh observed over the last decade.

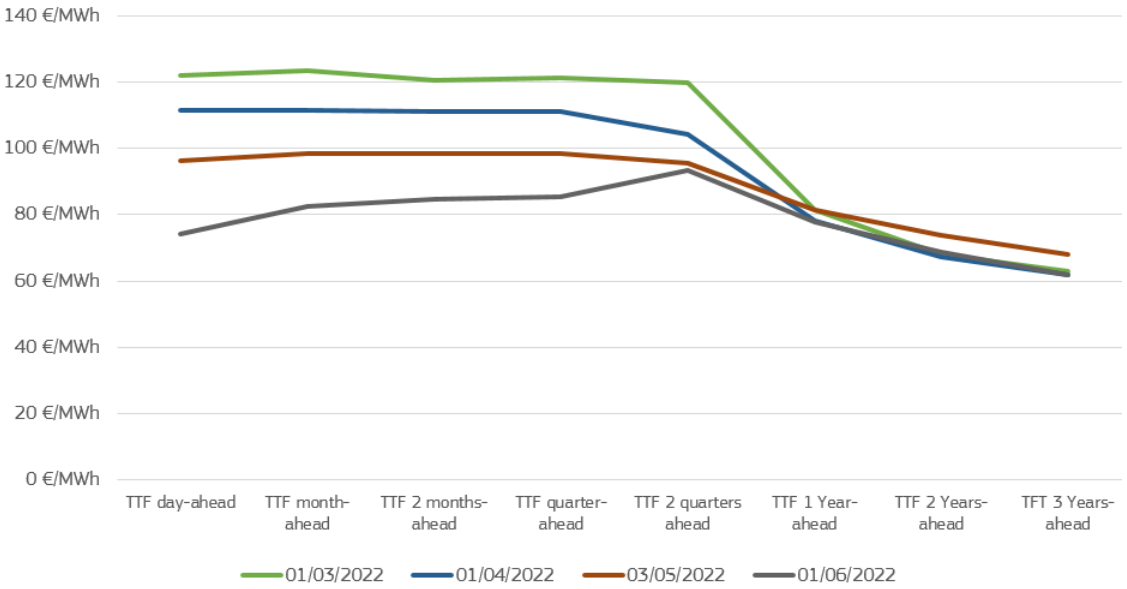
Figure 39 - Forward gas prices on the TTF hub



Source: S&P Global Platts

This expectation can also be followed on Figure 40, showing the forward price curves on the TTF market at the beginning of each month. On 1 June, the market anticipated lower prices for spot and the near-end of the curve, however, the market have been reacting with huge volatility on all news potentially impacting security of gas supply in the EU.

Figure 40 - Forward price curves on the first trading day of each month on the TTF wholesale gas market



Source: Title Trading Facility (TTF)

2.3.3. Prices of different pipeline contracts for gas in the EU

- Figure 41 compares a selection of estimated border prices of pipeline gas deliveries from the main exporters to the EU: Russia, Norway, Algeria and Azerbaijan. For comparison, the evolution of the day-ahead prices on the Dutch TTF hub is also presented on the chart.

- In the first quarter of 2022, the estimated Algerian pipeline import price in Spain was 35.8 €/MWh, up by 37% compared to the previous quarter (26.1 €/MWh), and by 161% compared to Q1 2021. The Algerian contract clearly reflects the time-lagged impact

of the increasing crude oil prices. In Q1 2022, the average estimated Algerian import price in Spain continued to be in a deep discount to the Spanish LNG import prices (64 €/MWh), providing a competitive advantage for Algerian imports. However, owing to the termination of the GME pipeline contract through Morocco in Q4 2021, import volumes to Spain could not increase further, as Medgaz pipeline, directly linking Spain with Morocco, also operated at nearly full capacity.

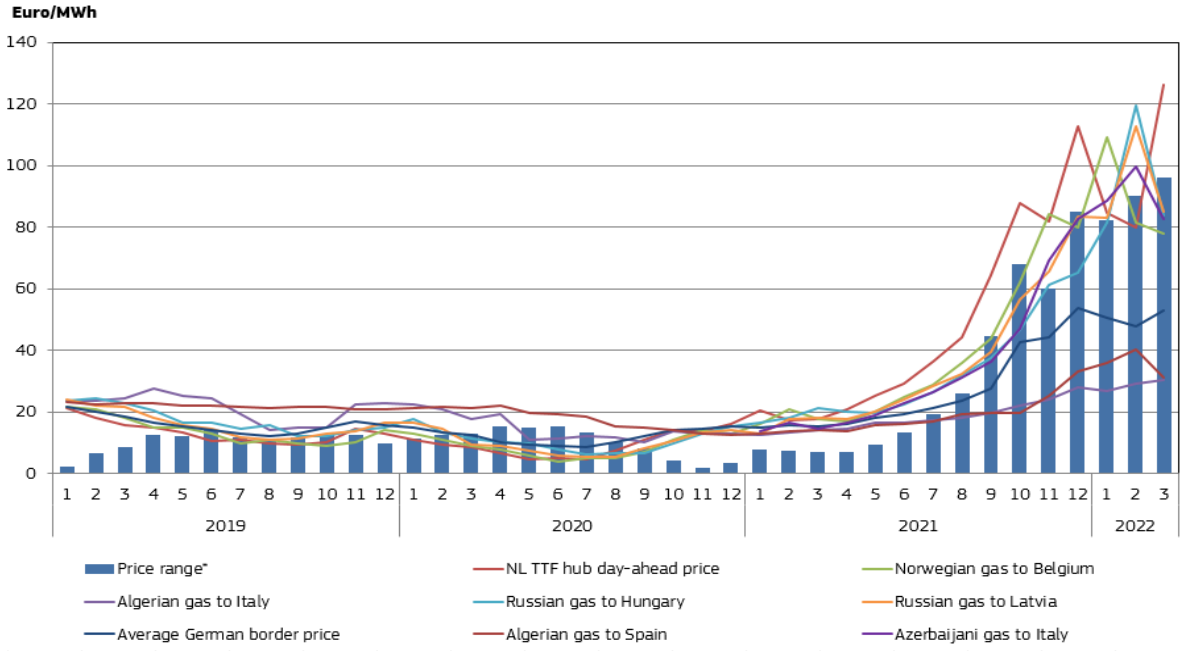
- Algerian gas import price in Italy (29 €/MWh) was lower than that in Spain in the first quarter of 2022. In quarter-on-quarter comparison, Algerian import price in Italy was up by 17%, and year-on-year it rose by 116% in Q1 2022. However, pipeline gas imports from Algeria was down by 5% in Q1 2022 year-on-year in Italy (See Chapter 1.3 Imports). For the future, the current advantage of oil-indexed contracts is likely to remain as long as spot gas prices are at current high levels, though recent high crude oil prices will filter in the oil-indexed contracts during further quarters of 2022.

- Russian gas imports prices in both Hungary and Latvia showed a substantial increase in Q1 2022 and were respectively up by 65% and 37% compared to the previous quarter, whereas year-on-year they rose by 411% and 477%. This implies a much closer mirroring of European hub prices compared to the oil priced contracts, implying that the latter must have had a minimal share in the pricing formulae. Hungarian and Latvian Russian gas import prices have been at similar magnitudes in Q1 2022 (94-95 €/MWh).

- Prices of European gas contracts showed further increasing divergence in Q1 2022, as the difference between the cheapest and most expensive contract rose from 85 €/MWh in December 2021 to 96 €/MWh in March 2022 to. In Q1 2022, the TTF spot prices proved to be the more expensive compared to the observed import contracts, as it takes some time till spot prices filter in the import contract pricing. Without TTF, price differential remained around 55 €/MWh between December 2021 and March 2022, however, in January-February 2022 it reached 80-90 €/MWh, implying that high and volatile price levels usually magnify differences between differently priced gas import contracts.

- Hub-based contracts and hub prices themselves continued their upturn in the first quarter of 2022, with a significant intra-quarter price volatility. Reported German border prices also rose slightly (from 47 €/MWh to 51 €/MWh in Q1 2022). The average German border price had a discount of 40-45 €/MWh to the hub-based contracts, probably reflecting the impact of time lags in the indexation to hub prices or to oil contracts.

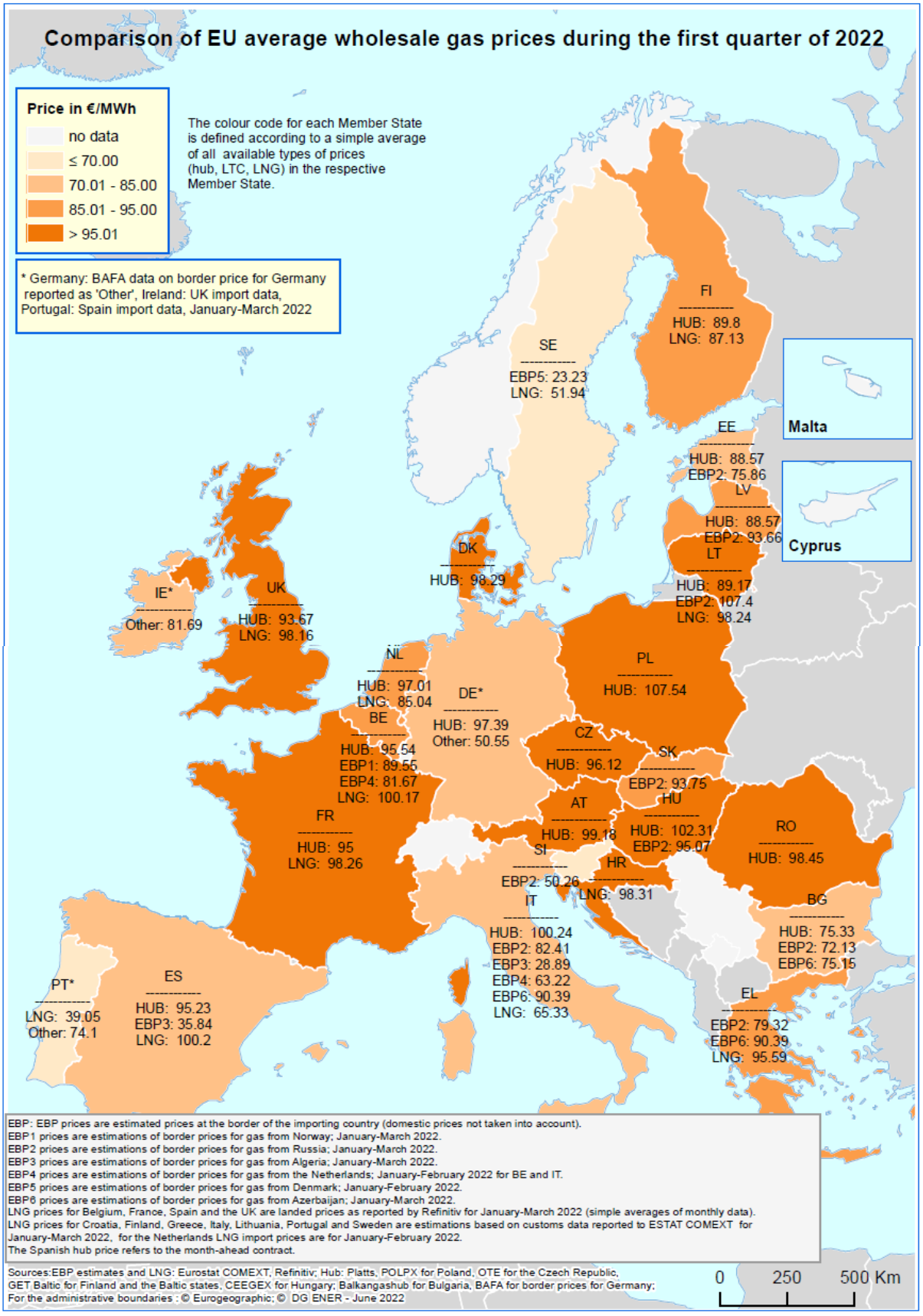
Figure 41 - Comparison of EU wholesale gas price estimations



Source: Eurostat COMEXT and European Commission estimations, BAFA, S&P Global Platts
*The difference between the highest and lowest price depicted on the graph
Note: Border prices are estimations of prices of piped gas imports paid at the border of the importing country, based on information collected by customs agencies, and are deemed to be representative of long-term contracts.

- Map 1 on the next page shows the different hub prices, estimated pipeline and LNG import prices in most of the European countries, giving an indication to wholesale gas prices in the given country in the first quarter of 2022. Owing to data revisions of national authorities, some average price numbers might change retrospectively, implying a certain cautiousness when comparing the data on the current maps with those in earlier editions of this report.

Map 1 - Comparison of EU wholesale gas prices in the first quarter of 2022



Note: Border prices are estimations of prices of piped gas imports paid at the border of the importing country, based on information collected by customs agencies, and are deemed to be representative of long-term gas contracts.

2.3.4. Gas trade on the EU hubs

- As Figure 42 shows, liquidity fell by 2% year-on-year on the main European gas hubs in the first quarter of 2022, after falling by 6% in Q4 2021 and rising by 27% year-on-year in Q3 2021. The total traded volume in Q1 2022 amounted to around 17 619 TWh (equivalent to around 1 635 bcm, and in monetary terms representing €1 709 billion[30]). The Q1 2022 traded volume was around 15 times more than the gas consumption in the seven Member States[31] covered by the analysis in January-March 2022. Comparing to the EU as a whole, traded volume in Q1 2022 represented 11 times the total EU-27 gas consumption in this period.

- The year-on-year change in traded volumes in Q1 2022 showed mixed picture among the observed trading hubs in Europe, but volumes mostly fall. Volumes on the largest and most liquid TTF hub rose slightly, by 2% year-on-year. However, volumes on the French TRF were up by 57% year-on year, and on the Spanish PVB hub they also increased significantly, by 75%, probably largely owing to increasing LNG imports. Traded volumes on the German THE hub (compared to the combined volumes of the separate NGC and Gaspool hubs in Q1 2021) were down narrowly, by 1%. In contrast, traded volumes fell sharply on the Italian PSV hub, the Austrian VTP hub and the Belgian Zeebrugge hub (respectively by 29%, 22% and 58%. Traded volumes on British NBP hub, which was still the second biggest hub on the broader European market, continued to fall, by 26% compared to Q1 2021.

- Albeit decreasing year-on-year traded volumes on the observed European hubs (-2%), traded volumes on the TTF went up by 2%, implying an increasing share of TTF within the total European trade. In Q1 2022, TTF represented almost 80% in the total European gas trade, up from 77% in Q1 2021. If looking at only the EU countries, its share was even bigger, 88%. The TTF hub became the most liquid European hub with good infrastructure connections, and its index is a benchmark referred to in Europe and in global gas trade as well. Traded volumes on the British NBP, once Europe's most liquid market, fell by 26% in Q1 2022 compared to the same period of 2021, and at the same period the share of NBP fell below 10% in the total European observed trade, down from 13% in Q1 2021.

- Other markets had lower shares: the German THE, in spite of expectations after the merger of NGC and Gaspool, did not manage to increase its share (5.1% in Q1 2022), while the French TRF had a lower share, 2.3%, followed by PSV (1.5%) and VTP (1.2%), while the Spanish PVB and the Belgian Zeebrugge had only minor shares of respectively 0.3% and 0.1% in the European gas trade in Q1 2022.

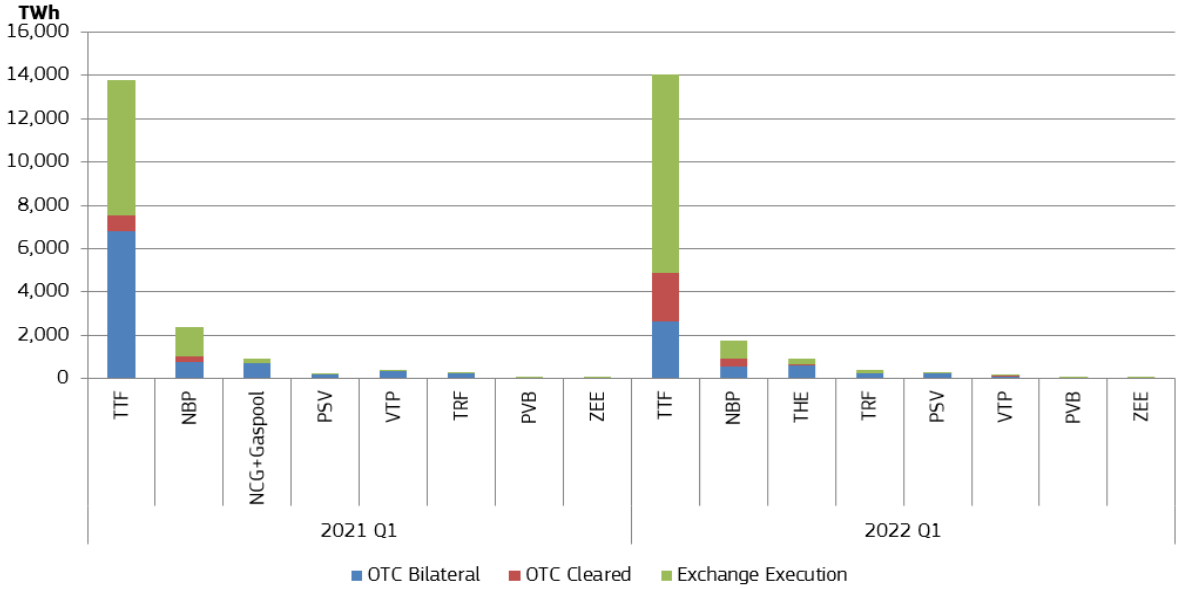
- Net gas import in the EU rose by 10% in Q1 2022, however, LNG imports soared by a magnificent 72% year-on-year. However, consumption of natural gas was down by 8% at the same period. Although increasing imports and significant LNG send-out could have been supportive, traded volumes were down on the most liquid European hubs. Shifting trade from the OTC market to exchange-executed contracts was helped by permanently high and volatile prices as the number of traders being able to effectively trade decreased, owing to elevated default risks and increasing margin calls for smaller traders on the OTC market. Exchange-executed trade is close by in term, helping smaller traders to engage in this market, in contrast to the OTC, where collaterals cover a decreasing number of contract and margin calls might be invoked for insurance reasons, also pushing out smaller participants from the OTC market.

- The share of exchange executed contracts on the Dutch TTF hub was 65% in Q1 2022, which was the highest among the observed countries, and was up by a remarkable 20% percentage points compared to Q1 2021. The share of exchange executed contracts on the TTF, 65%, surpassed the exchange share on the NBP hub in the UK (46%), where the share of exchange trade fell from 57% in Q1 2021. On the Austrian VTP, the share of exchange executed contracts was also 46% in Q1 2022, up from only 1% a year before. On the Spanish PVB, the share of exchange executed contracts amounted to 42% at the same time, falling by 11 percentage points year-on-year. In contrast, on the French TRF the share of exchange executed contracts rose to 36% in Q1 2022 (up from 15% in Q1 2021), while on the THE German hub it went up from 21% to 28% between Q1 2021 and Q1 2022. On Zeebrugge, the share of exchange-executed contracts was lower, only 6% (though up from 2% in Q1 2021), whereas it was the lowest on the Italian PSV, amounting to 1% in Q1 2022, similarly to the share a year before.

[30] Assuming that all trade was carried out on the quarterly average spot price of the TTF hub. As spot prices significantly rose in Q1 2022 and developed a considerable premium over forward contracts, this amount might overestimate the monetised traded value

[31] Netherlands, Germany, France, Italy, Belgium, Austria and Spain. The ratio of the quarterly traded volume and gas consumption can show a big volatility across different quarters, as gas consumption has a high seasonality, whereas gas trade depends on market factors, which are albeit linked to consumption but have less seasonality.

Figure 42 - Traded volumes on the main European gas hubs in the first quarters of 2021 and 2022

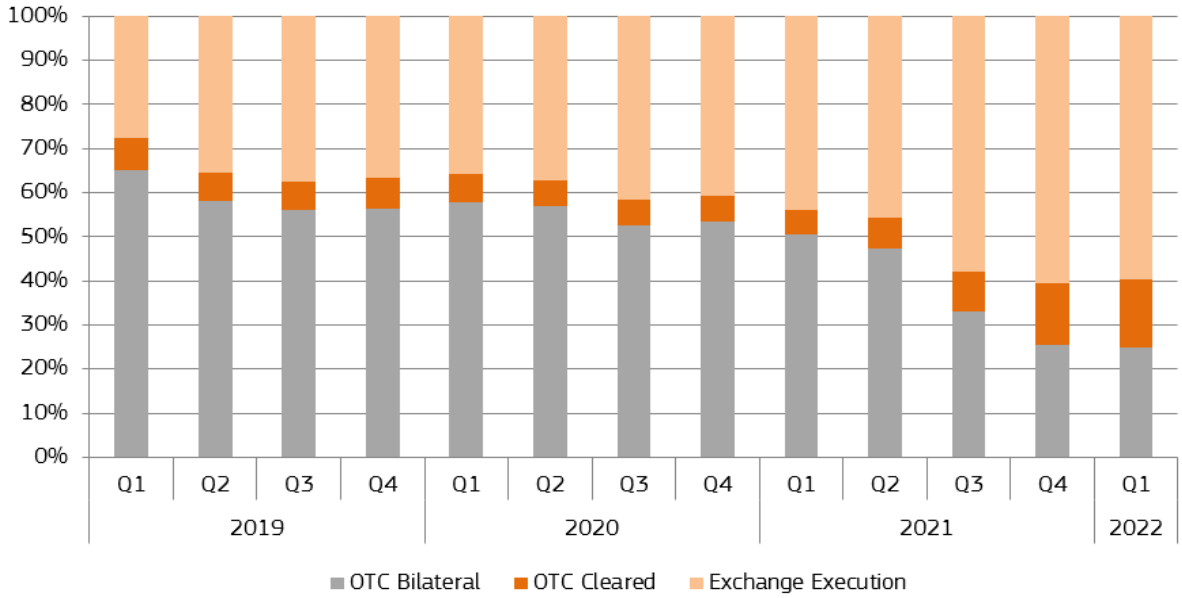


The chart covers the following trading hubs: Netherlands: TTF (Title Transfer Facility); Germany: THE (Trading Hub Europe); France: TRF (Trading Region France); Italy: PSV (Punto di Scambio Virtuale); Spain: PVB (Virtual Balancing Point); Austria: Virtual Trading Point (VTP); Belgium: Zeebrugge beach;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

- On the European hubs as whole, in Q1 2022 25% of the total trade was OTC bilateral, 15% was OTC cleared, whereas the share of exchange-executed contracts reached 60%, which latter was close to the record set in the previous quarter. The share of exchange-executed contracts increased by almost 16 percentage points year-on-year in Q1 2022, whereas the share of OTC bilateral fell by 26 percentage points, and that of OTC cleared went up by 10 percentage points.

- Amid the general decrease in traded volumes (2% in Q1 2022 year-on-year), exchange executed volumes managed to increase measurably, by 33% year-on-year on the observed European markets. In the same period, the total OTC traded volume (bilateral and cleared together) fell by 29%. This underlines the increasing importance of exchange-executed contracts in the gas trade on the major European hubs.

Figure 43 - 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

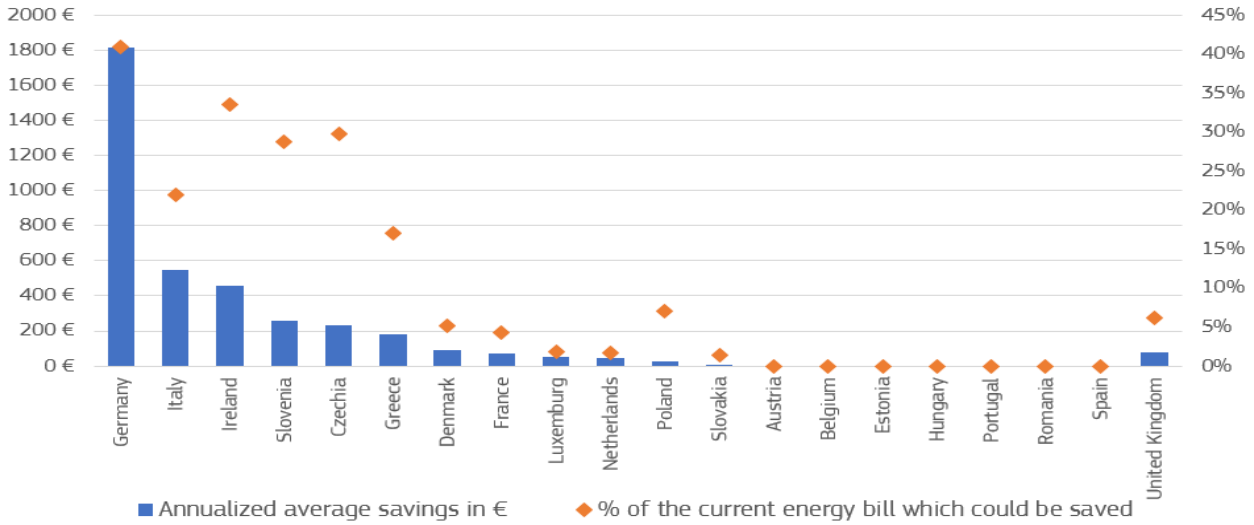
3. Retail gas markets in the EU and outside Europe

3.1 Savings from switching for residential gas customers

- The next chart shows the estimated annualised average gas bill savings in euro and in percent of the current energy bill, available to typical households who switched away from their local by-default contract to the cheapest offer available in April 2022. Prices in capital cities were used as a proxy to assess prices at the national level.

- In April 2022 in absolute terms, German households could have the highest annualised savings (€1 812 or 41%), had they switched from their incumbent utility to the most competitive offer available. On the other hand, households in Slovakia could have the lowest annualised savings, amounting to €7 or 1.3%, if they chose the most competitive offer.

Figure 44 – Annualised gas bill saving potential in April 2022 in the EU Member States and the United Kingdom



Source: VaasaETT data collection. Saving potential is reported to be zero for Austria, Belgium, Estonia, Hungary, Portugal, Romania and Spain. For Bulgaria, Croatia, Finland, Latvia, Lithuania, no data are available

3.2 Recent developments on EU retail gas markets

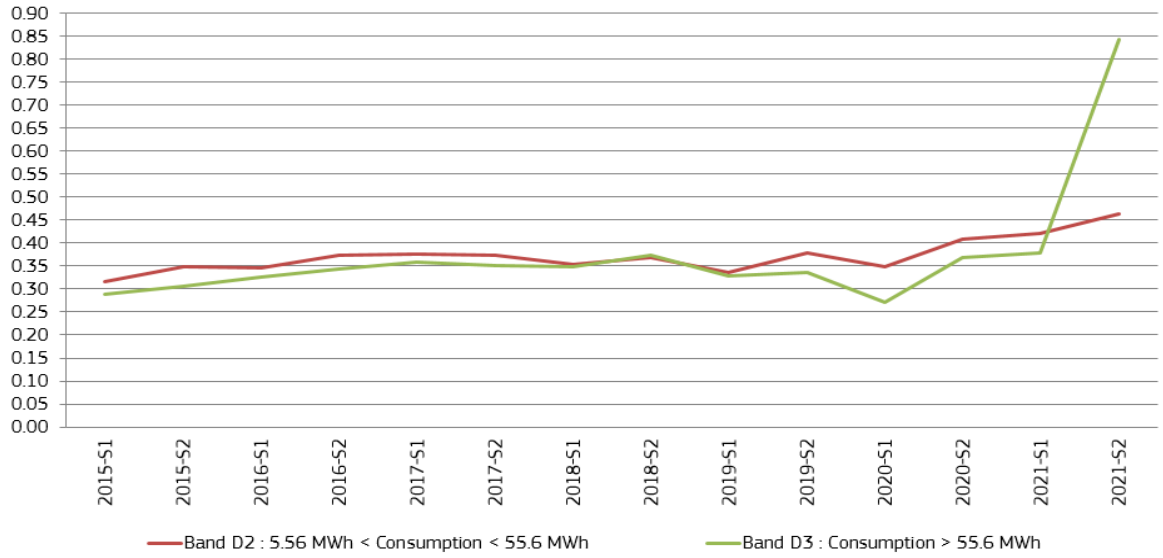
- Monthly and quarterly retail prices are estimated by using half-yearly prices from Eurostat (with the latest available figures relating to the second half of 2021) and Harmonised Consumer Price Indices (HICP) for both the household prices and industrial consumers.

- For household consumers, the estimated average retail price in Q1 2022 in the EU (including all taxes) showed a significant increase of 9.1% in year-on-year comparison, and compared to the previous quarter, Q4 2021, the average price went up by 54%. In the most typical consumption Band, D2, in the first quarter of 2022 the estimated average price (including all taxes) was 9.8 Eurocents/kWh, up from 8.3 Eurocents/kWh in the previous quarter and from 6.3 Eurocents/kWh in Q1 2021. (See the estimated household prices on Map 2). It is important to recall that substantial retail gas price increases occurred in the first quarter of 2022, implying that most of the wholesale price increases of the second half of 2021 and early 2022 must have probably appeared in the final retail prices, looking at the magnitude of retail price changes.

- In the first quarter of 2022, significant differences could be observed in retail gas prices across the EU. The lowest estimated household prices in consumption Band D2 could be observed in Hungary (3.0 Eurocents/kWh), Croatia (4.0 Eurocents/kWh), and Lithuania (5.0 Eurocent/kWh), whereas the highest prices could be measured in Sweden (18.9 Eurocents/kWh), the Netherlands (18.0 Eurocent/kWh) and Denmark (16.7 Eurocent/kWh). The price differential ratio between the cheapest and the most expensive Member State across the EU rose measurably in Q1 2022, to 6.3 (in the previous quarter it was 6.2), in comparison with that in Q1 2021 (4.5).

- As Figure 45 shows, price dispersion rose significantly across the EU, especially for households with higher annual gas consumption, principally owing to a more than two-fold increase for the retail gas prices in Sweden, as data of Eurostat shows.

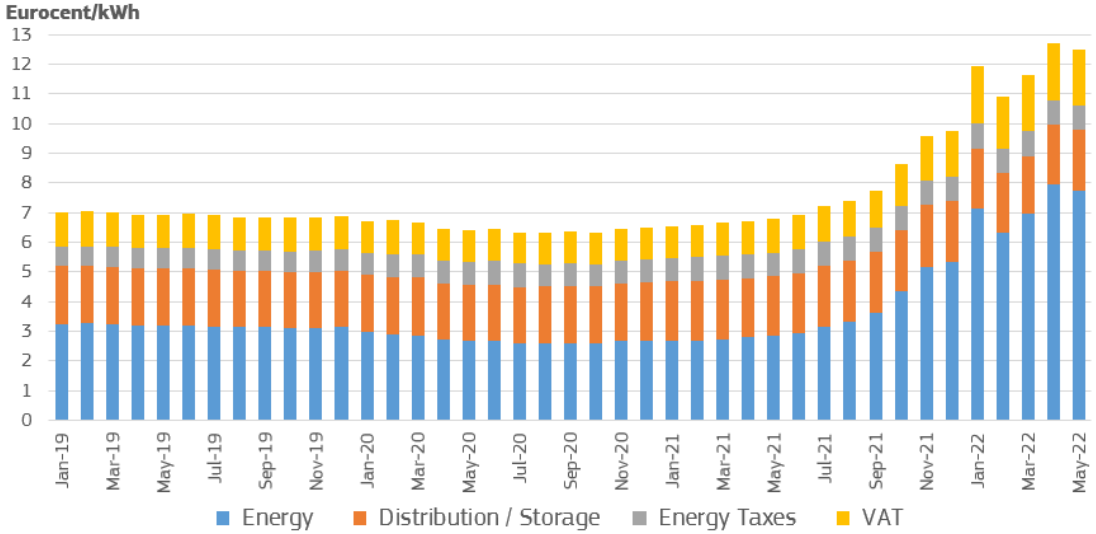
Figure 45 - Bi-annual retail gas price dispersion for household customers across the EU Member States, as measures by relative standard deviation



Source: Computation based on Eurostat data

- Figure 46 and Figure 47 show the monthly evolution of the EU average residential end-user retail gas prices over the last few years, the breakdown of prices paid by typical households in the European capitals in May 2022, and the change in percentages compared to May 2021. In May 2022, retail gas prices in EU capitals showed an estimated increase of 84%, year-on-year. In April 2022, the year-on-year increase rate was even higher, close to 90%. Over the recent period, as higher wholesale gas prices measurably appeared in the retail contracts, the share of the energy component showed a significant increase. On average, 62% of the retail price could be assigned to the energy component in May 2022, while the rest covered distribution/storage costs (16%), energy taxes (6%) and VAT (15%). The share of the energy component was generally increasing, as in May 2021 it was around 42% on average, increasing by 20 percentage points in the following year.
- There were significant differences in May 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 33% (Stockholm) to 82% (Warsaw and Zagreb). The share of distribution/storage costs ranged from 4% (Tallinn) and 5% (Amsterdam) to 36% (Stockholm) and 34% (Bratislava). The share of energy taxes ranged from 1% (Brussels and Madrid) to 17% (Amsterdam) and 16% (Copenhagen). For 8 of the 24 capitals covered, the price does not include any energy tax component. VAT content in the total gas price also varied a lot across the EU – from 5% in Zagreb to 21% in Budapest.

Figure 46 – Monthly average gas price in the EU, paid by typical household customers

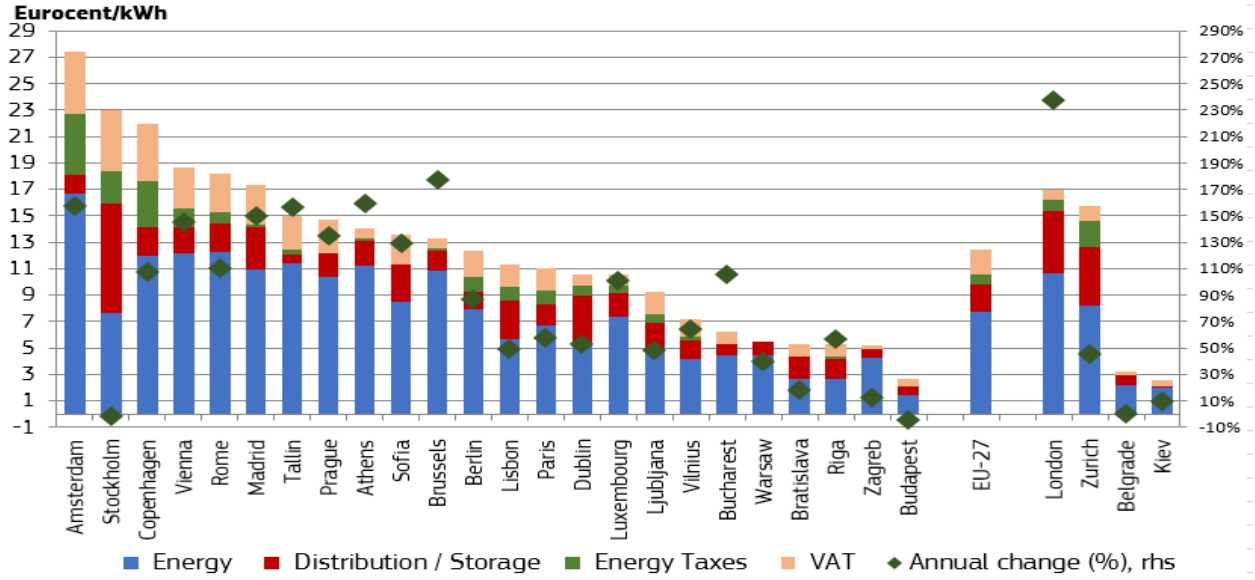


Source: VaasaETT

- Figure 47 also shows that even the energy component is measurably variable in absolute terms: in May 2022, it was 12.1 times higher in Amsterdam than in Budapest (for this latter the gas price is regulated for most of the households, not reflecting increasing energy costs). There were also considerable differences across the Member States in the relative share of network costs and taxes. The ratio of highest and lowest network components across the EU was 12.4 (between Tallinn and Stockholm). The highest-lowest tax component ratio (taking energy taxes and VAT together), not counting Warsaw, where energy taxes and VAT rates has been reported as 0, was 37.8 (Zagreb and Amsterdam) in the same period.

- With the exception of two capital cities out of the observed 24, prices were higher in May 2022, compared to the same month of the previous year. Prices decreased only in Budapest (5%) and Stockholm (2%), probably driven by the depreciation of the local currency vis-à-vis the euro. Prices went up by the most in Brussels (177%), Athens (159%), Amsterdam (158%), Tallinn (157%) and Madrid (150%), practically driven by the increase of energy costs, whereas in some cases network costs or energy taxes slightly decreased. It seems that significant price increases on wholesale gas markets have mostly appeared in the final retail household prices in most of the EU capital cities. In May 2022, Budapest remained the cheapest capital in the EU in terms of gas prices for household consumers, followed by Zagreb and Riga, whereas Amsterdam became the most expensive capital city, followed by Stockholm and Copenhagen.

Figure 47 - Breakdown of gas price paid by typical household customers in European capitals and annual change in prices, May 2022



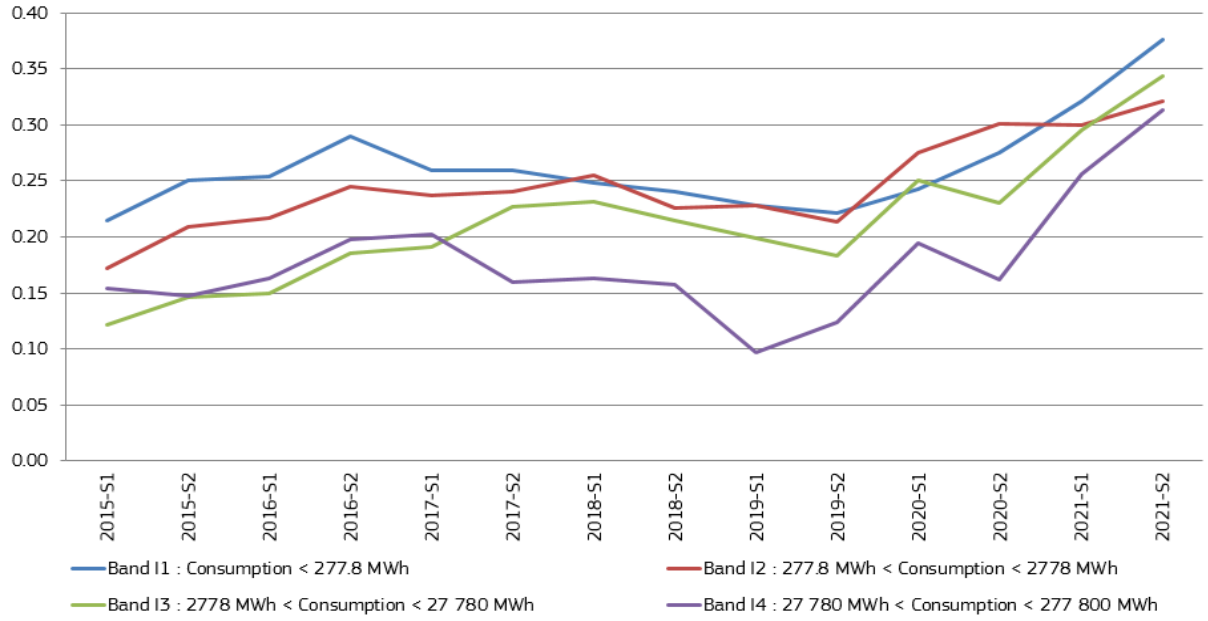
Source: VaasaETT. EU-27 represents an aggregate average of the 27 capital cities

- Estimated retail gas prices for industrial customers rose measurably, by 116% in Q1 2022 year-on-year in the EU on average, and the average estimated price (VAT and other recoverable taxes excluded) in consumption Band I4 was 5.2 Eurocent/kWh, up by 18% compared to Q4 2021 (when reaching 4.4 Eurocent/kWh on average - See the estimated industrial prices on Map 3.) In all of the 24 observed countries (data were not available for Cyprus, Luxembourg and Malta) price increases could be observed. It seems that price rises on wholesale gas markets have already appeared in the retail prices for industrial customers in Q1 2022, having an average consumption. Price increases could also be observed for industrial customers having larger annual gas consumption (in both Band I5 and Band I6 bands increases of 170-184% could be observed in Q1 2022 year-on-year). Significant price increases for energy intensive industries meant bigger production costs, leading to decrease in production and/or increases in the final product prices.

- It must be noted that these computed quarterly prices are based on Eurostat data (referring to the second half of 2021), corrected by HICP figures, implying that by the time the next half-yearly price data will be available, numbers might show different trends. In the first quarter of 2022, the lowest estimated industrial price in consumption Band I4 could be observed in Portugal (3.6 Eurocent/kWh), Slovakia (3.9 Eurocent/kWh) and Spain (4.1 Eurocent/kWh). The highest prices could be observed in Finland (10.8 Eurocent/kWh), Denmark (10.4 Eurocent/kWh) and Sweden (8.5 Eurocent/kWh), In Q1 2022, the price ratio of the cheapest and the most expensive country in the EU was 3.1, which was higher than in Q1 2021 (2.5)

- Figure 48 shows the price dispersion of retail gas prices paid by industrial customers with different annual consumption, according to the classification of Eurostat. Over the last two-three years, industrial retail gas prices showed an increasing divergence across the EU, implying that high prices and volatility on wholesale gas market impacted retail prices differently in each country.

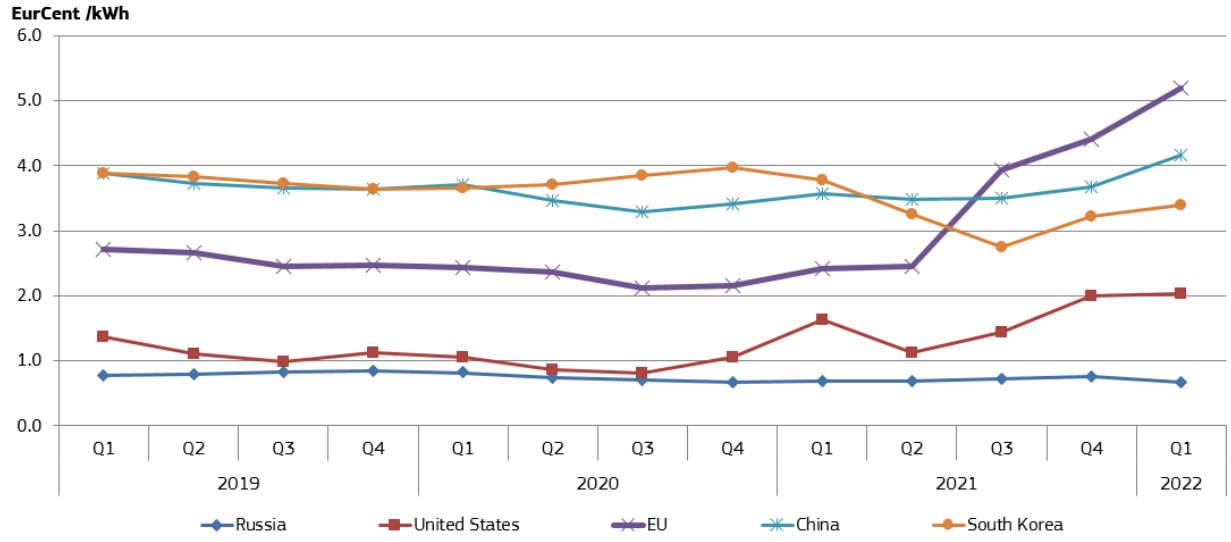
Figure 48 - Bi-annual retail gas price dispersion for industrial customers across the EU Member States, as measures by relative standard deviation



Source: Computation based on Eurostat data

- Figure 49 shows the evolution of industrial retail gas prices in the EU, compared with some important trade partners of the European economy. In the first quarter of 2022, retail gas prices for industrial customers in the EU remained the highest compared with the peers of the United States, China, Russia and South Korea. Prices were lower by 20% in China, by 35% in South Korea, by 61% in the United States and by 87% in Russia, implying that EU businesses consuming significant amount of gas compared to their production value faced higher energy costs compared to many global competitors. Retail industrial gas prices in the EU were up by 116% in Q1 2022 year-on-year, whereas gas price rose by 24% in the US and by 17% in China, and they were down by 2% in Russia and by 10% in South Korea.

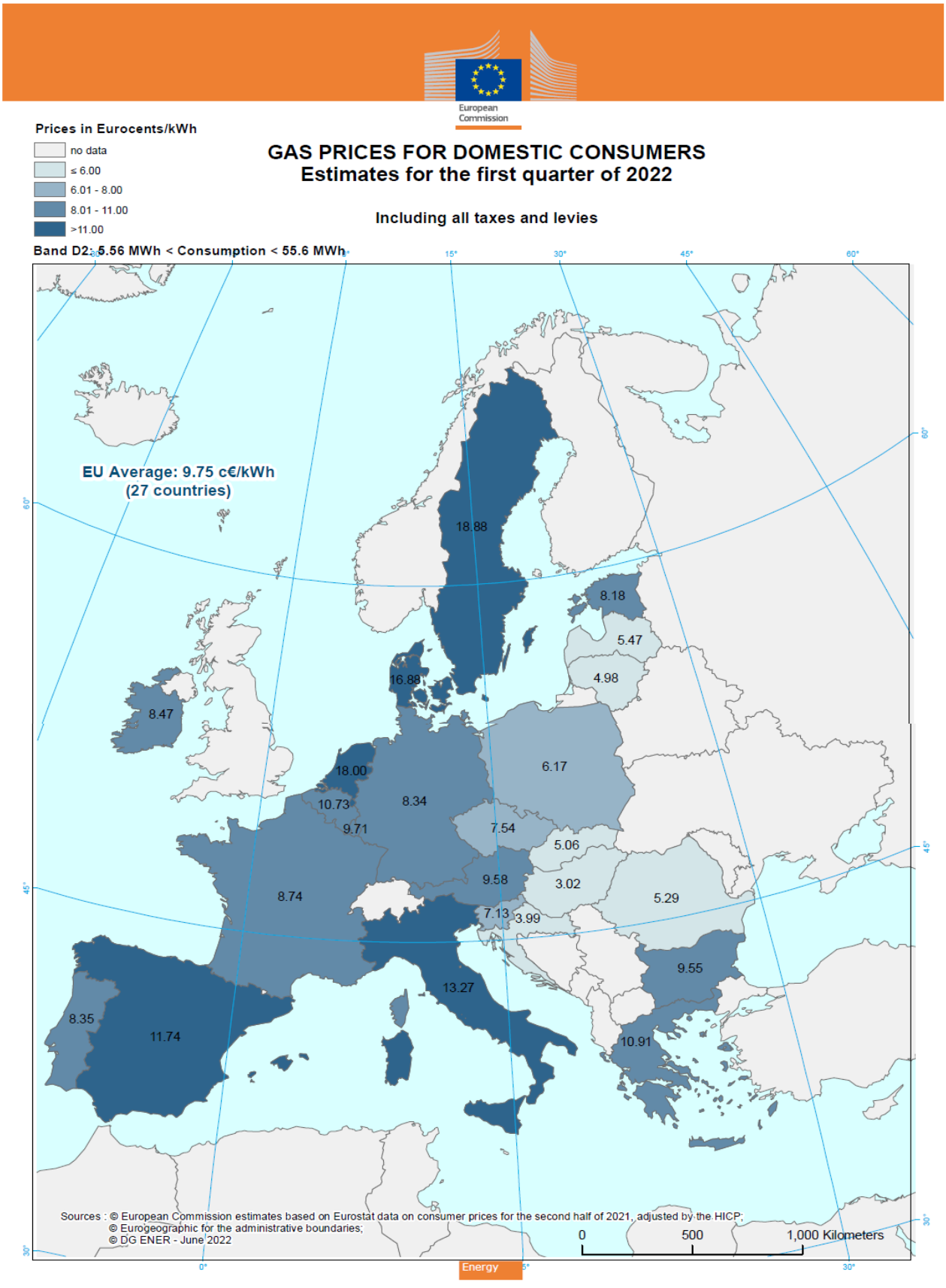
Figure 49 - The EU average industrial retail gas price in comparison with the prices of some important trade partners of the EU



Source: Eurostat (EU average, for industrial consumption band I4) and CEIC. Data of the United States, China, Russia and Korea were taken into account. EU prices are without VAT and other recoverable taxes

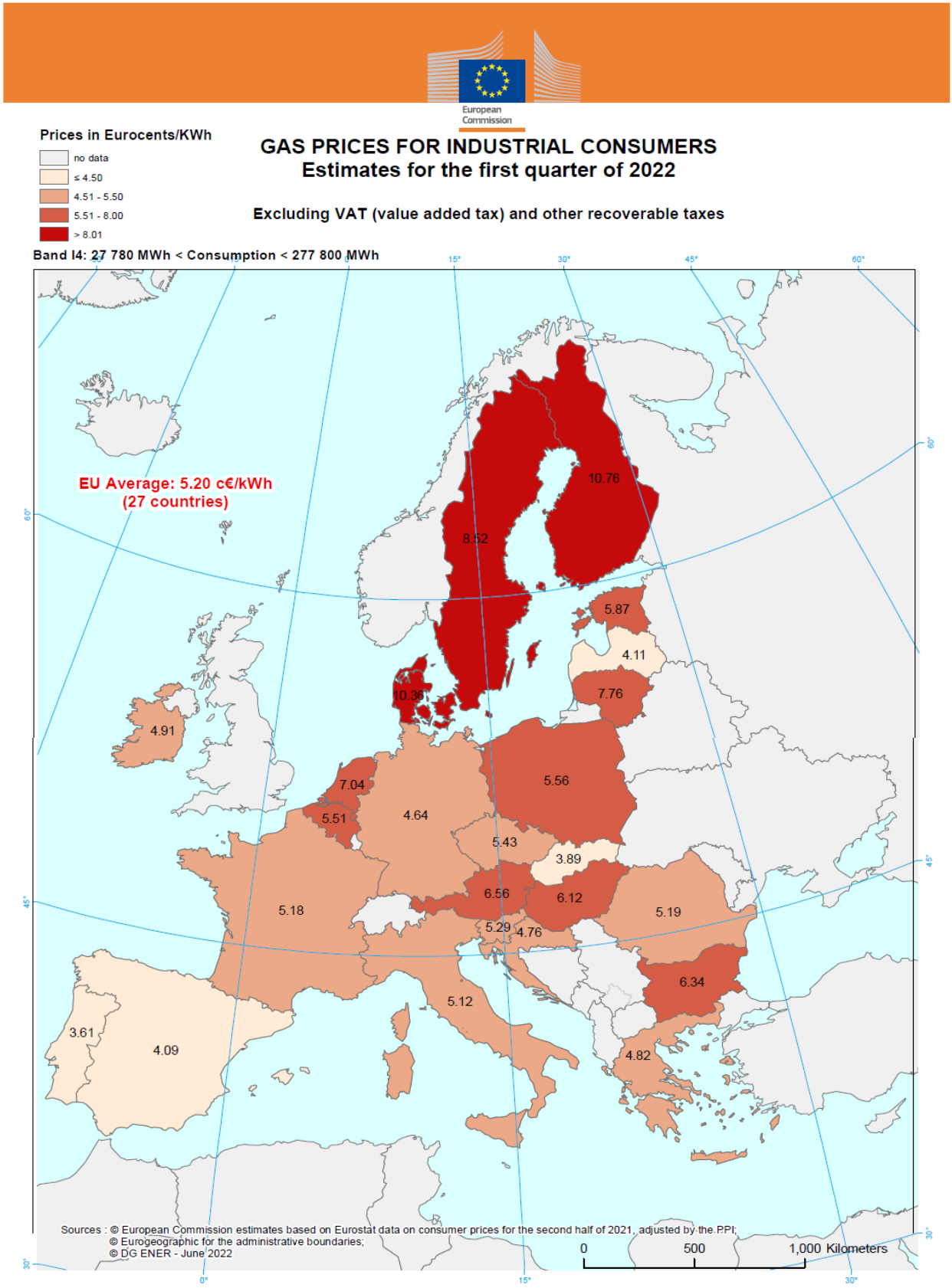
- Maps 2 and 3 on the next two pages show the estimated retail gas prices paid by households and industrial customers in the first quarter of 2022.

Map 2 - Retail gas price estimates for households in the EU – first quarter of 2022



Source: Eurostat

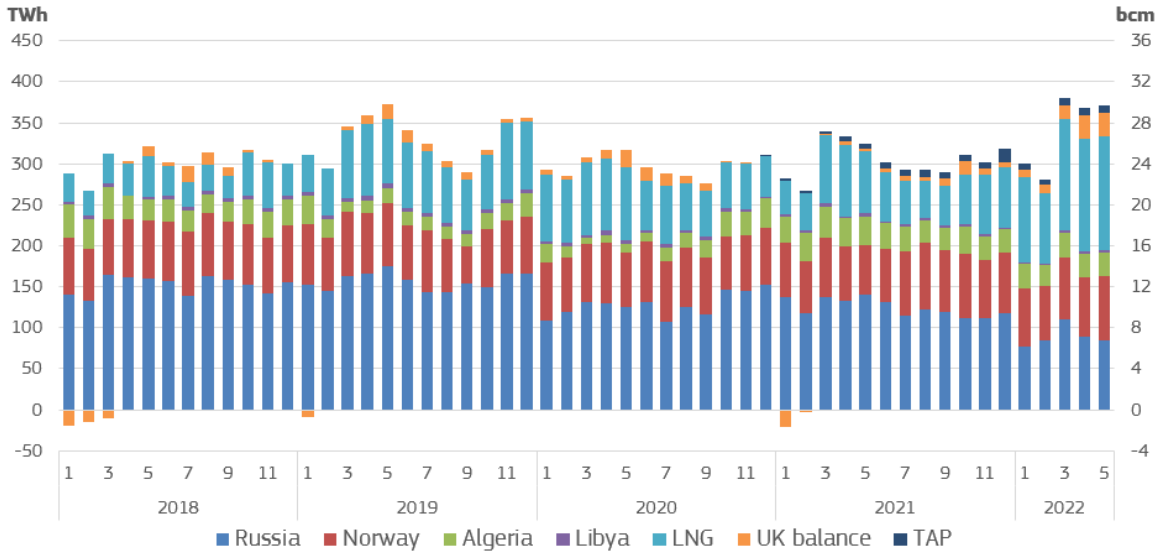
Map 3 - Retail gas price estimates for industrial consumers in the EU – first quarter of 2022



Source: Eurostat

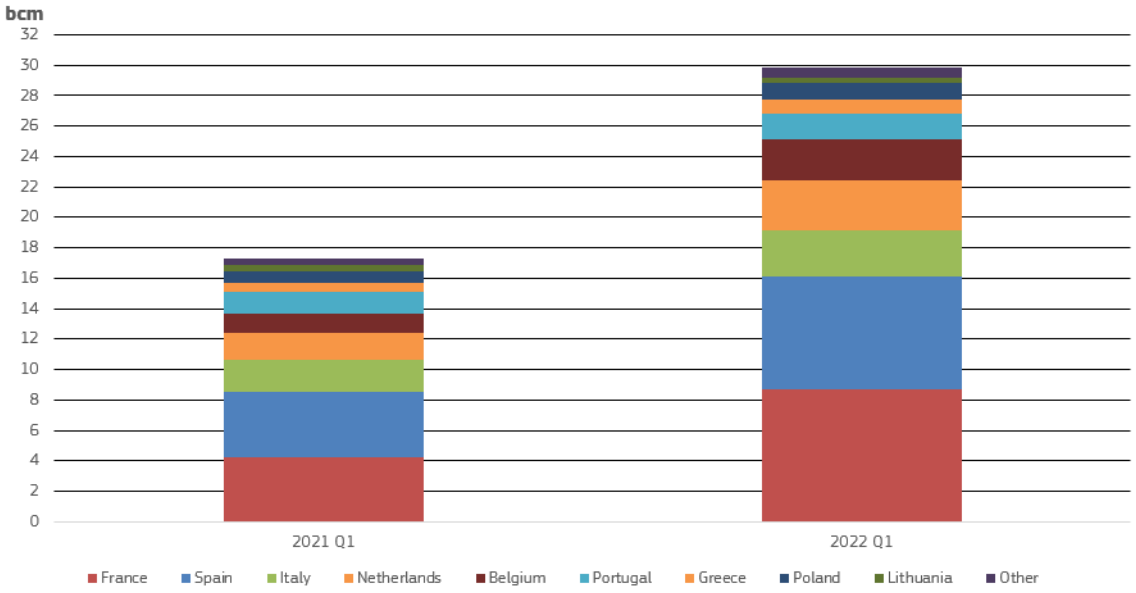
4. Appendix – charts providing further details on market developments[32]

Figure 50 – Monthly evolution of gas imports from extra-EU sources



Source: ENTSO-G

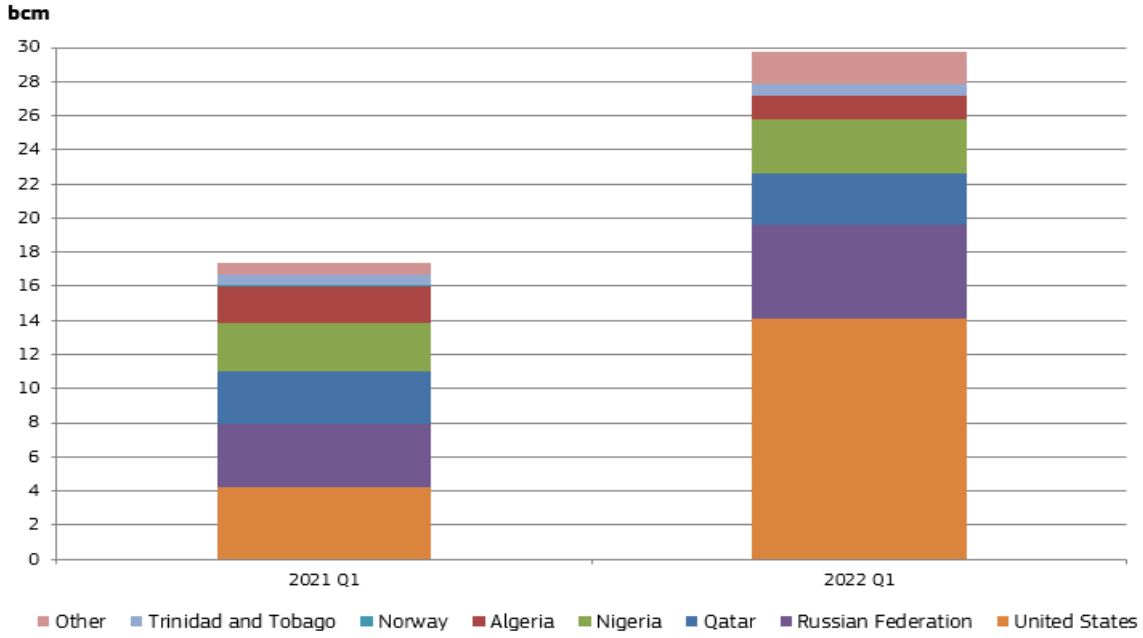
Figure 51 – LNG imports in the EU Member States, first quarters of 2021 and 2022



Source: Refinitiv

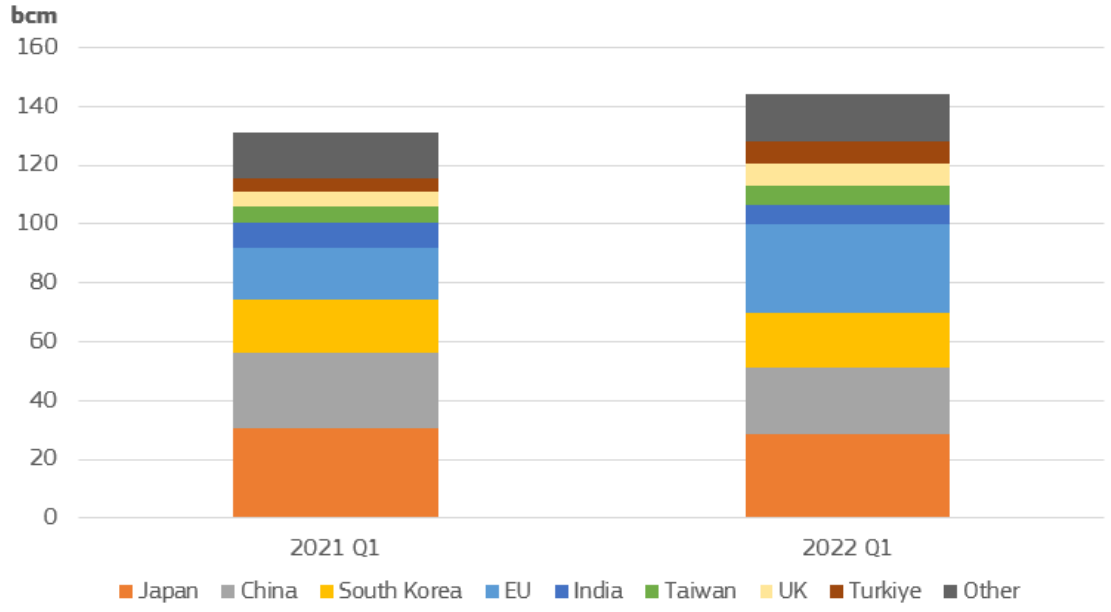
[32] These charts provide additional information on the main market developments, without textual comments and/or further detailed analysis

Figure 52 - LNG import from the main suppliers in the EU in the first quarters of 2021 and 2022



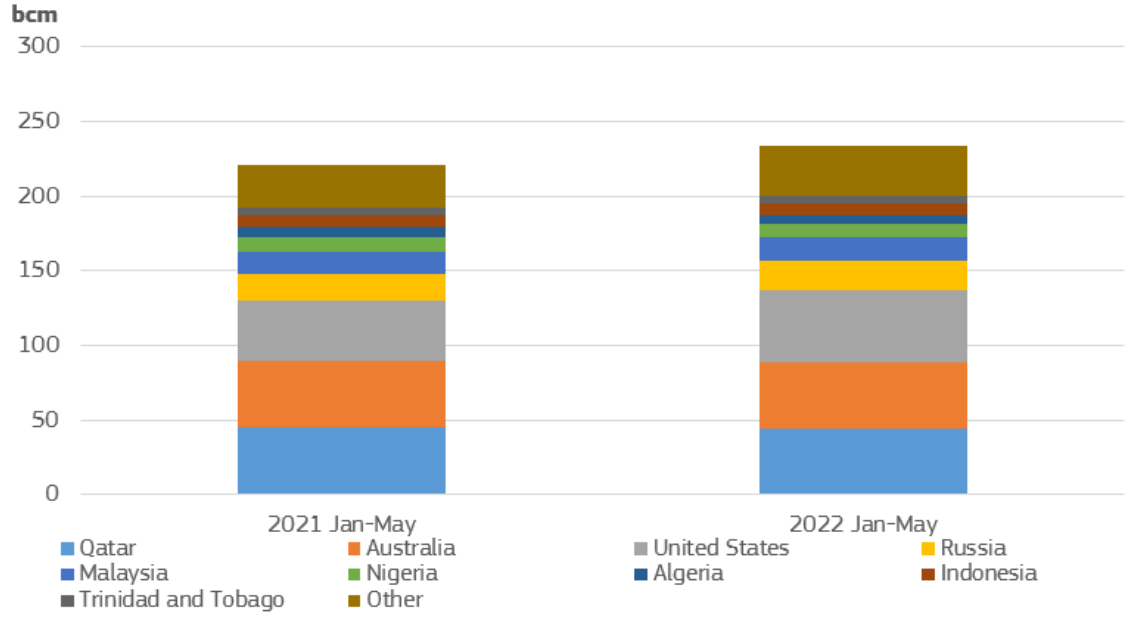
Source: Refinitiv

Figure 53 – LNG imports in the main consumer markets in January-May 2021 and 2022



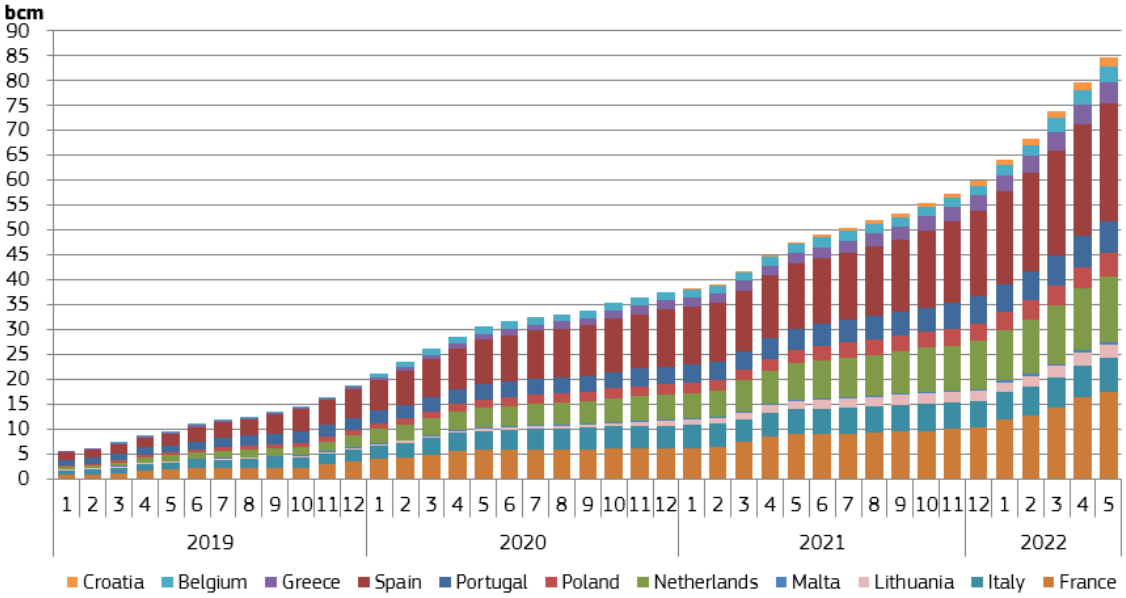
Source: Refinitiv

Figure 54 - LNG exports from the main gas producers in January-May 2021 and 2022



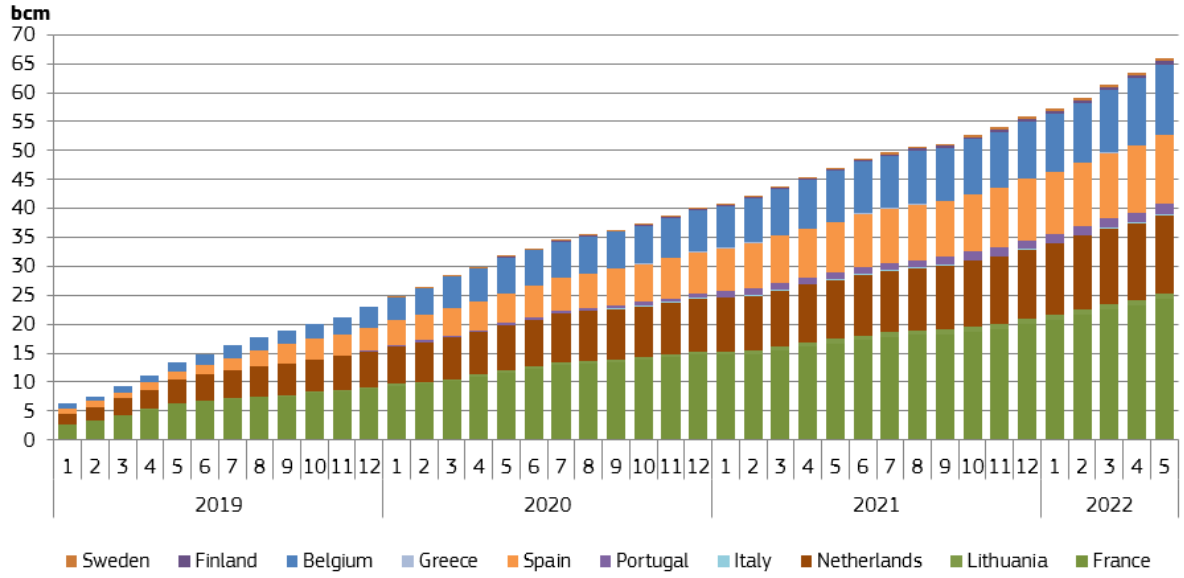
Source: Refinitiv

Figure 55 - Cumulative monthly LNG imports from the US in the EU



Source: Commission calculations based on tanker movements reported by Refinitiv

Figure 56 – Cumulative monthly LNG imports from Russia in the EU



Source: Commission calculations based on tanker movements reported by 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.