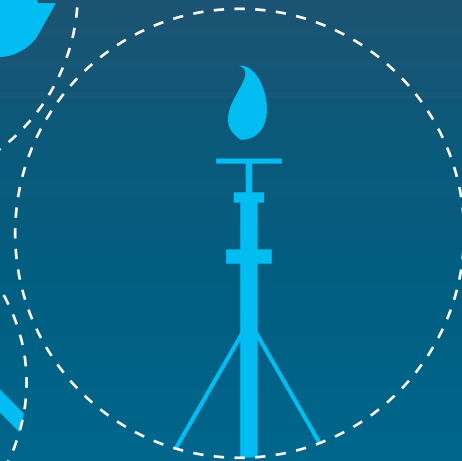
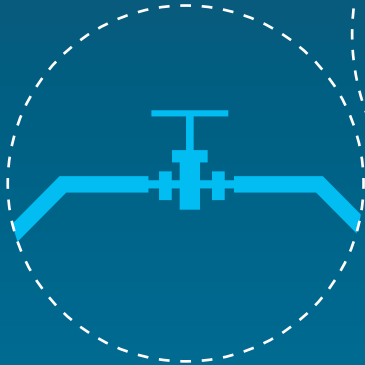




European  
Commission

# Quarterly report

## On European gas markets



Market Observatory for Energy  
DG Energy

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Energy

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## HIGHLIGHTS OF THE REPORT

- **The increasing trend of spot wholesale gas prices on the European hubs, which gained momentum in June 2022 in parallel with the announcements from Gazprom to reduce gas deliveries on Nord Stream 1, continued in July and by the end of August daily average prices rose to all-time highs, the Dutch TTF spot reached 320 €/MWh on 26 August. Further reductions of Nord Stream availability and finally the termination of all deliveries as of early September, amid elevated gas demand at the height of gas storage refilling season and multiple heat waves during the summer, have all contributed to a general tightness of the market and to soaring spot and forward prices. In September, owing to seasonally good gas storage levels and strong signals from the European Union and its Member States on willingness to reduce gas demand and ensuring security of supply at affordable prices during the forthcoming winter, gas wholesale prices started to decrease, the spot finishing the third quarter of 2022 at 159 €/MWh.**
- **Several policy measures and important events impacting the European gas grid** have taken place during the third quarter of 2022. In July, the Commission tabled a legislative proposal on gas demand reduction for the forthcoming winter period, which in early August was adopted by the Council. The regulation foresees a voluntary gas demand reduction of 15% between 1 August 2022 and 31 March 2023, compared to a specified period of five years, which in the case of a Council decision on Union alert, turns into mandatory reduction for the Member States. On the top of this, the Commission has proposed a gas demand reduction plan to help Member States to decide on measures and the choice on impacted economic sectors. Furthermore, thorough discussions on making gas more affordable and introducing a market correction mechanism in the period of excessively high hub prices have begun between the EU and its Member States, leading to the adoption of new measures in December 2022 by the Council.
- During Q3 2022, **new gas infrastructure projects**, such as the gas interconnector between Greece and Bulgaria, the Polish-Slovak gas interconnector, the Baltic pipe, delivering gas from Norway, and a new floating LNG terminal in Eemshaven in the Netherlands have been inaugurated and became operational in the following period. These new infrastructure projects will all contribute to security of gas supply and to replacing Russian pipeline gas, especially in Central and Eastern Europe, a region particularly dependent on Russian gas imports, in line with the objectives set out in the Repower EU Plan. Until the end of 2023, several new LNG terminals are expected to become operational in the EU, helping further to phase out Russian gas.
- **Within the course of the third quarter of 2022, the Nord Stream 1 pipeline practically terminated its operation.** Following the reduction to 60% and later to 40% of its total capacity in June, in July Gazprom announced a further reduction on the pipeline, to barely 20% of its capacity. Mid-August, an announcement came on an extraordinary maintenance on Nord Stream 1 at the end of the month on the top of the ten day maintenance in July 2022. After this three-day maintenance, since early September, Nord Stream 1 has no longer been operational. On 26 September, several sub-sea explosions inflicted serious damages on Nord Stream 1 and on the non-operational Nord Stream 2, probably owing to a sabotage action. Under current circumstances, it is not likely that Nord Stream 1 and 2 would be operational in the near future.
- **Russian gas imports fell measurably in the third quarter of 2022 and beyond.** Russian pipeline gas imports were down by 74% in Q3 2022 (though Belarus by 96%, via Nord Stream 1 by 85%, through Ukraine by 63%, only increasing via the Turk Stream, by 21%), year-on-year. In January-November 2022, Russian pipeline gas imports in the EU fell by 69 bcm year-on-year; taking into account the increase in Russian LNG imports of 4.5 bcm, total gas imports from Russia was down by 64 bcm. At the same time, non-Russian LNG imports were up by 45 bcm and pipeline imports other than from Russia rose by 19 bcm.
- **EU net gas imports rose by 2% year-on-year** (by 1.4 bcm) in Q3 2022. Russian pipeline supplies saw a steep fall, ensuring only 11% of the total extra-EU gas imports (which fell below 10% in October and November). Pipeline imports from Norway were also down, by 9% year-on-year, however, they ensured 26% of the total imports, more than twice the pipeline imports from Russia. The share of gas coming via LNG terminals rose to historic high, 39% within extra-EU gas imports, being the most important import supply source. Pipeline imports from Algeria, having a share of 11% in extra-EU imports, were up by 4% (owing to significant increase in flows to Italy). Imports from Libya continued to fall (-28% in Q3 2022). Net gas imports in the EU amounted to 82 bcm in Q3 2022, while in the first three quarters of 2022 they reached 264 bcm. The EU spent an estimated €101 billion (the highest in the last decade) on gas imports in Q3 2022, up from €29 billion in Q3 2021, principally owing to higher import prices. However, of this amount, payments for Russian pipeline gas amounted to only €9 billion (and plus around €7 billion for LNG from Russia), with dwindling import volumes.
- **EU LNG imports were up by a staggering 89% in Q3 2022 year-on-year**, amounting to 32 bcm. In most of 2022, gas hub prices in Europe 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 a permanent discount in LNG import prices to the TTF and other continental benchmarks. In Q3 2022, France was the biggest LNG importer in the EU, importing 8.8 bcm, ahead of Spain (7.0 bcm) and the Netherlands (4.7 bcm). The United States were by large margins the principal LNG supplier of the EU, ensuring 13 bcm (40% of the total EU LNG imports), followed by Qatar (5.4 bcm) and Russia (4.5 bcm). In January-November 2022, the EU imported 52 bcm of LNG from the US, compared to 22 bcm in 2021 as whole. The EU as block of 27 countries remained the biggest LNG importer in Q3 2022 in the world, ahead of Japan and China.
- **Gas storage injections were more intensive in Q3 2022**, than in the third quarter of 2021, adding more than 30 percentage points by the end of September, when on EU average the filling rate stood at 89%, 14 percentage points higher than on the same day in 2021 and close to the five year average of 2016-2020. The end of September filling rate corresponded to around 40% of a typical winter consumption (October to March) in the EU on average. The 80% EU storage level, originally foreseen for 1 November

in the gas storage regulation, as adopted by the Council in June 2022, has already been reached in the final days of August 2022. In October and the first half of November mild weather conditions have delayed the start of the heating season, resulting in ongoing injections and storages reaching the peak by mid-November (the EU average was nearly 96% on 13 November). By early November, formerly Gazprom operated gas storage facility filling rates have caught up to the other EU storage levels, whereas at the end of June they still had a filling gap of 36 percentage points. Winter-summer gas contract spreads for the next gas year remained negative at the TTF hub in Q3 2022, however, quarter-ahead and two quarters-ahead contracts retained their premium over spot TTF prices, giving market incentives to refill storages for the forthcoming winter.

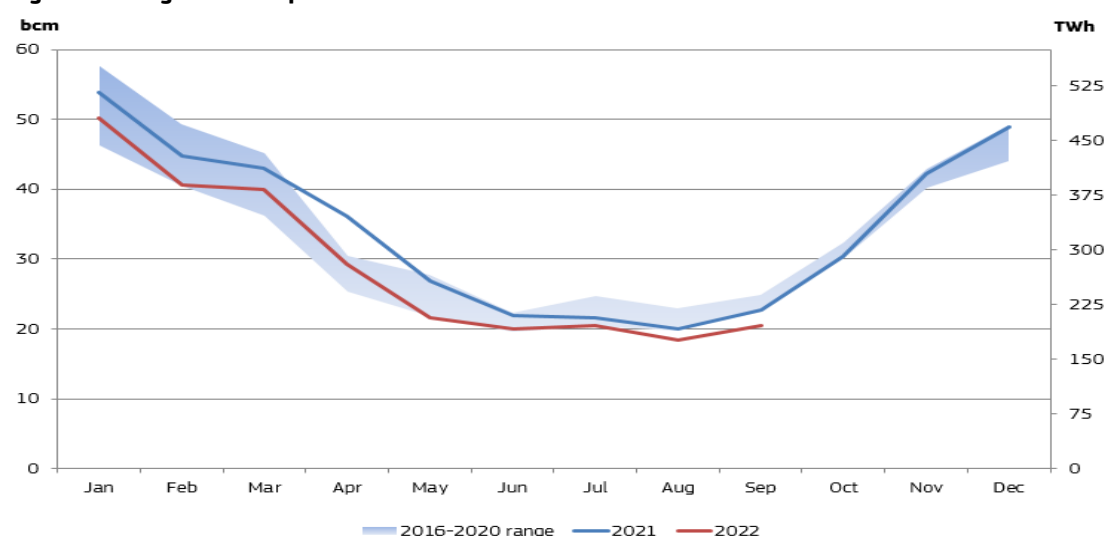
- **EU gas consumption in Q3 2022 fell by 8%**, (-5.1 bcm) year-on-year, amounting to 59 bcm. On the other hand, gas demand in electricity generation rose by 13% (+15 TWh) compared to Q3 2021. Increasing gas prices have led to demand destruction in energy intensive industries. In July and August 2022, weather was warmer than in 2021, leading to higher cooling needs in the residential sector, also impacting gas-fired electricity generation. In the first three quarters of 2022, gas consumption in the EU amounted to 261 bcm. Indigenous **gas production in the EU amounted to 10.7 bcm in Q3 2022, down by 9%** (1 bcm) compared to Q3 2021. In the first three quarters of 2022, gas production in the EU amounted to 35.9 bcm, down from 38.5 bcm in the same period of 2021, implying that high gas prices could not give incentives to more domestic gas production in the EU.
- **Gas traded volumes on the European hubs fell by 26% (4 472 TWh)** in Q3 2022 year-on-year, showing an accelerating decrease compared to the previous two quarters. In contrast to the earlier periods in 2022, both over-the-counter (OTC) trade and exchange executed trade fell by the same magnitude (-26%), implying that high market prices also severely impacted exchanges, not only the OTC market. The share of exchange-executed contracts within the total trade was 57% (down from 62% in Q2 2022).
- **Spot prices on the European gas hubs rose to the highest ever by the end of August 2022**, amid security of supply concerns and intensive gas storage replenishing during the summer. Contrary to the earlier months, forward contracts, notably year-ahead prices narrowed their discount gap to spot, implying permanent high price expectations on the market. In September spot prices started to decrease as the market became calmer, seeing the rapidly increasing gas storage levels. At the end of October and early November the TTF spot price fell temporarily as low to 30 €/MWh, as a number of LNG cargoes could not be unloaded at north-west European hubs, owing to high storage fullness rates in the region, which resulted in a congestion in the gas grid.
- **Retail gas prices for household customers in EU capital cities showed an estimated increase of 57% in November 2022 year-on-year**, which meant a deceleration compared to the doubling of prices seen in July and August, probably implying that wholesale market developments already appeared in retail prices. However, in four capital cities gas prices for households tripled year-on-year. Retail gas prices for industrial customers also showed significant increases, up by an estimated 95% year-on-year in Q3 2022, for consumers with median annual consumption. Industrial retail gas prices in the EU were measurably higher, compared to many of the global competitors, implying significant cost disadvantages for the European 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 648 €/MWh in September 2022, whereas with polymer electrolyte fuel cells (PEM) the cost was assessed at 765 €/MWh, and with steam methane forming (SMR) at around 364 €/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

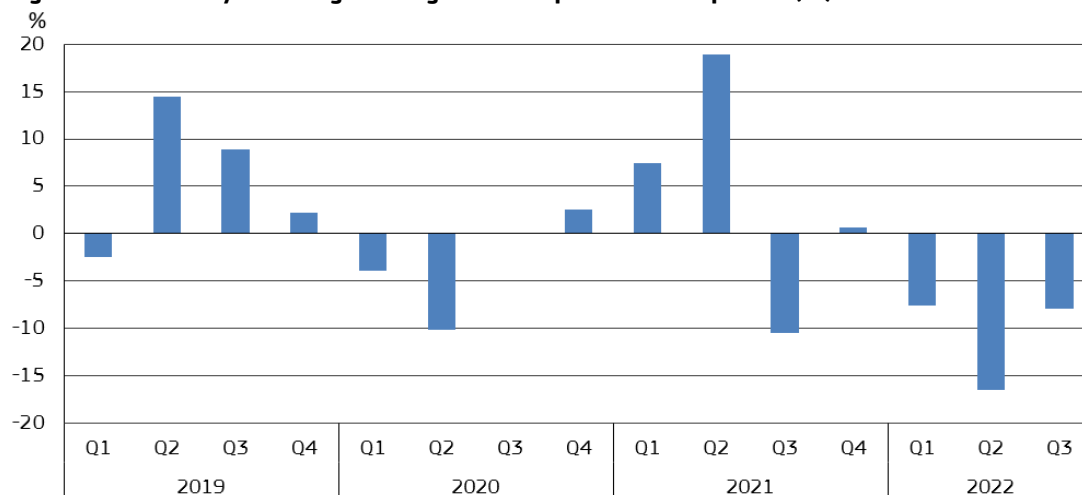
- EU gas consumption<sup>1</sup> in the third quarter of 2022 fell further, by 7.9% (-5.1 bcm) in year-on-year comparison, after decreasing by 16.5% in Q2 2022 and by 7.6% in Q1 2022. In absolute numbers, the quarterly gas consumption in Q3 2022 amounted to an estimated 59.3 bcm, down from 64.4 bcm in Q3 2021, and from the consumption of the previous spring-quarter, Q2 2022 (70.9 bcm), which included the end of the heating season. Gas use in power generation rose by 13.3% (+15.4 TWh) year-on-year, and even amid historically high wholesale gas prices. In July and August 2022, the weather in Europe was generally warmer than in the same period of 2021, increasing cooling related power generation and hence gas demand. On the other hand, high wholesale gas prices must also have had negative impact on gas demand in energy intensive industries, leading to reduction in production, which could already be observed in the previous quarters. As of August, the regulation on voluntary gas demand reduction (See Chapter 1.4) entered into force, and EU Member States started to monitor their gas consumption ahead of the winter. As Figure 1 below shows, in August and September 2022 gas consumption in the EU fell below the lower end of the range of the last five years. In the first three quarters of 2022, gas consumption in the EU amounted to 261 bcm, decreasing by 10.3% year-on-year, from 290.9 bcm in January-September 2021.

**Figure 1 - EU gas consumption**



Source: Eurostat, data as of 6 December 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 (%)**

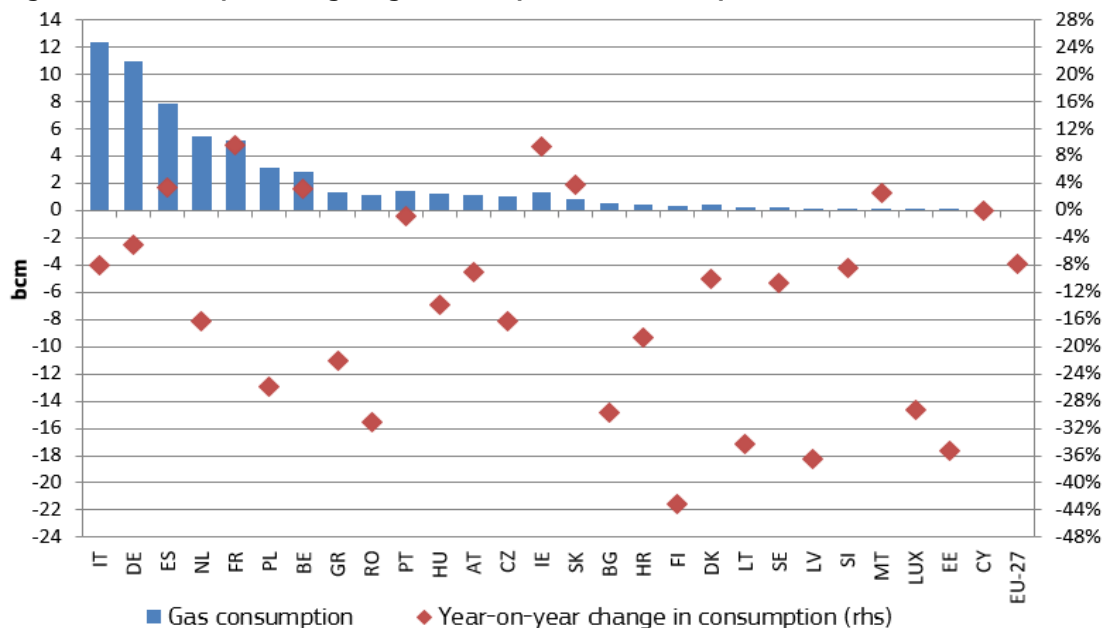


Source: Eurostat, data as of 6 December 2022 from data series nrg\_103m. In the next edition of this report numbers might change retrospectively

<sup>1</sup> 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 third quarter of 2022, there were only six EU Member State showing increasing gas consumption year-on-year; the two biggest rises could be observed in France (+10%, +0.4 bcm) and Ireland, (up by 9.3%, +0.1 bcm). In the other 20 countries (there are no data for Cyprus) gas consumption fell. In the order of percentage changes, has consumption fell by the most in Finland (-43%, -0.2 bcm), Latvia (-37%, -0.1 bcm), Estonia (-35%, -0.02 bcm) and Lithuania (-34%, -0.1 bcm). Among big gas consumer countries, consumption in Romania fell by 31% (-0.5 bcm) year-on-year in Q3 2022, whereas in Poland it decreased by 26% (-1.1 bcm), in the Netherlands by 16% (-1.0 bcm), in Italy by 8% (-1.1 bcm) and in Germany by 5% (-0.4 bcm). In Spain, gas consumption was up by 3% (+0.2 bcm) at the same time.
- In Q3 2022, Italy consumed the highest amount of gas (12.3 bcm), followed by Germany (11.0 bcm), Spain (7.8 bcm), the Netherlands (5.4 bcm), France (5.1 bcm), and Poland (3.1 bcm). In the first three quarters of 2022, gas consumption amounted to 57.2 bcm in Germany, to 51.4 bcm in Italy, to 26.2 bcm in France, to 24.9 bcm in Spain, to 24 bcm in the Netherlands and to 14 bcm in Poland.

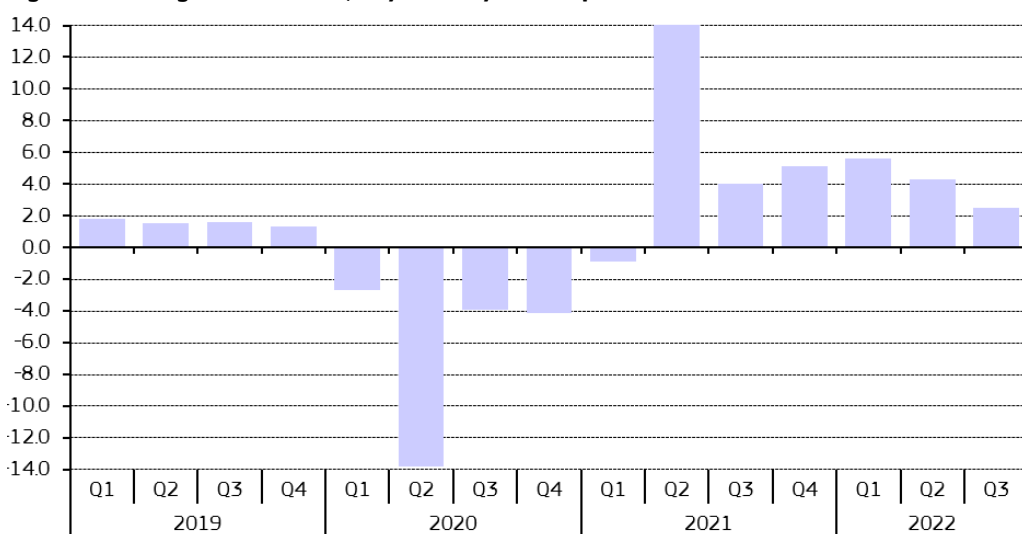
**Figure 3 - Year-on-year change in gas consumption in the third quarter of 2022**



Source: Eurostat, data as of 6 December 2022 from data series nrg\_103m. In the next edition of this report numbers might change retrospectively

- In the third quarter of 2022, GDP in the EU-27 was up by 2.5% in year-on-year comparison, showing a slight deceleration in comparison to the previous two quarters (down from 5.6% and 4.3%, respectively). At the same time, GDP was up by 0.4% 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.

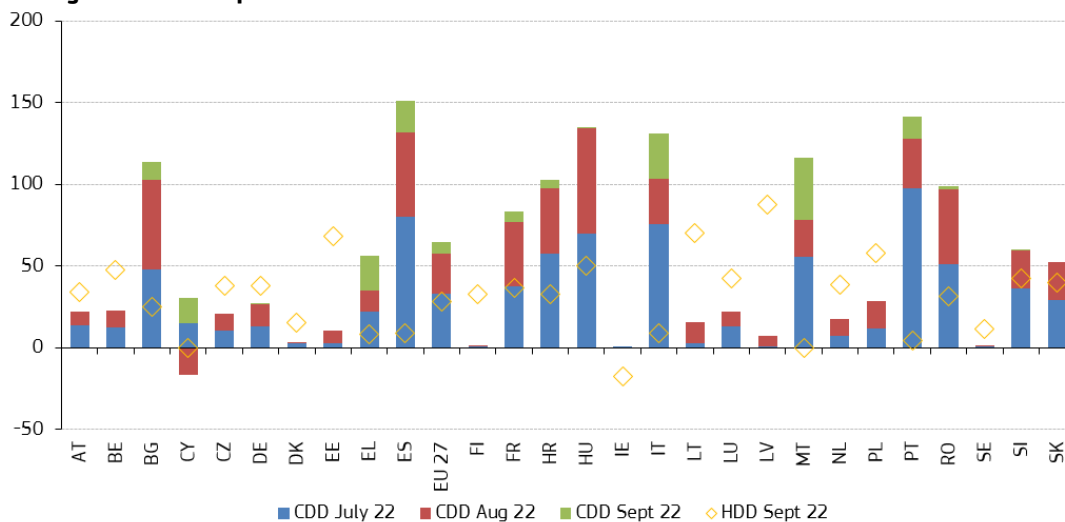
**Figure 4 - Change in EU27 GDP, in year-on-year comparison (%)**



Source: Eurostat, data as of 7 December 2022 from data series namq\_10\_gdp - Seasonally and calendar adjusted data

- Figure 5 shows the deviation of actual cooling degree days (CDDs) from the long-term average<sup>2</sup> in individual EU Member States in the third quarter of 2022 and the deviation of heating degree days (HDDs) from the long term average in the month of September. July and August 2022 was generally warmer than usual in most of the EU countries, and heat waves resulted in elevated cooling related electricity demand, often satisfied by gas-fired generation. Where relevant in southern Member States, September was still warmer than usual. On the other hand, heating degree days in September were higher than usual in some north-European countries, implying increasing heating needs in the residential sector. Nevertheless, market prices in Q3 2022 were mainly impacted by security of supply concerns amid dwindling gas flows from the east, and by the demand arising from filling of underground gas storages; weather conditions might have played a less important role.

**Figure 5 - Deviation of actual cooling degree days (CDDs) and heating degree days (HDDs) from the long-term average in the third quarter of 2022**



Source: Joint Research Centre (JRC), European Commission

- Based on data from ENTSO-E, gas-fired power generation rose by 13% (+15.4 TWh) year-on-year in Q3 2022, as Figure 6 shows. Gas-fired generation showed a significant upturn in July (+13%) and in August (+30%), whereas in September it remained stable year-on-year. In Q3 2022 wholesale gas prices at the EU hubs rose to new highs, which was not favourable to generation costs and hence the profitability of gas-fired generation. Carbon prices remained relatively stable in July and August 2022, while they decreased in September, so combined with high coal prices incentives have not been given to switch from gas to coal in power generation.
- In year-on-year comparison, the share of renewables in the EU power generation mix<sup>3</sup>, rose by 1.4 percentage points, and wind, solar, biomass and hydro together represented around 38.9% of the EU power mix, up from 37.5 in Q3 2021. However, within renewables, the share of hydro fell by 2.5 percentage points, owing to dry periods in many parts of the EU, whereas the share of solar power went up by 2.7 percentage points and that of wind by almost 1 point. Electricity generation from nuclear fell by 24% year-on-year, largely owing capacities taken offline in France, Germany and other countries, and its share was down by almost 6 percentage points, falling below 21% in Q3 2022.
- Even amid record high gas prices, the share of gas was up by 3 percentage points year-on-year, and amounted to 21% in Q3 2022. The share of power generation from solid fuels rose slightly in Q3 2022, reaching 16.8% (up from 15.2% a year before) as coal and lignite-fired generation together rose significantly, by more than 8% in Q3 2022 year-on-year. Gas prices showed a measurable increase within the third quarter of 2022 (up from 145 €/MWh early July to above 300 €/MWh late August, and falling back 159 €/MWh by the end of September). Price volatility continued in October and November as well. At the same time, coal prices were in the range of 300-400 €/Mt during most of the time in Q3 2022, falling back in October. Replacing gas by coal was limited by decreasing coal-fired capacities over the last few years, and missing nuclear capacities had to be replaced by gas and renewables.
- In Q3 2022, the amount of electricity generated from gas rose by 127% in France, by 45% in Spain, by 4% both in the Netherlands and Italy in year-on-year comparison, whereas in Germany it decreased by 2%.
- Beside demand side factors, the share of gas was impacted by changes in the local power generation mixes in each country. In France, the increase in gas-fired generation and other sources, such as solar power, could only partially compensate the impact of

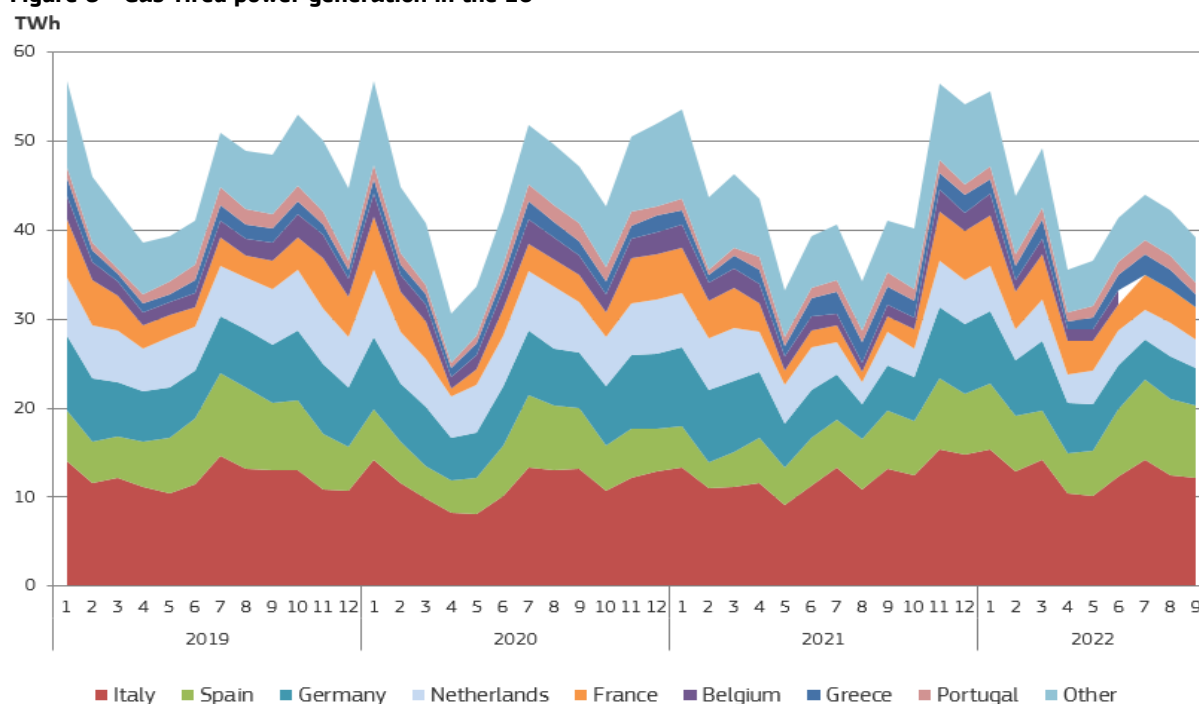
<sup>2</sup> Long term average temperatures, heating and cooling degree days refer to the period between 1978 and 2018

<sup>3</sup> See more information in Quarterly Report on the European Electricity Markets, Vol. 15, Issue 3



abruptly falling nuclear availability, dwindling hydro and less coal, which resulted in a 24% fall of the overall electricity generation in the country in Q3 2022, year-on-year. In Spain, increasing gas-fired generation, coupled with higher wind, solar and coal-fired generation abundantly overcompensated the low hydro availability, leading to an increase of 17% in electricity generation in Q3 2022 year-on-year, which also served the power demand in France. In the Netherlands, increasing solar, gas and coal-fired generation resulted in an overall increase of 11% in the amount of generated power, even with decreases for the other technologies. In Italy, decreasing hydro generation was mainly compensated by the rise of gas and coal-fired generation, and by other technologies, such as solar, leaving the overall electricity generation unchanged year-on-year. In Germany, the decrease in gas-fired generation was dwarfed by the significant fall in nuclear and hydro availability, which was mainly compensated by increasing solar, coal and lignite.

**Figure 6 - Gas-fired power generation in the EU**

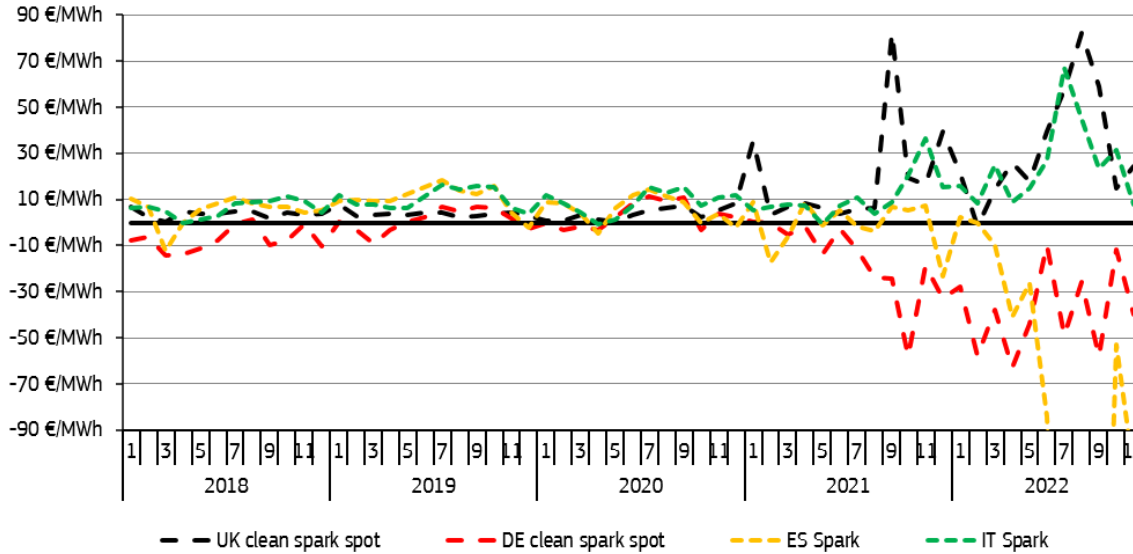


Source: Based on data from the ENTSO-E Transparency Platform and national data sources, data as of 7 December 2022.

- Clean spark spreads – measuring the profitability of gas-fired generation by taking into account variable costs – reached respectively in Q3 2022 -44.3 €/MWh, -291.4 €/MWh and 45.3 €/MWh in Germany, Spain and Italy, in comparison to the previous quarter (-38.9 €/MWh, -50.4 €/MWh and 16.9 €/MWh) and to Q3 2021 (-20.2 €/MWh, 0.4 €/MWh and 7.9 €/MWh) on average. Otherwise saying, the estimated profitability of gas-fired generation deteriorated in Germany and Spain, both in quarter-on-quarter and year-on-year comparison, but it improved in Italy over the same time horizons. In Germany, the wholesale electricity prices did not keep pace with the increase of gas prices, and in Spain the sudden decrease in profitability over the last two quarters have also been related to the new electricity market design, that subsidises gas-fired generation. In contrast, profitability of gas-fired generation improved in Italy, probably owing to much higher wholesale electricity prices, and much higher number of hours when gas is the marginal technology, setting the electricity generation costs and wholesale market prices (See Figure 7<sup>4</sup>).
- In the United Kingdom, having relevance for the European gas market, clean spark spreads averaged at 66.2 €/MWh in Q3 2022, up from 27.8 €/MWh in Q2 2022 and from 31.4 €/MWh in Q3 2021. In the UK, wholesale electricity prices were much higher than in continental Europe, resulting in higher profitability of gas-fired generation. Electricity generated from gas was up by 22% year-on-year in Q3 2022, exceeding the increase of overall electricity generation (+17%), which meant that the share of gas-fired generation rose from 49% to 51% between the third quarters of 2021 and 2022.

<sup>4</sup> Charts of clean spark spreads can also be found in the Quarterly Report of European Electricity Markets (Vol. 15, Issue 3). 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**



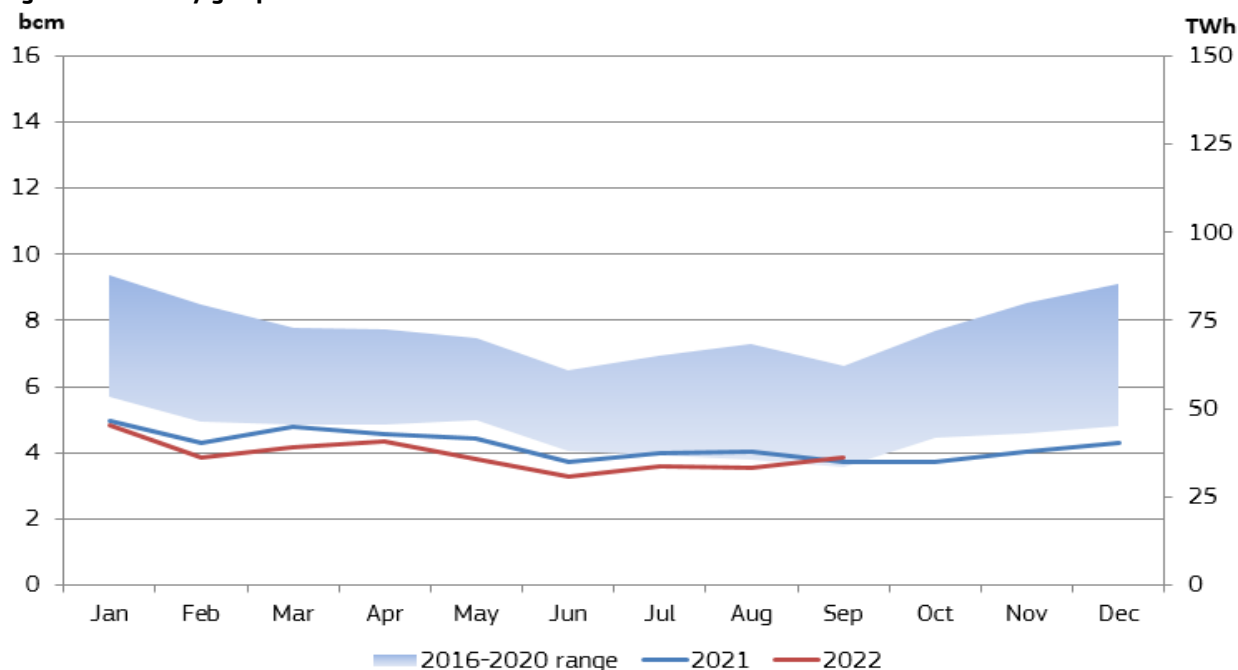
Source: Bloomberg

## 1.2 Production

- In the third quarter of 2022, EU natural gas production reached approximately 10.7 bcm<sup>5</sup>, falling year-on-year again, by 9%, (by 1.0 bcm - See Figure 8). In July and August, the actual quarterly production remained well below both the five-year range of 2016-2020 and 2021 figures as well, in September however, the monthly EU gas production (3.7 bcm) was slightly above the minimum of the five year range. This does not seem to change the long-term dwindling trend of domestic gas production in the EU. Compared to the previous quarter, production went down by 1.7 bcm in Q3 2022, following the seasonal decrease in gas consumption during the summer period.
- In the biggest gas producer Netherlands the production fell significantly, by 13% (-0.6 bcm) year-on-year, amounting to 4.2 bcm in Q3 2022. In Romania, the second biggest gas producer in the EU, production decreased slightly, by 2% (-0.1 bcm) and reached 2.1 bcm. In Germany, gas production was also down, by 9% (-0.1 bcm). At the same time, gas production rose by 14% in Denmark, by 11% in Ireland, by 8% in Hungary and by 3% in Italy, but in absolute amount, changes in gas production remained below 0.1 bcm in these countries. In Poland, gas production went down by 2% (-0.04 bcm) in Q3 2022, year-on-year. In the first three quarters of 2022, gas production in the EU amounted to 35.9 bcm, down from 38.5 bcm (-7%) in the same period of 2021.
- It seems that even amid extreme high wholesale gas prices at the European hubs, domestic production in most of the European countries could not increase over the last few quarters, implying that there are technical and societal/environmental obstacles (e.g. depleted gas fields, significant resistance from the society for further gas production owing to damages in some countries, etc.) play more important role than economic profitability, which result in permanently dwindling production in the EU.
- Gas production in Norway was up by 9% year-on year in Q3 2022, amounting to 30.7 bcm. In the first three quarters of 2022, Norway produced 91.4 bcm of natural gas, up from 83.2 bcm in the same period of 2021. In the United Kingdom, gas production amounted to 9 bcm in Q3 2022, up from 7.8 bcm a year before (+16%, year-on-year). In the three quarters of 2022, the UK produced 28 bcm of natural gas, up from 22.9 bcm a year before.

<sup>5</sup> Given that in some countries data for some periods are based on estimation, this number might retrospectively change

**Figure 8 - Monthly gas production in the EU**



Source: Eurostat, data as of 7 December 2022 from data series nrg\_103m. In the next edition of this report numbers might change retrospectively.

### 1.3 Imports

- According to Eurostat<sup>6</sup>, net gas imports in the EU increased by 2% (1.4 bcm) in the third quarter of 2022 (year-on-year), amid decreasing gas consumption and further dwindling domestic production, which also facilitated the replenishment of storages. Net imports in different EU countries showed a high variation in Q3 2022 in year-on-year comparison. In Denmark, in parallel with decreasing gas consumption, net imports fell to practically zero and in Latvia they fell by 52% (-0.4 bcm). In contrast, net gas import in Malta practically doubled (though increasing by a tiny 0.07 bcm), and in Hungary net imports rose by 58% (+1.1 bcm) year-on-year.
- Looking at the biggest importers, in the Netherlands net imports rose by 12% (+0.7 bcm), in Spain they went up 10% (+0.8 bcm), in Germany by 8% (+1.3 bcm), in Italy by 5% (+0.9 bcm) and in Belgium by 2% (+0.05 bcm), whereas they decreased by 3% (-0.3 bcm) in France and fell significantly in Poland (by 42%, -1.7 bcm). The biggest net importers in the EU were Germany (18 bcm), Italy (17 bcm), France (9 bcm), Spain (8.5 bcm), the Netherlands (7 bcm), Belgium (3 bcm) and Poland (2.4 bcm). These seven countries altogether imported 65 bcm out of the total gas imports of 82 bcm in Q3 2022 (the total up from 80.7 bcm in Q3 2021). In the first three quarters of 2022, the EU imported 264 bcm of natural gas, up from 251 bcm in the same period of 2021.
- According to ENTSO-G data, net imports amounted to 837 TWh in the third quarter of 2022, of which 61% arrived through pipelines and around 39% through LNG terminals. For a first time since the beginning of ENTSO-G time series (January 2014) almost four tenths of gas import arrived in the EU via LNG terminals. Pipeline gas imports from Russia saw a steep fall of 74% year-on-year in Q3 2022, showing an accelerating decline compared to the previous two quarters. Imports from Norway were also down, by 9% in Q3 2022, probably relating to maintenance works and industrial actions during the quarter. Pipeline gas imports from Algeria showed a slight increase of 4% year-on-year. At the same time, pipeline gas imports from Libya fell further, by 28%. At the same time, LNG imports reached 325 TWh in Q3 2022, close to the record set in the previous quarter. The same can be said on gas inflows from the UK, showing a three-fold rise year-on-year and reaching 84 TWh.
- The share of Russian pipeline gas in the EU external gas imports fell to 11% in Q3 2022. Year-on-year, the share of Russian pipeline imports fell significantly, by 29 percentage points<sup>7</sup>. In October and November, Russian pipeline gas ensured less than 10% of the EU gas imports.
- The share of pipeline gas imports from Norway was 26% in the third quarter of 2022, rising from 23% in previous quarter but down by 1 percentage point compared to Q3 2021. The share of pipeline gas imports from Norway was twice as high as the share

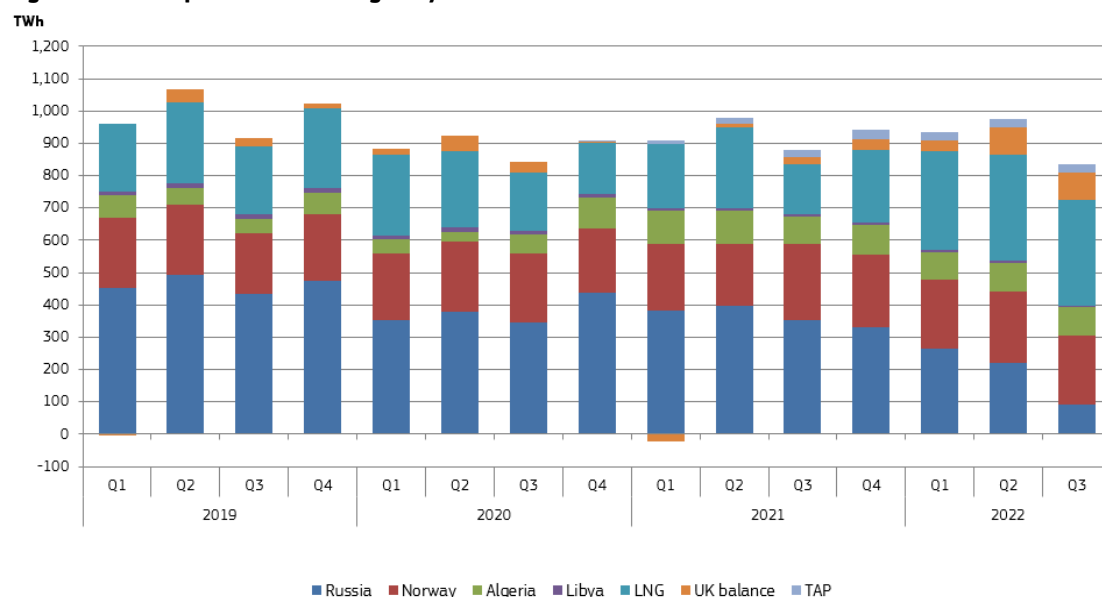
<sup>6</sup> Net imports equal imports minus exports and do not account for stock changes.

<sup>7</sup> It is worth to note that Russia increased its importance in the EU LNG imports over the last few years, numbers presented in this section, with the exception of LNG or unless otherwise indicated, refer to pipeline imports.

of pipeline imports from Russia. In the third quarter of 2022, Norwegian gas production<sup>8</sup> amounted to 31 bcm, up by 9% year-on-year.

- In the third quarter of 2022, pipeline gas imports from Algeria were up by 4% year-on-year, which resulted in an increasing share within the total extra-EU imports (rising to 11% in Q3 2022). Even if oil-indexed contracts gas contracts with Algeria were quite competitively priced in Q3 2022 vis-à-vis hub based contracts, 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 36% in Q3 2022 year-on-year, as only the Medgaz pipeline remained in operation, even with increased capacity. At the same time, pipeline gas supply from Algeria to Italy was up by 41% year-on-year. Imports from Libya continued to fall and its share was barely 0.7% in the total EU gas imports.
- In Q3 2022, the share of LNG rose to historic high, 39% in the total EU gas imports, up by a 21 percentage points compared to Q3 2021, prompting LNG as of Europe to the Asian markets, as 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 Q3 2022 the year-on-year decrease in the share of Russian pipeline flows was mainly compensated by increasing LNG and rising inflows from the UK, whereas the share of other sources (Norway, North Africa, etc.) did not change significantly.
- The Trans Adriatic Pipeline (TAP) ensured around 28 TWh gas imports in the EU in the third quarter of 2022, up from 23 TWh in Q3 2021 (+21% year-on-year), which represented around 3.4% of the EU total gas imports. TAP provides access to Azerbaijani gas resources via the Southern Gas Corridor, an important result of the EU security of gas supply policies. The EU wants to rely more on the Southern Gas Corridor too in the future, replacing gas imports from Russia.
- Looking at the evolution of daily gas inflows from different sources on Figure 10, it is obvious that daily inflows from Russia continuously decreased in Q3 2022, and in October and November stabilised at very low levels, 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 (with decrease in UK inflows at the end of November), but with dwindling Russian imports their relative importance increased.

**Figure 9 - EU imports of natural gas by source**



Source: Based on data from the ENTSO-G Transparency Platform, data as of 2 December 2022.

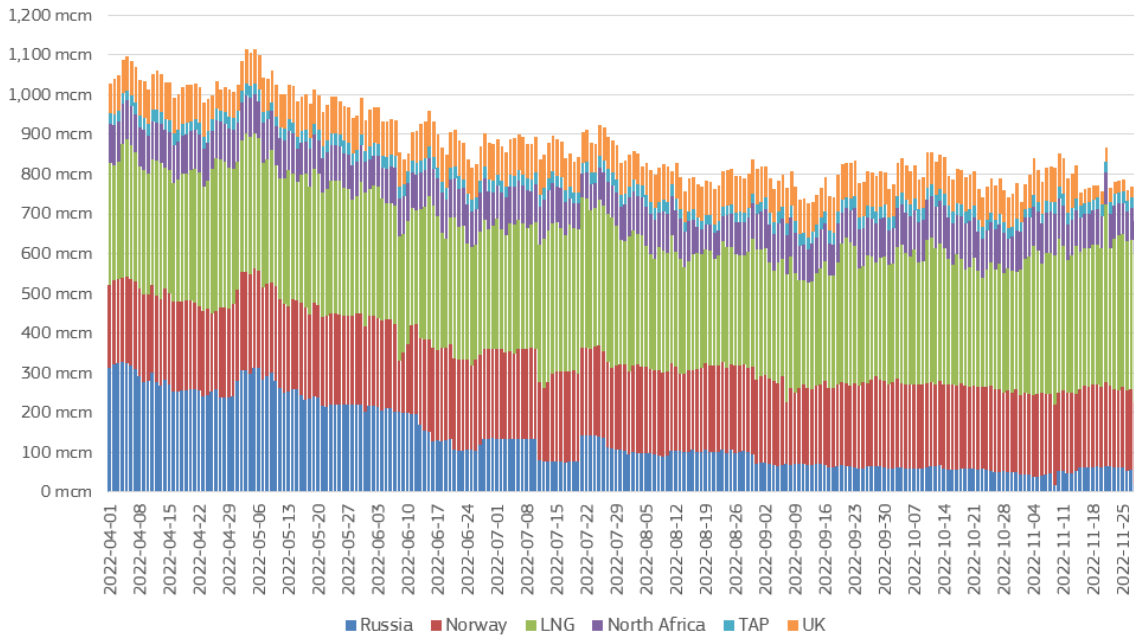
Exports to the Baltic-states and Finland are not included in the chart owing to unavailability of reliable data

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.

<sup>8</sup> <https://www.npd.no/en/facts/news/Production-figures/>

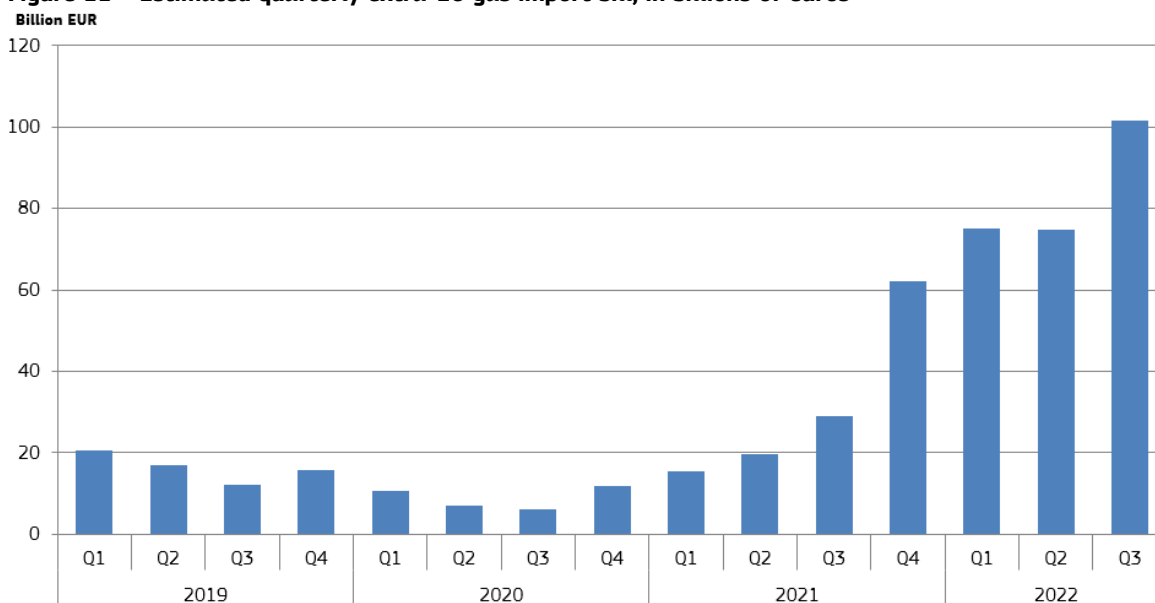
**Figure 10 - EU daily imports of natural gas by source**



Source: Based on data from the ENTSO-G Transparency Platform, data as of 2 December 2022.

- As average import gas prices increased significantly year-on-year (showing a nearly three-fold growth compared to Q3 2021), in the third quarter of 2022 the estimated gas import bill amounted to more than €101 billion, implying a new record and up from the previous quarter (€75 billion). In comparison to €29 billion in Q3 2021, the bill rose by 249% 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. Out of these the estimated amount, gas imported from Norway was around €27 billion, whereas imports from Russia amounted to €9 billion, followed by North Africa (Algeria and Libya, €6.5 billion) and the TAP (€4.7 billion). If LNG imports from Russia, Norway and North Africa accounted to the source of origin, the total gas import bill from Russia amounted to €16.4 billion, that of Norway to €27.6 billion and that of North Africa to €13.5 billion.

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



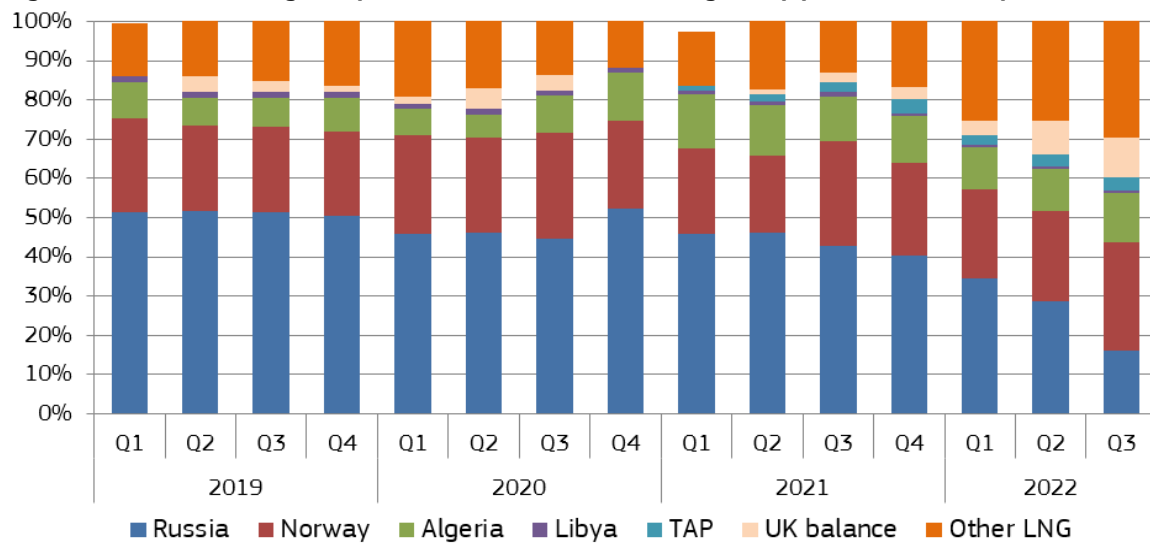
Source: ENTSO-G, Eurostat and own data calculations for the EU weighted average of import gas prices

- As important pipeline gas source countries, such as Russia, Norway and Algeria are also active on the LNG market, this 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 16% in Q3 2022 (the lowest over the last eight years), split by 11% of pipeline imports and 5% of LNG. Although Russia managed to strengthen its position on the EU LNG market over the last few years, increasing LNG exports to the EU could not counter-balance its market losses in the pipeline segment in Q3 2022. The combined share of pipeline and LNG gas of Russian origin fell by 27 percentage points in Q3 2022 year-on-year.

- The share of Norway was 28% within gas imports in Q3 2022 (2 percentage points higher than the share of Norwegian pipeline gas, as after two years of disruption the Hammerfest LNG plant came back to operation in June 2022). The share of Algeria within the total extra-EU gas imports was 12.6% with LNG (as opposed to 11% only including pipeline gas), up by 1 percentage point year-on-year. The share of 'Other' LNG reached historic high in Q3 2022 (29.6%, on the top of LNG accounted in shipments from Russia, Norway and Algeria), up from 13% in Q3 2021. The share of gas inflows from the UK was close to 10%. The decreasing share of imports from Russia between the third quarters of 2021 and 2022 was mainly compensated by the increasing shares of LNG and inflows from the UK (and to a lesser extent, by the higher share of Norway and the TAP).

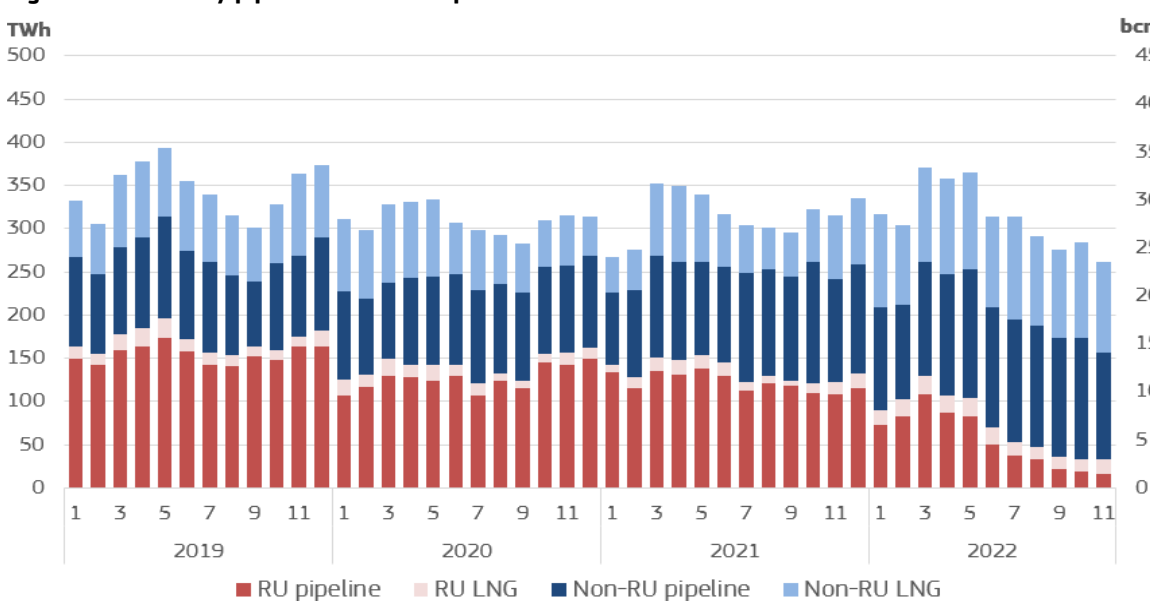
**Figure 12 – The share of gas imports within the total, combining both pipeline and LNG imports**



Source: Based on data from the ENTSO-G Transparency Platform, data as of 2 December 2022.

- Figure 13 shows how remarkably the role of Russian gas imports changed over the last couple of years. While in January 2021 Russia ensured (with pipeline and LNG supplies) around 53% of the total extra-EU gas imports, in November 2022 this dropped to barely 13%, a trend well aligned with the objective of the Repower EU plan to phase out fossil energy imports from Russia.

**Figure 13 – Monthly pipeline and LNG imports from Russian and other sources**

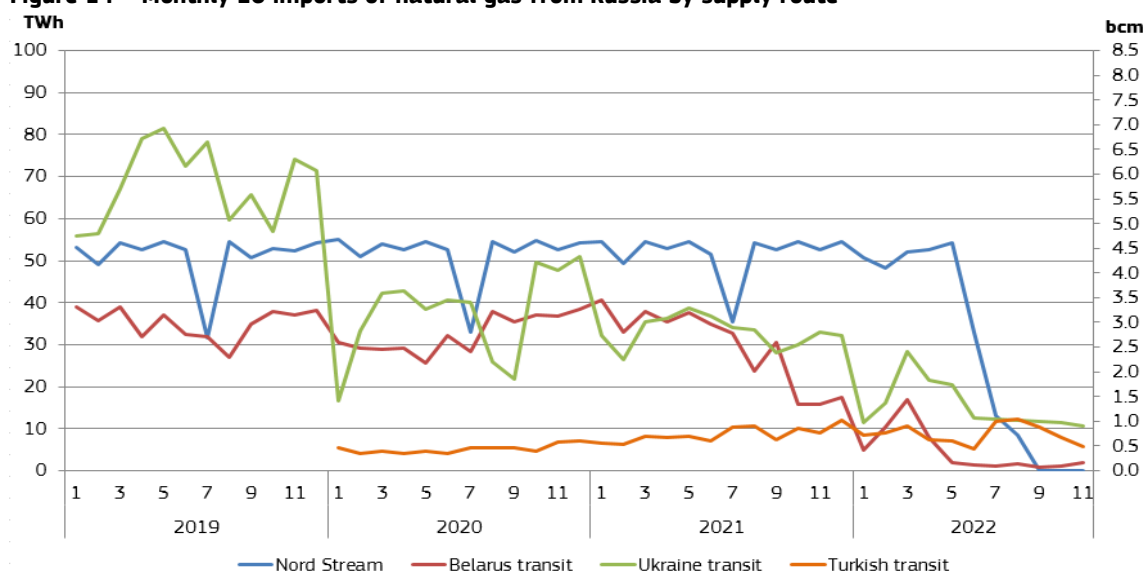


Source: Based on data from the ENTSO-G Transparency Platform, data as of 2 December 2022.

### 1.3.1. Pipeline imports from Russia

- 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 third quarter of 2022, the volume of Russian imports fell significantly, by 74%, 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 96% in Q3 2022 year-on-year. In July, August and September the average monthly flow through the Yamal pipeline was 0.1 bcm, in November a slight uptick to 0.2 bcm was perceivable.
- Gas flows transiting Ukraine were down by 63% in comparison to Q3 2021, showing decreasing trend within the quarter. The monthly average transit through Ukraine was 1.1 bcm, down from 3 bcm in Q3 2021, and was about 85% lower compared to the same periods of 2018-2019 (pre-Covid-19 and energy crisis years). In October-November 2022 the monthly transit volume through Ukraine with EU destinations was around 1 bcm.
- In July and August 2022, transited volumes through the Nord Stream fell respectively to 1.2 bcm and 0.8 bcm, definitively lower than the average monthly volume of Q2 2022 (4.4 bcm), impacted by a planned maintenance between 11 and 21 July and a three day long works at the end of August. As from early September transit fell to zero through Nord Stream 1 and at the end of the that month a sabotage action resulted in serious damages on the pair of pipelines, making unlikely the return of this transit route to operation (See Chapter 1.4). On quarterly average, transit through Nord Stream 1 was down by 85% in Q3 2022, year-on-year.
- The only transit route where volumes showed a year-on-year increase in Q3 2022 was the Turk Stream, up by 21% and amounting to 1.1 bcm on monthly average. In October-November volumes also dropped on this route (to 0.7 bcm and 0.5 bcm, respectively), probably owing to the end of delivering additional gas volumes to Hungary at the final period of the storage filling season.
- As a result, in Q3 2022 the share of Nord Stream within Russian pipeline gas supply to Europe fell to the lowest over the last few years (22%, as opposed to 62% in Q2 2022, and to 40% in Q3 2021). For the first time in several quarters, the Ukraine transit route came to the first place, ensuring 38% of the total Russian pipeline gas transit, however, amid drastically falling overall Russian pipeline imports. The Belarus transit route represented only 4% of the total Russian pipeline imports in Q3 2022 down from 5% in the previous quarter and from 25% in Q3 2021. The share of Turk Stream rose to the highest ever, 36% in Q3 2022, reflecting the relative stability of flows amid the falling utilisation of the other supply routes.
- In Q3 2022 Nord Stream represented slightly more than 2% (2 bcm) in the total net extra-EU gas imports, the Ukrainian transit had a share of 4% (3.4 bcm), whereas the Belarus transit route ensured only 0.4% (0.3 bcm). Turk Stream had also had share of 4%, with around 3.2 bcm gas transit within the total net extra-EU gas imports in Q3 2022.
- If the total transit through Ukraine (without Moldova) is counted, in January-November 2022 around 16 bcm gas arrived from Russia via this route (to compare with the objective of 40 bcm total transit for 2022 in the EU-Ukraine-Russia trilateral agreement), whereas Nord-Stream 1 transited 29 bcm. Via the Turk Stream more than 11 bcm arrived (with all destinations, to the EU only 9 bcm), and the via the Belarus transit only 4.6 bcm was shipped in January-November 2022.

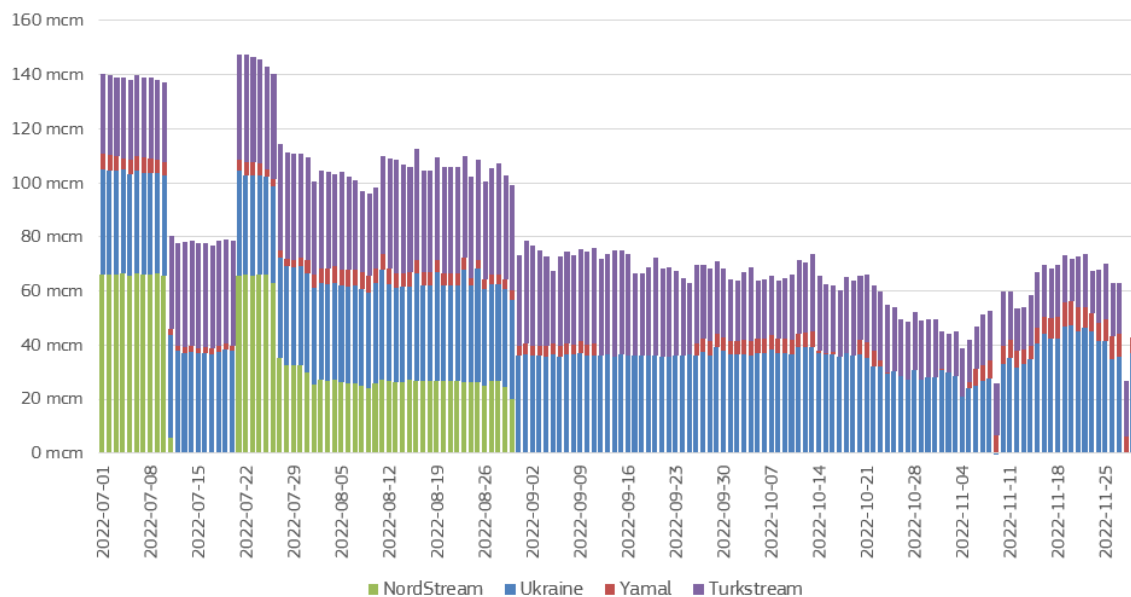
**Figure 14 – Monthly EU imports of natural gas from Russia by supply route**



Source: Based on data from the ENTSO-G Transparency Platform, data as of 2 December 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 15 – Daily EU imports of natural gas from Russia by supply route**



Source: Based on data from the ENTSO-G Transparency Platform, data as of 2 December 2022.

- In the first eleven months of the year, based on data from ENTSO-G, EU pipeline gas imports from Russia decreased by almost 69 bcm, which implies that the total 2022 pipeline imports will be around slightly more than half of the 2021 total imports (138 bcm). At the same time, estimated send-out data show that Russian LNG imports grew by 4.5 bcm in January-November 2022 year-on-year, and pipeline imports from non-Russian sources (Norway, Algeria, Azerbaijan, Libya and the UK) were up by 19 bcm, and LNG imports from non-Russian sources rose by more than 45 bcm.

### 1.3.2. LNG imports

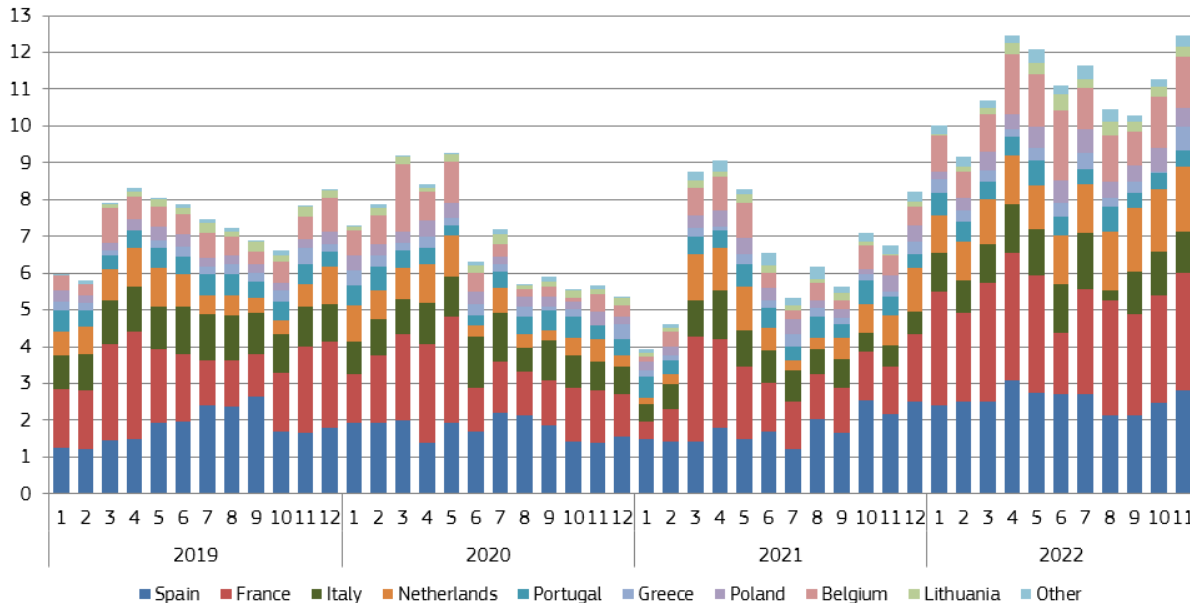
- LNG imports<sup>9</sup> in the EU grew significantly, by a staggering 89% in Q3 2022 in year-on-year comparison, after growing by 49% in the previous quarter. Looking at the three months of the quarter, EU LNG imports were up by 119% in July, by 70% in August and by 83% in September, compared to the same months of 2021. In October and November 2022 EU LNG imports respectively grew by 59% and 84%, largely owing to the measurable price premium of European gas market to Asia and other parts of the world. In Q3 2022 EU LNG imports amounted to 32.4 bcm, down from 35.7 bcm in the previous quarter but up from 17.1 bcm in Q3 2021, as Figure 15 shows. The total number of LNG cargoes arrived in the EU was 403 in Q3 2022, slightly down from 433 in Q2 2022, but up from 246 in Q3 2021.
- In Q3 2022, France was the biggest LNG importer in the EU, importing 8.8 bcm of liquefied natural gas, slightly ahead of Spain, where LNG imports amounted to 7.0 bcm. In year-on-year comparison, imports were up by 134% in France, whereas in Spain they rose by 43%. LNG imports in the Netherlands, amounting to 4.7 bcm in Q3 2022, showed a three-fold increase (up by 299%) year-on-year. Belgium and was the fourth biggest importer, receiving 3.3 bcm of LNG (+256%), followed by Italy, importing around 3.0 bcm (up by 27% year-on-year). Both Poland and Portugal imported 1.5 bcm of LNG in Q3 2022 (respectively +73% and 13%). Greece imported around 1 bcm in Q3 2022, up by 29%, while Lithuania had a quarterly import of 0.9 bcm (109% higher than in Q3 2021). At the same time, Croatia imported 0.6 bcm (+42%). The total EU LNG imports amounted to an estimated €57 billion in Q3 2022, up from €8.0 billion a year before, principally owing to the impact of sharply increasing wholesale gas prices (rising to more than three-fold) year-on-year, and to the significant increase in imported volumes (89%). In the first three quarters of 2022, the EU imported 97.9 bcm LNG, in comparison to 58.3 bcm imported in the same period of 2021.
- LNG imports in the United Kingdom in Q3 2022, amounting to 4.1 bcm, were significantly up year-on-year (+472%, rising from 0.7 bcm in Q3 2021, when maintenance works impacted LNG cargo arrivals). The number of cargoes berthed in the country picked up, and reached 40, as opposed to only 5 in Q3 2021.

<sup>9</sup> In the report LNG imports are based on cargo tracking data from Refinitiv. Import numbers also include possible re-exports to third countries, implying that consumption of natural gas in the EU is less than these numbers would suggest. Actual consumption data is rather based on the send-out numbers of regasification terminals, provided by ENTSO-G



- In Q3 2022, wholesale gas prices rose to record highs in the EU and during most of the time Europe offered a premium for LNG cargoes compared to Asia. At the end of October, in parallel with falling TTF spot prices amid cargo congestions in north-western Europe, prices switched to discount to Asia, however, as of November, the premium returned (see Figure 30 and Figure 31). Price premium during most of the time resulted in abundant LNG imports in the EU. In north-western and south-western Europe local LNG import benchmarks maintained the measurable discounts vis-à-vis the general gas benchmark TTF during most of Q3 2022.

**Figure 16 - LNG imports to the EU by Member States**  
bcm

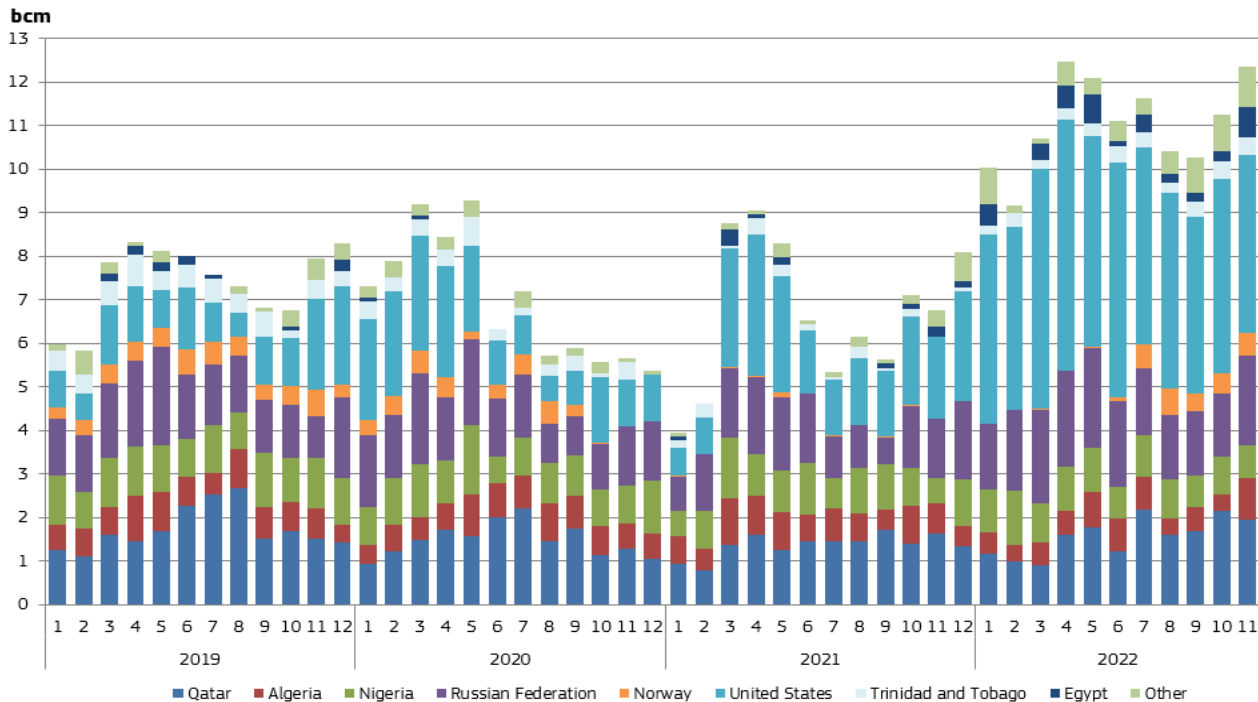


Source: Commission calculations based on tanker movements reported by Refinitiv "Other" includes Finland, Malta and Croatia

- In the third quarter of 2022, similarly to 2022 so far, the United States proved to be the biggest LNG supplier of the EU, by a large margin to its competitors, ensuring 13 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 40% of the total imports. Year-on-year, LNG imports from the US more than tripled, up by 203%, and the share of the US in total EU LNG imports rose by 15 percentage points. In January-November 2022 the EU imported almost 52 bcm LNG from the US, implying that the objective of the March 2022 EU-US joint statement on energy security<sup>10</sup>, which foresaw an increase of 15 bcm compared to 2021, has by a large margin been exceeded.
- Qatar was the second biggest EU LNG import source in Q3 2022 (with an import share of 17% and imports amounting to 5.4 bcm, +17% year-on-year). Russia came to the third place, representing 14% of the total EU LNG imports (4.5 bcm, up by 77% year-on-year), followed by Nigeria (with an import share of only 8% - 2.5 bcm, falling by 9% year-on-year). LNG imports from Algeria amounted to 1.7 bcm, falling by 7% year-on-year and representing only 5% of the total imports. For the first time in two years, Norway came back to the key LNG suppliers of the EU and represented 5% (1.5 bcm) within the total EU LNG imports in Q3 2022.
- On the top of these, LNG imports from Trinidad and Tobago amounted to 0.9 bcm and ensured around 3% of the total EU LNG imports, whereas LNG from Egypt rose more than seven-fold year-on-year, reaching 0.8 bcm (2% of the total EU imports) – See Figure 16. LNG imports from Angola amounted to 0.9 bcm, while those from Cameroon and Equatorial Guinea to 0.3 bcm each, signalling the increasing importance of new African import sources.

<sup>10</sup> See more in Quarterly Report on European Gas Markets, first quarter of 2022 (Vol 15, issue 1).

**Figure 17 - LNG imports in the EU by supplier country**



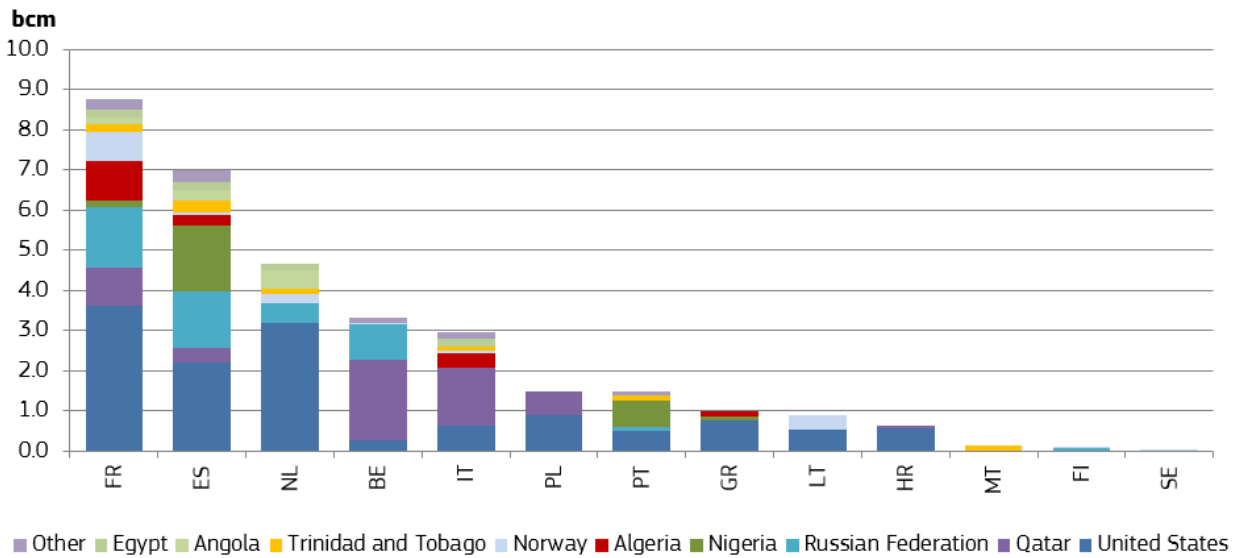
Source: Commission calculations based on tanker movements reported by Refinitiv

Imports coming from other EU Member States (re-exports) are excluded

"Other" includes Angola, Brazil, the Dominican Republic, Equatorial Guinea, Oman, Peru, Singapore, the United Arab Emirates and Yemen

- In the third quarter of 2022, the United States were the biggest LNG supplier of Croatia (86% of the country's total LNG imports), Netherlands (68%), Lithuania (60%) and Poland (59%) (60%) and France (41%). The US came to the second place in the Portugal (32%) and Italy (22%). Qatar was the biggest supplier in Belgium (61% of the country's total LNG imports), and in Italy (48%), and was the second biggest in Poland (41%) and Croatia (15%).
- Russia was the biggest LNG supplier of Finland (representing 88% of the imports), and came to the second place in Sweden (34%), Belgium (27%), and France (17%), and was the third biggest supplier in Spain (20%). It seems that self-restriction of western European energy consumers, perceivable on the oil market, did not manifest yet in LNG imports from Russia, though compared to the first and to the second quarters of 2022, Russia supplied less EU Member States in Q3 2022.
- Nigeria was the biggest supplier in Portugal (44%), and ensured 23% of the LNG imports in Spain. Algeria ensured 14% of LNG supply in Greece and 11% in France in Q3 2022. Norway was the biggest supplier of Sweden (66%) and the second biggest in Lithuania (40%) and Finland (12%). Trinidad and Tobago was the single supplier of Malta.
- In the third quarter of 2022, 147 LNG cargoes arrived in the EU from the US, down from 174 in Q2 2022 and 49 in Q3 2021). LNG imports from the US amounted to 13 bcm in Q3 2022, down from 16 bcm in Q2 2022 but up from 4.3 bcm Q3 2021). The estimated market value of LNG imports from the US was around €23.2 billion in Q3 2022. In October-November 2022, LNG imports from the US continued at high pace, and 96 cargoes arrived, with 8.5 bcm of LNG, in a value of €8.2 billion, even amid the ongoing unavailability of the Freeport terminal in the US. LNG imports from the United States became of particular importance in the EU, as geopolitical tensions mounted over the last year, putting gas supply from the East under security risk.
- LNG exports to Europe represented 54% of the total US exports in Q3 2022, making Europe a market of principal interest for US LNG shipments. A year before, in Q3 2021 the share of the EU in US LNG exports was barely 20%. In October-November 2022, the share of the EU as export destination remained high, around 51%, though decreasing a bit compared to Q3 2022.
- In the third quarter of 2022, the three most important EU destinations of the US LNG exports were France (3.6 bcm), the Netherlands (3.2 bcm) and Spain (2.2 bcm). The United Kingdom imported slightly less than 1 bcm of US LNG in Q3 2022.

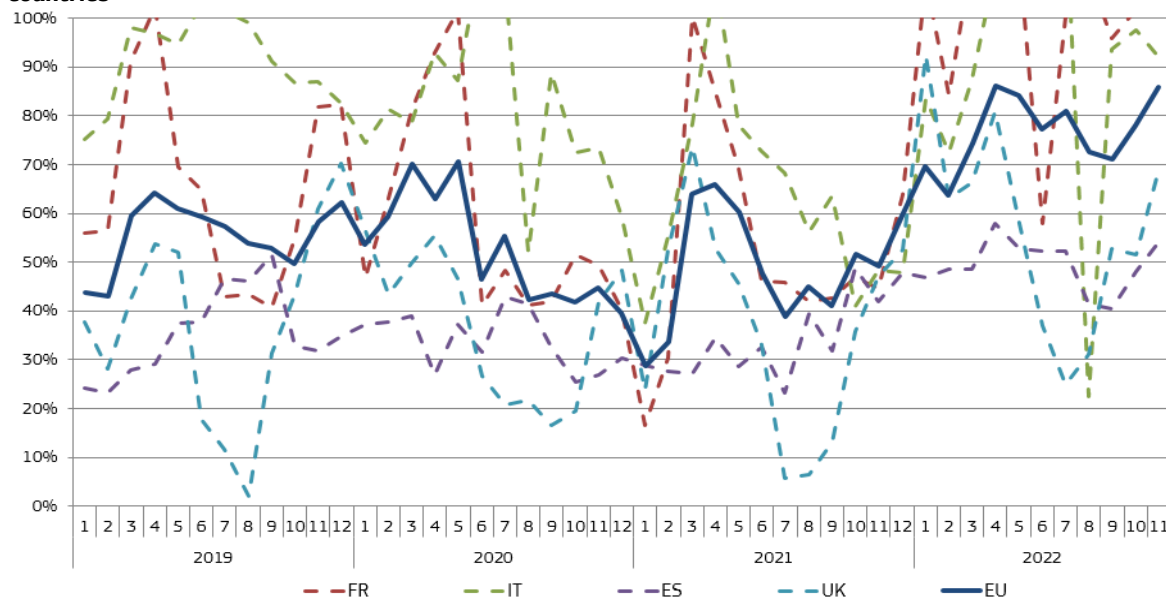
**Figure 18 – LNG imports in the EU Member States from different sources in the third quarter of 2022**



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

- The average 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 77% in June, rose to 81% in July, then fell back to 73% in August and to 71% in September, but rebounding again in October and November. 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 was above 100% based on annual nameplate capacities in July and August, whereas in September it fell back to 96%, however, in October and November it rose again above 100%. In Italy, also having higher utilisation rate than the EU average, it started Q3 2022 well above 100%, in August, probably owing some maintenance works, fell back sharply, before going above 90% again in September. The utilisation rate in Spain fell from 52% to 40% between June and September 2022, however, by November it rebounded to 54%, albeit remaining below the EU average during all the time. In the UK utilisation the average utilisation rate fell as low as 25% in July 2022, after it began to rebound, reaching 53% in September and 69% in November.

**Figure 19 – Average monthly regasification terminal utilisation rates in the EU and in some significant LNG importer countries**



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

## 1.4 Policy developments and gas infrastructure

- In the third quarter of 2022, the European Commission has come up with several proposals to continue the work laid out in the Repower EU Plan in May 2022, and to ensure security of energy supply at affordable prices during the forthcoming winter of 2022/2023 and beyond. On 20 July, the Commission proposed a new legislative tool<sup>11</sup> to reduce gas use in Europe by 15% until next spring. The new regulation set a target for all Member States to reduce gas demand by 15% between 1 August 2022 and 31 March 2023. To help Member States deliver the necessary demand reductions, the Commission has also adopted a European Gas Demand Reduction Plan which sets out measures, principles and criteria for coordinated demand reduction.
- The Gas Demand Reduction Plan focuses on substitution of gas with other fuels, and overall energy savings in all sectors. Based on criteria, such as societal criticality (like food, healthcare, refining and other sectors), cross border supply chains, possible damage to installations (avoid problems while resuming operation) and gas reduction possibilities taking into account product/fuel substitution, the Plan will help Member States to identify the most critical sectors and installations when making decisions on the reduction of gas consumption.
- On 5 August 2022, following the proposal from the Commission mentioned in the paragraph above, the Council has adopted a regulation<sup>12</sup> on a voluntary reduction of natural gas demand by 15% this winter. The regulation foresees the possibility for the Council to trigger a 'Union alert' on security of supply, in which case the gas demand reduction would become mandatory. The purpose of the gas demand reduction is to make savings for this winter, in order to prepare for possible disruptions of gas supplies from Russia.
- The Council specified some exemptions and possibilities to apply a partial or in some cases a full derogation from the mandatory reduction target (e.g. in the case of countries that are not interconnected to other member states' gas networks), in order to reflect the particular situations of Member States and to ensure that the gas reductions are effective in increasing security of supply in the EU. The so-called 'Union alert' would be activated by a Council implementing decision, acting on a proposal from the Commission. The Commission shall present a proposal to trigger a 'Union alert' in case of a substantial risk of a severe gas shortage or an exceptionally high gas demand, or if five or more Member States that have declared an alert at national level request the Commission to do so.
- Later during the autumn months of 2022, the Commission has proposed further measures to address high gas prices in the EU and ensure security of supply this winter. On 18 October, a new regulation was proposed<sup>13</sup>, focussing on (i) the aggregation of EU demand and joint gas purchasing to negotiate better prices and reduce the risk of Member States outbidding each other on the global market, on (ii) proposing a price correction mechanism to establish a dynamic price limit for transactions on the European gas exchanges, with a temporary collar or bandwidth to prevent extreme price spikes in derivatives markets, and on (iii) default solidarity rules between Member States in case of supply shortages. On 19 December 2022 the Council has adopted<sup>14</sup> these new regulations.
- Important developments could also be witnessed on the infrastructure side of the European gas market in the third quarter of 2022. On 8 July, the construction phase of the gas interconnector Greece-Bulgaria (IGB) has been completed<sup>15</sup>. The IGB pipeline connects to the gas transmission network of Greece and to the Trans-Adriatic pipeline (TAP) close to the Greek city of Komotini. The IGB has been developed from the very beginning with a number of other key projects such as TAP, Trans-Anatolian Pipeline (TANAP) and the Alexandroupolis LNG terminal in mind, and this has made it an integral part of Europe's overall energy strategy and priorities. After the finalisation of all administrative procedures under Greek and Bulgarian jurisdictions, the IGB became operational at the beginning of October 2022.
- On 26 August, another important piece of infrastructure, the gas interconnector<sup>16</sup> between Poland and Slovakia was inaugurated<sup>16</sup>. Its completion marked a cornerstone of the North-South gas infrastructure corridor between the Baltic Sea, the Adriatic and Aegean Seas, the eastern Mediterranean Sea and the Black Sea. The pipeline, with a total length of approximately 165 km, was a Project of Common Interest (PCI) over the period 2013-2021 and has received more than €100 million of EU funding through the Connecting Europe Facility (CEF), which represents around 40% of the project costs. As of November 2022 physical gas flows already started on this pipeline.
- On 27 September, the Baltic Pipeline was also inaugurated<sup>17</sup> at an opening ceremony in Goleniów, Poland. The event marked the end of the process of the Baltic Pipe construction, a key route to carry gas from Norway through Denmark to Poland and neighbouring countries. The Baltic Pipe will make it possible to import up to 10 billion cubic metres (bcm) of gas annually from Norway to Poland and to transport 3 bcm of gas from Poland to Denmark. The project, supported by the Trans-European Networks for Energy (TEN-E), enhances the diversification of gas supply in Central-Eastern Europe and the Baltic States by opening a new

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<sup>11</sup> [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_22\\_4608](https://ec.europa.eu/commission/presscorner/detail/en/ip_22_4608)

<sup>12</sup> <https://www.consilium.europa.eu/en/press/press-releases/2022/08/05/council-adopts-regulation-on-reducing-gas-demand-by-15-this-winter/>

<sup>13</sup> [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_22\\_6225](https://ec.europa.eu/commission/presscorner/detail/en/IP_22_6225)

<sup>14</sup> <https://www.consilium.europa.eu/en/meetings/tte/2022/12/19/>

<sup>15</sup> <https://www.icqb.eu/the-construction-phase-of-the-greece-bulgaria-interconnector-is-completed>

<sup>16</sup> [https://commission.europa.eu/news/inauguration-gas-interconnector-between-poland-and-slovakia-2022-08-26\\_en](https://commission.europa.eu/news/inauguration-gas-interconnector-between-poland-and-slovakia-2022-08-26_en)

<sup>17</sup> [https://commission.europa.eu/news/launch-baltic-pipe-2022-09-27\\_en](https://commission.europa.eu/news/launch-baltic-pipe-2022-09-27_en)

import route from the North Sea to the EU. The Baltic Pipe has been a PCI since 2013 and has received around €267 million of EU funding through the (CEF).

- On 8 September, the official start was given to the construction phase of the Eems Energy Terminal, a floating LNG terminal in Eemshaven (Groningen)<sup>18</sup>. The first LNG tanker also arrived that day. The Eems Energy Terminal will be able to make a total of 8 bcm of natural gas per year available to the national natural gas network after processing the LNG supplied. It is an important step not only to ensure new supply sources for the Netherlands, but it also can serve customers in Central Europe, such as Czechia. Until the end of 2023, new LNG regasification terminals are expected to be operational (in many cases as interim solution, floating storage and regasification units – FSRUs) in Germany, France, Italy, Greece, Poland and Finland, adding around 50 bcm<sup>19</sup> to the total annual LNG regasification capacity in the EU, which might have a pivotal role in phasing out pipeline gas imports from Russia.
- On the other hand, on 26 September 2022, both Nord Stream 1, being operational until the end of August 2022, and Nord Stream 2 (actually never been put in operation) gas pipelines suffered damages on international waters, probably owing to hostile actions on the infrastructure<sup>20</sup>, resulting in a significant gas leakage in the Baltic Sea. Over the past few months, multiple investigations point to probable sabotage action through series of explosions on the subsea pipelines. Given the time needed for reparation of such damages and the current geopolitical context, it is not realistic to assume that the pipelines would be operational in the forthcoming years. Over the past few years, Nord Stream 1 used to be a key infrastructure in delivering more than 55 bcm gas of Russian origin to the EU.

## 1.5 Storage

- Figure 19 shows EU gas stock levels as the percentage of storage capacity in gas years<sup>21</sup> 2020 and 2021, compared to the 5-year range of gas years 2015-2019. According to figures published by Gas Infrastructure Europe (GIE), operational EU storage capacity amounts to 1,148 TWh (roughly 106 bcm) as of July 2021<sup>22</sup>.
- The third quarter of the year is traditionally the peak of the refilling period of gas storages in the EU. Concerns on security of gas supply ahead of winter 2022/23 and the slow pace of the last storage filling period in 2021 has put an accent on refilling of storages. The differential between quarter-ahead and two quarters-ahead prices to spot contracts was also favourable during most of Q3 2022, giving a strong incentive to refill storages (in contrast to the same period in 2021, when the forward gas price curve was in backwardation). The gas storage regulation, adopted in June 2022 by the Council foresaw a minimum filling rate of 80% by 1 November 2022 for most of the Member States. At EU level this was practically reached by the end of August 2022, two months before the deadline.
- On 30 June 2022, the average storage filling rate in the EU was 58.3%, which was almost 11 percentage points higher compared to 30 June 2021 (47.4%), however, it was still 4 percentage point lower compared to the five year average of 2016-2020. On 30 September however, the EU average filling rate rose to 88.7%, which was 14 percentage points higher on the same day in 2021 (74.6%) and was close to the five year average (89.9%). In Q3 2022 storage injections were faster than a year before (30.4 percentage points in 2022 vs. 27.2 percentage points in 2021), and this was facilitated by significantly higher LNG inflows to the EU, increasing pipeline flows from several directions, with lower gas consumption, even amid dwindling pipeline gas imports from Russia. Further in October until mid-November, the average EU filling rate kept on growing, reaching the peak on 13 November (95.6%), almost a month later than usually, owing to mild weather and the delayed start of the heating season.
- Since the start of the storage filling season until the spring of 2021, storages operated by Gazprom in the EU could be characterised by much lower filling rates compared to other facilities, which resulted in lower than usual overall filling rates on EU averages during the 2021/22 winter heating season. During spring 2022, formerly Gazprom managed storages (the facilities of Bergermeer in the Netherlands, Rehden and Katharina in Germany, Haidach in Austria and Damboricein in Czechia were practically requisitioned, partly or totally, by the national governments upon the ‘use it or lose it’ principles of gas security of supply regulations). In consequence, storage filling rates in formerly Gazprom managed facilities started to catch up rapidly. On 30 June 2022, storages formerly operated by Gazprom had an average filling rate of 25.7%, whereas other EU storages had a filling rate 61.7%. By 30 September this gap of 36 percent fell to 9 percent, and by 2 November both ‘Gazprom’ and ‘non-Gazprom’ related storage filling rates rose to 95%, and the gap between the two groups has practically disappeared, as Figure 21 shows.

<sup>18</sup> <https://www.gasunie.nl/en/news/first-natural-gas-available-from-new-floating-lng-terminal-in-eemshaven-in-mid-september>

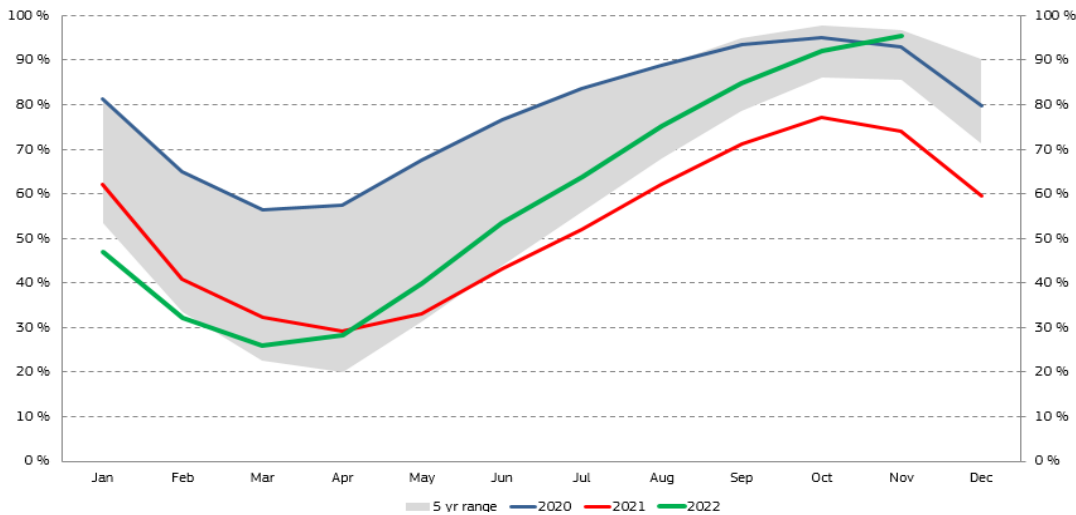
<sup>19</sup> <https://www.energyintel.com/00000184-2f21-d8b5-ab9f-af2d9dfd0000>

<sup>20</sup> <https://www.bbc.com/news/world-europe-63297085>

<sup>21</sup> 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

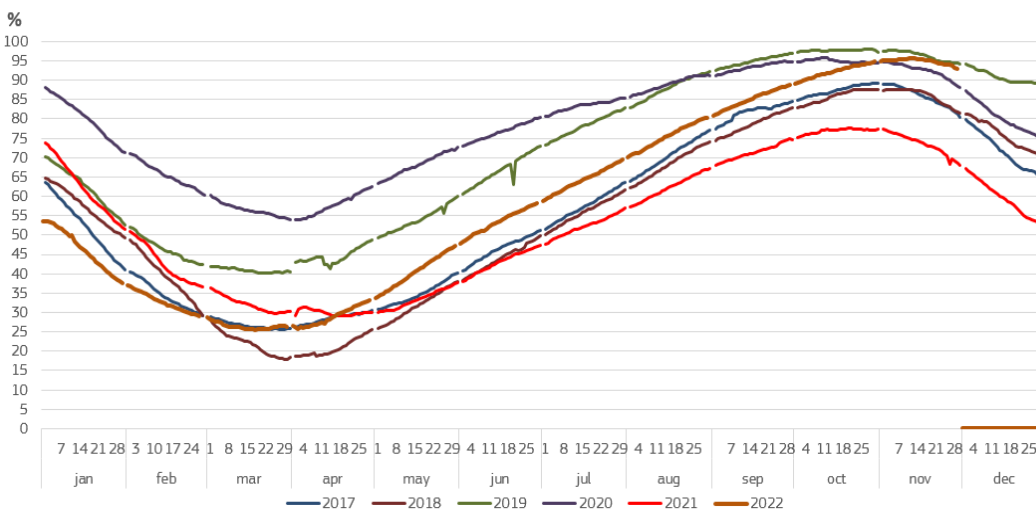
<sup>22</sup> <https://www.gie.eu/transparency/databases/storage-database/>

**Figure 20 - Gas storage levels as percentage of maximum gas storage capacity in the EU in the middle of the month**



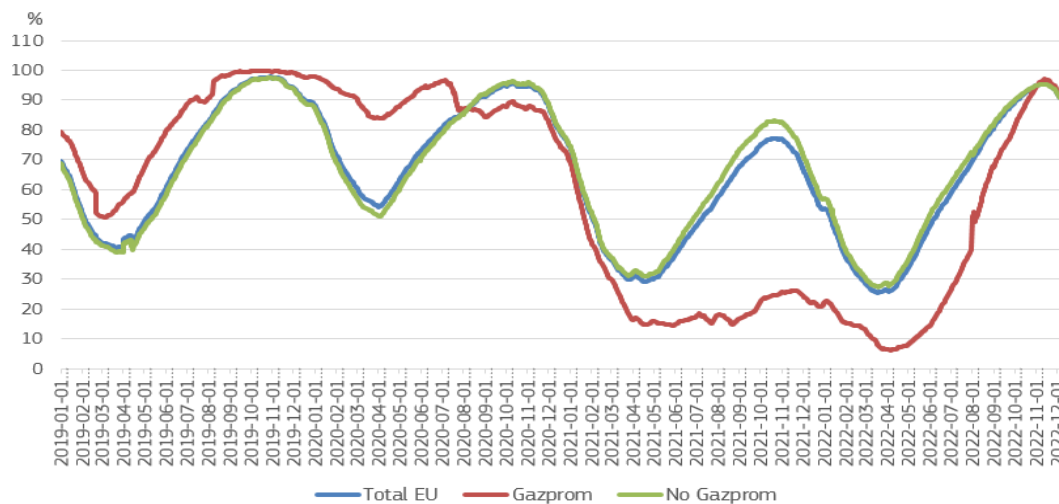
Source: Gas Storage Europe AGSI+ Aggregated Gas Storage Inventory, extracted on 4 December 2022. See explanations on data coverage at <https://agsi.gie.eu/#faq>. The 5-year range reflects stock levels in years 2015-2019. The graph shows stock levels on the 15<sup>th</sup> day of the given month.

**Figure 21 – 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 4 December 2022. See explanations on data coverage at <https://agsi.gie.eu/#faq>.

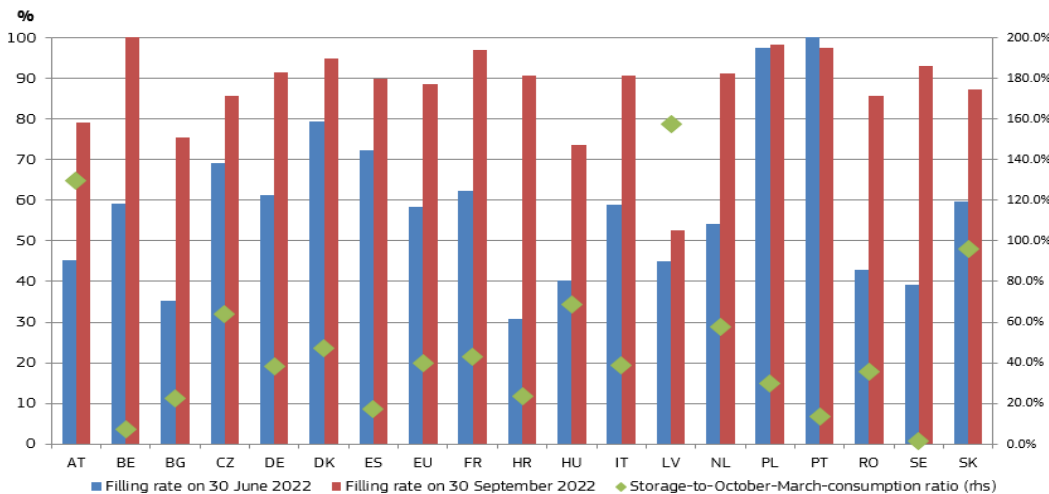
**Figure 22 – Difference in the filling rates of ‘Gazprom-controlled’ storages and other storages**



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

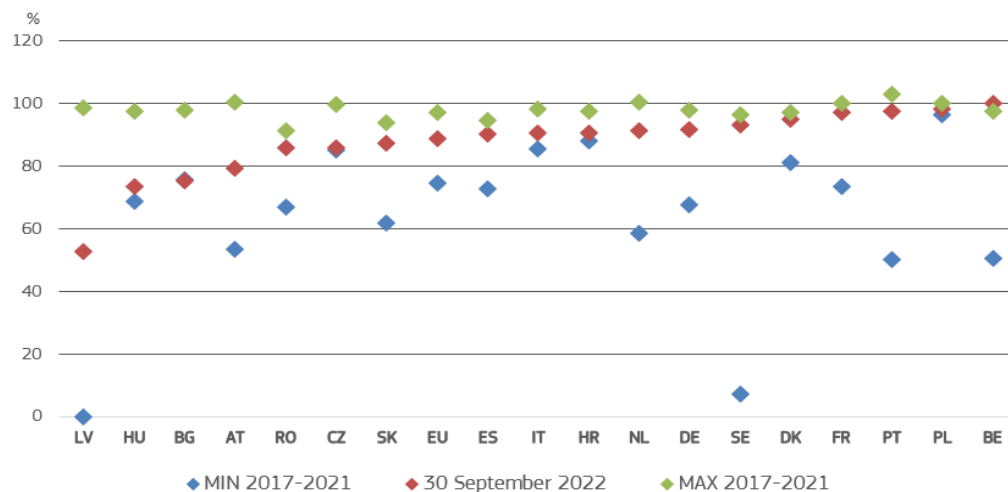
- On 30 June 2022, the EU average filling rate was 58.3% with the lowest filling rates in Croatia (30.7%), Bulgaria (35%) and Sweden (39%) whereas the highest fullness rates could be observed in Portugal (100%), Poland (97.4%) and Denmark (79.3%). On 30 September 2022, the EU average filling rate reached 88.7%. The lowest filling rates could be observed in Latvia (52.5%), Hungary (73.5%) and Austria (79.2%), whereas the highest rates could be observed in Belgium (100%), Poland (98.3%) and Portugal (97.4%).
- However, the picture is different if we compare the amount of gas in storages on 30 September 2022 with the average winter (October-March) consumption of the last five years. In the EU as whole, around 40% of the average winter consumption was covered by the actual storage levels at the end of September. In Latvia the actual filling covered 158% of the winter consumption (though Latvia also supplies Estonia and Lithuania from its storage facility). In Austria, Slovakia, and Hungary the ‘coverage rates’ respectively were 130%, 96% and 69%. On the other hand, in Sweden, Belgium and Portugal coverage rates respectively reached only 1.3%, 7.4% and 13.4%
- Looking at the average filling rates on 30 September 2022, in all countries the actual filling rates were higher than the minimum of the 2017-2021 period, while the actual filling rate was only higher in Belgium than the maximum of the 2017-2021 period.
- The average EU injection rate between 30 June and 30 September 2022 was 30.4 percentage points, whereas it was only 27.2 percentage points in Q3 2021. The lowest injection rates in Q3 2022 could be observed in Poland (0.9 percentage points, starting the quarter at already high levels) and Latvia (7 percentage points), whereas in Portugal storage filling even decreased, by 2 percentage points. On the other hand, filling rates rose by 60 percentage points in Croatia, by 54 percentage points in Sweden and by 43 percentage points in Romania.

**Figure 23 - Gas storage levels as percentage of maximum gas storage capacity at the end of June and September 2022, and the share of winter consumption covered by gas stored on 30 September, by Member State**



Source: Gas Storage Europe AGSI+ Aggregated Gas Storage Inventory, extracted on 4 December 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 24 – Gas storage levels on 30 September 2022, compared with five-year minimums and maximums**

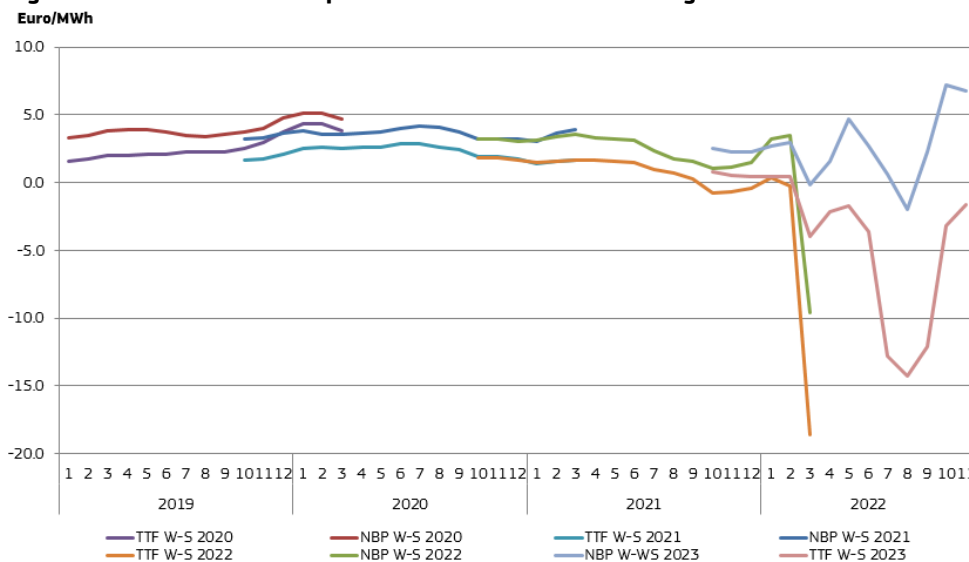


Source: Gas Storage Europe AGSI+ Aggregated Gas Storage Inventory, extracted on 4 December 2022



- The next two charts (Figure 25 and Figure 26) show the winter-summer spreads, (difference in the winter and summer contracts for given years). Difference between winter and summer contracts, if positive, give incentive to gas storage operators to inject gas during the injection (summer) season, as winter contract prices are higher, so the storage activity is profitable. In the case of negative winter summer spreads there is a lack of such incentive, implying that storing gas is not profitable, assuming all other factors unchanged. Figure 27 also shows the difference between the spot prices and quarter-ahead and two quarters-ahead contracts, which on the short run can also be a good metric for assessing incentives to refill gas storages for the next heating season.
- Contrarily to Q2 2022, when the TTF winter-summer spreads were only slightly in the negative range, in Q3 2022 a deep dive followed and monthly average spreads fell to a range of -12-14 €/MWh, reflecting that high spot and front-curve prices also impacted contracts of summer 2023 and winter 2023/24. Under the volatile market during summer 2022 it is questionable how next summer and winter contracts can predict the profitability in the 2023 storage season. In October and November, as market volatility decreased, the spreads came back from low levels but remained in the negative range.
- However, looking at the difference between the spot TTF prices and quarter-ahead and two quarters-ahead contracts, they were mostly in the positive range during Q3 2022, and in parallel with the sudden drop of spot prices in October they rose to high levels, indicating incentives on the market to fill up gas storages (this was reflected in faster refilling over summer and early autumn of 2022 than a year before).
- At the same time, the seasonal spread on the NBP remained mostly in the positive range in July, August and September (reaching respectively 0.6 €/MWh, -2.0 €/MWh and 2.2 €/MWh), primarily owing much lower spot and forward contracts on the NBP compared to the continental peers amid abundant LNG influx to the British gas wholesale market. In October and November the NBP spread moved further up in the positive range.

**Figure 25 - Winter-summer spreads on the Dutch and British gas hubs**

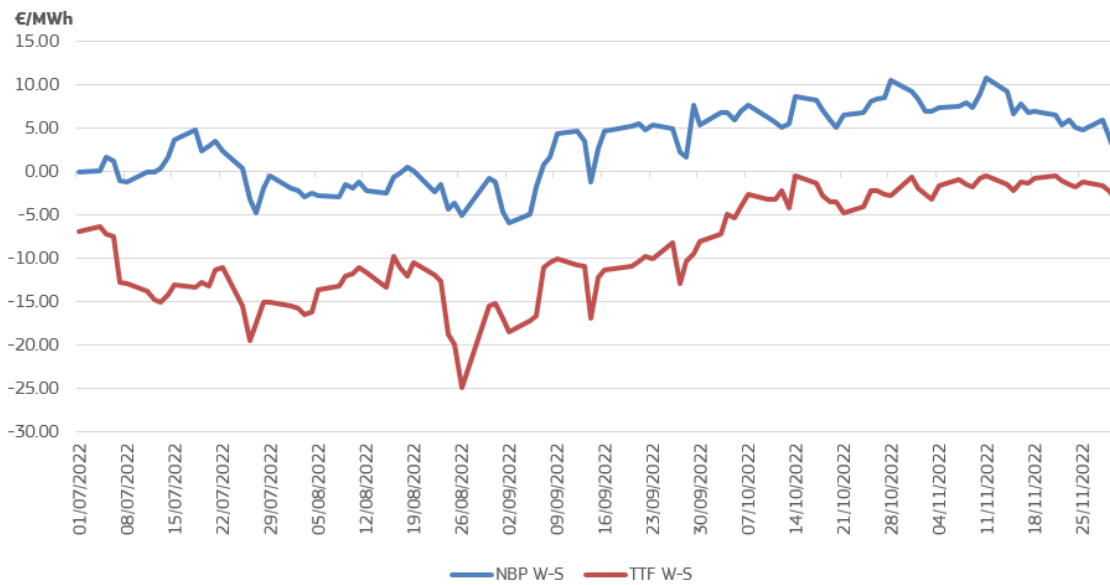


Source: S&P Global Platts

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.

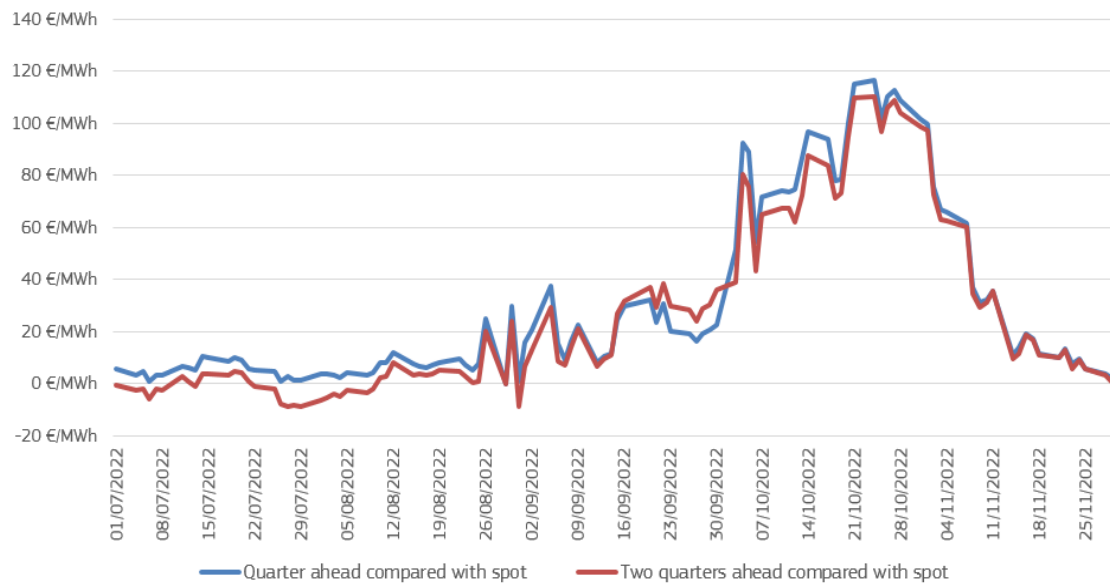


**Figure 26 – Daily winter-summer spread on the Dutch TTF hub**



Source: S&P Global Platts  
W-S refers to W-S 2023.

**Figure 27 – Spot TTF prices compared with quarter-ahead and two quarters-ahead contracts**

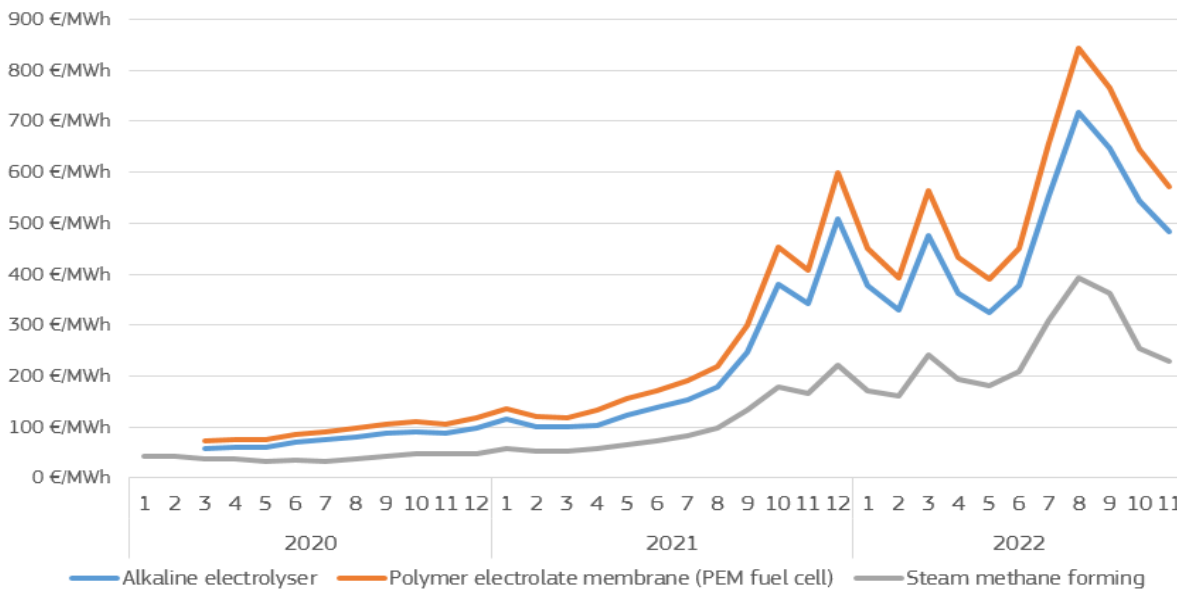


Source: S&P Global Platts

## 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. For this latter technology, the chart below also includes the costs of Carbon Capture and Storage (CCS).

**Figure 28 - 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.

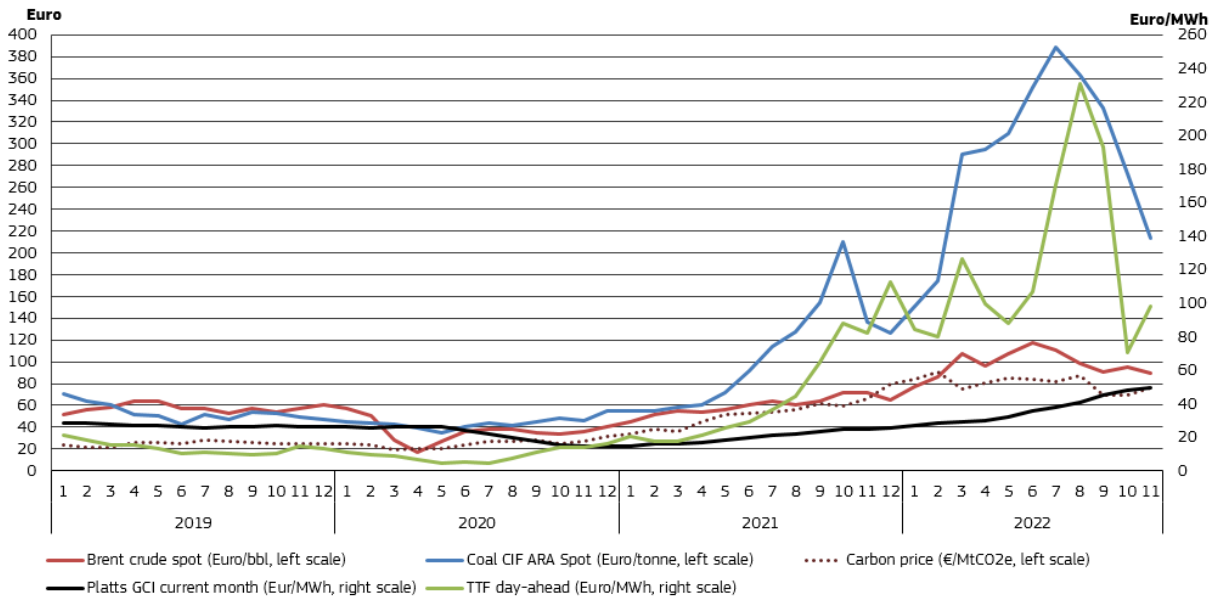
- Whereas alkaline electrolysis and PEM technology costs predominantly depend on the electricity price, the costs of SMR technology is driven by the cost of natural gas used for producing hydrogen. Alkaline and PEM are related to green power (hydrogen generation cost assessment is practically based on 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 July 2022, the TTF spot gas hub prices averaged at 171 €/MWh, rising to 231 €/MWh in August and fell back to 193 €/MWh in September. At the same time, the Pan-European Electricity wholesale price, averaging at 260 €/MWh in July, rose to 369 €/MWh in August and fell back to 297 €/MWh in September. In October and November 2022 both wholesale gas and electricity prices in the EU markets fell to lower levels compared to averages of the summer months. 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 increased from 376 €/MWh in June 2022 to 648 €/MWh in September, falling back to 543 €/MWh in October and to 482 €/MWh in November (including CAPEX costs), whereas prices of PEM fuel cell technology based generation rose from 450 €/MWh in June to 765 €/MWh in September (and falling back to 644 €/MWh in October and to 572 €/MWh in November 2022). These cost assessments were two to three times as high as wholesale electricity prices. At the same time, SMR technology based costs assessments rose from 209 €/MWh in June to 364 €/MWh in September (falling back to 254 €/MWh and 228 €/MWh in the following two months), being around twice the wholesale natural gas price in each month.

## 2. Wholesale gas markets

### 2.1 EU energy commodity markets

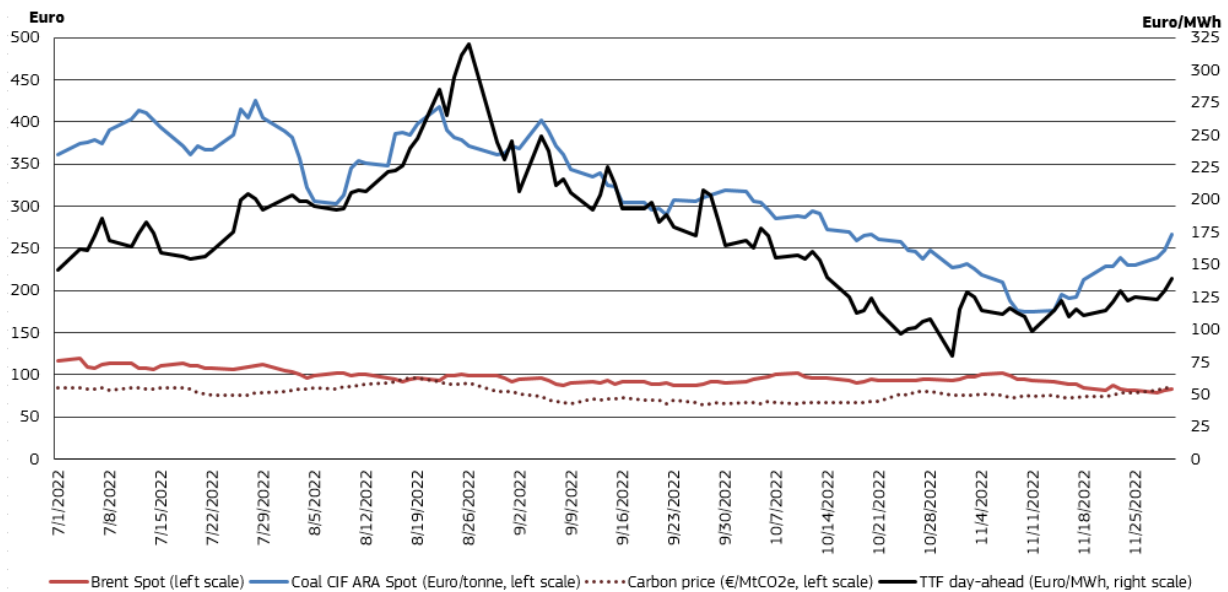
- During the third quarter of 2022, crude oil prices showed a gradual decrease, starting the quarter at 122 USD/bbl (117 €/bbl), and falling to 88 USD/bbl (91 €/bbl) on 30 September. After peaks in spring and early summer, demand side impacts on the global oil market (renewed lockdowns in China, increasing fear of recession in the world economy) started to weigh on spot oil prices. The dollar continued its appreciation vis-à-vis the euro in the third quarter of 2022, and by September it crossed the parity, implying less decrease in consumers prices in the EU. In October and November prices remained most of the time below 100 USD/bbl, in spite of the decision of OPEC+ countries on 5 October to cut daily production by 2 million barrel per day (in reality the decrease was lower as original production quotas were not fulfilled in several member countries). In the first two weeks of December, the spot crude oil price fell as low as 75 USD/bbl, the lowest in a year time. The discount of year-ahead contracts vis-à-vis the spot contract shrunk from 29USD/bbl (28 €/bbl) at the beginning of Q3 2022 to 11.5 USD/bbl (12 €/bbl) by the end of September 2022, in parallel with decreasing spot prices. By the end of November 2022, the discount fell further to 4 USD/bbl (3.5 €/bbl).
- The summer of 2022 has brought new record high spot wholesale gas prices on the EU hubs. Gas inflows from Russia on the Nord Stream 1 pipeline started to fall in June, as Gazprom cut back supplies referring to technical and maintenance problems, (in June by two steps to 60% and 40% of the total capacity, at the end of July to 20%) and by early September all shipments were terminated. Since early September two pipelines (Nord Stream 1 and Yamal) are practically no longer operational, and on the route through Ukraine a fraction (10-15%) of usual volumes arrived. As result, in July and August (at the height of storage filling season) TTF spot price rose significantly, from 146 €/MWh early July to all-time high, 320 €/MWh on 26 August, falling back to 165 €/MWh by the end of September, amid good storage filling levels and expectations on policy interventions to tackle high energy prices. In October, owing to warmer than usual weather and high storage filling rates across the EU, spot gas prices were down again, by the end of the month falling below 100 €/MWh for a short time as LNG cargoes could not unload their gas shipments in north-west European terminals, resulting in a local congestion. In November with the onset of colder weather wholesale gas prices rose again. TTF one year-ahead contracts started Q3 2022 with a discount of 29 €/MWh, whereas at the end of September they were in a premium of 10 €/MWh vis-à-vis the spot prices.
- Platt's North West Europe Gas Contract Indicator (GCI), a theoretical index showing a gas price linked 100% to oil, continued its upturn in Q3 2022, mirroring the increase of crude oil prices in the first half of 2022. Typically, crude oil price changes appear in the oil-indexed contracts with a time lag of 6 months. GCI contracts rose from 36 €/MWh in June 2022 to 45 €/MWh in September 2022 (and rose further to 48 €/MWh in October, and to 50 €/MWh in November 2022, which was the highest in more than a decade). High crude oil prices in spring and summer of 2022 will probably filter in oil-indexed gas contracts until the end of 2022/beginning of 2023. Amid current high gas wholesale prices, oil-indexed gas contracts still offer a competitive opportunity for gas imports in the EU.
- Spot coal prices (CIF ARA) were practically all the time in the range of 300-400 €/Mt during Q3 2022, starting the month of July at 361 €/Mt and finishing September at 318 €/Mt. As of August 2022, import ban of Russian coal entered into force in the EU, this resulted in discounted Russian coal sales in other parts of the world. High gas prices have kept demand for coal in power generation in the EU. In October and November coal prices became lower, falling to 228 €/Mt, and turning up from a level of 175 €/Mt mid-November to finish the month at 266 €/Mt. During the autumn months of 2022 the movement of coal prices mirrored that of gas prices, as Figure 29 shows.
- Carbon prices in July and August 2022 showed a range-bound trade between 80 and 95 €/MtCO<sub>2e</sub>, whereas by the end of September, in parallel with the generally decreasing price trend of the energy complex, they fell to 66 €/MtCO<sub>2e</sub>, the lowest in 2022 so far. Since mid-October, they started to recover, reaching 85 €/MtCO<sub>2e</sub> at the end of November.

**Figure 29 – Monthly spot prices of oil, coal and gas in the EU**



Source: S&P Global Platts

**Figure 30 - Monthly spot prices of oil, coal and gas in the EU**



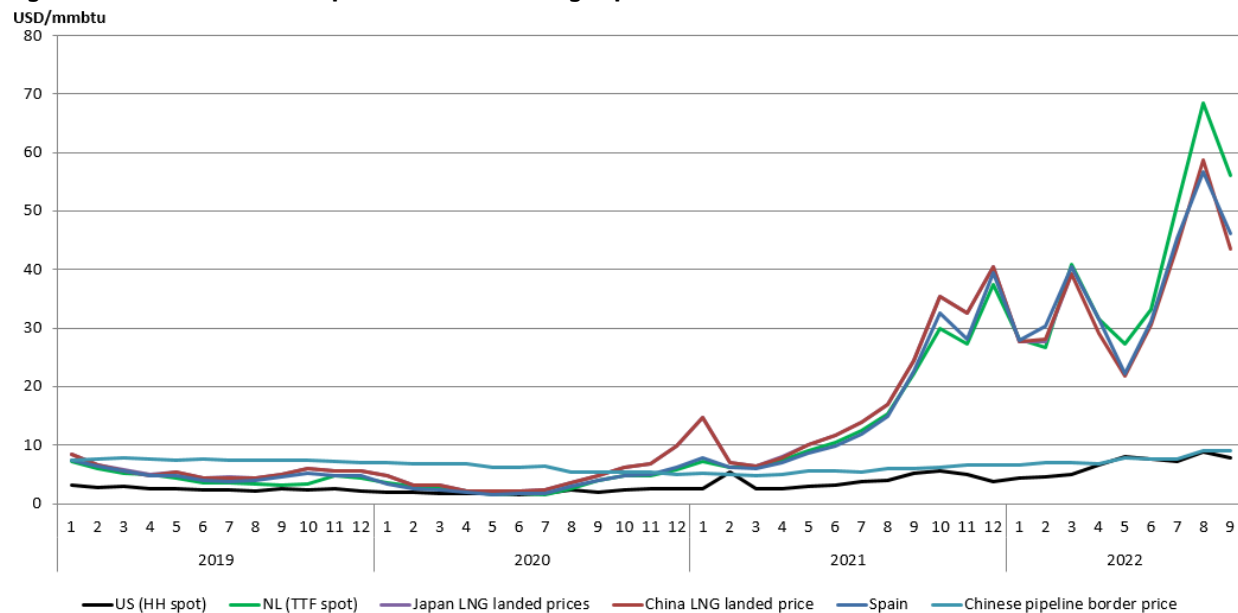
Source: S&P Global Platts

## 2.2 LNG and international gas markets

- Figure 30 displays the international comparison of wholesale gas prices, including hub, LNG landed and pipeline import gas prices. In Q3 2022, the Henry Hub spot prices rose to fourteen year high in August 2022 reaching 8.8 USD/mmbtu on average. 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. As around half of LNG exports from the US were sent to Europe, so the European gas market had increasing importance in shaping US domestic wholesale gas prices. Meanwhile, Asian contracts also showed a measurable increase in July and August 2022, while in September they fell again on monthly average. The TTF followed a similar pattern, and was in premium to the JKM practically during the whole Q3 2022, providing for good opportunity to lure LNG cargoes to Europe.
- The quarterly average Japanese LNG price was 48.8 USD/mmbtu in Q3 2022, up from 27.2 USD/mmbtu in Q2 2022, and from 18.4 USD/mmbtu in Q3 2021. The price discount of the Japanese LNG deepened in Q3 2022, reaching 9.7 USD/mmbtu, whereas in Q2 2022 it was only 3.5 USD/mmbtu, and a year before in Q3 2021 it still showed a premium of 1.7 USD/mmbtu. LNG import prices in China were comparable with their Japanese peers (48.7 USD/mmbtu in Q3 2022).

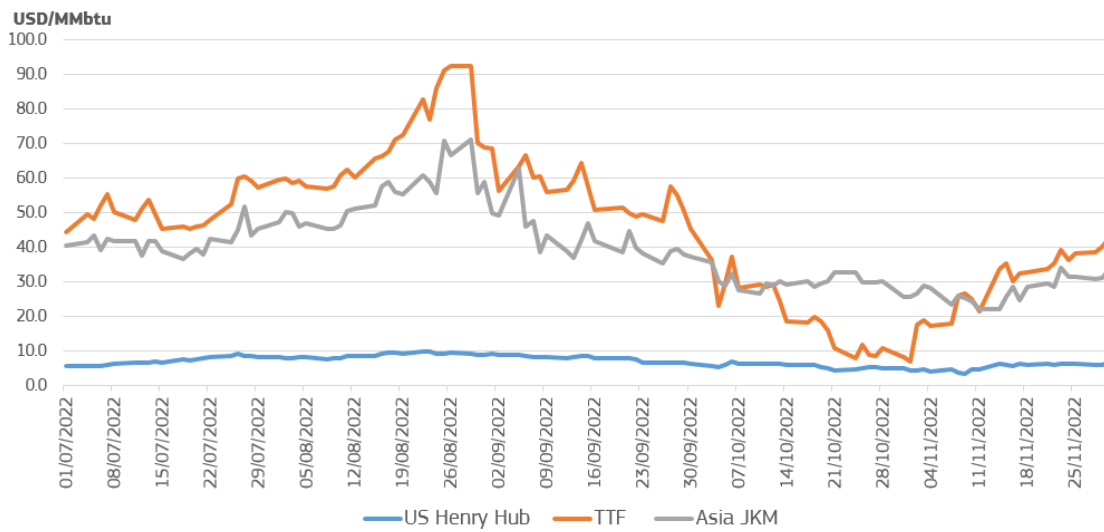
- Chinese pipeline gas imports, presumably mostly based on oil-indexed contracts, were at 8.5 USD/mmbtu in Q3 2022, up from 7.4 USD/mmbtu in Q2 2022, and from 5.8 USD/mmbtu in Q3 2021, showing a significant price advantage vis-à-vis LNG imports (with the aforementioned quarterly average price of 48.7 USD/mmbtu in Q3 2022). High global (Asian and European) spot LNG prices are likely to ensure the competitiveness of oil-indexed contracts in the forthcoming months, even if price increases on the oil market seen in the first half of 2022 might still not be fully priced in.
- The Henry Hub price rose by 7% quarter-on-quarter in Q3 2022 (to 8.0 USD/mmbtu from 7.4 USD/mmbtu in Q2 2022) and rose by 84% year-on-year (from 4.3 USD/mmbtu). As Figure 31 shows, both TTF and JKM continued to show measurable premiums vis-à-vis Henry Hub. Over the third quarter of 2022, TTF kept its premium to JKM, as Figure 32 shows, which resulted in an attractive gas market for LNG cargoes in Europe in these periods. In October the TTF premium turned to discount vis-à-vis the Asian markets, owing to LNG cargo congestion at the shores of north-western Europe as result of very high underground storage filling rates the gas grid could not absorb all LNG import volumes. In November as spot TTF prices rose, the TTF premium to Asia returned. On quarterly average, TTF had a premium of 51 USD/mmbtu to Henry Hub (up from 23 USD/mmbtu in Q2 2022), whereas JKM had a premium to Henry hub of 41 USD/mmbtu in Q3 2022 (up from 20 USD/mmbtu in Q2 2022). The euro continued its depreciation against the USD in Q3 2022 (in June 2022 the exchange rate was 1.06, whereas in September it fell to 0.99, below the parity for the first time since twenty years), but this did not really impact the difference between the TTF and the Henry Hub.
- In the third quarter of 2022, TTF averaged at 58.5 USD/mmbtu (198 €/MWh), up from 30.7 USD/mmbtu (98 €/MWh) in Q2 2022. The average German border price in Q3 2022 was lower than the TTF (37.4 USD/mmbtu or 127 €/MWh, but up from 18.9 USD/mmbtu or 98 €/MWh in Q2 2022), showing that the impact of high spot prices in the long term contracts in the German gas import mix, presumably 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 Q3 2022, the Spanish LNG landed price was 49.4 USD/mmbtu on average, showing a discount to the Dutch TTF spot (58.5 USD/mmbtu). During practically the whole Q3 2022 north-western and south-western LNG import prices were in discount to TTF, which for a few weeks' period switched to premium in October 2022, owing to the aforementioned cargo congestion at western Europe at the end of the storage filling season amid warm temperatures, leading to less than expected gas consumption and hence import needs (see Figure 33).
- Average LNG landed prices in China and Japan reached 48.7-48.8 USD/mmbtu in the third quarter of 2022. At the same time, the JCC (Japanese Crude Cocktail) contracts reached 21. USD/mmbtu on average, up from 16.2 USD/mmbtu in Q2 2022 and from 10.8 USD/mmbtu in Q3 2021, showing the impact of the increase in oil prices, but were significantly lower than both the Japanese LNG import price (48.8 USD/mmbtu), and the TTF (58.5 USD/mmbtu).

**Figure 31 - International comparison of wholesale gas prices**



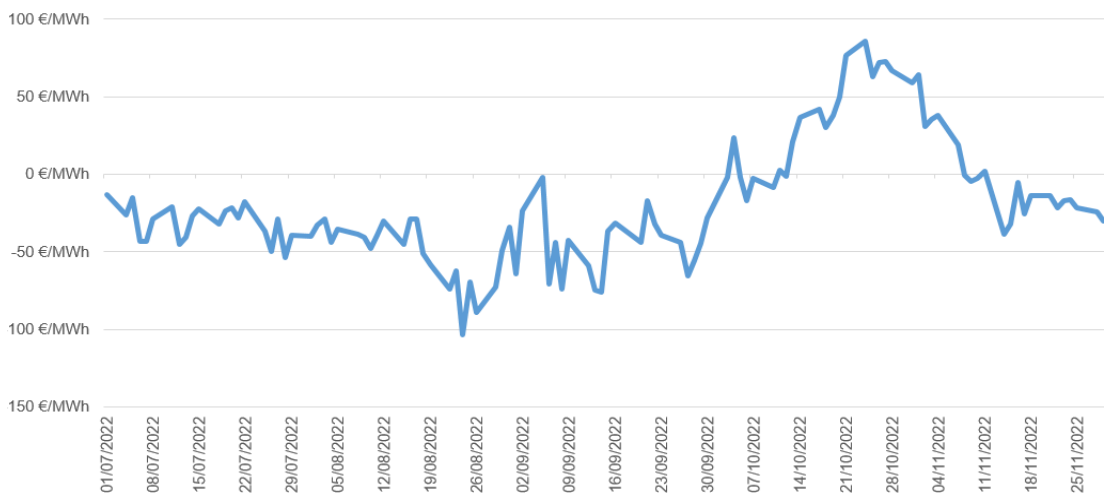
Sources: S&P Global Platts, Refinitiv, BAFA, CEIC

**Figure 32 – Daily average prices on the TTF (Dutch), the US Henry hub and the JKM Asian reference index**



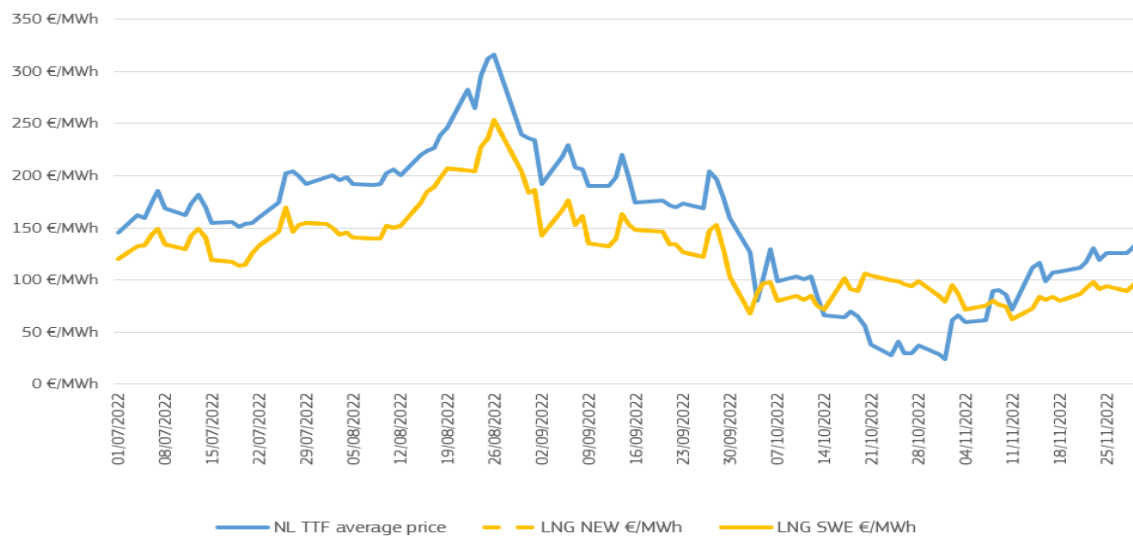
Sources: S&P Global Platts

**Figure 33 – The difference of the daily JKM and TTF spots**



Sources: S&P Global Platts

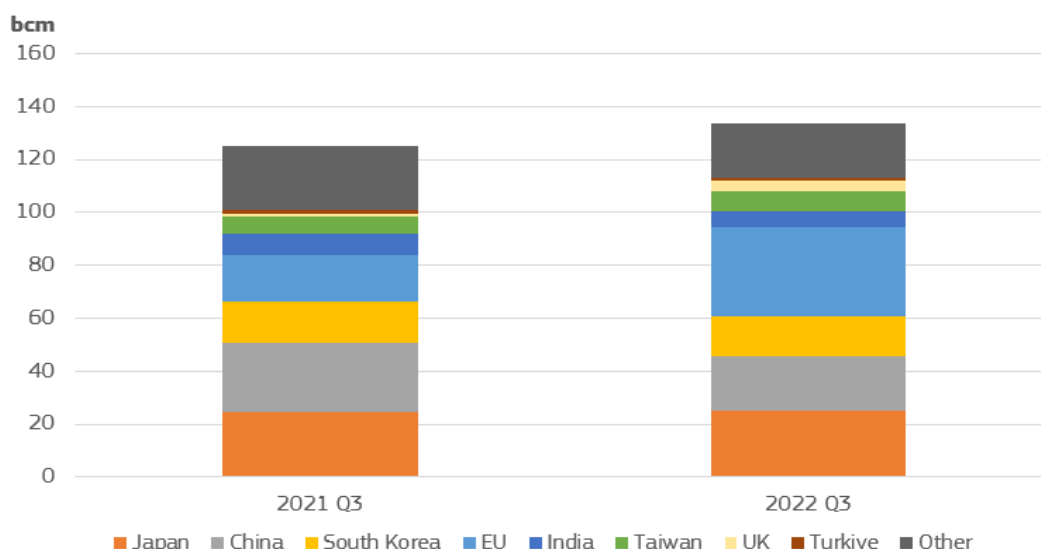
**Figure 34 – LNG import benchmarks on north-western and south-western Europe compared with TTF**



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 third quarter of 2022, the EU as a block of 27 countries remained the largest LNG importer in the world (with an import of 32 bcm), owing to favourable sales prices in Europe, whereas Japan came to the second place, with imports of 25.1 bcm. China was only the third biggest LNG importer (20.3 bcm), followed by South Korea (15.3 bcm), Taiwan (7.5 bcm), India (6.2 bcm), the UK (4.2 bcm) and Turkiye (1.0 bcm). The total global LNG market could be estimated at 134 bcm in Q3 2022, up from 125 bcm in Q3 2021. Compared to the third quarter of 2021, a significant increase could be observed in the imports of the EU as whole (92%, +16 bcm), the UK (464%, +3.4 bcm, increasing from a low base in Q3 2021, owing to maintenance works that time), whereas in Turkiye imports fell by 43% (-0.8 bcm), along with those in China and India (both by 23%, respectively by -5.9 bcm and -1.8 bcm). In the first three quarters of 2022, the three biggest LNG importer were: the EU (as block of 27 countries – 99.7 bcm), Japan (77 bcm) and China (63 bcm).

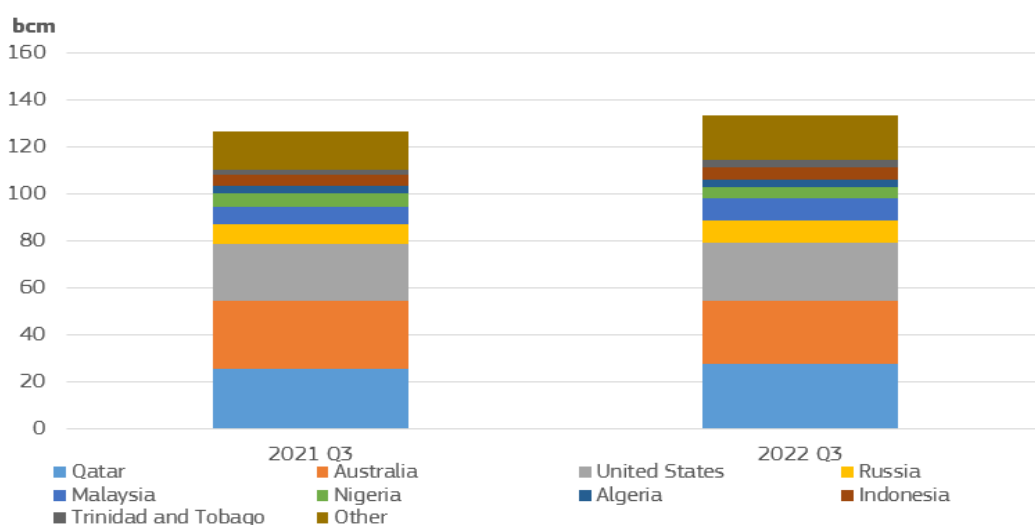
**Figure 35 – LNG imports in the main consumer markets in the third quarters of 2021 and 2022**



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 Q3 2022 Qatar exported 27.6 bcm, slightly more than Australia (27.1 bcm) and the United States (24.5 bcm). The fourth biggest LNG exporter was Russia (10 bcm), followed by Malaysia (9.1 bcm), Indonesia (5.6 bcm), Nigeria (4.7 bcm), Algeria and Trinidad and Tobago (both 3.2 bcm). Looking at year-on-year changes, LNG exports rose by 58% in Trinidad and Tobago (+1.2 bcm), in Malaysia (by 22%, +1.6 bcm), in Russia (by 21%, +1.7 bcm), whereas in the US LNG exports remained stable in Q3 2022 year-on-year, and they fell substantially in Nigeria (by 18%, -1.1 bcm) and in Australia (by 6%, -1.6 bcm). In the first three quarters of 2022, the three biggest LNG exporters performed almost equally: Australia (82 bcm) the United States (81 bcm), and Qatar (80.7 bcm).

**Figure 36 – LNG exports from the main gas producers in the third quarters of 2021 and 2022**



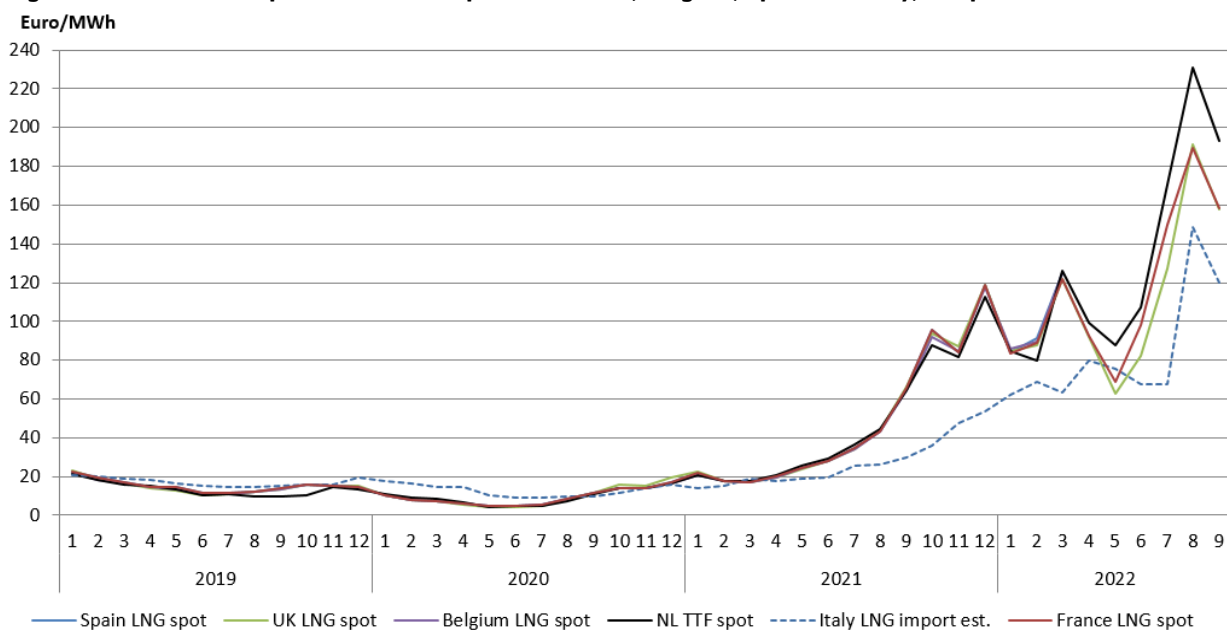
Source: Refinitiv tracking of LNG vessels. Export data are based on cargo departure dates, therefore total amount of global exports might differ from global import numbers

## 2.3 European gas markets

### 2.3.1 LNG contracts in Europe

- Figure 36 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 (data from Refinitiv).
- In the third quarter of 2022, hub prices and hub-based import price contracts in western-Europe rose to new highs, in August 2022. Looking merely the hub based contracts, a clear sign of divergence appeared, and differentials in July 2022 amounted to more than 100 €/MWh and remained above 70-80 €/MWh in August and September as well. In Q3 2022 TTF became the most expensive among the observed import and hub prices, owing to the abundance of LNG imports and grid bottlenecks hampering flow of LNG from western European terminals to other parts of the continent. Even if we do not take into account the Italian COMEXT derived average price, the difference was around 35 €/MWh in September 2022, up from 10-20 €/MWh in June. The discount of UK import contracts vis-à-vis other LNG import prices practically disappeared over Q3 2022. The LNG import contracts in Italy might either not be 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 the Italian contract we can observe a measurable increase compared to earlier periods.
- The Q3 2022 quarterly average hub-based prices rose again quarter-on-quarter (between 85% and 101%). In year-on-year comparison, most contracts showed three-to-four-fold increases. The estimated price increase for LNG import contracts in Italy showed an upturn of 51% quarter-on-quarter, while year-on-year it went up by 313%. Compared to the cheap third quarter of 2020 in the middle of Covid-19 induced demand destruction, gas import contracts showed a nearly twenty-fold increase in Q3 2022.

**Figure 38 - 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 15 September 2022.

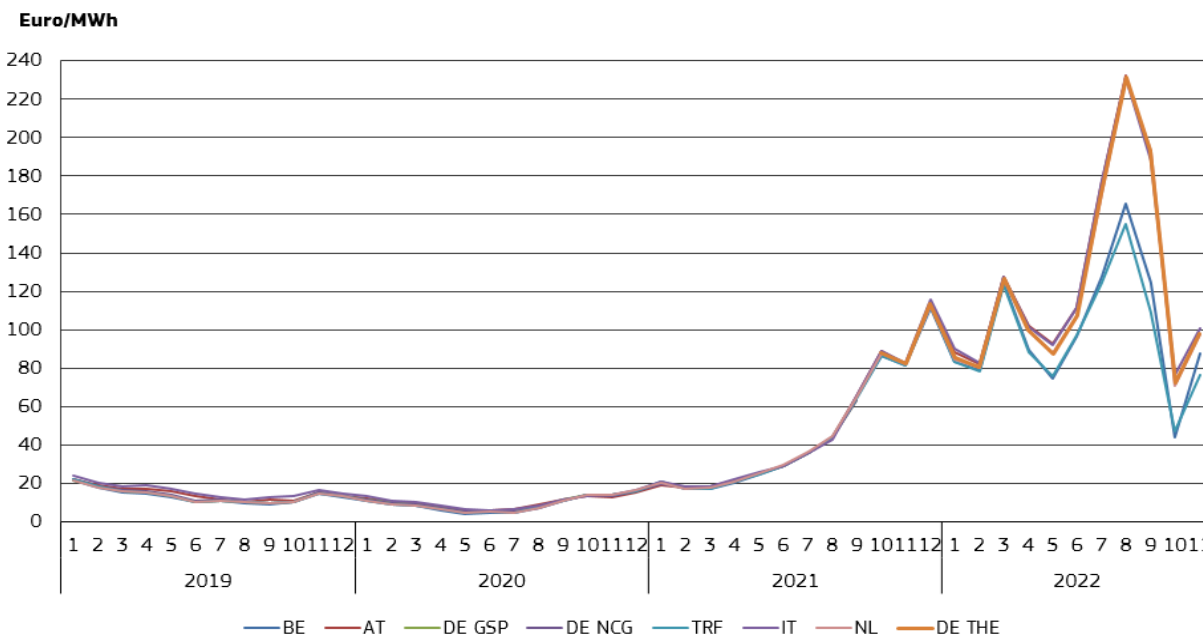
### 2.3.2 Wholesale price developments in the EU

- European spot hub prices, continuing the rise started in June, reached new peaks in August 2022, then fell back in September and especially sharply in October. In Q3 2022 they reached 129-201 €/MWh on quarterly average and were 50-110% higher than in the previous quarter, Q2 2022 (87-102 €/MWh). Hub prices in year-on-year comparison showed a three-fold increase, compared to the price range in Q3 2021 (47-48 €/MWh). The average TTF hub price was 198 €/MWh in Q3 2022, significantly up from 98 €/MWh measured in Q2 2022 and from Q3 2021 (48 €/MWh). In October 2022, European spot hub prices were in a range of 44-79 €/MWh, the lowest since August-September 2021, whereas in November 2022 they rose back to the range of 76-100 €/MWh.



- In the third quarter of 2022, principally geopolitical tensions, fears on gas security of supply ahead the winter, announcements from the Russian side to reduce or terminate gas shipments to the EU markets and news on European measures to accommodate gas demand during the winter and ensuring affordable gas prices impacted the gas markets. During the autumn months, better than expected storage filling rates and warmer than usual weather, resulting in a drop of seasonal gas demand, exerted a lowering pressure on spot gas hub prices.

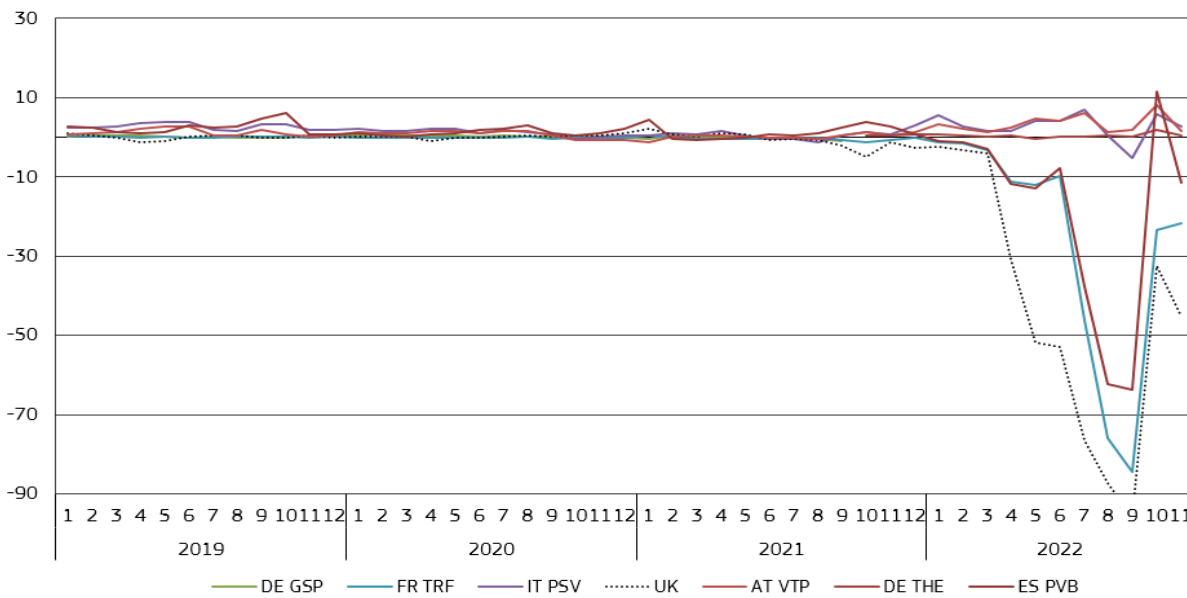
**Figure 39 - Wholesale day-ahead gas prices on gas hubs in the EU**



Source: S&P Global Platts

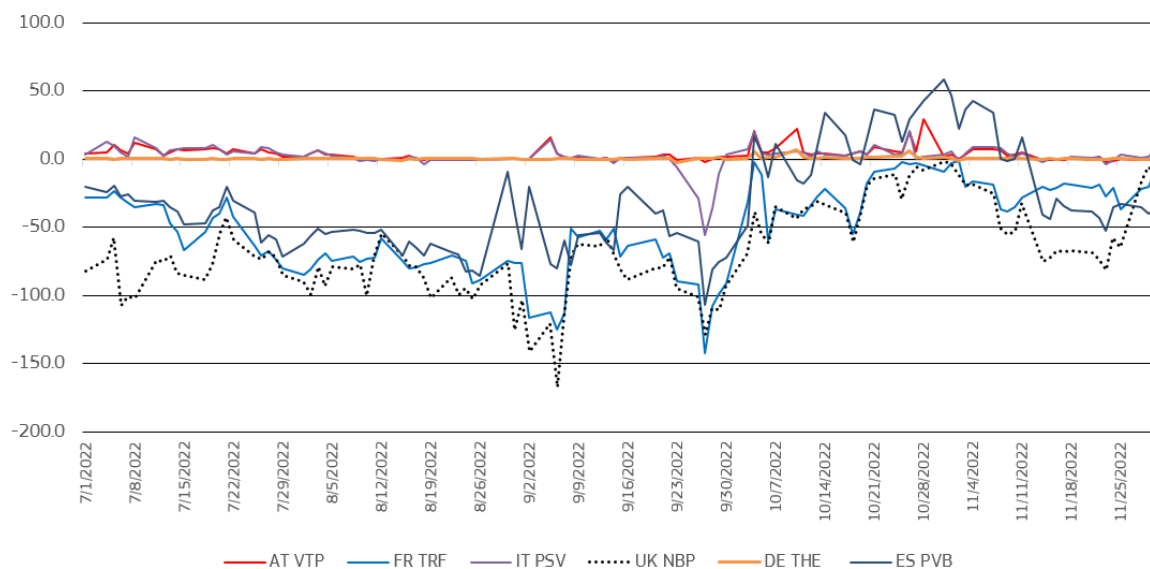
- As Figure 38 and Figure 39 show, the French TRF market showed a deepening discount to the TTF during most of the time in Q3 2022, which started to recover in October and November. During the summer months of 2022, high continental gas hub prices, principally the TTF, resulted in beneficial conditions to sell LNG in Europe. As Russian flows dropped significantly to Central Europe, impacting the TTF hub as well, the French market, having generally low dependency on Russian gas market and abundant LNG send-out during Q3 2022, could benefit from lower prices.
- Compared to other western European benchmarks, the German THE market remained closely aligned with the TTF in Q3 2022, even having a slight premium to the Dutch hub, principally owing to less direct access to LNG. In July, THE contracts were impacted by the planned maintenance works of Nord Stream 1 (between 11 and 21 July), by a short period of outage on the Norwegian infrastructure, and by the end of August prices soared on news of unplanned maintenance on NS1 (at the end of which flows through NS1 did not resume at all). By the end of September, amid windy weather and good storage filling rates, prices fell on the main continental hubs, including the German THE.
- Both the Italian PSV and the Austrian VTP wholesale gas hub prices were in premium to the TTF market practically throughout the whole month of July 2022. Reduced flows on Nord Stream after the end of the maintenance works, and at the end of July (20<sup>th</sup> - 26<sup>th</sup>) reduced flows through the Transmed pipe shipping Algerian gas pushed PSV hub prices above the TTF, also helped by low LNG send-out. In August and September, as renewables picked up, gas storage fillings were higher than in the same period of 2021 and abundant flows from Algeria and Azerbaijan increased supply, the PSV gas premium to TTF turned into discount, while in the case of Austria, having abundant storage capacities compared to its gas consumption, high storage levels helped in eliminating price premium vis-à-vis the TTF by the end of September. In October and early November, when TTF showed a significant fall on LNG cargo congestion in north-western Europe, both Italian and Austrian hubs showed again premium to TTF.
- During the third quarter of 2022, the NBP hub spot price remained in a deep discount to the TTF, principally owing to abundant LNG shipments to the United Kingdom. In early July the discount was bigger than 80 €/MWh, at the end of August reaching 120 €/MWh, and on some days of September even 160 €/MWh. Furthermore, NBP prices were quite volatile in Q3 2022, impacted by NS1 maintenance works and definitive termination of shipments (resulting in good gas export opportunities to the continent), heat waves in July and outages on the Norwegian infrastructure in early September. By the end of October in parallel with the fall of TTF spot, the NBP discount disappeared for a while, whereas it redeveloped during the month of November.

**Figure 40 - Premium of monthly average wholesale day-ahead gas prices at selected hubs compared to TTF Euro/MWh**



Source: S&P Global Platts, European Commission computations

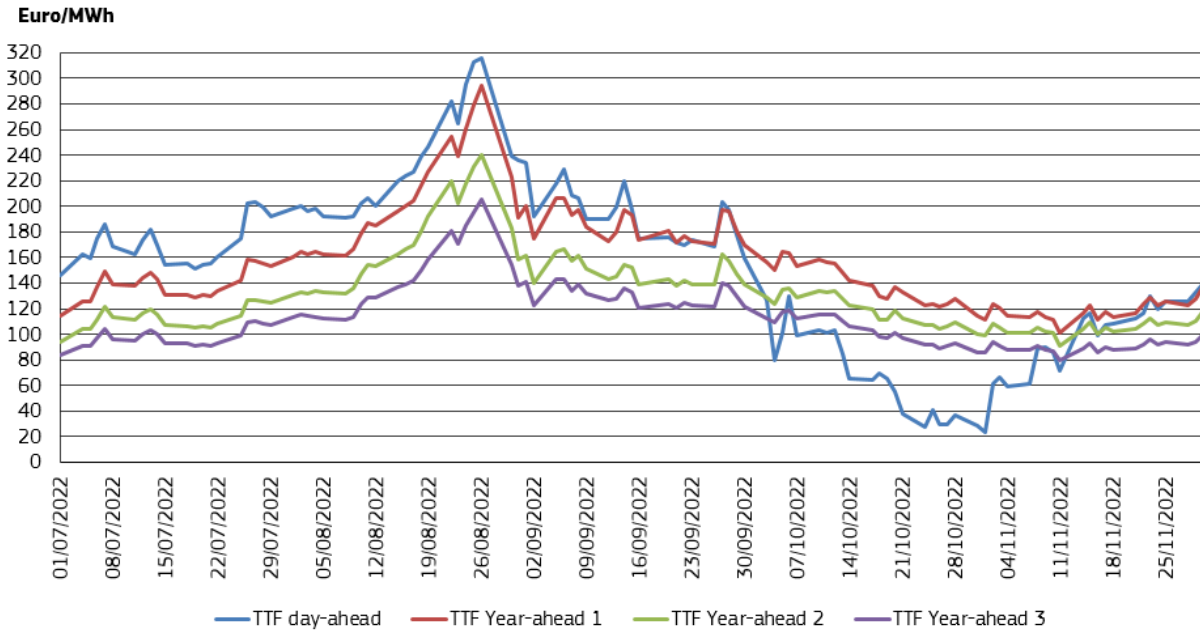
**Figure 41 - Premium of daily average wholesale day-ahead gas prices at selected hubs compared to TTF Euro/MWh**



Source: S&P Global Platts, European Commission computations

- Figure 40 looks at the development of forward prices of one-year, two-year and three-year ahead contracts in comparison to the development of the day-ahead price on the Dutch TTF.
- Daily spot prices on the TTF hub kept on being volatile over Q3 2022. At the beginning of Q3 2022, the spot daily average stood at 145 €/MWh, while year-ahead, two years-ahead, and three years ahead contracts respectively were 114 €/MWh, 95 €/MWh and 87 €/MWh. On 26 August, as daily spot prices reached a historical peak of 316 €/MWh, the discount of the year-ahead contract amounted to 22 €/MWh, even lower than at the beginning of July. At the same time, discount of three-year ahead contracts rose to 110 €/MWh on this trading day, reflecting the impact of incredible high spot prices. By the end of September, the spot price fell to 159 €/MWh, which was 10 €/MWh below the year-ahead, but spot still had a premium vis-à-vis two-years ahead and three-years ahead contracts of 22 €/MWh and 27 €/MWh, respectively. By the end of October and early November, the spot TTF fell below 30 €/MWh, whereas year-ahead contracts remained above 30 €/MWh, reflecting the temporary nature of the spot price fall.

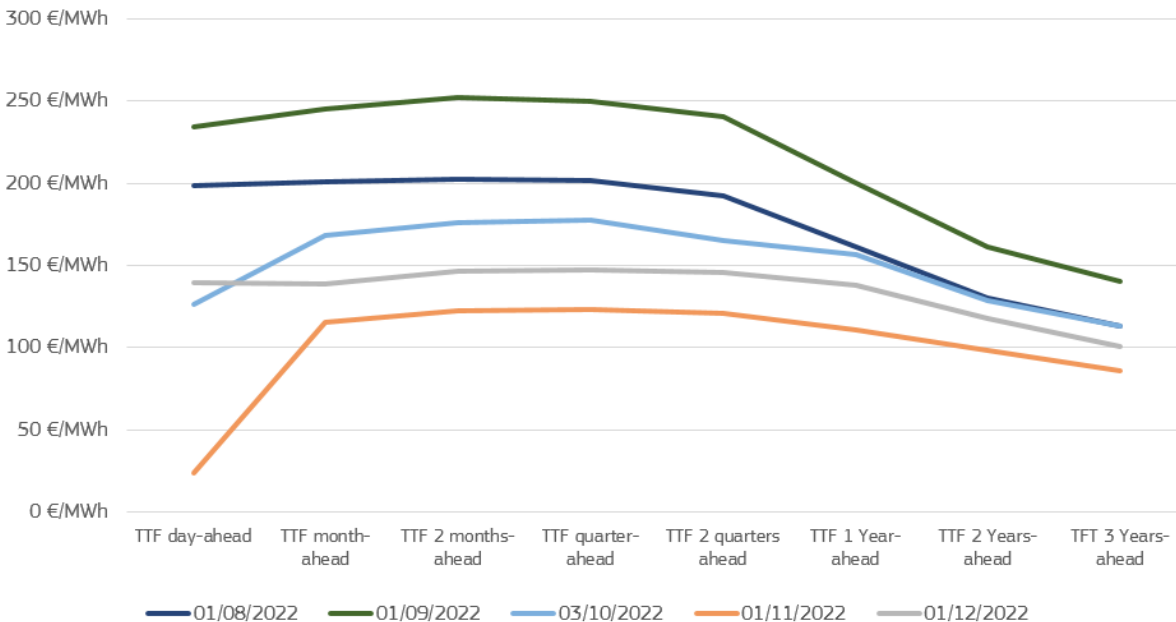
**Figure 42 - Forward gas prices on the TTF hub**



Source: S&P Global Platts

This expectation on ongoing high prices can also be followed on Figure 41, showing the forward price curves on the TTF market at the beginning of each month. In August and September 2022 the forward curve shifted upwards significantly as the market anticipated a much higher price trajectory over the forthcoming years, even three-year ahead prices were up from 100 €/MWh to 150 €/MWh. However, this trend reversed in October and November with lower spot and near-end curve prices. At the beginning of December the price curve became quite flat, anticipating ongoing high prices with slight decrease expectations with two-three years' time.

**Figure 43 - Forward price curves on the first trading day of each month on the TTF wholesale gas market**

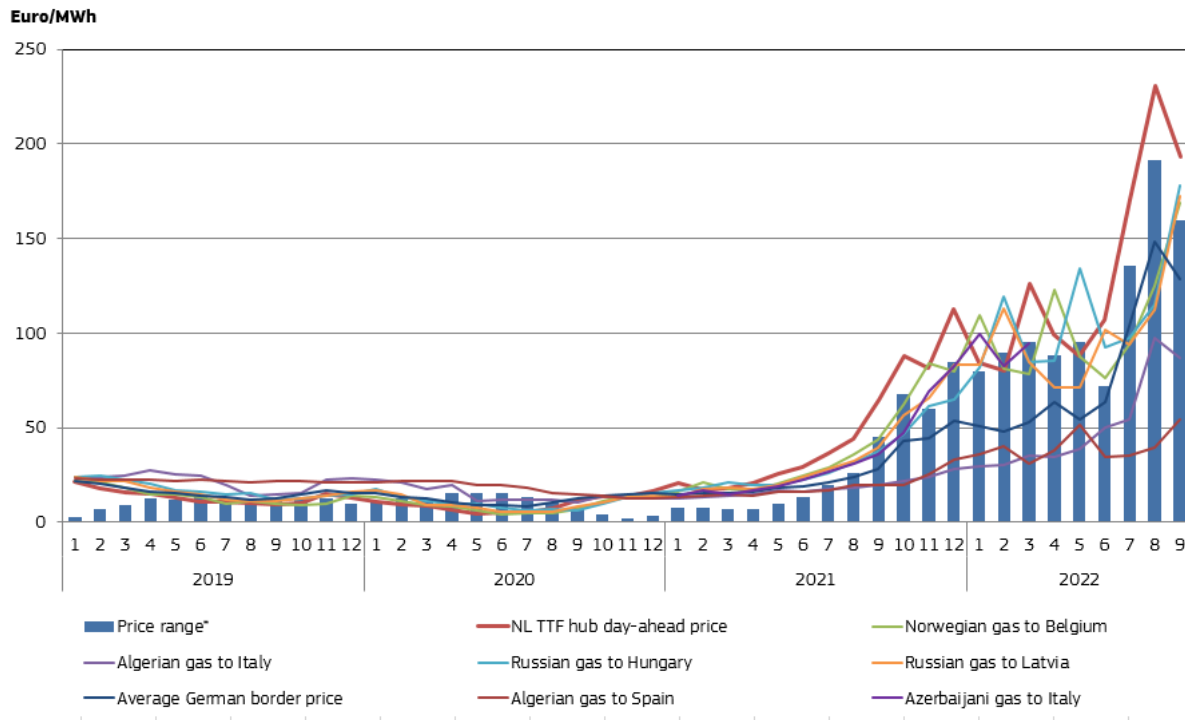


Source: S&P Global Platts

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

- Figure 42 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 third quarter of 2022, the estimated Algerian pipeline import price in Spain was 43 €/MWh, up from 41.5 €/MWh in the previous quarter (+4%) and by 129% compared to Q3 2021. The Algerian contract clearly reflects the time-lagged impact of the increasing crude oil prices. In Q3 2022, the average estimated Algerian import price in Spain continued to be in a deep discount to the Spanish LNG import prices (144 €/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 was down by 36% year-on-year in Q3 2022, even if the Medgaz pipeline, directly linking Algeria with Spain, also operated at nearly full capacity.
- Algerian gas import price in Italy (79.5 €/MWh) was much higher than that in Spain in the third quarter of 2022, implying that the share of spot hub pricing in the Italian contract is probably higher. In quarter-on-quarter comparison, Algerian import price in Italy was measurably up, by 94%, and year-on-year it rose by a staggering 332% in Q3 2022, in a similar extent to European spot gas hub prices. Pipeline gas imports from Algeria was up by 41% in Q3 2022 year-on-year in Italy (See Chapter 1.3 Imports), probably owing to the fact that Algerian import prices were the lowest among all import sources for Italy.
- Russian gas imports prices in Hungary showed an increase of 25% in Q3 2022 compared to the previous quarter, whereas in the case of Latvia import prices were up by 56%. On year-on-year comparison, Russian import prices showed three-to-four fold increases in both countries. This indicates a close mirroring of European hub prices, implying that the pricing formulae is practically based on gas hub prices. Hungarian import gas prices of Russian origin averaged at 130 €/MWh in Q3 2022, whereas in Latvia they amounted to 126 €/MWh in the same period.
- Prices of European gas contracts continued to show an increasing divergence in Q3 2022, as the difference between the cheapest and most expensive contract rose from 72 €/MWh in June to 160 €/MWh in September 2022. In Q3 2022, the TTF spot prices (198 €/MWh on average) proved to be the more expensive compared to the observed import contracts, as the recent increase in TTF spot might be reflected in gas hub based contracts only in later periods.
- Hub-based contracts and hub prices themselves showed a measurable increase in the third quarter of 2022. Reported German border prices also rose significantly (from 60 €/MWh in Q2 2022 to 127 €/MWh in Q3 2022). The average German border price had a discount of only a few euros to the hub-based contracts, as opposed to the measurable discount of earlier periods, which reflects that higher gas hub prices have significantly filtered in the average import prices in Germany.

**Figure 44 - Comparison of EU wholesale gas price estimations**



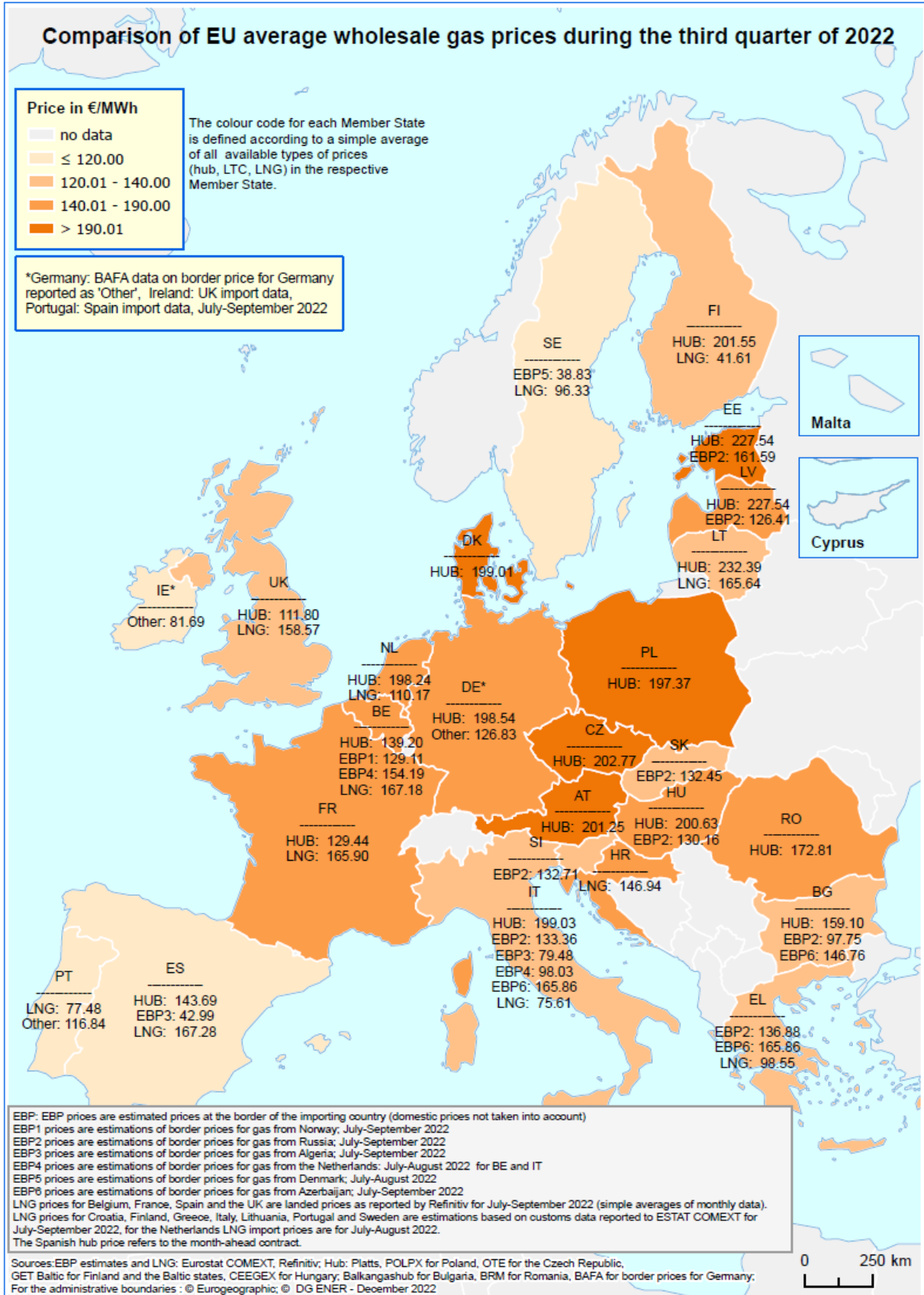
Source: Eurostat COMEXT and European Commission estimations, BAFA, S&P Global Platts

\*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 third quarter of 2022. Owing to data revisions of national authorities, some average price numbers might change retrospectively, implying the need for 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 third 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

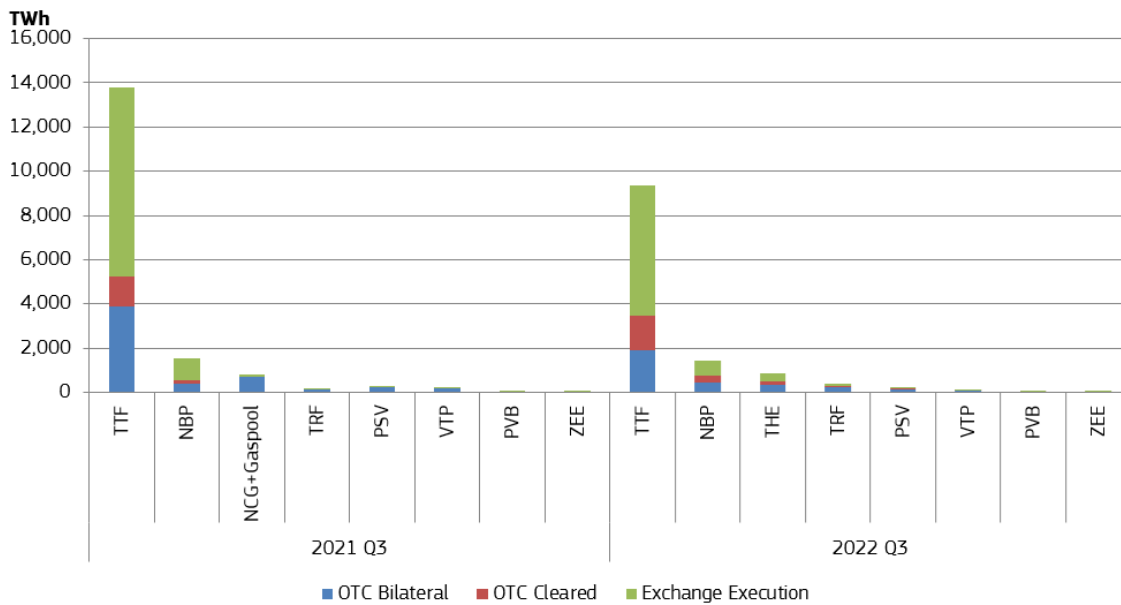
- As Figure 43 shows, liquidity fell by 26% on the main European gas hubs in the third quarter of 2022 year-on-year (by 4 472 TWh), after a fall of 17% in Q2 2022 and by 2% in Q1 2022, implying that decrease in traded volumes showed an accelerating trend in the first three quarters of 2022. The total traded volume in Q3 2022 amounted to around 12 427 TWh (equivalent to around 1 153 bcm, and in monetary terms representing €2 463 billion<sup>23</sup>). The Q3 2022 traded volume was around 22 times more than the gas consumption in the seven Member States<sup>24</sup> covered by the analysis in July–September 2022. Comparing to the EU as a whole, traded volume in Q3 2022 represented 17 times the total EU-27 gas consumption in this period.
- Observed hubs in Europe showed mixed picture regarding the year-on-year evolution of traded volumes in Q3 2022. Volumes on the largest and most liquid TTF hub fell by a staggering 32% year-on-year. Similarly to TTF, volumes on the Italian PSV and the Austrian VTP showed a double-digit percentage decrease (by 35% and 28% respectively). In contrast, traded volumes on the French TRF hub almost doubled (up by 95%) in Q3 2022, whereas on the Spanish PVB hub traded volumes rose by 7%, and they were up by 5% on the German THE hub (compared to the combined volumes of the separate NGC and Gaspool hubs in Q3 2021). Traded volumes on the Belgian Zeebrugge hub fell (from a very low base value anyway) by 40% in Q3 2022 year-on-year. On the British NBP hub, which was still the second biggest hub on the broader European market, volumes decreased by 7% compared to Q3 2021.
- As fall in traded volumes on the TTF (-32%) exceeded the decrease in traded volumes of the observed European markets (-26%), the share of TTF within the total European trade also decreased. In Q3 2022, TTF represented around 75% in the total European gas trade, down from 82% in Q3 2021. If looking at only the EU countries, its share was bigger, 85%. 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. However, over the months in the second and third quarters of 2022, LNG imports have a significant price discount to TTF, reflecting infrastructure bottlenecks in the EU gas grid, and the impact of gas flow reductions from east. As traded volumes on the British NBP fell only by 7% in Q3 2022 compared to the same period of 2021, the share of NBP rose to 12% in the total European observed trade, up from 9% in Q3 2021.
- Other markets had lower shares: the German THE, in spite of expectations after the merger of NGC and Gaspool, managed only to slightly increase its share (6.9% in Q3 2022, as opposed to 4.9% in Q3 2021), while the French TRF had a lower share, 3% (though tripling year-on-year), followed by PSV (1.4%) and VTP (1.3%), 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 Q3 2022.
- Net gas import in the EU rose by 2% in Q3 2022, however, LNG imports soared by a magnificent 89% 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. Over the last few quarters, shifting trade from the OTC market to exchange-executed contracts has been helped by permanently high and volatile prices as the number of traders being able to trade effectively 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 total traded volume in Q3 2022 amounted to 12 427 TWh on the observed European markets, and this was the lowest traded volume since Q4 2018, as Figure 44 shows.
- The share of exchange executed contracts on the Dutch TTF hub was 63% in Q3 2022, which was the highest among the observed countries, and was up by 1 percentage points compared to Q3 2021. On the NBP market, the share of exchange executed contracts was the second highest, (48%, however, decreasing by 17 percentage points year-on-year). On the Austrian VTP, the share of exchange executed contracts was 47% in Q3 2022, up from only 22% a year before, while on the THE German hub it went up from 15% to 44% between Q3 2021 and Q3 2022. At the same time, the share of exchange executed contracts on the French TRF rose from 22% to 24%, while on the Spanish PVB, it fell to 13% from 59% a year before. On Zeebrugge, the share of exchange-executed contracts amounted to 16% in Q3 2022 (up from 9% in Q3 2021), whereas it was the lowest on the Italian PSV, amounting to 1% in Q3 2022, even slightly down from 2% a year before.
- On the European hubs as whole, in Q3 2022 26% of the total trade was OTC bilateral, 17% was OTC cleared, whereas the share of exchange-executed contracts fell slightly back to 57% from 62% measured in Q2 2022. The share of exchange-executed contracts remained practically stable year-on-year in Q3 2022, whereas the share of OTC bilateral fell by 7 percentage points, and that of OTC cleared went up by 7 percentage points.

<sup>23</sup> Assuming that all trade was carried out on the quarterly average spot price of the TTF hub. As spot in Q3 2022 had a considerable premium over some of the forward contracts, this amount might overestimate the monetised traded value.

<sup>24</sup> 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.

- Amid the general decrease in traded volumes (26% in Q3 2022 year-on-year), exchange executed volumes in this quarter decreased by the same magnitude (-26%) on the observed European markets, as OTC traded volumes (bilateral and cleared together). Since the peak of traded volumes measured in Q1 2020, the OTC market trade fell by 60%, whereas exchange executed contracts fell only by 3%. This trend differs from the previous quarters when the role of exchange executed contracts increased, it seems that high wholesale gas prices impacted trade liquidity on exchanges as well.

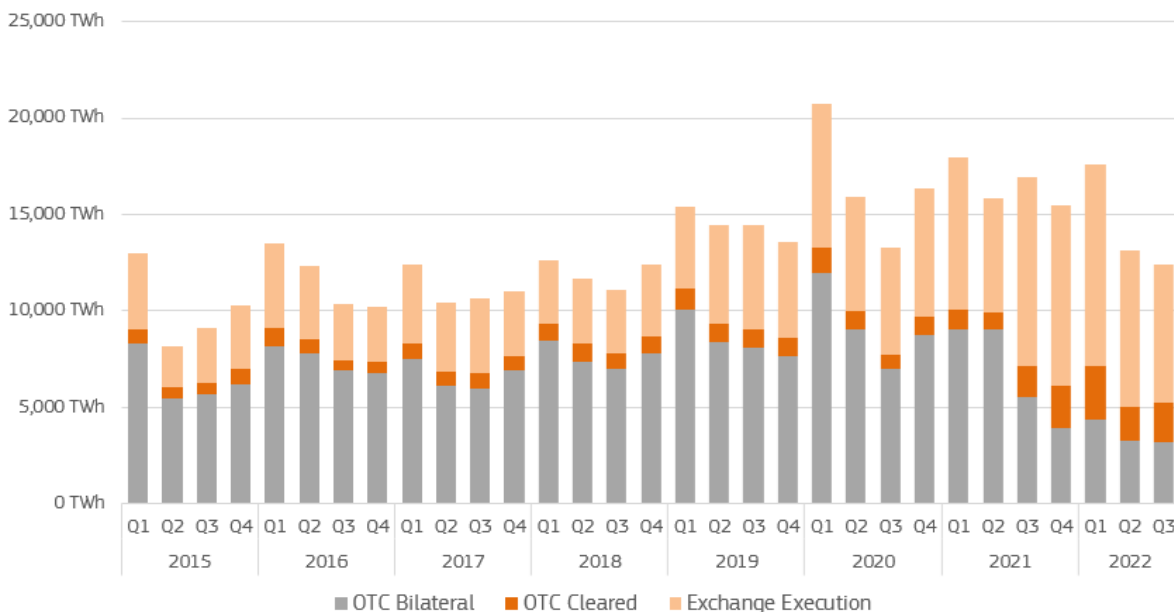
**Figure 45 - Traded volumes on the main European gas hubs in the third quarters of 2021 and 2022**



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

**Figure 46 – Over the counter (OTC – bilateral and cleared) and exchange executed trade on the EU gas hubs**

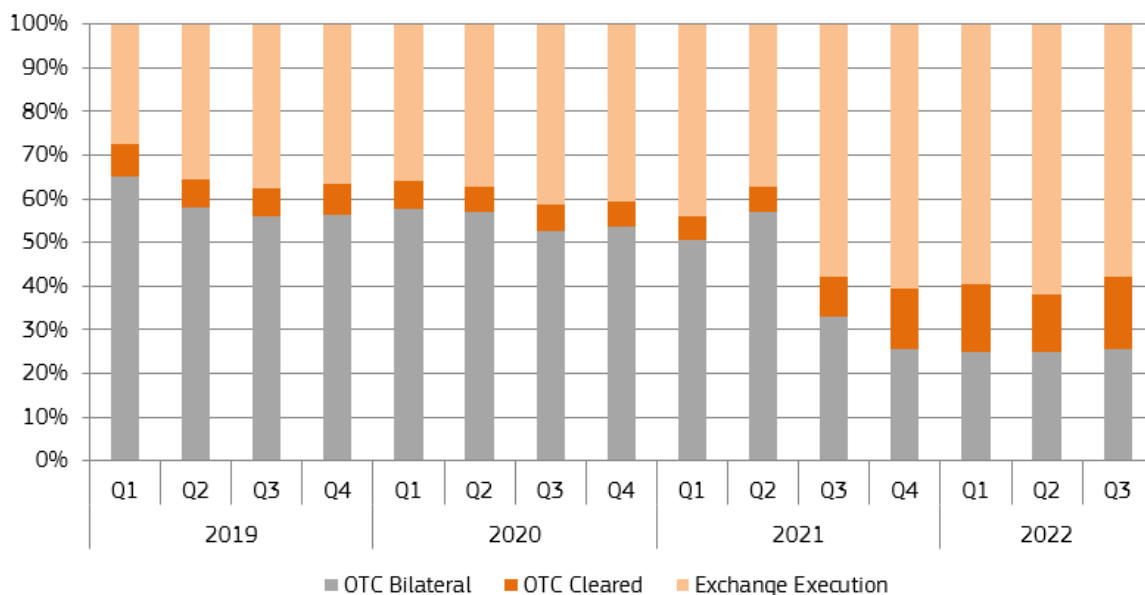


The chart covers the following trading hubs: Netherlands: TTF (Title Transfer Facility); Germany: THE (Trading Hub Europe); France: PEG (Point d'Echange Gaz); Italy: PSV (Punto di Scambio Virtuale); Spain: PVB (Virtual Balancing Point); Belgium: Zeebrugge beach, Austria: Virtual Trading Point (VTP);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

Source: Trayport Euro Commodities Market Dynamics Report



**Figure 47 - 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'Exchange Gaz); Italy: PSV (Punto di Scambio Virtuale); Spain: PVB (Virtual Balancing Point); Belgium: Zeebrugge beach, Austria: Virtual Trading Point (VTP); UK: NBP (National Balancing Point).

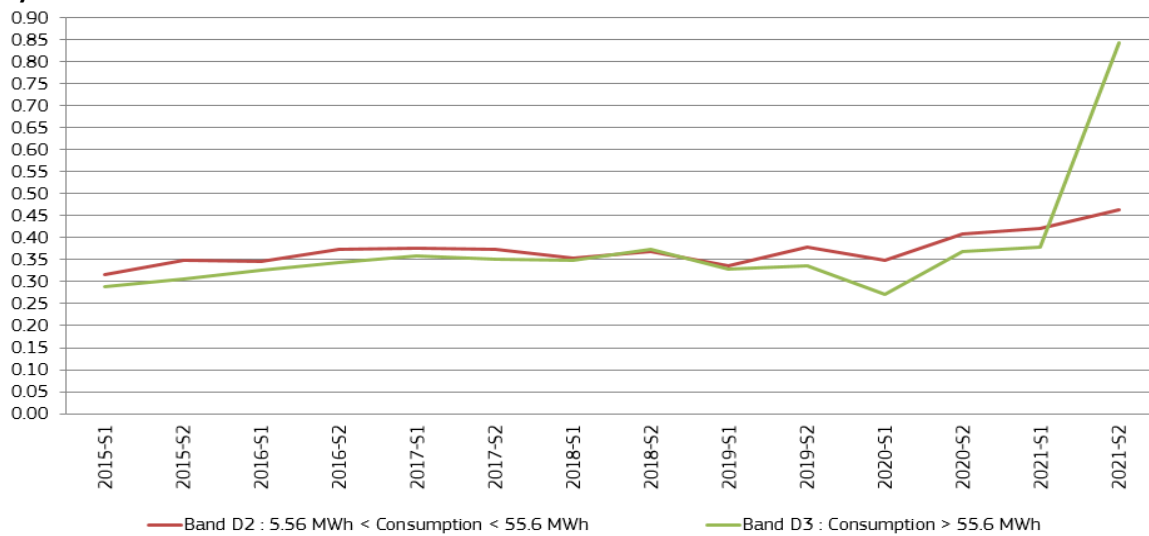
Source: Trayport Euro Commodities Market Dynamics Report

### 3. Retail gas markets in the EU and outside Europe

#### 3.1 Recent developments on EU retail gas markets

- Monthly and quarterly retail prices are estimated by using half-yearly prices from Eurostat (with the latest available figures relating to the first half of 2022) and Harmonised Consumer Price Indices (HICP) for both the household prices and industrial consumers.
- For household consumers, the estimated average retail price in Q3 2022 in the EU (including all taxes) showed a significant increase of 38% in year-on-year comparison, and compared to the previous quarter, Q2 2022, the average price went up by 26%. In the most typical consumption Band, D2, in the third quarter of 2022 the estimated average price (including all taxes) was 10.2 Eurocents/kWh, up from 8.1 Eurocents/kWh in the previous quarter and from 7.4 Eurocents/kWh in Q3 2021. (See the estimated household prices on Map 2). It is important to recall that substantial retail gas price increases occurred in the third quarter of 2022, implying that a significant part of the wholesale price increases of the first three quarters of 2022 must have probably appeared in the final retail prices, looking merely at the magnitude of retail price changes.
- In the third 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 Croatia (4.4 Eurocents/kWh), Hungary (4.8 Eurocents/kWh), and Slovakia (4.9 Eurocents/kWh), whereas the highest prices could be measured in Denmark (22.1 Eurocents/kWh), Sweden (21.9 Eurocents/kWh) and Greece (19.8 Eurocents/kWh). The price differential ratio between the cheapest and the most expensive Member State across the EU decreased in Q3 2022, to 5.0 (in the previous quarter it was 6.3), and in comparison with that in Q3 2021 (6.0), principally owing to the change in some Member States' practices where retail gas prices had still not followed increasing wholesale contracts in the preceding quarters, however, now prices have been gradually adjusted.
- However, as Figure 46 shows, price dispersion in the first half of 2022 rose significantly across the EU, especially for households with higher annual gas consumption, principally owing to a more than two-fold year-on-year increase for the retail gas prices in Belgium, Bulgaria, Estonia and Lithuania in this period, as data of Eurostat shows.

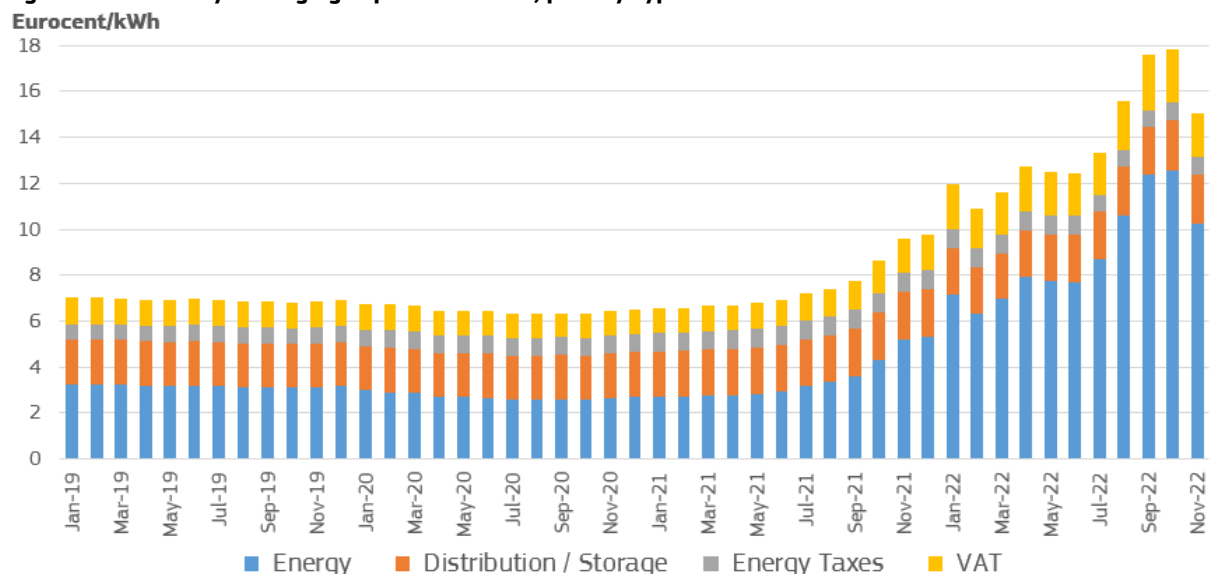
**Figure 48 - Bi-annual retail gas price dispersion for household customers across the EU Member States, as measured by relative standard deviation**



Source: Computation based on Eurostat data

- Figure 47 and Figure 48 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 November 2022, and the change in percentages compared to November 2021. In November 2022, retail gas prices in EU capitals rose by 57% year-on-year, which might signal that in this month the price peak might already have been left behind, as both average European retail gas prices and year-on-year increases were the biggest in September and October 2022. This monthly evolution basically followed wholesale gas prices, which peaked at the end of August 2022 on the EU gas hubs. In 2022 so far, as higher wholesale gas prices measurably appeared in the retail contracts, the share of the energy component within final consumer prices showed a significant increase. On average, 68% of the retail price could be assigned to the energy component in November 2022 (slightly down from as high as 70% in September and October), while the rest covered distribution/storage costs (14%), energy taxes (5%) and VAT (13%). The share of the energy component was generally increasing, as in November 2021 it was around 54% on average, increasing by 14 percentage points in the following twelve months.
- There were significant differences in November 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 29% (Stockholm) and Bratislava (50%) to 86% (Brussels and Luxembourg). The share of distribution/storage costs ranged from 4% (Amsterdam) and 5% (Tallinn) and to 37% (Stockholm) and 34% (Bratislava and Dublin). The share of energy taxes ranged from 1% (Brussels, Madrid and Athens) to 16% (Copenhagen) and 14% (Amsterdam). For 7 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, whereas according to the VaasaETT data collection VAT content in Warsaw was 0.

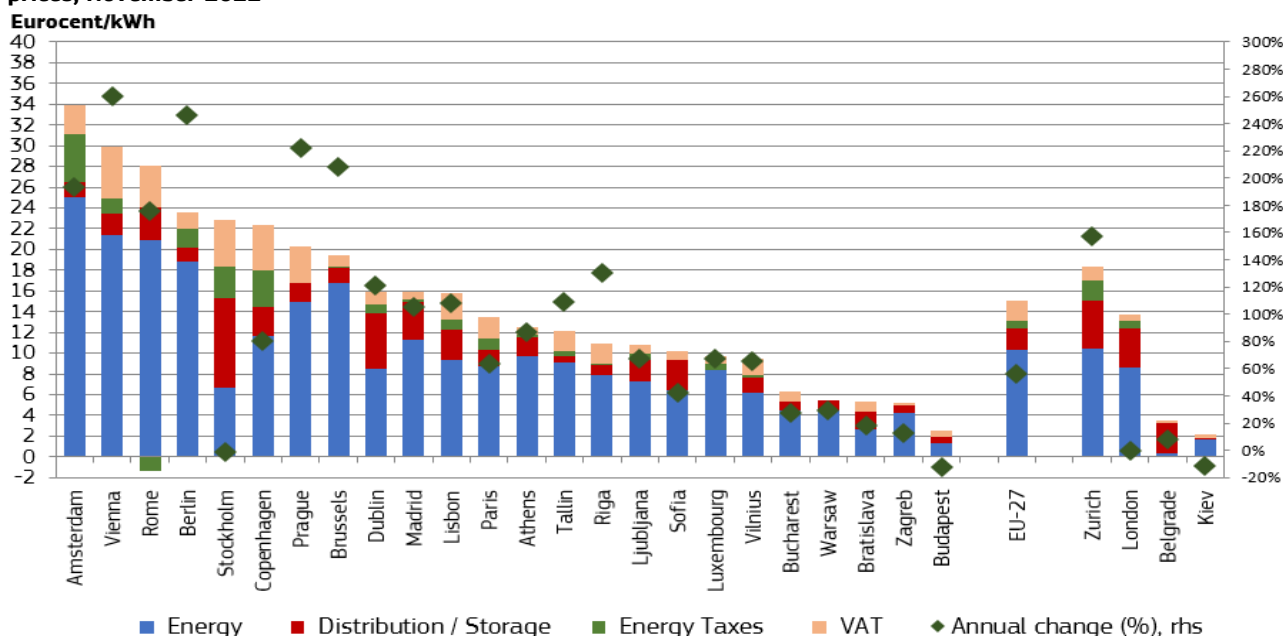
**Figure 49 – Monthly average gas price in the EU, paid by typical household customers**



Source: VaasaETT

- Figure 48 also shows that even the energy component is measurably variable in absolute terms: in November 2022, it was 19.4 times higher in Amsterdam than in Budapest (as household gas prices remained relatively cheap in Budapest, even after the adjustment to market conditions of the regulated prices for households having greater than average gas consumption). 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 12.9 (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 32.0 (Zagreb and Amsterdam) in the same period.
- With the exception of two capital cities out of the observed 24, prices were higher in November 2022, compared to the same month of the previous year. Prices decreased in Budapest (13%), probably driven by the depreciation of the local currency vis-à-vis the euro amid constant final consumer prices, while in Stockholm prices were also slightly down (-2%). Prices more than tripled in Vienna (+260%), Berlin (+246%), Prague (+222%) and Brussels (+206%), practically driven by the increase of energy costs, and in Athens and Berlin energy taxes also rose. 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 November 2022, Budapest remained the cheapest capital in the EU in terms of gas prices for household consumers, followed by Zagreb and Bratislava, whereas Amsterdam was the most expensive capital city, followed by Vienna and Rome.

**Figure 50 - Breakdown of gas price paid by typical household customers in European capitals and annual change in prices, November 2022**

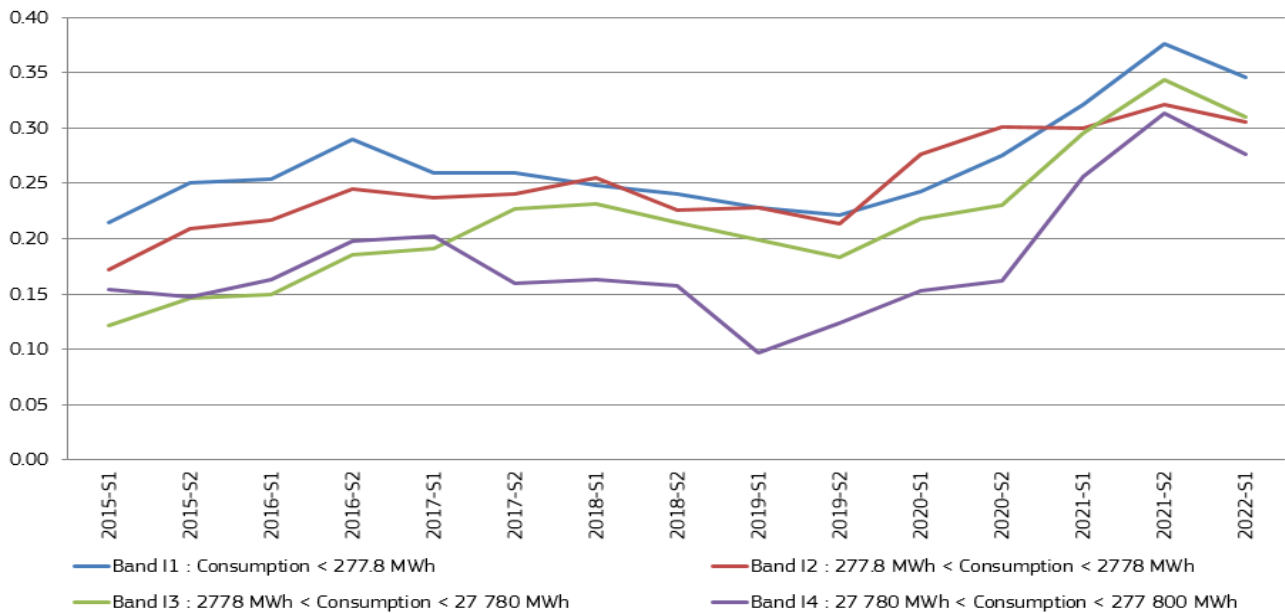


Source: VaasaETT. EU-27 represents an aggregate average of the 27 capital cities

- Estimated retail gas prices for industrial customers rose measurably, by 95% in Q3 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 7.7 Eurocents/KWh, up by 78% compared to Q2 2022 (when reaching 4.3 Eurocents/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 year-on-year. It seems that price rises on wholesale gas markets have already appeared in the retail prices for industrial customers in Q3 2022, having an average annual consumption. Price increases could also be observed for industrial customers having larger annual gas consumption (in Band I5 and Band I6 price increases of 93% and 102%, respectively could be observed in Q3 2022, year-on-year). Significant price increases for energy intensive industries meant bigger production costs, leading to decrease (or shut down) 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 first half of 2022), corrected by HICP figures, implying that by the time the next half-yearly price data will be available (usually in April/May and October/November each year), numbers might show different trends after retrospective corrections. In the third quarter of 2022, the lowest estimated industrial price in consumption Band I4 could be observed in Belgium (5.5 Eurocents/KWh), Croatia (5.6 Eurocents/KWh), and Slovenia (6.1 Eurocents/KWh). The highest prices could be observed in Greece (16.7 Eurocents/KWh), Estonia (15.3 Eurocents/KWh), and Denmark (14.1 Eurocents/KWh). In Q3 2022, the price ratio of the cheapest and the most expensive country in the EU was 3.1, which was slightly lower than in Q3 2021 (3.3).
- Figure 49 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. However, in the first half of 2022, price divergences seemed to decrease slightly.

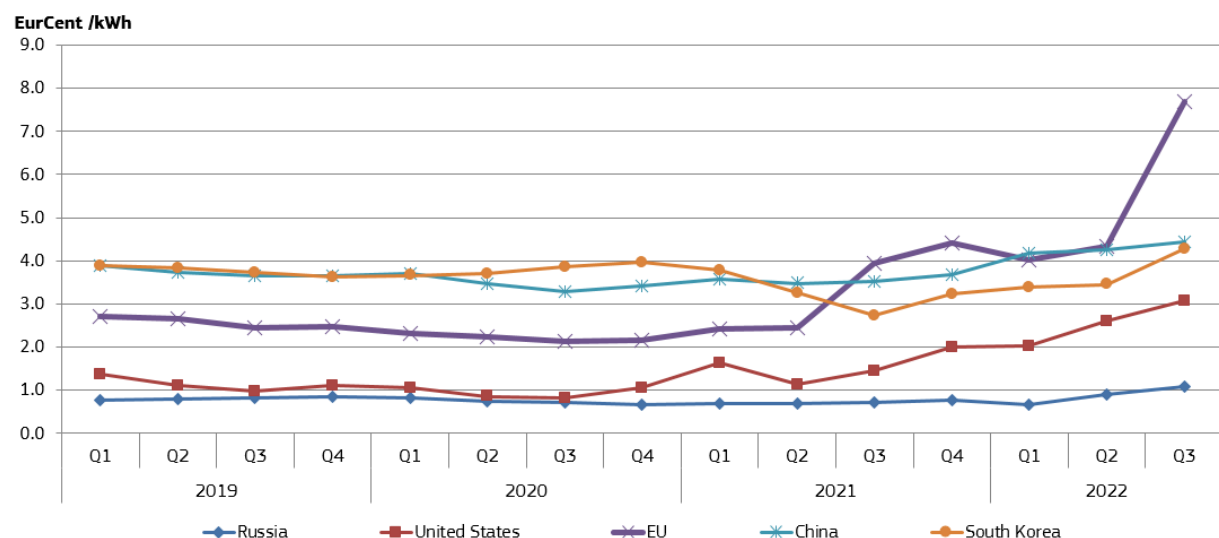
**Figure 51 - Bi-annual retail gas price dispersion for industrial customers across the EU Member States, as measured by relative standard deviation**



Source: Computation based on Eurostat data

- Figure 50 shows the evolution of industrial retail gas prices in the EU, compared with some important trade partners of the European economy. In the third quarter of 2022, retail gas prices for industrial customers were the highest in the EU, compared with the peers of the United States, China, Russia and South Korea. In comparison to the EU average, prices were lower by 42% in China, by 44% in South Korea, by 60% in the United States and by 86% in Russia, implying that EU businesses consuming significant amount of gas compared to their production value faced significantly higher energy costs compared to many global competitors. Retail industrial gas prices in the EU were up by 95% in Q3 2022 year-on-year. Gas price rose by 113% in the US, by 56% in South Korea by 49% in Russia, and by 26% in China in Q3 2022, year-on-year.

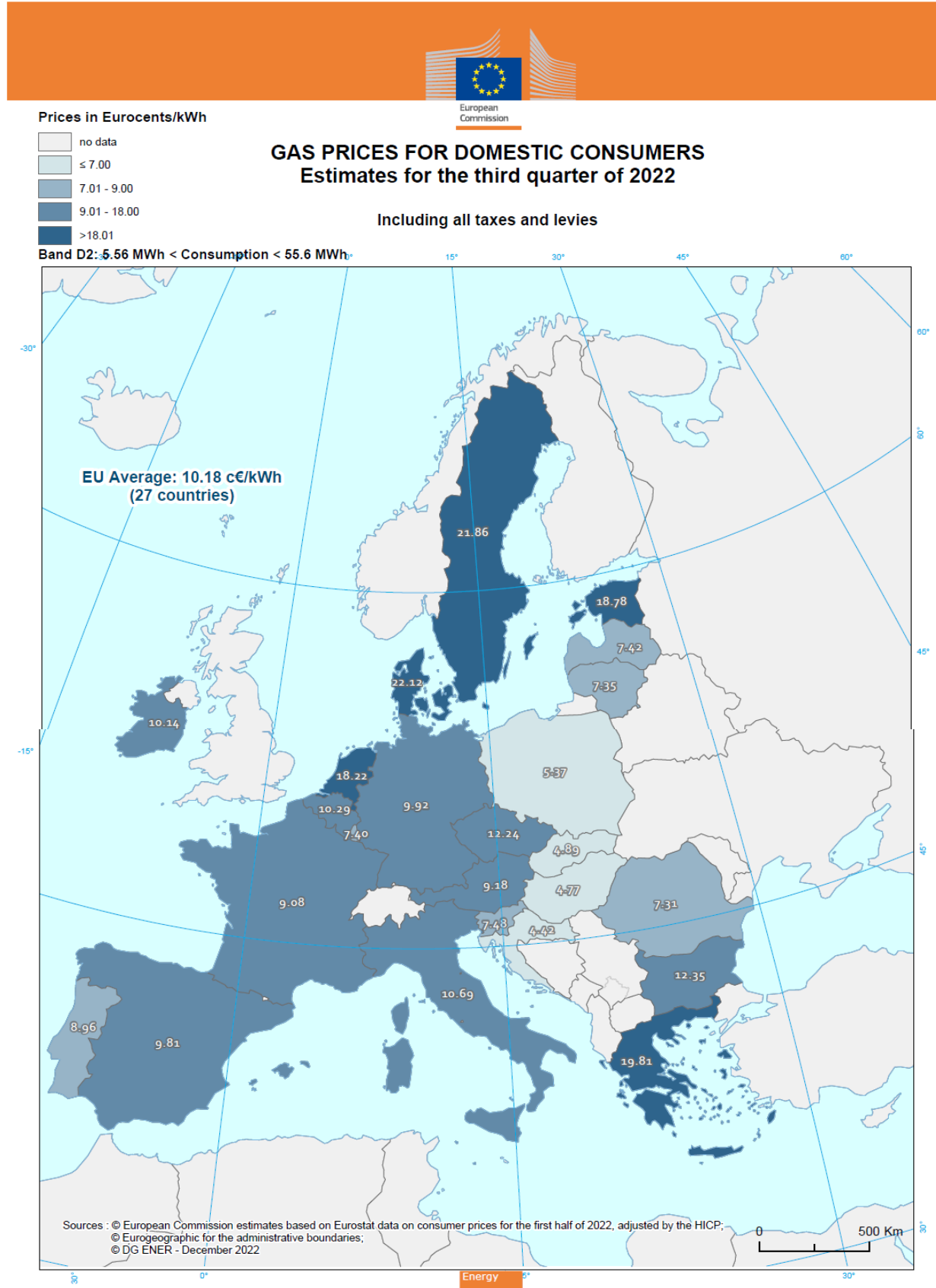
**Figure 52 - The EU average industrial retail gas price in comparison with the prices of some important trade partners of the EU**



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 third quarter of 2022.

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

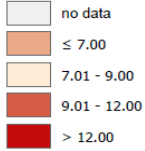


Source: Eurostat

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



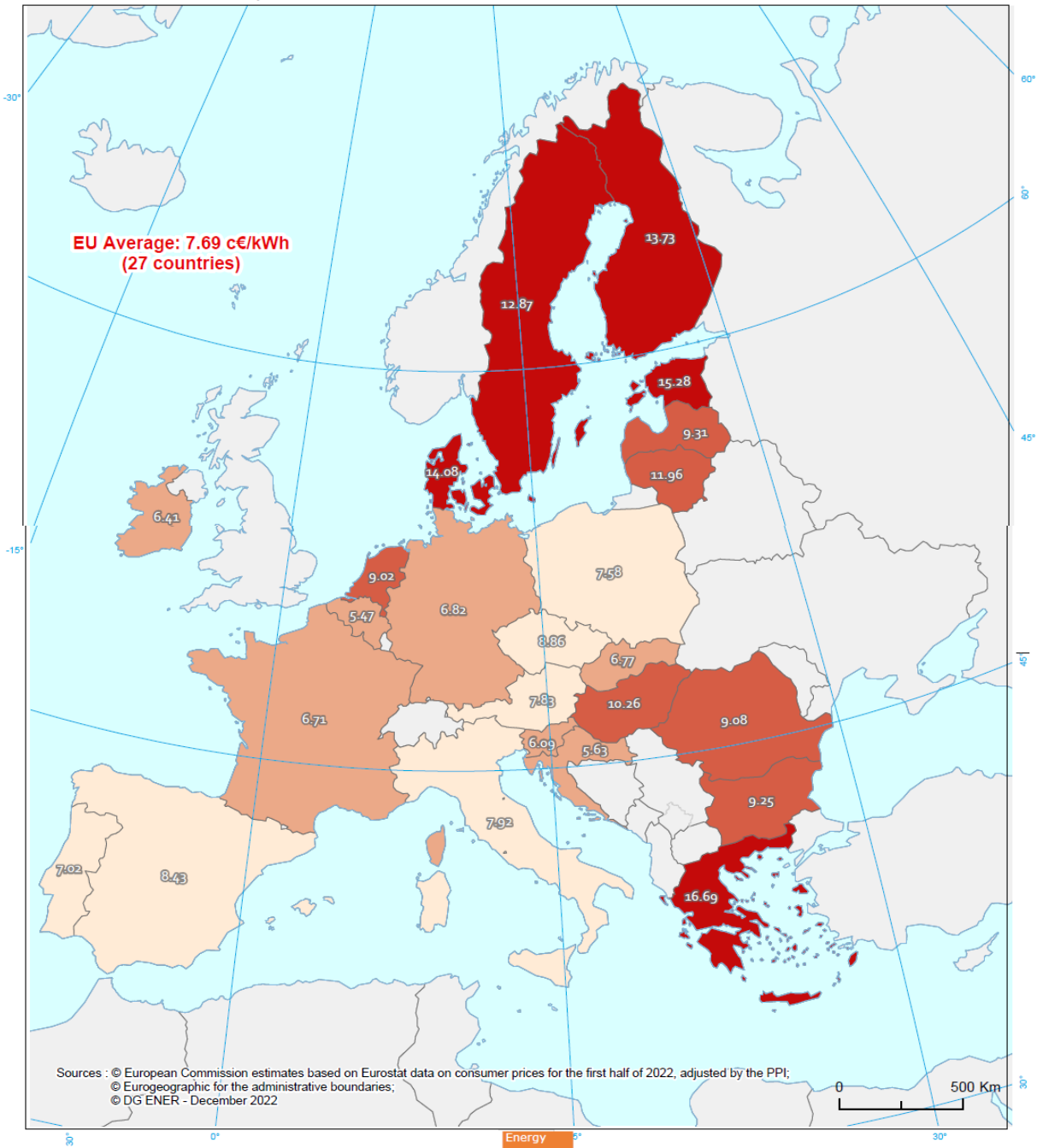
Prices in Eurocents/kWh



**GAS PRICES FOR INDUSTRIAL CONSUMERS**  
**Estimates for the third quarter of 2022**

Excluding VAT (value added tax) and other recoverable taxes

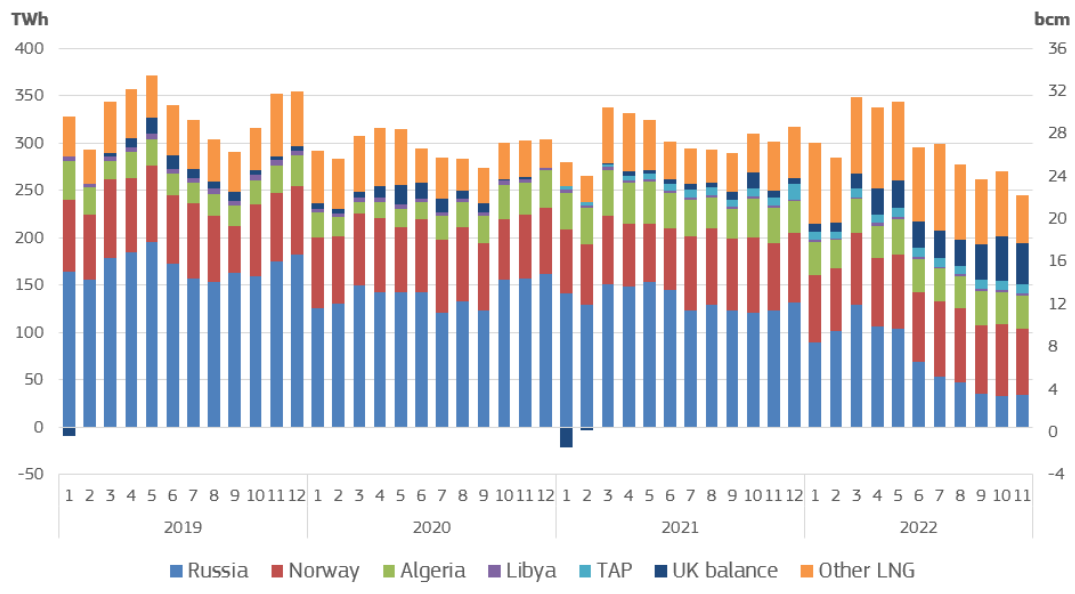
Band I4: 27 780 MWh < Consumption < 277 800 MWh



Source: Eurostat

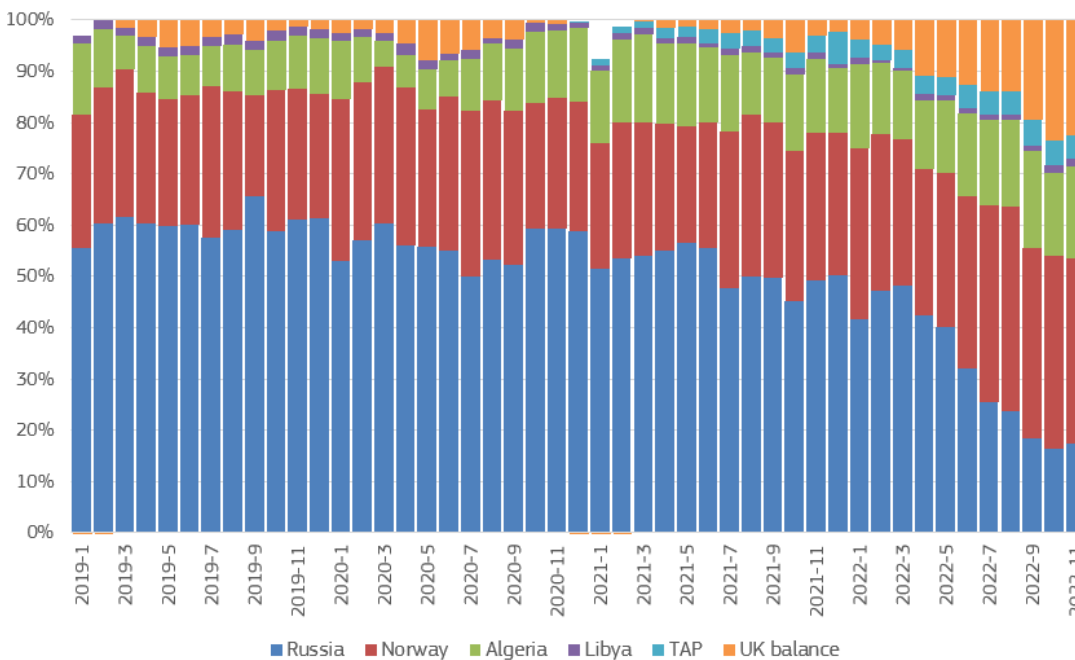
## 4. Appendix – charts providing further details on market developments<sup>25</sup>

**Figure 53 – Monthly evolution of gas imports from extra-EU sources**



Source: ENTSO-G

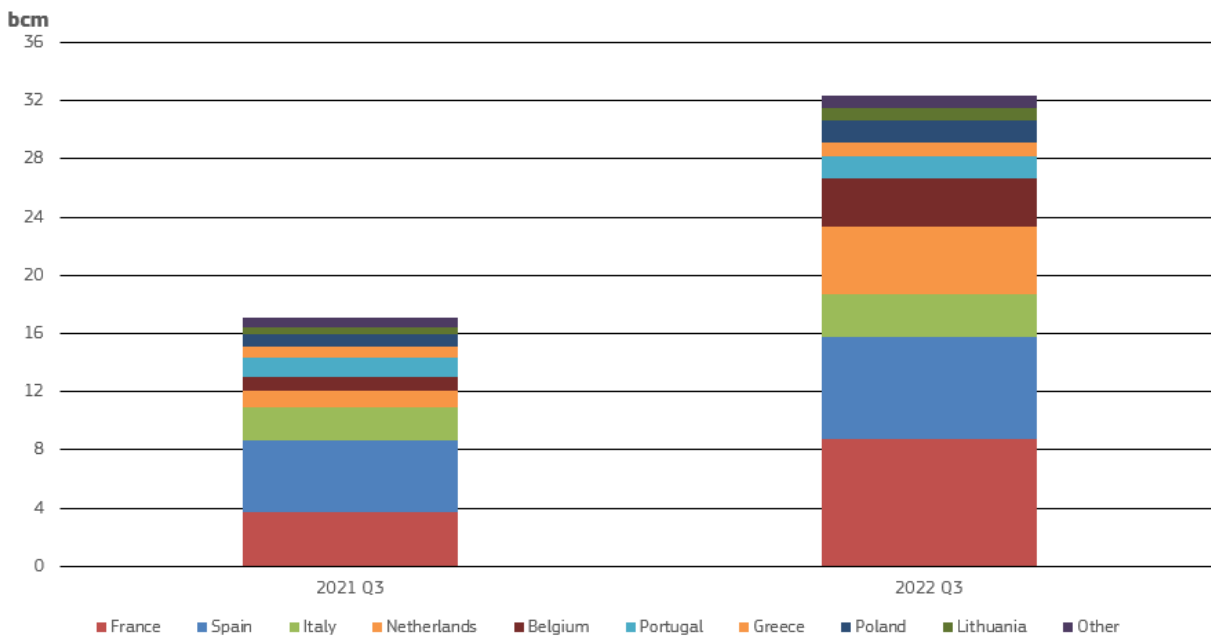
**Figure 54 - Monthly share of gas imports from various sources (pipeline and LNG both included)**



Source: ENTSO-G

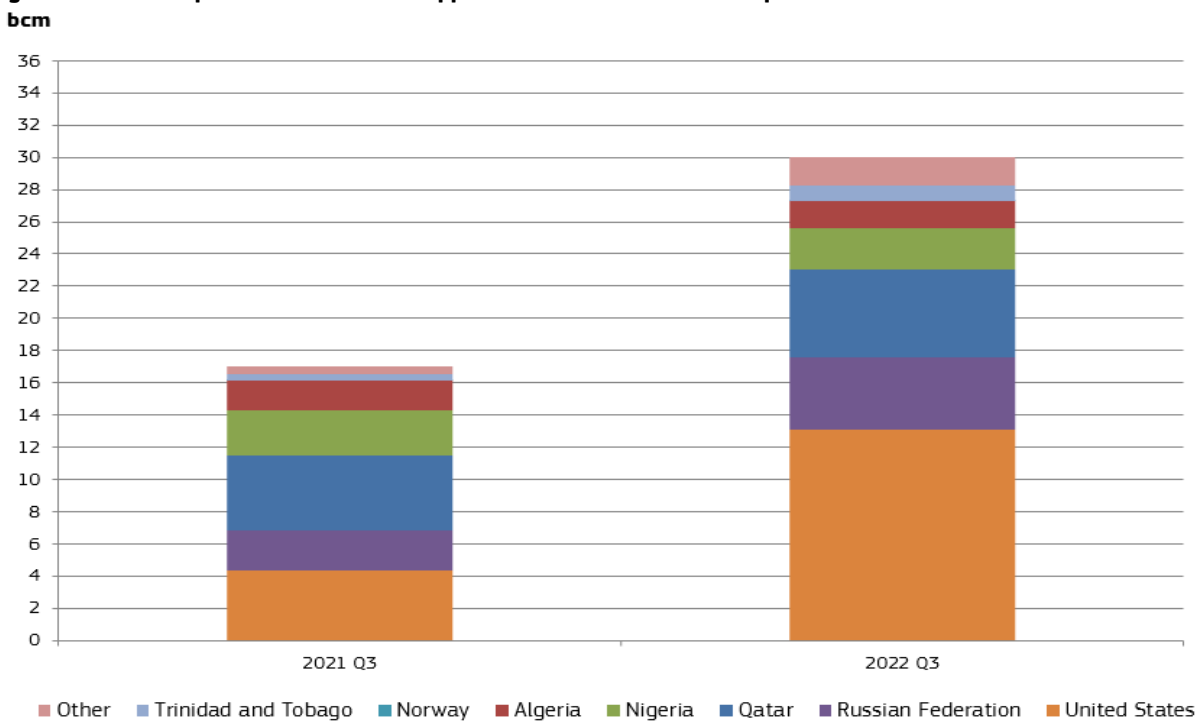
<sup>25</sup> These charts provide additional information on the main market developments, without textual comments and/or further detailed analysis

**Figure 55 – LNG imports in the EU Member States, third quarters of 2021 and 2022**



Source: Refinitiv

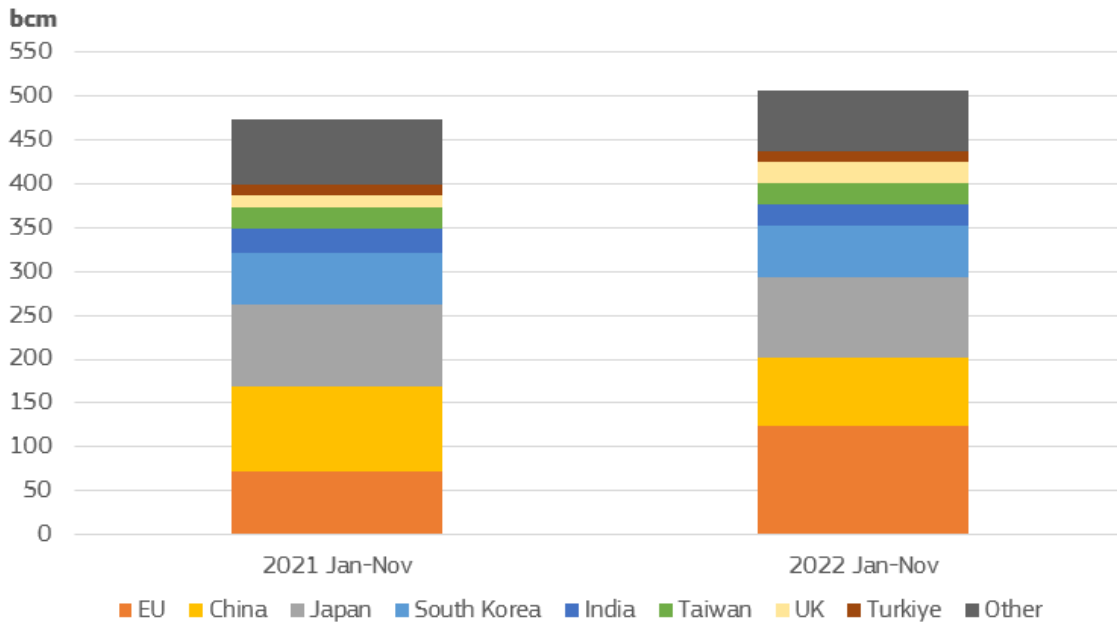
**Figure 56 - LNG import from the main suppliers in the EU in the third quarters of 2021 and 2022**



Source: Refinitiv

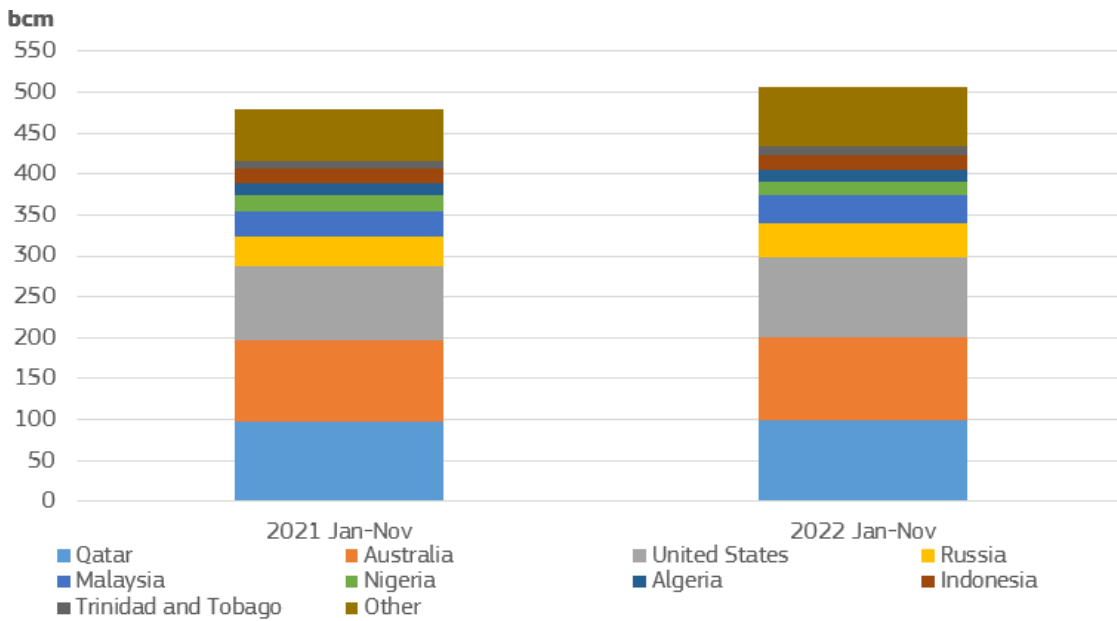


**Figure 57 – LNG imports in the main consumer markets in January–November of 2021 and 2022**



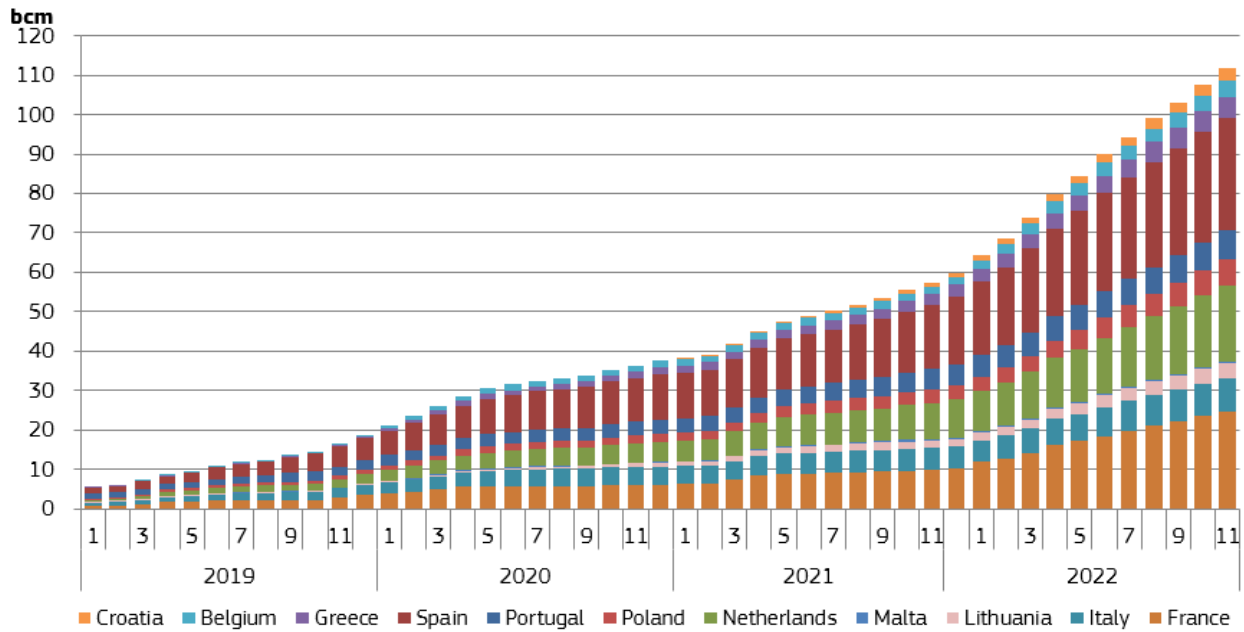
Source: Refinitiv

**Figure 58 - LNG exports from the main gas producers in January–November of 2021 and 2022**



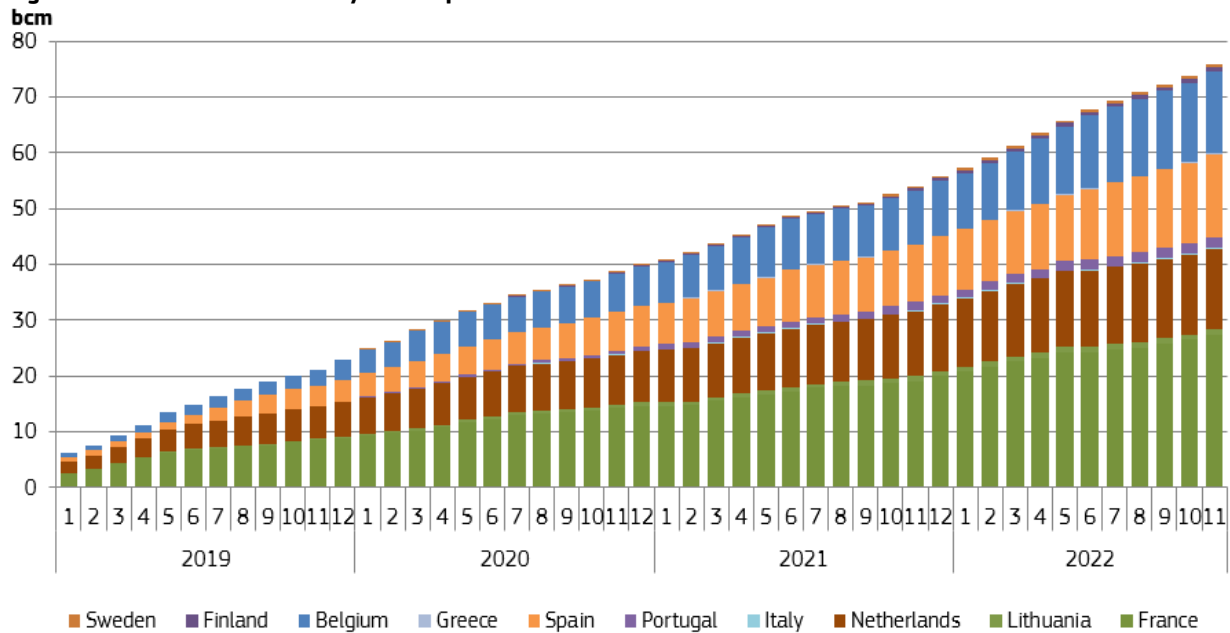
Source: Refinitiv

**Figure 59 - Cumulative monthly LNG imports from the US in the EU**



Source: Commission calculations based on tanker movements reported by Refinitiv

**Figure 60 – 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.