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Quarterly Report

on European Gas Markets

with focus on the impact of Covid-19 on the global LNG market

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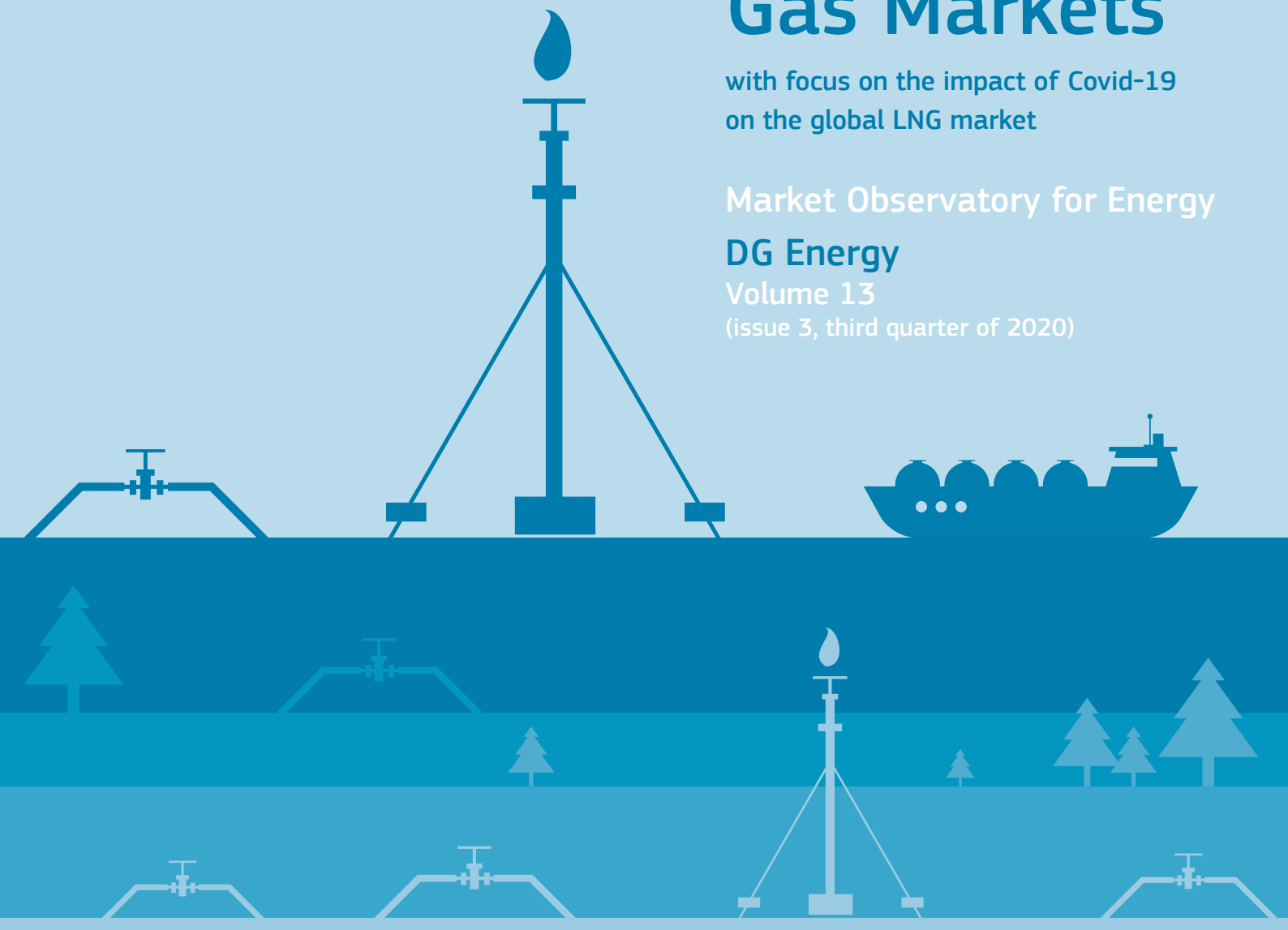

Energy

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CONTENT

HIGHLIGHTS OF THE REPORT

- **After the first wave of the Covid-19 pandemic, lockdown measures were lifted at the beginning of summer 2020 in most the EU countries, impacting the mobility of EU citizens, the economy and the energy markets, undergoing a general recovery in the third quarter of 2020.** However, GDP in the EU was still down by 4% in Q3 2020 in year-on-year comparison.

- In the third quarter of 2020 **EU gas consumption decreased slightly, by 0.6%** (0.4 bcm) compared to Q3 2019, after the 10% fall in the previous quarter. Demand for gas was limited by the abundant renewable electricity generation and the high level of gas storages. Gas consumption in Q3 2020 was 71.5 bcm in the EU, whereas in the first three quarters it reached 274 bcm, down from 288 bcm (by 5%) a year before.

- Indigenous **gas production in the EU**, **amounting to less than 12 bcm in Q3 2020, was down by 29%** (4.7 bcm) compared to Q3 2019. In Q3 2020 the Netherlands produced 4.4 bcm of gas (the lowest quarterly in the last seven years), down by 41% year-on-year. The Dutch government announced that the production cap for the next gas year is set to 8.1 bcm for the Groningen field. Romania produced 2 bcm of gas, followed by Germany (1.1 bcm) and Italy (0.9 bcm). In the first three quarters of 2020, gas production in the EU amounted to 41 bcm, down from 54 bcm in the same period of 2019.

- **EU net gas imports fell by 6% year-on-year** (5 bcm) in Q3 2020. Russian pipeline supplies covered 41% of extra-EU net gas imports. Norwegian pipeline gas was the second most important source (25%), LNG imports together covered 22% of the total EU imports followed by pipeline imports from North Africa (8%). Net gas imports amounted to 77 bcm in Q3 2020, while in the first three quarters of 2020 it reached 242 bcm.

- **Nord Stream remained the most important supply route of Russian pipeline gas to the EU in Q3 2020**. The share of the Nord Stream reached 40% (13 bcm transit), the Belarus transit came to the second place, with 29% (10 bcm), and for the first time over the last few years the Ukrainian transit route came only to the third place, with a share of 25% and transited volume of 8 bcm. In Q3 2020 the Ukrainian transit volume was down by 57% year-on-year, also impacted by some maintenance works. The share of Turk Stream was only 5% in Q3 2020. In the first three quarters of 2020 39 bcm of Russian gas was transited through Nord Stream, 25 bcm of gas through Ukraine, 23 bcm though the Yamal pipeline (Belarus) and only 4 bcm through the Turkstream.

- **Gas storage levels in the EU stood at 95% at the end of September 2020,** which was albeit high in historical comparison but 2 percentage points lower than in the same period of 2019.

- EU **LNG imports decreased by 15% year-on-year** in Q3 2020, widely reflecting the impact of LNG cargo cancellations during the summer of 2020. As cargo cancellations mainly impacted shipments from the US, the country's hare in the Q3 2020 EU LNG imports fell to 12%, which was only the fifth after Qatar (29%), Russia (18%), Nigeria (15%) and Algeria (13%). In Q3 2020 Spain was the biggest LNG importer in the EU (6.2 bcm), ahead of France (3.5 bcm) and Italy (3.1 bcm).

- **The EU's estimated gas import bill, slightly increasing from the six years' low of the previous quarter, amounted to €7 billion in the Q3 2020**, down from €10.6 billion (by 34%) in Q3 2019, principally owing to falling import prices (by 28%) and decreasing imports. The EU LNG import bill was estimated at €1.6 billion in Q3 2020, down from €2.4 billion in Q3 2019. In the first three quarters of 2020, the total gas import bill was €23 billion, down from €45 billion in the three quarters of 2019.

- **Gas traded volumes on the European hubs was down by 8% (plus 1 150 TWh)** in Q3 2020 year-on-year, after several years of practically continuous expansion. Falling LNG imports in the EU, in parallel with lower pipeline imports and consumption, contributed to lower traded volumes in Q3 2020. The Dutch TTF hub, the most liquid of all European hubs, was the only hub that managed to preserve the traded volumes in year-on-year comparison, while for the other hubs steep falls could be observed.

- **Spot prices on the European gas hubs in Q3 2020 recovered from the lows of previous quarter, but were still 19-27% lower in year-on-year comparison.** By the end of September 2020 the TTF spot price rose to 12 €/MWh, the highest since the end of 2019. Increasing spot prices were principally owing to the accommodation of gas supply to the lower demand, as large volume of LNG cargoes were cancelled and some infrastructure maintenance works (e.g. some Norwegian gas fields) were also carried out during Q3 2020. Both the TTF and Asian benchmarks started to re-develop the premium to the US Henry hub, implying improving profitability of US LNG exports in the forthcoming quarters.

- **Retail gas prices for household customers showed a decrease of 12% year-on-year in Q3 2020, while industrial customers faced a decrease of 6% in the same period**. With only one exception, gas prices for households in the European capitals were lower in September 2020 compared to a year earlier.

EXECUTIVE SUMMARY

- **In the third quarter of 2020, after Covid-19-related lockdown measures introduced in the previous quarter were lifted in almost all EU Member States, mobility of European citizens, the economic activity, including the energy markets, underwent a general recovery**. In Q3 2020 the EU economy showed an upturn of 11% compared to Q2 2020, after a fall of similar magnitude in the previous quarter, however, in year-on-year comparison GDP was still down by 4% in Q3 2020. This signalled a recovery from the lows of 14% decrease in Q2 2020, however, in the fourth quarter of 2020 new restrictive measures were introduced, probably impacting the overall economic activity in the EU. On the energy markets, after swift recovery in June 2020, oil prices remained relatively stable in Q3 2020. In contrast, wholesale gas prices in the EU (specifically the TTF hub price) practically doubled in Q3 2020 and by the end of September they reached the highest since the end of 2019, highs before the outbreak of the pandemic.
- **EU gas consumption in the third quarter of 2020 decreased slightly, by 0.6% year-on-year,** after the steep fall of 10% in the previous quarter. Gas-fired electricity generation was slightly up by 0.2% year-on-year, limited by abundant generation from renewable sources, largely replacing decreasing solid fuels and lower nuclear. Less injection need in Q3 2020 for storages also limited the increase in gas demand amid recovering economic activity. In July and August 2020 warmer than usual weather in many EU countries might have increased cooling related needs, inducing more gas-fired electricity generation. In absolute numbers, gas consumption in Q3 2020 amounted to 71.5 bcm, down from 71.9 bcm a year before, whereas in the first three quarters of 2020 EU gas consumption amounted to 274 bcm, down from 288 bcm (by 5%) a year before.
- **EU gas production fell by 29%** year-on-year in the third quarter of 2020; amounting to less than 12 bcm. Gas production decreased in the biggest EU gas producer, the Netherlands by 41% in Q3 2020, falling to 4.4 bcm, which signalled a seven year low. The Dutch government announced on 22 September 2020 that the production cap for the Groningen gas field is set to 8.1 bcm for the 2020 gas year, whereas this cap was set to 11.8 bcm in the previous gas year ending in September 2020. In the second biggest producer, Romania, gas production fell by 16% to 2 bcm. Gas production in Germany, Italy and Ireland respectively amounted to 1.1 bcm, 0.9 bcm and 0.5 bcm, down by 18%-25% year-on-year. In the first three quarters of 2020, gas production in the EU amounted to 41 bcm, with the biggest producers, the Netherlands (18 bcm), Romania (7 bcm) and Germany (4 bcm), and decreased from 54 bcm in the same period of 2019.
- **EU net gas imports fell by 6% in the third quarter of 2020**, compared to Q3 2019. In Q3 2020, the amount of net gas imports (77 bcm) and domestic gas production (11 bcm) together covered the quarterly gas consumption of 71 bcm and the increase in gas storage levels (17 bcm). Pipeline gas imports from Russia fell by 20% year-on-year in Q3 2020, whereas pipeline imports from Norway were up by 15%, taking back the second most important import gas source for the EU in Q3 2020. Pipeline gas imports from Algeria, in contrast to the previous quarters, rose by 26% compared to Q3 2019, as oil-indexed prices, decreasing in Q3 2020, became more competitive vis-a-vis hub-based contracts. Pipeline gas import from Libya, having only a small share in EU imports, fell steeply, by 28%. In the first three quarters of 2020, EU net gas imports amounted to 242 bcm, down from 265 bcm in the same period of 2019.
- **Russian pipeline supplies remained the main source of EU gas imports**, covering 41% of extra-EU imports in Q3 2020, down by 7 percentage points year-on-year. Norway came to the second place, ensuring 25% of the total EU pipeline imports, while the share of re-gasified LNG coming in the EU terminals was 22%, followed by Algeria (7%). When looking at the combined share of pipeline and LNG imports per country, Russia's share was 45% in the total extra-EU gas imports, followed by Norway (27%), and the share of LNG sources other than from Russia, Norway and Algeria was 18%. In year-on-year comparison, decreasing share of Russia (-7 percentage points) was mainly compensated by the increasing share of Norway (+ 5 percentage points) and Algeria (2 percentage points), whereas the share of other sources remained more or less stable in Q3 2020 in the EU gas supply mix. The EU's estimated gas import bill in Q3 2020 fell to €7 billion, 34% less than a year earlier, mainly as a result of falling import prices (by 28%) and decreasing gas imports. The total EU LNG import bill amounted to an estimated €1.6 billion in Q3 2020, down from €2.4 billion a year before. In the first three quarters of 2020, the total gas import bill was €23 billion, down from €45 billion in the first nine months of 2019.
- In the third quarter of 2020, **Nord Stream remained the main supply route of Russian gas to the EU,** covering 40% of the total Russian supplies (around 13 bcm), up by 6 percentage points compared to in Q3 2019. The historically most important Ukrainian transit route's share fell to 25%, down from 47% in the third quarter of 2019 and transited around 8 bcm of gas in Q3 2020, down by 57% year-on-year. In Q3 2020 gas supplies transiting Belarus were up by 8% compared to Q3 2019, and covered 29% (10 bcm) within the total EU imports from Russia, implying that for the first time Belarus became the second transit route for gas of Russian origin to the EU, ahead of Ukraine. Low Ukrainian transits in Q3 2020 were also influenced by maintenance works on the Budnice interconnector between Slovakia and Ukraine between 1 and 22 September 2020. In July 2020 traditional maintenance works were also carried out on Nord Stream and Yamal. TurkStream had an increasing, though still low share in the Russian gas transit, amounting to 5% in Q3 2020 and transiting less than 2 bcm gas to the EU.
- In the first three quarters of 2020 39 bcm of gas was transited through Nord Stream, 25 bcm gas was transited through Ukraine, 23 bcm though the Yamal pipeline (Belarus) and around 4 bcm through the Turk Stream. It seems that decrease in EU gas imports from Russia mainly impacted gas transits through Ukraine in the first nine months of 2020, which creates questions around how the contractual obligation of shipping at least 65 bcm through the Ukrainian transit route could be fulfilled by Gazprom this year.

Meanwhile, Gazprom revised its export target to Europe (incl. Turkey) to 170 bcm, slightly upward from the previous forecast in April (167 bcm), however, well below the 199 bcm fulfilment of 2019.

- Over the recent months, **the European Commission has adopted several initiatives that might significantly impact the EU gas markets**, especially in the longer run. On 8 July 2020, both the Hydrogen strategy for a climate-neutral Europe, and the EU strategy for energy system integration were adopted. Energy system integration will change the traditional way of thinking on separate sectors, such as electricity, gas, heating, transport, etc. The hydrogen strategy rolls out the actions plans on alternative fuels, such as hydrogen, which will serve as replacement to natural gas, especially after 2030. The Climate Target Plan ("Stepping up Europe's 2030 climate ambition"), adopted by the Commission on 17 September led in December 2020 to raising the EU's wide greenhouse gas emission reduction target to 55% by 2030. On 14 October 2020, the Commission adopted the EU Methane strategy, which also has relevance in the gas sector, especially when thinking on natural gas flaring and venting.

- **EU LNG imports fell by 15% in the third quarter of 2020 in year-on-year comparison**. In July, August and September 2020 the year-on-year decreases respectively amounted to 4%, 18% and 13%, clearly reflecting the impact of massive LNG cargo cancellations during the summer of 2020. It seems that the LNG market could ensure the quickest way of accommodation of the supply side of the gas market to the decreased demand. The cancellation impacted especially shipments from the US, possibly reflecting bigger flexibilities in European contracts with US LNG suppliers, compared with other LNG sources. In Q3 2020 Qatar became again the largest LNG supplier, with a total share of 29% in the EU LNG imports, ahead of Russia (16%), Nigeria (15%) and Algeria (13%). The United States were only the fifth LNG supplier to the EU in Q3 2020, with a share of 12% in the total EU LNG imports. In Q3 2020 Spain was the biggest LNG importer in the EU (6.2 bcm), ahead of France (3.5 bcm) and Italy (3.1 bcm). The average EU LNG regasification terminal utilisation rate, in parallel with falling imports, fell below 40% in August and September 2020, which was the lowest since mid-2018.

- **Gas storage levels in the EU stood at 95% at the end of September 2020.** Albeit high in historical comparison, it was 2 percentage points less than in the same period of 2019. At the beginning of the Q3 2020 storage levels (reaching 80% on EU average) already stood 6 percentage points higher than at the beginning of Q3 2019. In Q3 2020 the increase in storage levels amounted to 14% on EU average, whereas a year before storage fillings reached 22% of the total EU storage capacities. Less intensive storage injection activity also contributed to the lower demand on the European gas markets. At the beginning of the heating season, the total gas storage volumes would have covered around 40% of the typical winter gas consumption in the EU. Winter-summer contract price spreads reached the peak at the beginning of Q3 2020, later, in parallel with increasing spot and near-end curve forwards prices, the spreads also decreased.

- **Spot gas prices in Q3 2020 recovered from the lows measured in the previous quarter, and were in the range of 7.6–9 €/MWh on the European gas hubs.** However, in year-on-year comparison, gas prices on the EU hubs were still down by 19-27%. The Dutch TTF spot price started Q3 2020 at 5.6€/MWh, and by the end of September it rose to 12 €/MWh, which was the highest since the end of 2019, and practically quadrupling since the trough at the end of May (3.1 €/MWh). Gas prices in Europe were impacted by the accommodating supply to the decreased gas demand (for example, in the form of LNG shipment cancellations) and by the generally positive mood on the energy markets, recovering after lifting the confinement measures at the end of the first wave of the pandemic at early summer of 2020. A further factor on the supply side was general maintenance works in this period on some important supply infrastructure (e.g. gas fields in Norway). However, gas demand was limited by abundant renewable based power generation and high level of gas storages. As of September 2020 the TTF price, which moved closely with the US Henry Hub in July and August, started to redevelop its usual premium to the US peer, and the same can be mentioned for the Asian benchmark (JKM). Price premium of the European and Asian indices to the US benchmark will probably incentivise US LNG exports in the forthcoming quarters. Meanwhile, TTF and the Asian benchmarks remained relatively well-aligned in Q3 2020. The average price ratio of the Japanese LNG prices and the TTF was 1.3, similar to Q2 2020, whereas the ratio between the Japanese prices and the US Henry hub rose from 1.3 to 1.8 in Q3 2020. On quarterly average, the price ratio of the TTF and Henry hub rose to 1.4 from 1 in Q2 2020. In parallel with increasing spot prices, the premium of the forward contracts (contango) decreased over the third quarter of 2020.

- **After a practically continuous increase through many years, in Q3 2020 traded volumes on the major European gas hubs decreased by 8% (1 150 TWh)** year-on-year, whereas in the previous two quarters volumes were still up by respectively 32% and 7%. The total traded volume on the most liquid European hubs was around 13 235 TWh (equivalent to around 1 105 bcm and representing 15 times the combined EU consumption of natural gas in Q3 2020). LNG imports in the EU decreased by 15% in Q3 2020 year-on-year, and this in parallel with decreasing pipeline gas imports contributed to lower trading volumes on the EU gas hubs. The most liquid hub, the TTF, managed to preserve traded volumes year-on-year, while in the case of other observed hubs steep falls could be seen in the volumes.

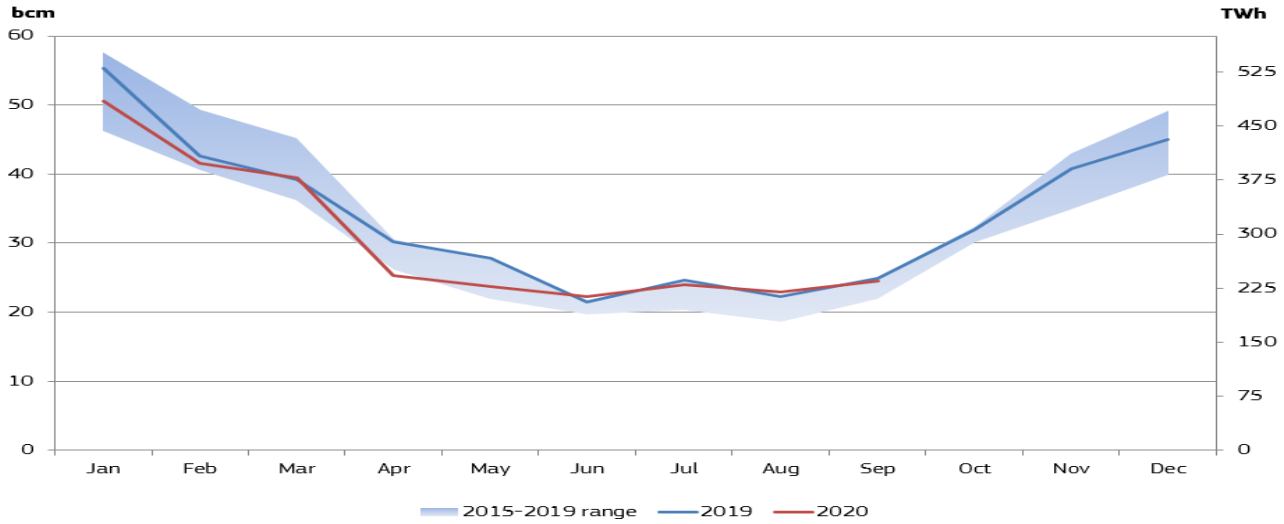
- **Retail gas prices for household customers** with average annual consumption **were down by an estimated 12% in Q3 2020** in year-on-year comparison, while industrial customers with average annual consumption faced a price decrease of 6% year-on-year. Industrial customers with higher annual consumption benefited from bigger decreases (9% for the two largest consumption bands), implying that price falls of the first half of 2020 on the wholesale gas markets already appeared in both household and industrial retail price contracts in Q3 2020. In September 2020, with the exception of only one EU capital out of the observed 24, prices were lower compared to the same month of the previous year.

1. Gas market fundamentals

1.1 Consumption

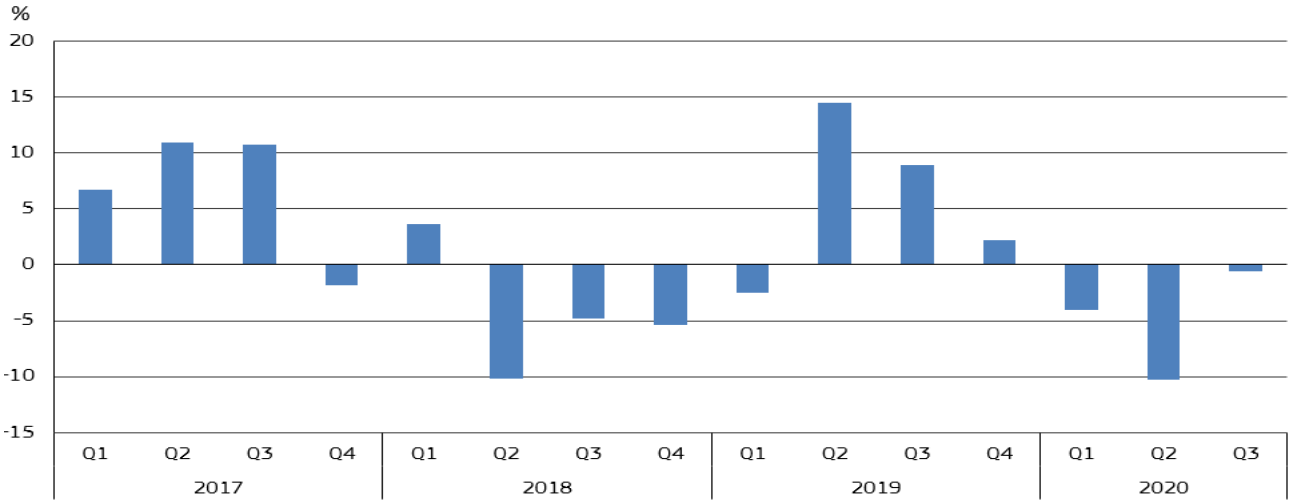
- EU gas consumption[1] in the third quarter of 2020 decreased slightly, by 0.6% in year-on-year comparison, after falling by more than 10% in Q2 2020 and by 4% in the first quarter of the year. In absolute numbers, the quarterly gas consumption in Q3 2020 amounted to an estimated 71.5 bcm, decreasing slightly from 71.9 bcm in Q3 2019, and staying on similar level as in Q2 2020 (71.3 bcm). After the end of the first wave of the Covid-19 pandemic, confinement measures were lifted in most of the EU countries, and this could also be tracked in gas demand for industry. In electricity generation, demand for gas was slightly up, by 0.2% year-on-year (increasing by 0.2 TWh). Weather across Europe in July and August was generally warmer than usual, impacting residential cooling needs by increasing electricity generation from gas-fired sources as well. September 2020 was milder than usual, reducing the eventual heating needs in northern European countries in this early autumn month. As Figure 1 below shows, in the third quarter of 2020 gas consumption in the EU was similar to that in Q3 2019 an was in the upper range of the last five years. In the first three quarters of 2020 gas consumption in the EU amounted to 274 bcm, down by 14 bcm (5%) compared to the same period of 2019.

Figure 1. EU gas consumption



Source: Eurostat, data as of 9 December 2020 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 (%)



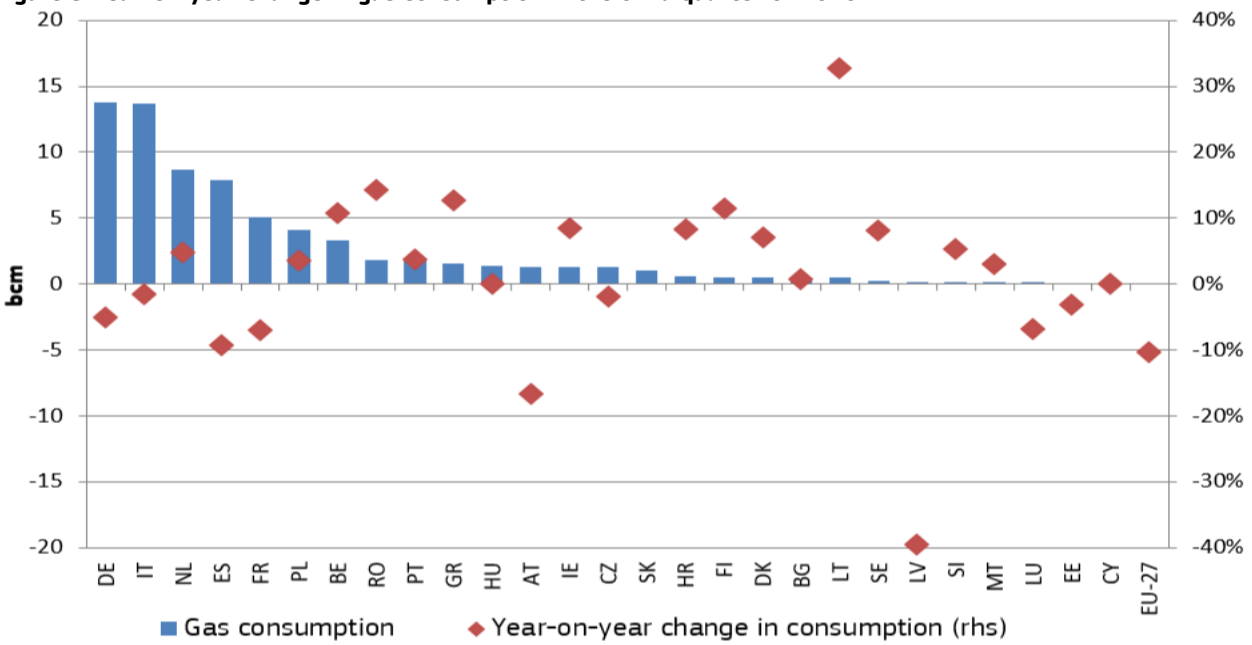
Source: Eurostat, data as of 9 December 2020 from data series nrg_103m. In the next edition of this report numbers might change retrospectively

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

- In the third quarter of 2020, the biggest year-on-year increase in gas consumption could be observed in Slovakia (75%, though representing only an increase of 0.4 bcm) and Lithuania and Romania (respectively representing increases of 32% and 14%, and 0.1 bcm and 0.2 bcm, compared to Q3 2019). Gas consumption, measured in percentages, fell by the most in Latvia (by 40%, 0.1 bcm) and in Austria (by 17%, 0.3 bcm). Among the five biggest gas consumer countries, consumption went down by 9% in Spain (by 0.8 bcm), by 7% in France (0.4 bcm), in Germany by 5% (by 0.7 bcm), by 1.5% in Italy (0.2 bcm), whereas in the Netherlands it rose by almost 5% (0.4 bcm). In the remaining EU Member States the change in gas consumption remained in the range of -10% to +20%, compared to Q3 2019. In the United Kingdom[2] consumption of natural gas went up by 8% (0.9 bcm) in Q3 2020 compared to the third quarter of 2019.

- In the first three quarters of 2020 gas consumption in the EU was down by 5% (14 bcm). The biggest decreases could be observed in Italy (4.6 bcm, or -8%), Germany (3.5 bcm, -5.5%), France (3.3 bcm, -11%) and Spain (3 bcm, -12%), compared with the same period of 2019. In the United Kingdom consumption of gas decreased by 2.3 bcm (-4%) during the same period.

Figure 3 Year-on-year change in gas consumption in the third quarter of 2020



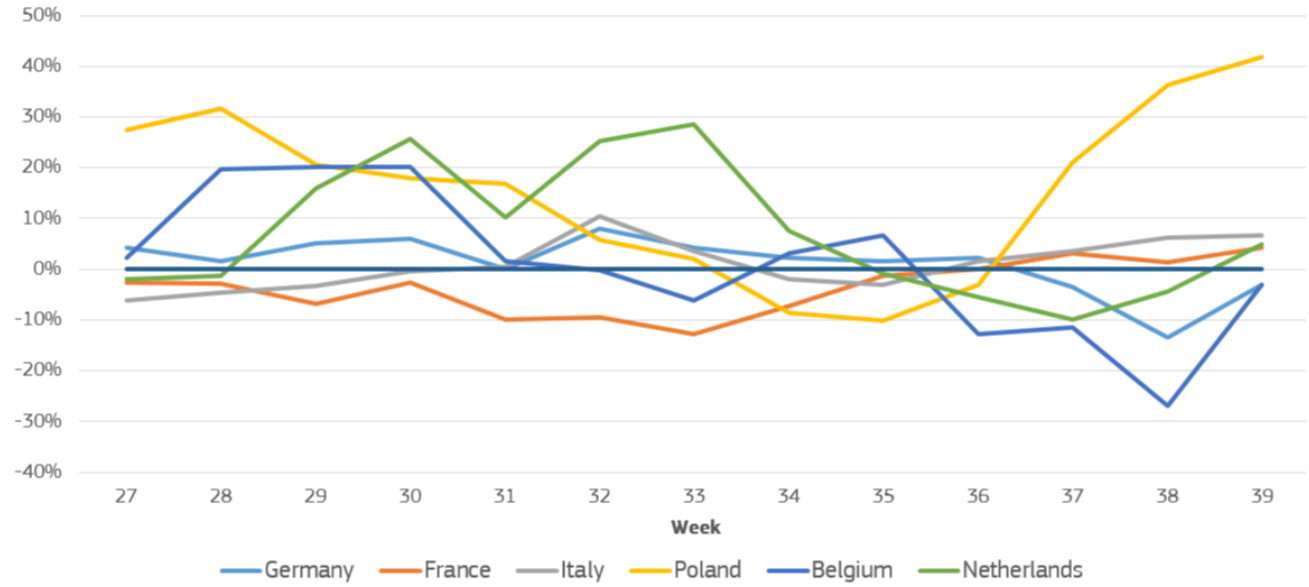
Source: Eurostat, data as of 9 December 2020 from data series nrg_103m. In the next edition of this report numbers might change retrospectively.

- In the third quarter of 2020 confinement measures owing to the Covid-19 pandemic were lifted in most of the EU countries after the end of the first wave of infections, and additional measures were mostly introduced in the fourth quarter of 2020. This resulted in increasing economic activity in Q3 2020, which could be observed in the evolution in demand for energy, including natural gas.

- Figure 4 shows the weekly evolution of demand for gas in the industrial sector and for other non-local distribution companies' customers in some selected EU Member States in the third quarter of 2020. In sharp contrast to the second quarter of 2020, when gas consumption in almost all the EU showed significant decrease, in this quarter the impact of the economic recovery was perceivable, however, in year-on-year comparison there were several weeks in few countries when decrease in gas consumption could be observed.

[2] The United Kingdom has in many respect still much relevance for the European gas market, therefore developments in this country are often mentioned in the text

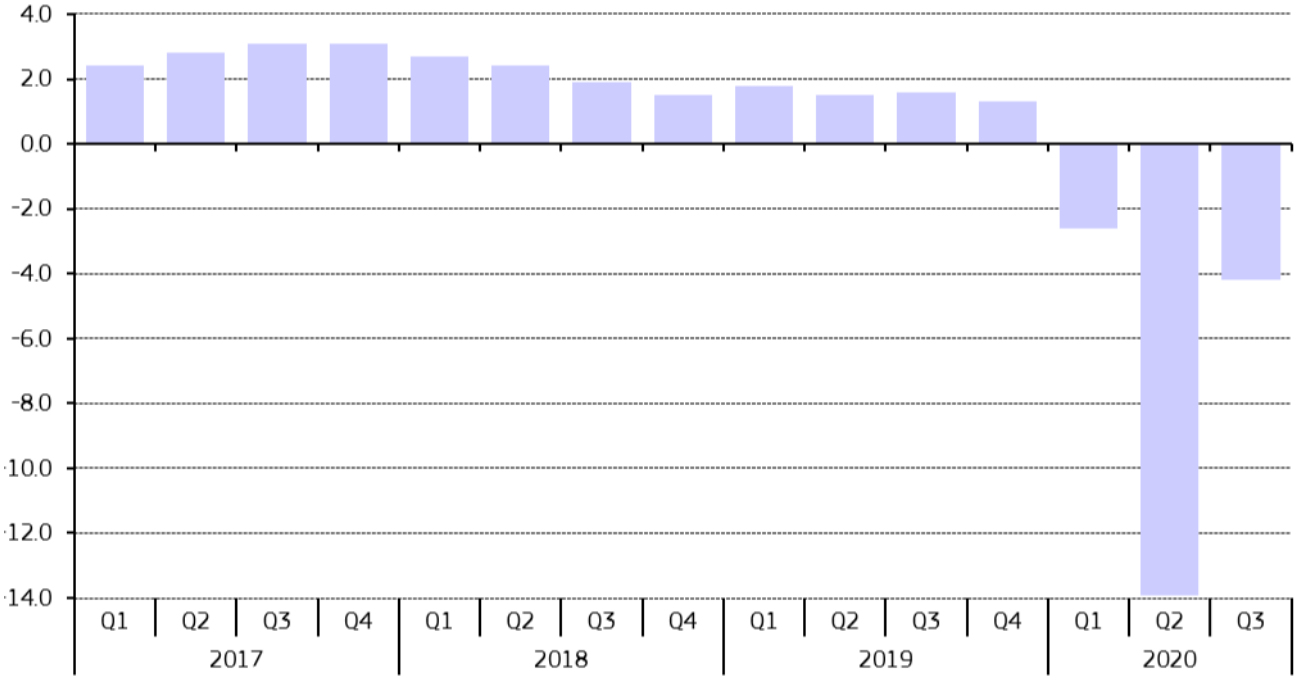
Figure 4 Change in weekly consumption of natural gas for industrial and non-households customers in Q3 2020 in some EU countries, as compared to the same week of the previous year



Source: S&P Global Platts Eclipse, own computations. The chart shows in different countries change in gas consumption in the industry or customers supplied by non-local distribution companies, an approximation of non-household consumers, therefore the numbers are not fully comparable across countries.

- In the third quarter of 2020, though showing an upturn of 11% compared to the previous quarter, following a similar magnitude of decrease in Q2 2020, GDP in the EU-27 was still down by 4% in year-on-year comparison[3], probably signalling that the deepest period of the economic recession was over, as in Q2 2020 the annual decrease of GDP was 14%. As the drop in the economic activity was steeper than the decrease in demand for natural gas, it can be assumed that the consumption of some other fossil fuels (e.g.: oil and petroleum products) fell even more steeply than that of natural gas.

Figure 5 Change in EU27 GDP, in year-on-year comparison %)

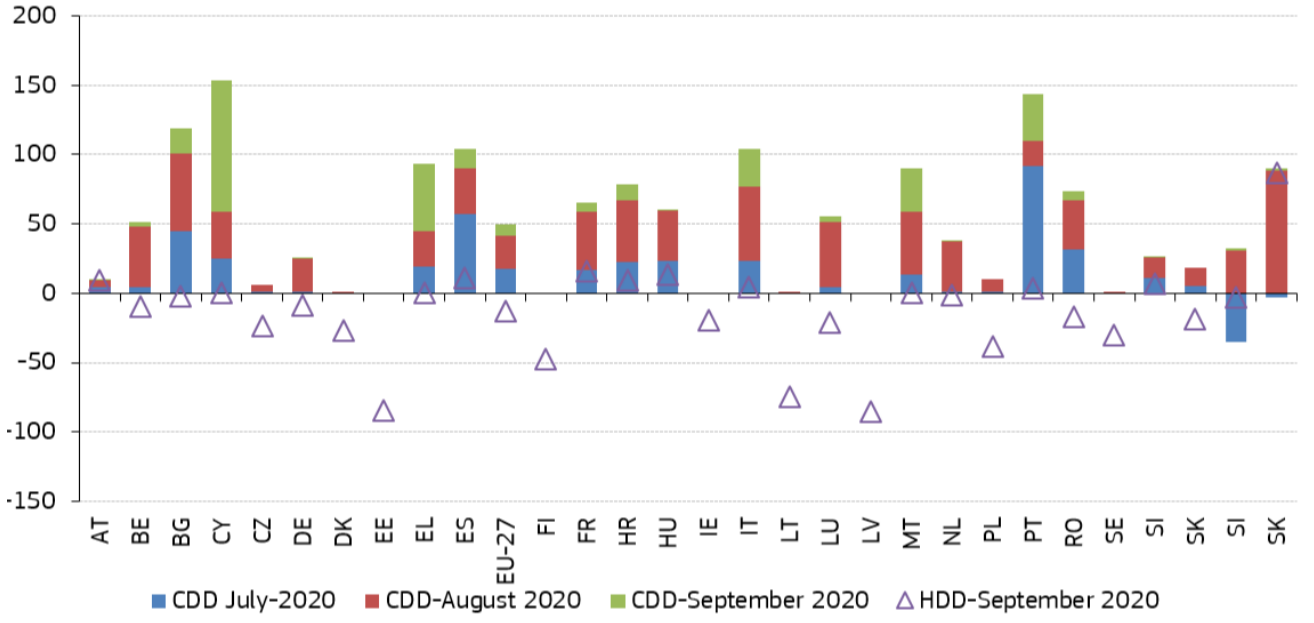


Source: Eurostat, data as of 8 December 2020 from data series namq_10_gdp - Seasonally and calendar adjusted data

[3] Source: Eurostat, data as of 8 September 2020 from data series namq_10_a10; seasonally and calendar adjusted data

- Figure 5 shows the deviation of actual cooling degree days (CDDs) from the long-term average[4] in individual EU Member States in the third quarter of 2020, along with the deviation of the actual heating degree days (HDDs) from the long term average in September 2020. In most of the EU countries, the third quarter of 2020 was warmer than usual, implying increasing demand for cooling in the residential sector, which translates into increasing demand for electricity and probably for electricity generated from natural gas. September 2020 was milder than usual in most of the EU, which could result in less demand for gas heating at the beginning of the autumn, especially in countries of northern and central Europe. At the same time, September 2020 was warmer in most of southern European countries, implying higher need for residential cooling.

Figure 6 Deviation of actual heating degree days from the long-term average in the third quarter of 2020



Source: Joint Research Centre (JRC), European Commission

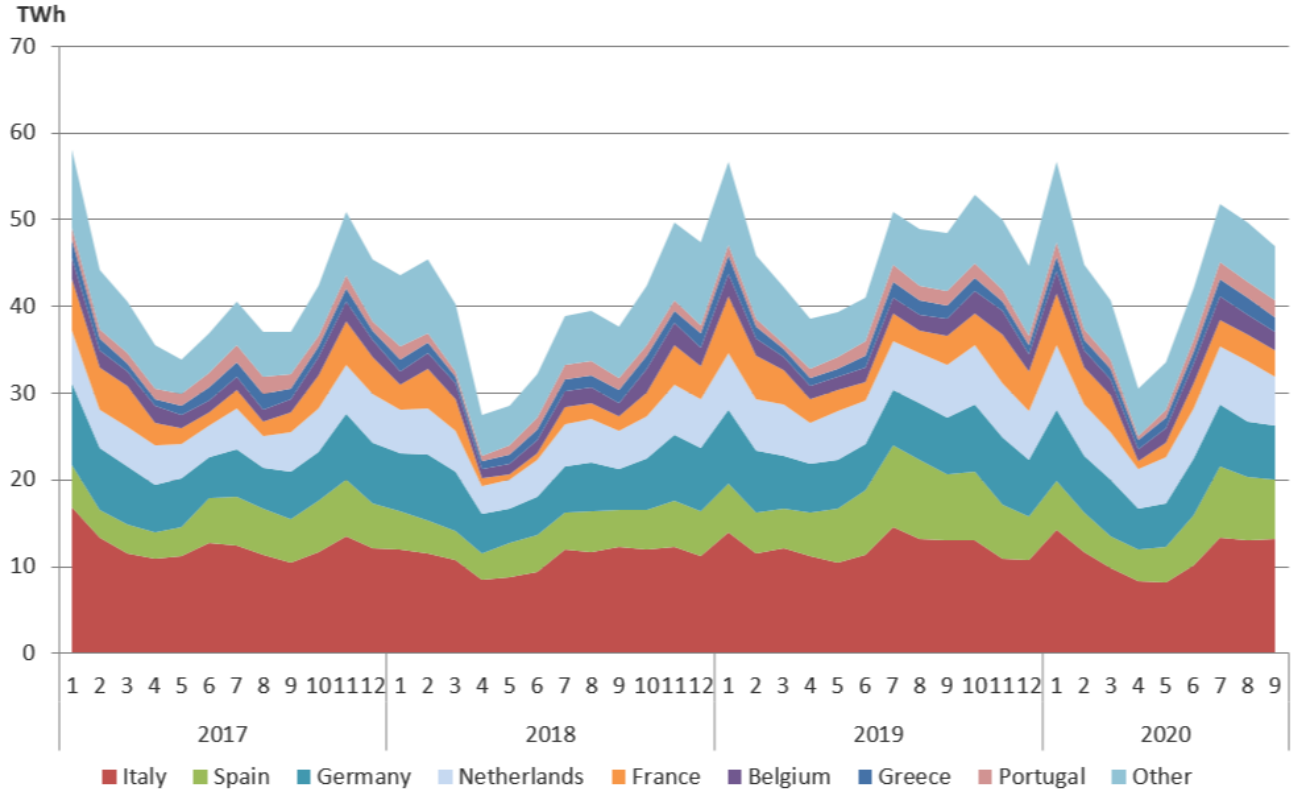
- Based on data from ENTSO-E, gas-fired power generation was slightly up, by 0.2% in the third quarter of 2020 in the EU, compared to the same period of 2019. In absolute terms, electricity generated from gas rose by 0.2 TWh year-on-year, as Figure 7 shows. In Q3 2020 gas wholesale prices recovered from the historical lows measured in the previous quarter, and by the end of September 2020 they reached similar levels to that at the end of 2019. Increasing gas prices were not favourable to generation costs and profitability of gas fired generation. In year-on-year comparison the share of renewables in the EU power generation mix rose further in Q3 2020. Wind, solar, biomass and hydro together represented around 37% of the EU power mix, leaving only a smaller share for gas (around 24%). Power generation from solid fuels extended its falling trend, decreasing by more than 10% compared the same period of 2019[5]. Nuclear generation was also down by 16% in Q3 2020 year-on-year in the EU. Carbon prices remained relatively stable in the third quarter of 2020, reaching 27.4 €/t_{CO2e} on average, which high level did not contribute either to the competitiveness of coal and lignite in EU power generation.

- In Q3 2020 the amount of electricity generated from gas fell in Spain by 15% in year-on-year comparison, in Italy it decreased by 3%, whereas in France it was down by 1%. At the same time there was an increase of 3% in Germany, whereas in the Netherlands and Belgium gas-fired generation rose respectively by 10% and 29%. Besides demand side factors, the role of gas was impacted by changes in the local power generation mixes. In Spain rise in electricity generation from hydro, solar and wind contributed to the replacement of gas in the local mix, whereas coal-fired generation practically halved year-on-year in Q3 2020. Nuclear power generation decreased measurably in France, Belgium and Germany, whereas in the Netherlands it rose slightly and in Spain it remained stable. In Germany renewable generation decreased with the exception of solar, and besides dwindling solid fuel and nuclear generation gas-fired generation rose slightly in Q3 2020 in year-on-year comparison. In France gas-fired generation decreased slightly amid falling coal and nuclear generation and increasing hydro and renewables. In the Netherlands decreasing hydro and coal-fired generation was compensated by increasing renewables and gas, and in Belgium falling nuclear and coal-fired generation was replaced by increasing gas, hydro and renewable sources in the local electricity mix in Q3 2020.

[4] Long term average temperatures, heating and cooling degree days refer to the period between 1978 and 2018

[5] See more information in Quarterly Report on the European Electricity Markets, Vol. 13, Issue 3

Figure 7 Gas-fuelled power generation in the EU



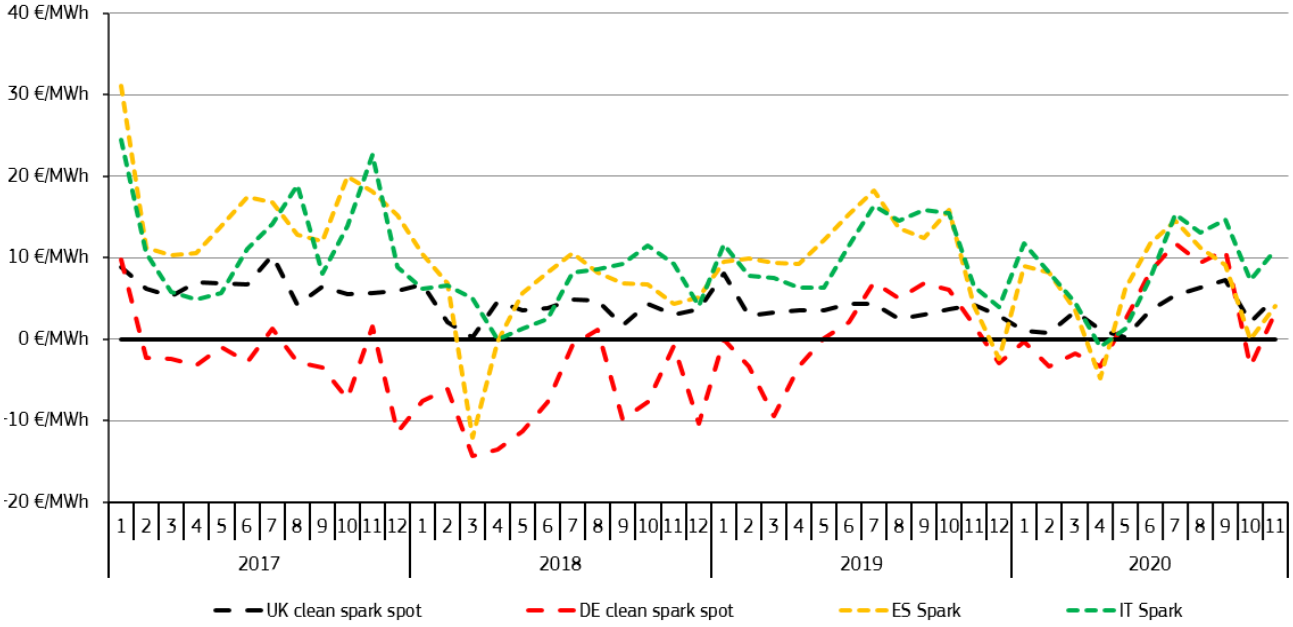
Source: Based on data from the ENTSO-E Transparency Platform and national data sources, data as of 14 December 2020

- Clean spark spreads – measuring the profitability of gas-fired generation by taking into account variable costs – reached respectively 10.7 €/MWh, 11.6 €/MWh and 14.4 €/MWh in Germany, Spain and Italy in Q3 2020, all the three higher than in the previous quarter, implying an improving profitability of gas-fired generation[6] in the biggest markets of continental Europe (See Figure 8[7]). Although gas prices underwent a measurable recovery in Q3 2020, wholesale electricity prices also increased in parallel with the general positive trend on energy markets, and with stable emission allowance prices, this achievement ensured the profitability of gas-fired electricity generation. Higher clean sparks spreads in Spain and Italy, compared to Germany, was primarily owing to higher wholesale electricity prices in these two markets.

- In the United Kingdom, also having relevance for the European gas market, clean spark spreads averaged 6.4 €/MWh in Q3 2020, increasing from 1.5 €/MWh measured in Q2 2020. Similarly to the continental markets, profitability of gas-fired generation improved in the UK. Improving profitability was also reflected in the UK power mix in Q3 2020 as well, as decreasing nuclear, solar and hydro generation was replaced by increasing gas (+5% year-on-year) and wind energy.

[6] Assuming an average gas power plant efficiency, see more in the Glossary
[7] Charts of clean spark spreads can also be found in the Quarterly Report of European Electricity Markets (Vol. 13, Issue 3). Data on the share of gas in electricity generation come from the database of ENTSO-E

Figure 8 Clean spark spreads in Germany, Spain, Italy and the United Kingdom



Source: Bloomberg

1.2 Production

- In the third quarter of 2020 EU gas production reached approximately 11.5 bcm[8], 29% (4.7 bcm) less than in the same quarter of 2019 (See Figure 9). During the whole Q3 2020, similarly to the previous two quarters, gas output was below the 2015-2019 range, reflecting the dwindling trend of gas production in the EU.

- In the biggest EU producer Netherlands natural gas production in Q3 2020 decreased significantly, by 41% (by 3.1 bcm), amounting to 4.4 bcm, which was the lowest in the last seven years. According to the announcement of the Dutch government on 22 September 2020, the production cap for the Groningen gas field is set to 8.1 bcm[9] for the 2020 gas year (1 October 2020 to 30 September 2021). In the previous gas year the production cap was set to 11.8 bcm (1 October 2019 to 30 September 2020), which was supposed to decline further to 9.3 bcm as of 1 October 2020, however, the Dutch government announced a sharper than expected cut, in order to curb earthquakes and accommodate gas supply to the Covid-related decreasing demand.

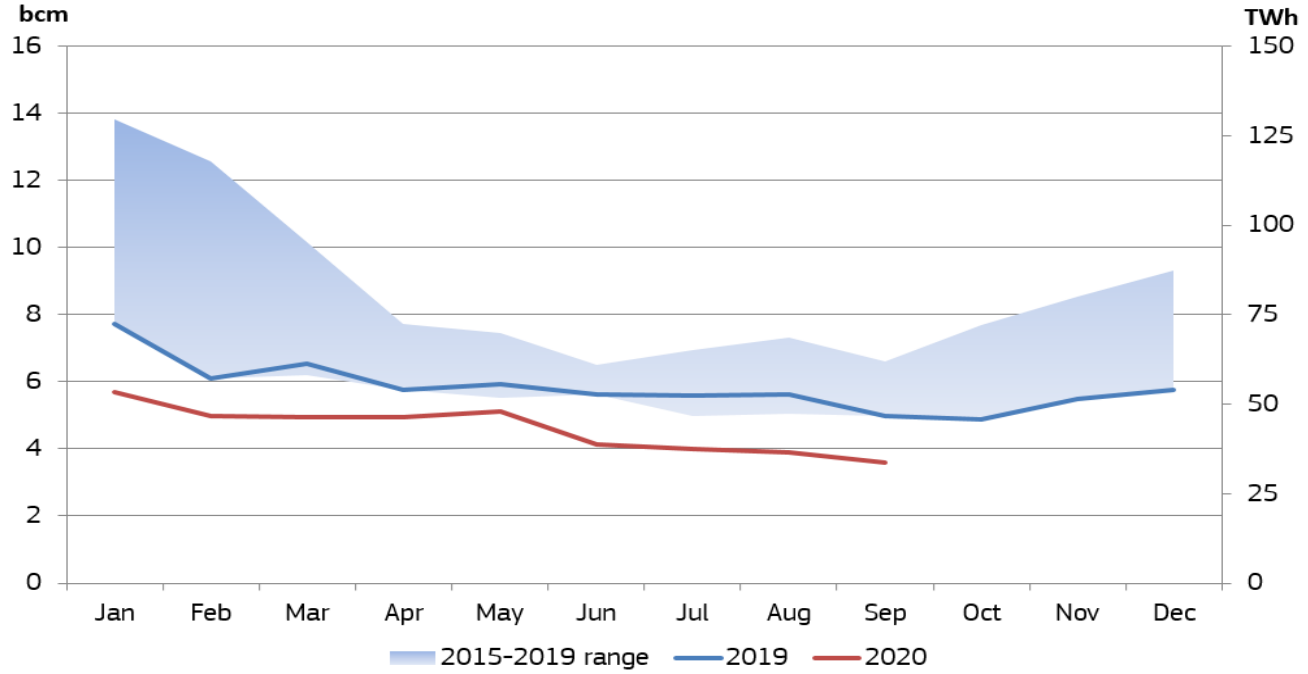
- In Romania, being the second biggest gas producer in the EU, production went down by 16% (0.4 bcm), falling to 2 bcm in Q3 2020, which was similar to the production level of the previous quarter and was close to the lowest in the last seven years. Gas production remained stable in Poland in and amounted to 1.4 bcm. In Germany, Italy and Ireland, where production respectively amounted to 1.1 bcm, 0.9 bcm and 0.5 bcm in Q3 2020, year on year decreases varied between 18% and 25% and production went down by 0.2-0.3 bcm. Gas output in Denmark showed a very strong decrease (by 58%, 0.4 bcm year-on-year, principally owing to the suspension of production at the Tyra fields in the Danish North Sea, ahead of the redevelopment[10] until 2022). The country produced 0.3 bcm of gas in Q3 2020.

- In the first three quarters of 2020 gas production in the EU amounted to 41.3 bcm, down from 53.9 bcm in the same period of 2019. The Netherlands produced 18.4 bcm gas (vs. 26.2 bcm a year before), followed by 6.6 bcm in Romania (7.5 bcm in the same period of 2019) and by Germany (3.7 bcm vs 4.3 bcm a year before).

- Gas production in the United Kingdom amounted to 9.1 bcm in Q3 2020, slightly (-1% and 0.1 bcm) less than in Q3 2019, whereas in the first three quarters of 2020 it produced 29.9 bcm (vs 29.1 bcm a year before). Gas production in Norway increased by 13%, from 23.7 bcm in Q3 2019 to 26.7 bcm in Q3 2020, in spite of a long maintenance outage at the Langeled field as of mid-August. In the first three quarters of 2020, gas production in Norway reached 83 bcm, slightly down from 85 bcm in the first nine months of 2019.

[8] Given that in some countries data for some periods are based on estimation, this number might retrospectively change
[9] https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/100920-gas-production-at-dutch-groningen-field-drops-by-half-in-gy-19
[10] https://dk.total.com/total-denmark/better-energy-projects-denmark/tyra-redevelopment-tyra-gas-field-processing-90-nations-gas-production

Figure 9 Monthly gas production in the EU



Source: Eurostat, data as of 9 December 2020 from data series nrg_103m. In the next edition of this report numbers might change retrospectively.

1.3 Imports

- According to Eurostat[11], net imports decreased by 6% in the third quarter of 2020 (year-on-year), as gas consumption remained practically stable, domestic production in the EU decreased and less intensive gas storage refilling needs resulted in lower demand than in Q3 2019. Net imports in different EU countries showed a high variation in Q3 2020, ranging from a decrease of 59% (in Austria) to an increase of 136% (in Malta, though by marginal value, 0.1 bcm) and in the Netherlands (by 81%, 3.3 bcm) in year-on-year comparison. Among big gas consumer countries net imports decreased in Romania (40%), Spain and Germany (15% both), France (13%), Italy (7%), whereas in Netherlands it rose significantly (by 81%). In Poland net imports rose only slightly, by 3% in Q3 2020 year-on-year.

- In the third quarter of 2020, the total net extra-EU gas imports reached 76.7 bcm, down by 6% (5 bcm) from 81.7 bcm in the same period of 2019. The five biggest importers in the EU were Italy (16 bcm) and Germany (14 bcm), Spain (9 bcm), France (8 bcm), and the Netherlands (7 bcm), representing together more than 70% of the total EU net gas imports in Q3 2020. In the first three quarters of 2020, total net gas imports in the EU amounted to 242 bcm, down from 265 bcm in the same period of 2019.

- According to ENTSO-G data, net imports amounted to 846 TWh in the third quarter of 2020, of which 78% through pipelines and 22% through LNG terminals. Pipeline gas imports from Russia, similarly to the previous quarter, fell significantly, by 20% in year-on-year comparison, as gas transit through the Ukrainian route was much lower compared to the same period of 2019. Pipeline gas imports from Algeria, in contrast to the previous quarters, rose by 26% in Q3 2020, while that from Libya fell further, by 28%. Imports from Norway were up by 15% in Q3 2020 in year-on-year comparison. At the same time, LNG imports, decreased by 15% year-on-year (after going down by 3% on the previous quarter), and reached 185 TWh in Q3 2020.

- Russia remained the top gas supplier of the EU, however, the share of Russian pipeline gas in the extra-EU gas imports fell to 41% in the third quarter of 2020, down from 48 % in Q3 2019, and close to the lowest in the last six years reached in the preceding two quarters[12].

- Pipeline gas imports from Norway increased measurably, by 15% year-on-year in the third quarter of 2020, in consequence the country's share in extra-EU gas imports rose to 25%[13], compared to Q3 2019, when it was only 20%. In the third quarter of 2020

[11] Net imports equal imports minus exports and do not account for stock changes.
[12] It is worth to note that Russia increased its importance in the EU LNG imports as well over the last two-three years, numbers presented in this section, with the exception of LNG or unless otherwise indicated, refer to pipeline imports
[13] Note that Norway to UK flows reported by ENTSO-G includes some gas from UK offshore fields, resulting in an overestimation of Norwegian imports.

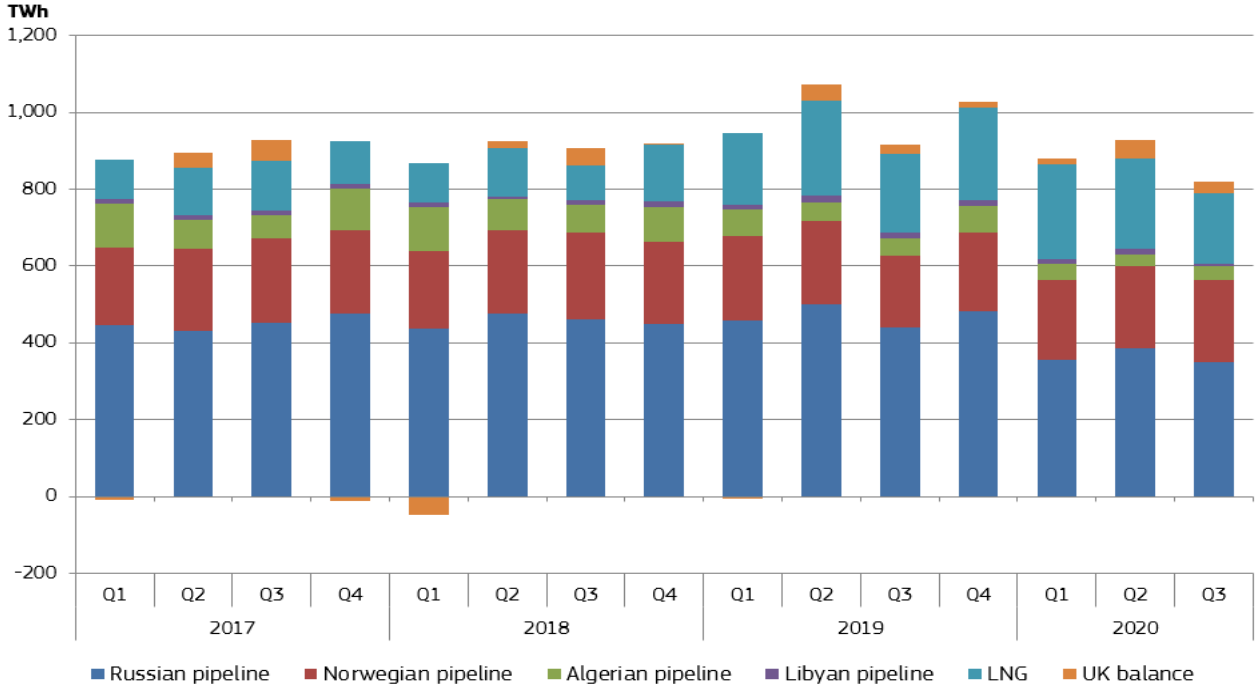
Norwegian gas production[14] amounted to 26.7 bcm, increasing by 13% year-on-year. It seems that decreasing share of the Russian pipeline gas was compensated by gas from Norway, as due to LNG cargo cancellations the dynamic increase in the share of LNG in the total EU gas imports came to a halt in the second and third quarters of 2020. Increasing wholesale gas prices also gave a support to the profitability of gas production in Norway.

- In the third quarter of 2020 pipeline gas imports from Algeria recovered, up by 26% year-on-year, which resulted in an increasing share within the total extra-EU imports (7% in Q3 2020 vs. 5% in Q3 2019). As the impact of the falling oil prices in the first half of 2020 started to appear in the oil indexed Algerian import prices in Q3 2020, owing to contractual obligations on gas shipment volumes to fulfil before the end of each year, imports went up in Q3 2020 and we could expect the same in the remaining period of 2020. Imports from Libya continued to fall (-28% in Q3 2020 compared to the same period of the previous year), and its share was only 1.3% in the total EU gas imports.

- In Q3 2020, Norwegian pipeline import gas took back its second position contested by LNG during the last few quarters, as its share in the EU gas imports (25%) was higher than that of the LNG (22%). The share of LNG was practically the same in Q3 2020 as a year before, however, it lose more than 6 percentage points compared to Q1 2020, reflecting the impact of cancellation of LNG shipments in Q3 2020, owing to low gas demand across the European markets.

- In the three quarters of 2020 gas imports in the EU fell by 10%, in year-on-year comparison, as result of 22% less import from Russia, an increase of 2% in Norwegian imports, whereas gas imports from Algeria and Libya fell steeply (both by 20%). LNG imports remained practically unchanged in the same period.

Figure 10 EU imports of natural gas by source, 2017-2020

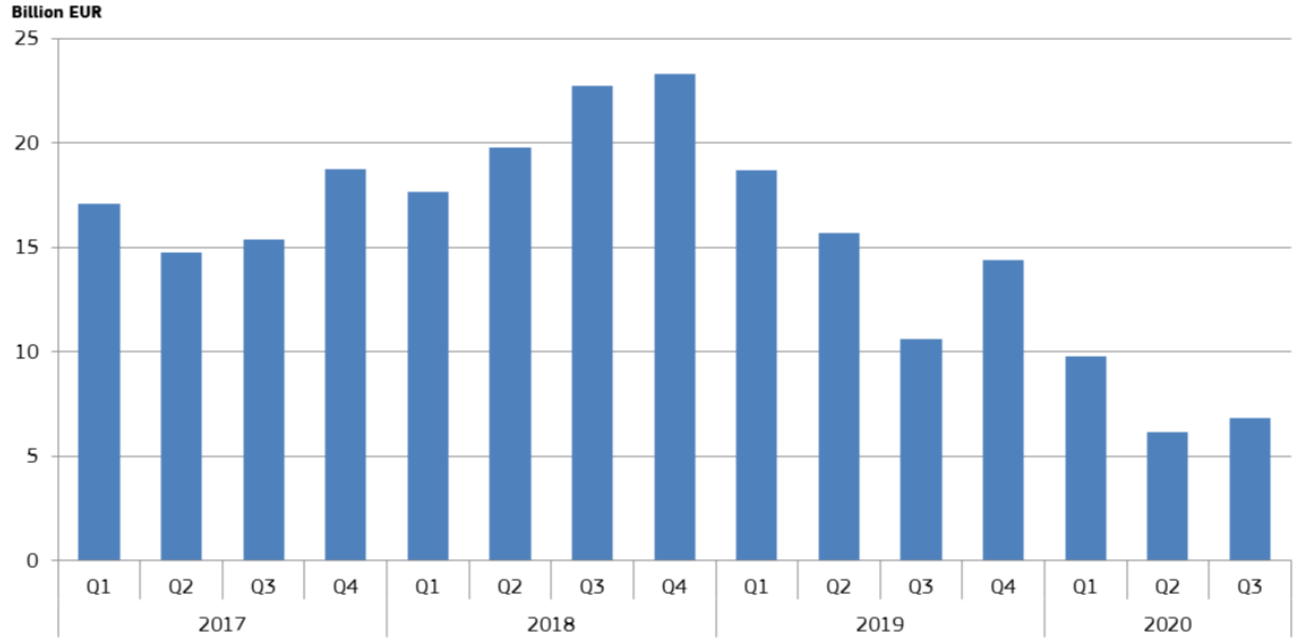


Source: Based on data from the ENTSO-G Transparency Platform, data as of 10 December 2020.
Exports to the Baltic-states and Finland are not included in the chart owing to unavailability of reliable data
Russia, Norway, Algeria and Libya include pipeline imports only; LNG imports coming from these countries 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..).

- Due to decreasing import volumes and falling average import prices, in the third quarter of 2020 the estimated gas import bill fell to as low as €7 billion, (in comparison to €10.6 billion in Q3 2019, falling by 34% year-on-year). Wholesale gas prices in Europe, albeit recovering from the historic lows in Q2 2020, were still lower by 28% in Q3 2020 year-on-year. The quarterly gas import bill however was slightly up in Q3 2020 compared to the previous quarter (€6.2 billion). In the first three quarters of 2020 the total gas import bill was €23.1 billion, down from €45 billion in the same period of 2019.

[14] https://www.npd.no/en/facts/news/Production-figures/2020/production-figures-march-2020/

Figure 10 – Estimated quarterly extra-EU gas import bill, in billions of euros

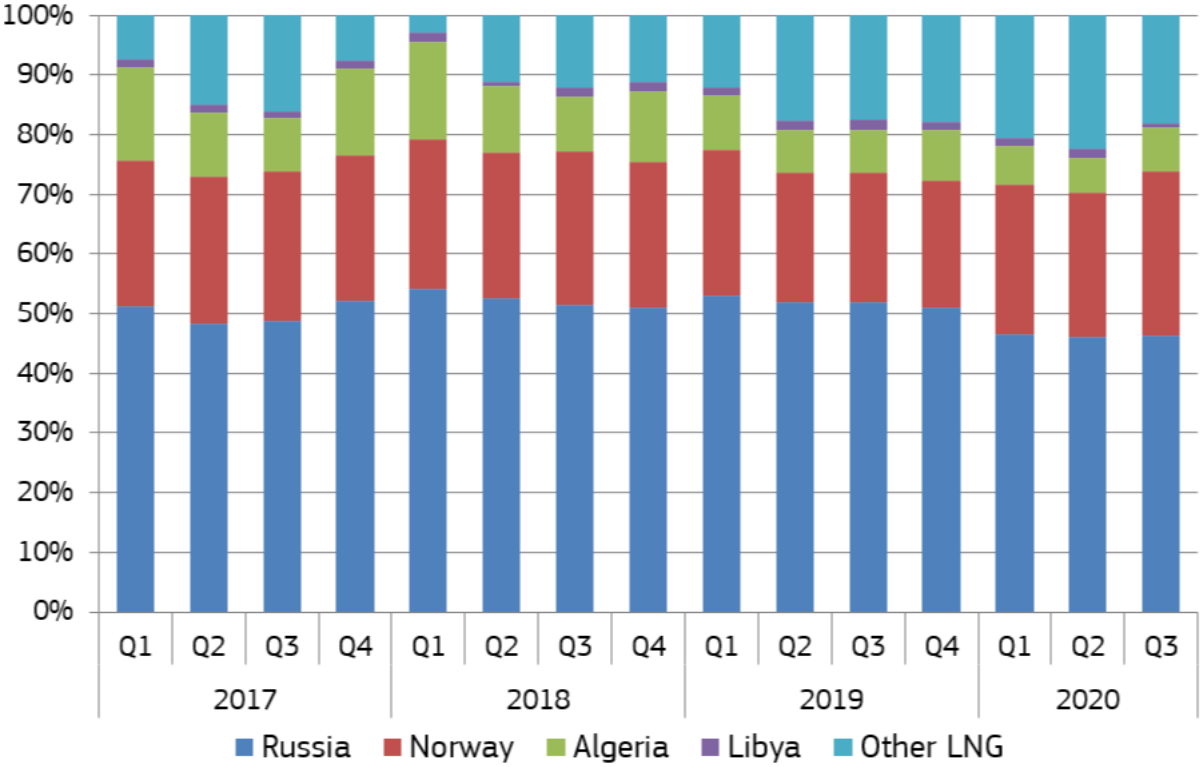


Source: ENTSO-G, Eurostat and own data calculations for the EU weighted average of import gas prices

- As the importance of LNG in the EU gas market, even with temporal setbacks, increased over the last few years and important pipeline gas source countries, such as Russia, Norway and Algeria are also active on the LNG market, it is worth to look at the combined imports of pipeline gas and LNG from these countries and to calculate the share of import sources in this way, too. As Figure 11 shows, the share of Russia within total extra-EU gas imports (pipeline and LNG together) amounted to 45% in Q3 2020, split by 41% of pipeline imports and 4% of LNG, indicating that Russia is also an important actor in European LNG imports, not only in the traditional pipeline gas supply. Russia is trying to maintain its market share by switching to a more competitive export strategy, integrating EU benchmarks in the contract price formation formula, for both pipeline gas and LNG contracts. Whereas between the third quarters of 2019 and 2020 the share of pipeline import gas of Russian origin went down from 48% to 41% within the total extra-EU gas imports, by taking into account LNG the share of Russia decreased from 52% to 45%.

- The share of Norway was 27% in Q3 2020 (vs. the aforementioned share of 25% for the pipeline imports only), and the share of Algeria is 9.6% with LNG (as opposed to 7% only including pipeline gas). The share of LNG in the total extra-EU imports was 18%, (on the top of LNG accounted in shipments from Russia, Norway and Algeria). The import share of LNG was similar to that in Q3 2019, however, compared to the second quarter of 2020 it fell by almost 5 percentage points. It seems that the decrease in the share of Russia was mainly compensated by the increasing gas imports from Norway and Algeria, and the share of LNG did not change year-on-year.

Figure 11 – 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 10 December 2020.

1.3.1.Pipeline imports from Russia and EU supply to Ukraine

- Figure 12 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 (mainly the Yamal pipeline), Nord Stream and TurkStream.

- In the third quarter of 2020 the volume of Russian imports fell by 20%, if compared with the same quarter of 2019. As shown on Figure 12, gas flows transiting Ukraine were 57% lower than in Q3 2019. During Q3 2020 a monthly average of 2.5 bcm of gas of Russian origin was transited through Ukraine, whereas in Q3 2019 the average monthly transit volume was 5.7 bcm. This steep fall in transited volumes though Ukraine, especially in the month of September, must have been related to maintenance works on the Budnice interconnector between Ukraine and Slovakia, in the period of 1-22 September 2020. In the first nine months of 2020 around 25 bcm gas was transited through Ukraine (by the end of November the total transit amount was still barely around 34 bcm), which is worth to compare with the contractual obligation of 65 bcm for 2020.

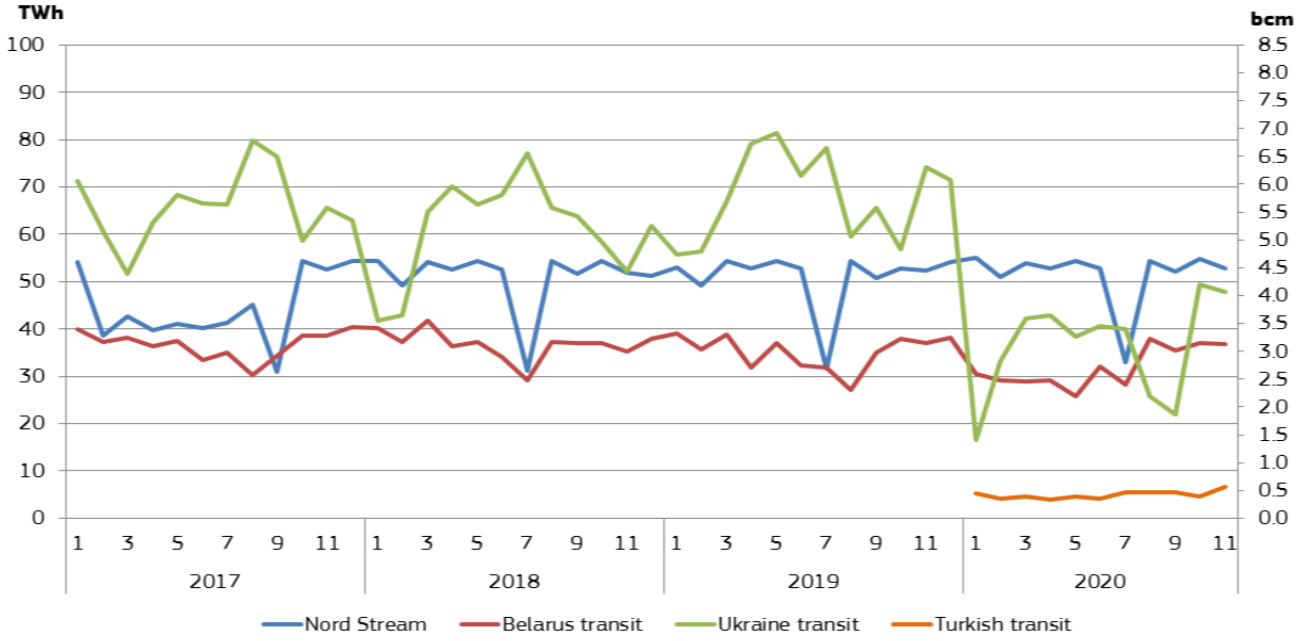
- Flows through Belarus were up by 8% in Q3 2020 compared to the same quarter of 2019. Between 6 and 11 July 2020 there were maintenance works on the Yamal pipeline as well, however, this could not really impact the quarterly transited volume. Transited volumes through the Nord Stream were up by 2% in Q3 2020 year-on-year. Between 14 and 27 July 2020 maintenance works were carried out on Nord Stream, practically in the same period as in 2019.

- As a result, in Q3 2020 the share of the transit through Ukraine was down in year-on-year comparison, reaching only 25%, compared to 47% in Q3 2019. Nord Stream remained the main supply route of Russian gas to Europe, as its share reached 40% of the total Russian pipeline gas imports in Q3 2020 in the EU, up from 34% a year earlier. The Belarus transit route represented 29% in Q3 2020, up from 22% in Q3 2019. For the first time, even the share of the Belarus transit route was higher than Ukraine, implying that once the most important transit route was only the third in transited volumes in Q3 2020. It seems that the European demand decrease for Russian gas principally impacts the Ukrainian transit route. The share of Turk Stream was still lower, around 5% in Q3 2020 (even slightly up from 3% ibn Q2 2020 and 4% in Q1 2020).

- In Q3 2020 Nord Stream represented 17% (13 bcm) in the total net extra-EU imports, the Ukrainian transit had a share of 11% (8 bcm), and the Belarus transit route ensured 13% (10 bcm). At the same time, the TurkStream had a share of less than 2%, with slightly more than 1.6 bcm gas transit within the total net extra-EU gas imports in Q3 2020. In the three quarters of 2020 39 bcm of gas was transited through Nord Stream, 25 bcm gas was transited through Ukraine, 23 bcm though the Yamal pipeline (Belarus) and around 4 bcm through the Turk Stream.

- Amid lower share of pipeline gas imports from Russia, directly competing with LNG imports and pipeline imports from Norway in the European gas market, the importance of transit through Ukraine seems to undergo further decreases, in spite of the existing agreement for the period of 2020-2024, setting a minimum amount of Russian gas transit through the country (65 bcm for 2020). The Trans-Balkan pipeline, which transited Russian gas to the countries of the Balkans coming from the Ukrainian route, now operates as route for the Russian gas coming through the TurkStream, though amid much lower utilisation rate, as low transit volumes through this pipeline indicated.

Figure 12 EU imports of natural gas from Russia by supply route, 2017-2020



Source: Based on data from the ENTSO-G Transparency Platform, data as of 10 December 2020.
Deliveries to Estonia, Finland and Latvia are not included; transit volumes from Russia to the Former Yugoslav Republic of Macedonia and Serbia are excluded. Since the inauguration of Turk Stream flows to Turkey via the Balkans are not significant.

- In the third quarter of 2020, Ukrainian natural gas imports from EU countries amounted to 1.2 bcm in July and August, almost exclusively using the Slovakian route. In September 2020 however, in parallel with the maintenance works on the Budnice Slovak-Ukrainian interconnector, Ukrainian imports fell to 0.1 bcm. In Q3 2020 as whole Ukraine imported 2.4 bcm gas from the EU, down from 5.3 bcm in Q3 2019. Gas storage filling rates were more than 10-20 percentage point higher in Q3 2020 than in the same period of 2019, this also could explain lower gas import needs. In the first three quarters of 2020 total Ukrainian gas imports from the EU amounted to 7.1 bcm, down from 9.9 bcm in the same period of 2019. Over the past few years gas market in Ukraine has evolved in a storage balancing facility, namely if storages are full in the EU, gas traders tend to use Ukrainian storage capacities to store gas.

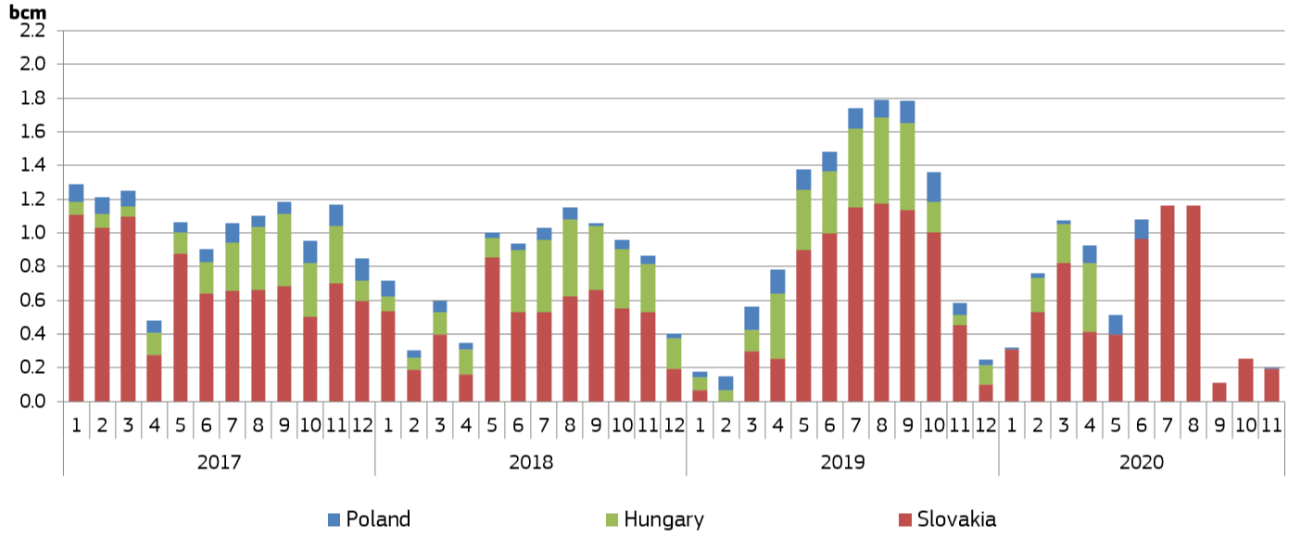
- After significant increase in Q2 2020 traded volumes on Gazprom Electronic Sales Platform (ESP) decreased in Q3 2020, from 8.8 bcm in Q2 2020 to 4.7 bcm in Q3 2020, and in year-on-year comparison the traded volume was also slightly down (from 5 bcm in Q3 2019). In the first three quarters of 2020 the total ESP sales amounted to 21.1 bcm, up from 10 bcm observed in the same period of 2019. By the end of November cumulative ESP sales reached more than 23 bcm.

- In Q3 2020 the principal delivery points from ESP sales were the German Gaspool market (2 bcm delivered), and the Slovakian and Austrian virtual trading point (VTP Slovakia and VTP Austria – 0.7 bcm both), and Olbernhau on the German-Czech border (0.5 bcm).

- After the significant downward revision at the end of April, targeting 167 bcm exports (including Turkey as well), in comparison to the 2019 exports of 199 bcm, Gazprom indicated at the end of summer 2020 that exports to Europe might reach 170 bcm in 2020[15].

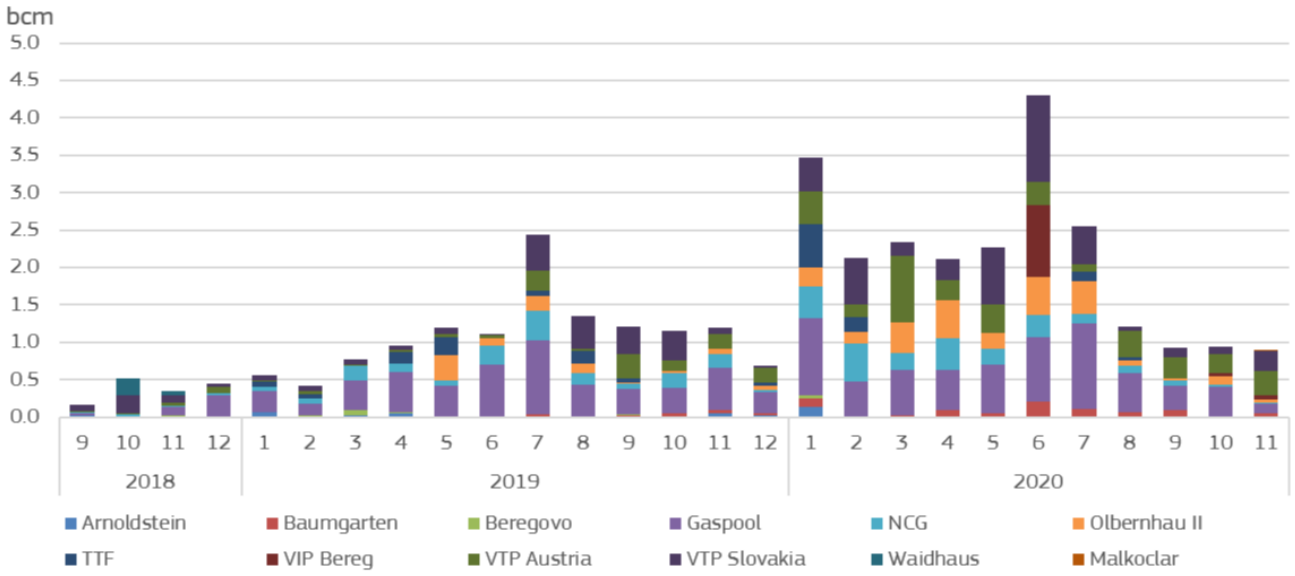
[15] https://tass.com/economy/1195709

Figure 13 – Ukrainian pipeline gas imports from Poland, Slovakia and Hungary



Source: Based on data from the ENTSO-G Transparency Platform, data as of 10 December 2020

Figure 14 – Monthly sales on the Gazprom Electronic Sales Platform (ESP) with delivery points



Source: Gazprom Electronic Sales Platform

1.3.2. LNG imports

After the minor decrease (3%) registered in Q2 2020, LNG imports in the EU fell by 15% in Q3 2020 year-on-year. Looking at the three months of the quarter, EU LNG imports were respectively down by 4% in July, by 18% in August and by 13% in September 2020, in year-on-year comparison. This clearly reflects the impact of cancellation of LNG shipments during summer 2020, which was particularly intensive in the period of June-August 2020, and it especially concerned cargos from the US. The quarterly LNG import in Q3 2020 was 18.5 bcm, decreasing from 21.7 bcm in Q3 2019, as Figure 15 shows. The total number of LNG cargoes arrived in the EU went down from 283 to 235 between the third quarters of 2019 and 2020. With the exception of Poland, LNG imports decreased in all major EU importer countries, and only in Sweden and Finland, both importing minor volumes, could we see an increase in Q3 2020 year-on-year.

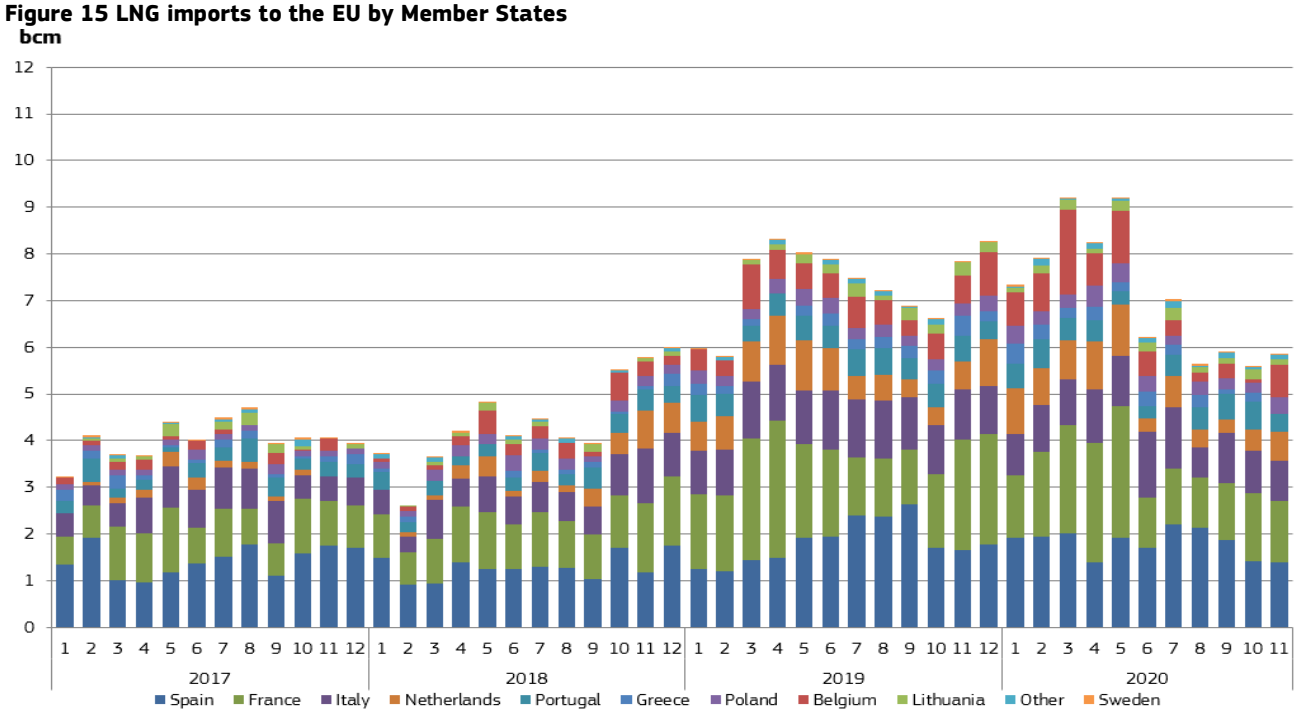
- In Q3 2020 Spain was the biggest importer (with a quarterly import of 6.2 bcm, down by 16% year-on-year), followed by France, importing 3.5 bcm, showing a year-on-year decrease of 5%. Italy was the third biggest importer, (3.1 bcm, falling by 15% year-on-year). Portugal imported 1.5 bcm of LNG in Q3 2020 (down by 8% year-on-year), whereas LNG imports in Netherlands amounted to 1.3 bcm at the same time, decreasing by 8%. In Belgium LNG imports fall by 47% in Q3 2020 and reached only 0.8 bcm, whereas in Poland imports increased by 7% year-on-year, amounting to 0.7 bcm in Q3 2020. Sweden and Finland both imported

only 0.1 bcm of LNG in Q3 2020, respectively up by 148% and 25% compared to Q3 2019. The total EU LNG imports amounted to an estimated €1.6 billion in Q3 2020, down from €2.4 billion a year before, as the result of sharply decreasing LNG import gas prices (decreasing by 23% year-on-year), and decreasing import volumes in Q3 2020. In the first three quarters of 2020 LNG import volumes in the EU amounted to 66 bcm (representing an estimated value of €5.6 billion), similarly to the first three quarters of 2019 (65 bcm, with a monetary value of €10 billion).

- In contrast to the continental Europe, LNG imports in the United Kingdom rose measurably, by 31% in Q3 2020, reaching almost 2.4 bcm. The UK has always been playing an important role as berthing site of LNG vessels for continental Europe and shipments were transported to Europe via gas interconnectors with Belgium and the Netherlands. In the first three quarters of 2020 UK LNG imports reached 13.5 bcm, up from 9.2 bcm in the same period of 2019.

- Over the last one-two years, gas hub prices in Europe remained aligned with their East Asian peers (see Figure 25 and Figure 26). In Q3 2020 LNG price premium of the Asian markets reappeared which also might have impacted LNG imports in Europe. However, the Asian price premium did not seem to be sufficiently big in Q3 2020 that it could measurably result in cargo redirection from Europe towards Asia. Europe has a good geographical position, offering proximity to cargos from the Atlantic Basin, the Middle East and LNG of Russian origin (production at the Yamal Peninsula), resulting in favourable shipment costs.

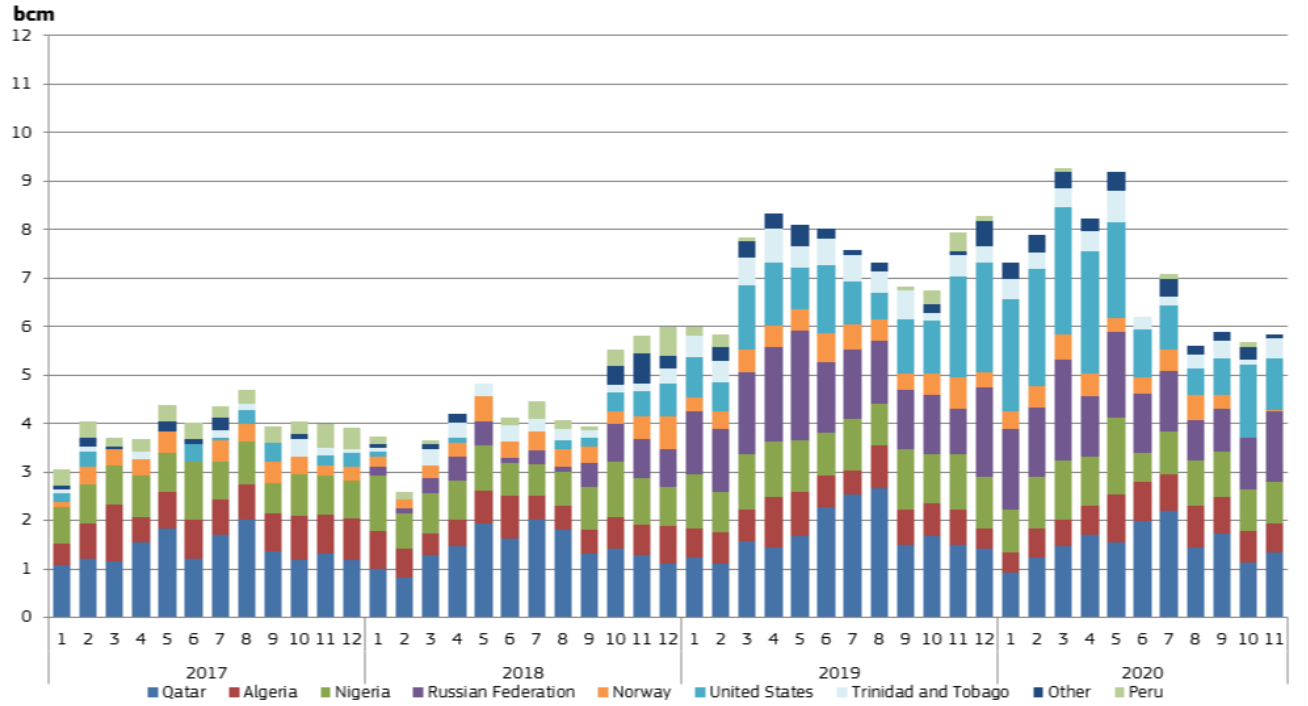
Figure 15 LNG imports to the EU by Member States



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

- In the third quarter of 2020, Qatar became the largest LNG supplier to the EU, having a share of 29% of all LNG imports (7 percentage points up compared to Q2 2020). Russia was the second LNG import source for the EU, with a share of 16% in Q3 2020 (down from 18% in Q2 2020). Nigeria was the third biggest import source in Q3 2020, (with a market share of 15%), followed by Algeria (13%). The United States was only the fifth LNG supplier in Q3 2020 for the EU, ensuring only 12% of the total imports, significantly down from 23% in Q2 2020. This clearly reflect the impact of LNG cargo cancellations, especially those of US origin, implying that European customers have more flexible conditions in their LNG contracts with US suppliers than with other countries (shorter duration of contracts, less take or pay type of provisions, etc.). Following the sudden fall in gas demand in Q2 2020 the most flexible way for European customers to accommodate supply to lower demand was to cancel shipments from the US. In Q3 2020 Norway had a share of 7% in total EU LNG imports, whereas Trinidad and Tobago ensured 5% of imports – See Figure 16.

Figure 16 LNG imports to the EU by supplier



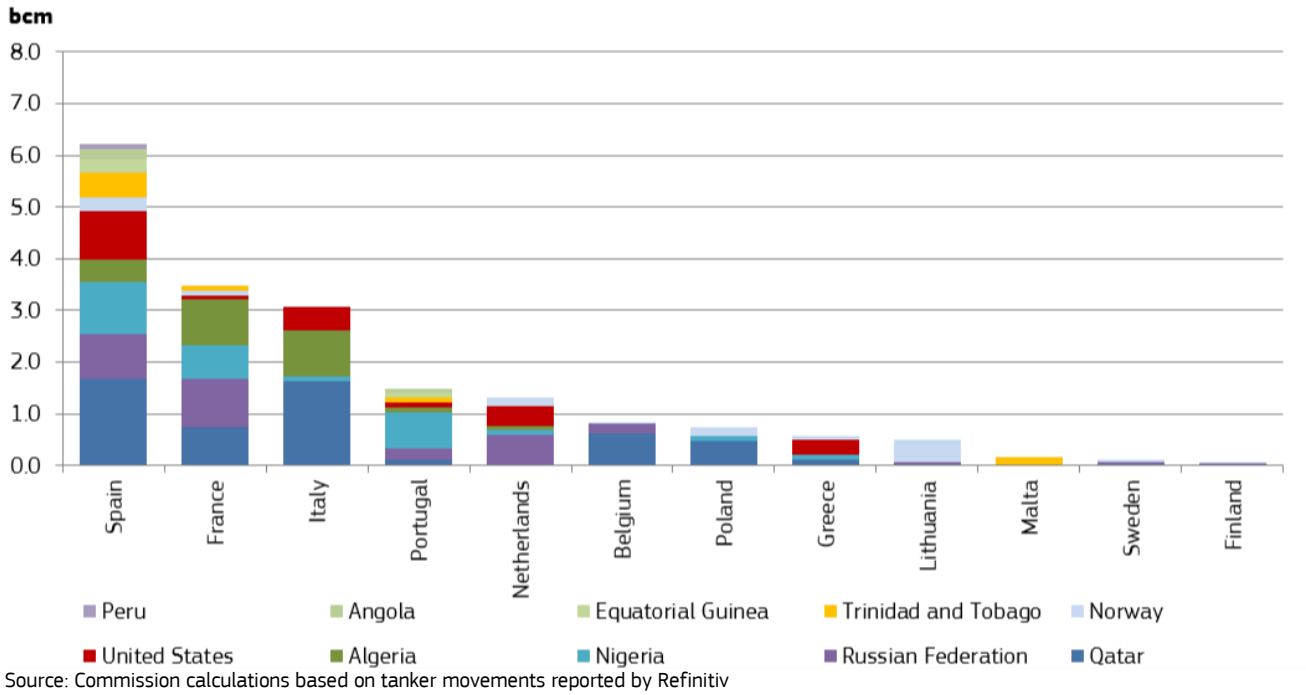
Source: Commission calculations based on tanker movements reported by Refinitiv
Imports coming from other EU Member States (re-exports) are excluded
"Other" includes Angola, Brazil, the Dominican Republic, Egypt, Equatorial Guinea, Oman, Peru, Singapore, the United Arab Emirates and Yemen

- In the third quarter of 2020, Qatar was the biggest supplier of Belgium (77% of the country's total LNG imports), Poland (66%), and Italy (52%). Russia was the biggest supplier of Finland (93%), Sweden (59%), the Netherlands (46%), France (27%), and it came to second place in Belgium (23%), implying that Russian LNG has increasing importance in North-Western Europe, probably not independently from the dwindling domestic gas production in the Netherlands.

- The United States were the biggest LNG supplier of Greece (49%) and it came to the second place in the Netherlands (29%). Nigeria had a share of 47% in the Portuguese LNG imports, whereas its share was lower in France (19%), Spain and Greece (both 16%). Algeria had a share of 29% in Italy and ensured 26% of the French imports in Q3 2020. Norway was the biggest LNG supplier in Lithuania (89%) and the second biggest in Sweden (41%). At the same time, Trinidad and Tobago was the sole LNG supplier of Malta and ensured around 6-8% of LNG imports in Spain and Portugal. In Q3 2020 Spain and France had the most diversified LNG import source structure, receiving cargoes respectively from ten and seven different countries. On the other hand, Malta had a single supplier of LNG sources.

- In Q3 2020, owing to the large-scale LNG cargo cancellations, the US exported less LNG (2.2 bcm) to the EU than Russia (2.9 bcm). However, if demand for LNG once rebounds in the EU, we can expect increasing US exports again, as liquefaction capacities came online over the last few years in the US had low utilisation rates in Q3 2020 and this might provide good opportunities to the US to increase its market share in the EU in the future.

Figure 17 – LNG imports in the EU Member States from different sources in the third quarter of 2020



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

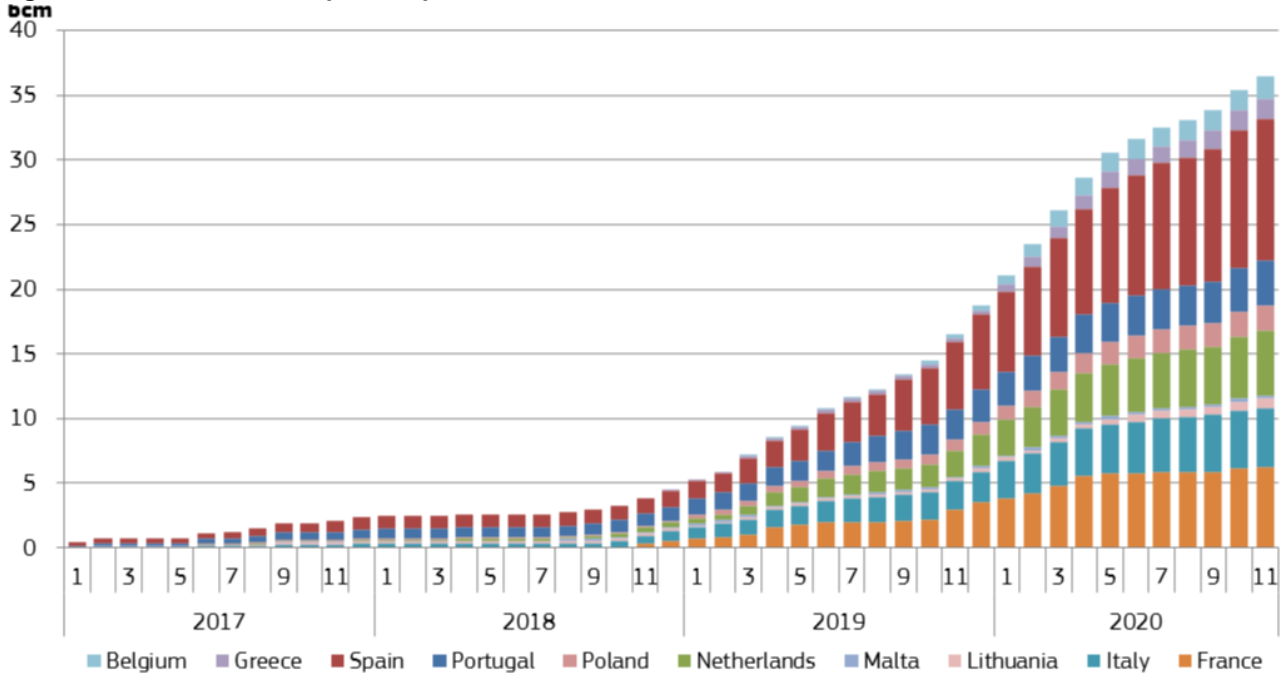
- In the third quarter of 2020 24 LNG cargoes arrived from the US, unloading 2.2 bcm of LNG (in re-gasified form), with an estimated monetary value of €0.2 billion. In the third quarter of 2019 28 US LNG cargoes arrived in the EU (with a total re-gasified volume of 2.6 bcm). In the first three quarters of 2020 the total number of US cargoes was 163, while the total imported volume of LNG from the US amounted to 15 bcm in the EU.

- LNG exports to Europe represented 25% in Q3 2020 of the total US exports, which was lower than in the previous quarter (39%[16]), Implying that US LNG cancellations affected more the European customers than the rest of the world (EU customers used US LNG as flexibility option to reduce gas oversupply). In June, July, August and September respectively 46, 50, 45 and 26 US cargos were estimated to be cancelled[17], though these were not exclusively with European destinations. In the third quarter of 2020 the four most important EU destinations of the US LNG exports were Spain (940 mcm), Italy (452 mcm), France (379 mcm), and Greece (281 mcm). The United Kingdom imported less US LNG in Q3 2020 than in the previous quarter, only 80 mcm.

- In Q3 2020, Russia sent 49 cargoes of LNG to the EU, representing a volume of 2.9 bcm and an estimated monetary value of €0.26 billion. A year before, in Q3 2019 the number of Russia cargoes arriving in the EU was 63, transporting 3.9 bcm LNG in re-gasified form. In the first three quarters of 2020 186 cargoes arrived with 12.4 bcm of LNG from Russia.

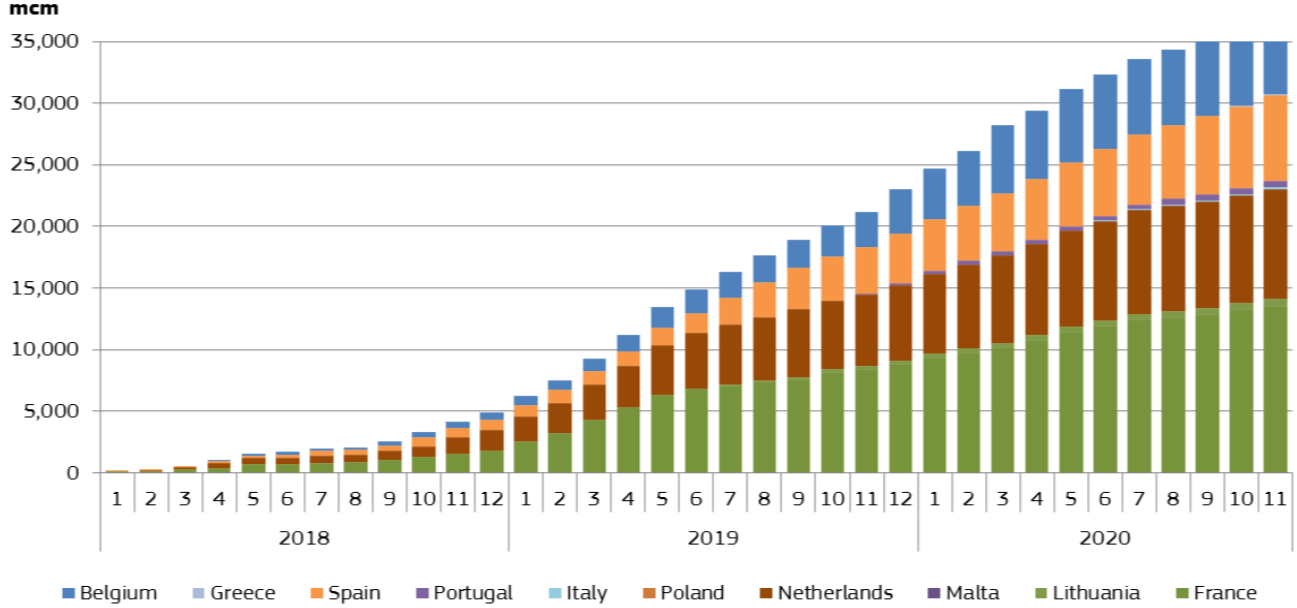
[16] Europe here includes the EU and the UK
[17] See here: https://insights.alerian.com/us-lng-exports-outlook-improves-as-macro-headwinds-ease

Figure 18 Cumulative monthly LNG imports from the US in the EU



Source: Commission calculations based on tanker movements reported by Refinitiv

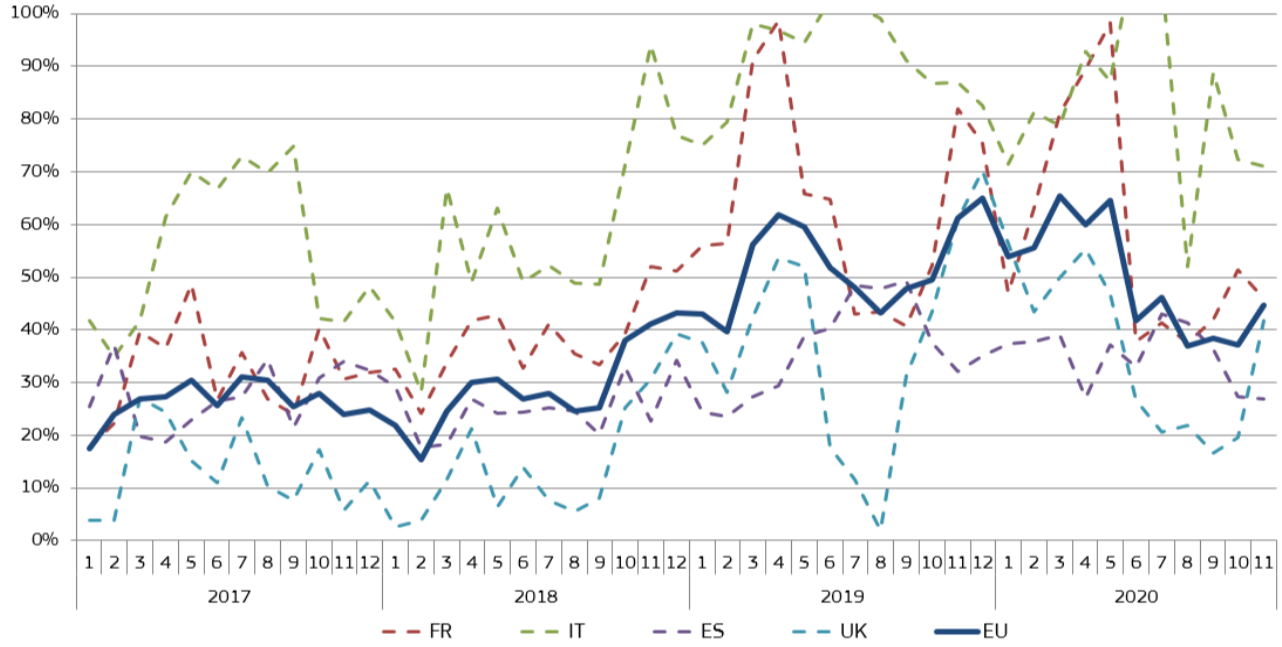
Figure 19 – Cumulative monthly LNG imports from Russia in the EU



Source: Commission calculations based on tanker movements reported by Refinitiv

- The average monthly utilisation rates of terminals in the LNG importing EU Member States are presented on Figure 20 for some countries in the EU, the EU on average, and the UK. In Q3 2020 the average EU utilisation rate remained at lower levels than in the previous quarters; after the big fall in June it reached respectively 46%, 37% and 38% in July, August and September 2020. Lower LNG imports resulted in lower utilisation rates in Q3 2020 in the EU, generally. 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 Italy, utilisation rates remained higher than the EU average in in Q3 2020, and in France the utilisation rate fell to the level of the EU average after higher levels in the previous two quarters. On the other hand, in Spain utilisation rates were close to the EU average in July and August, while they fell below in September 2020. In the UK utilisation rates were below the EU average in the whole Q3 2020.

Figure 20 – 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

- On 1 July the EIB has signed a €65 million loan agreement[18] with the Lithuanian gas transmission system operator Amber Grid to support the Poland–Lithuania gas interconnector. The operation concerns an EU Project of Common Interest (PCI) as it integrates the Baltic States and Finland into the wider EU gas market. The interconnector will diversify gas supply sources, and increase security and reliability of supply for Lithuania and the region.

- On 12 July 2020 the new Taxonomy Regulation[19], establishing the framework to facilitate sustainable investment, entered into force, providing the task for the Commission to establish the actual list of environmentally sustainable activities by defining technical screening criteria for each environmental objective. These criteria will be established through delegated acts.

- On 4 September 2020 it was announced by Hungarian authorities[20] that as of January 2021, the state owned MVM, through its subsidiary, booked an annual regasification capacity of 1 bcm of the Krk terminal (out of the total capacity of 2.6 bcm) in Croatia until 2026. At the same time a purchase agreement for the same period with Shell for an annual volume of 0.25 bcm LNG in re-gasified form. This will constitute the first time access to gas of origin of sources other than Russa.

- On 18 September 2020, following the alleged poisoning of the Russian opposition leader Navalny, the European Parliament passed a resolution[21] calling for further sanctions against Russia and stopping the construction of the Nord Stream 2 gas pipeline. However, this move might have a limited impact on the future of the project, being more than 90% ready, as sanctions taken by the US administration during the summer 2020 directly targeted European companies participating in the construction, and they already retreated from the project. Meanwhile at the end of December 2020 pipe-laying activities were said to restart.[22]

- On 23 September 2020 the Bulgarian government announced that the Balkan Stream pipeline, having an annual capacity of 20 bcm, is going to be operational at the end of 2020[23] (or in the first half of 2021 at latest), and will able to deliver gas of Russian origin through the Turk Stream, from Azeri and LNG sources as well, if once the Bulgaria-Greece interconnector is operational. The Bulgarian section of Balkan Stream is 480 km long, whereas Serbia completed in December 2019 the laying on its territory of about 400 km of pipes of the string of the pipeline for the transit of natural gas to Europe from Turkey via Bulgaria, Serbia and Hungary.

- Over the recent months, the European Commission has adopted several initiatives that might significantly impact the EU gas markets, especially on the longer run. On 8 July 2020, both the Hydrogen strategy for a climate-neutral Europe[24], and the EU strategy for energy system integration[25] were adopted. Energy system integration will change the traditional way of thinking on separate sectors, such as electricity, gas, heating, transport, etc.

- The hydrogen strategy rolls out the actions plans on alternative fuels, such as hydrogen, will serve as replacement to natural gas, especially after 2030. The Climate Target Plan ("Stepping up Europe's 2030 climate ambition"[26], adopted by the Commission on 17 September) led in December 2020 to raising the EU's wide greenhouse gas emission reduction target to 55% by 2030. On 14 October 2020, the Commission adopted the EU Methane strategy[27], which also has relevance in the gas sector, especially when thinking on natural gas flaring and venting.

- However, it must be noted here that production of hydrogen is still costly compared to other forms of energy. Whereas at the end of September 2020 the spot gas wholesale price on the TTF hub stood at 12 €/MWh, the hydrogen price assessment in the Netherlands reached 70 €/MWh, with alkaline electrolysis technologies, and 78 €/MWh with polymer electrolyte membrane (PEM) fuel cells[28], not taking account capital expenditure (CAPEX) costs. This reflects the need for technological development for hydrogen production and/or financial support measures to make hydrogen competitive with mature energy production sources.

[18] https://www.eib.org/en/press/all/2020-169-european-loan-for-gas-interconnection-project-between-poland-and-lithuania
[19] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0852&from=EN
[20] https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/090420-shell-to-supply-025-bcmyear-of-lng-to-hungary-via-croatia-terminal-minister
[21] https://www.europarl.europa.eu/doceo/document/TA-9-2020-0232_EN.pdf
[22] https://oilprice.com/Latest-Energy-News/World-News/Nord-Stream-2-Pipe-Laying-To-Restart-In-Denmark.html
[23] https://europost.eu/en/a/view/balkan-stream-enters-its-final-phase-30923
[24] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0301&from=EN (As special topic covered in the Quarterly Report on European Gas Markets, second quarter of 2020)
[25] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0301&from=EN
[26] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0562&from=EN
[27] https://ec.europa.eu/energy/sites/ener/files/eu_methane_strategy.pdf
[28] Source: S&P Platts European Gas Daily

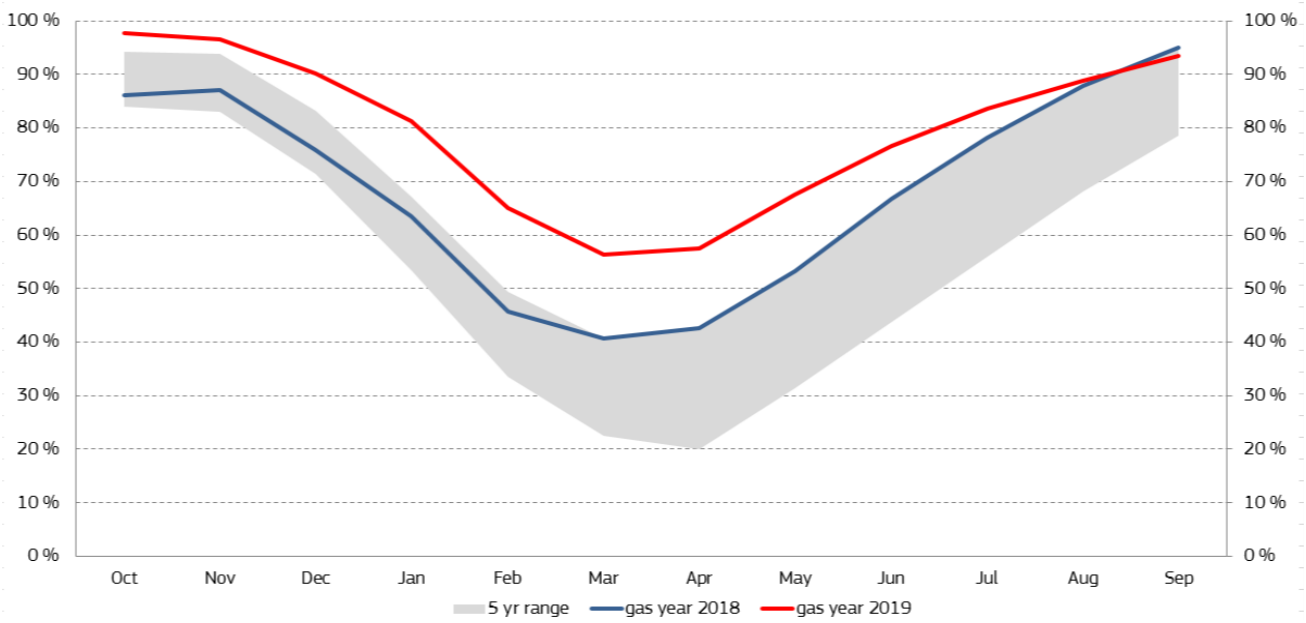
1.5 Storage

- Figure 21 shows EU stock levels as the percentage of storage capacity in gas years[29] 2018 and 2019, compared to the 5-year range of gas years 2014-2018. According to figures published by Gas Infrastructure Europe, operational EU storage capacity amounted to 1,131 TWh (roughly 100 bcm) by the end of 2018[30].

- The third quarter of the year is the summer season and the period when storages injections are most intensive before the start of the new gas year and the heating season in the fourth quarter. Owing to the relatively mild winter, which resulted in high filling rates in spring, decreasing demand for gas in industry and power generation in Q2 2020, the average EU storage filling rate was higher on 30 June 2020 than a year before (80.3% vs. 73%), implying less demand for natural gas in Q3 2020 stemming from storage refilling. On EU average, net storage injections made during the third quarter of 2020 were equivalent to 14.3% of storage capacity, which was a lower than that of 21.6% in the same period of 2019. However, on 30 September 2020 the average filling rate was 2.2% lower than a year before (94.7% vs 96.9%), which might also be related to the market uncertainty in 2019 around the long term future of Russian gas supplies[31].

- Lower demand from storage injection probably did not impact deeply the gas market in Q3 2020, as increase in the wholesale gas prices was driven by increasing demand in the industry, after confinement measures were lifted in June 2020, the generally positive mood on energy commodity markets and by supply side factors, such as cancellations of LNG cargoes and maintenance works on some important gas fields in Europe.

Figure 21 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 9 December 2020. See explanations on data coverage at https://agsi.gie.eu/#/faq.
The 5-year range reflects stock levels in gas years 2014-2018. The graph shows stock levels on the 15th day of the given month.

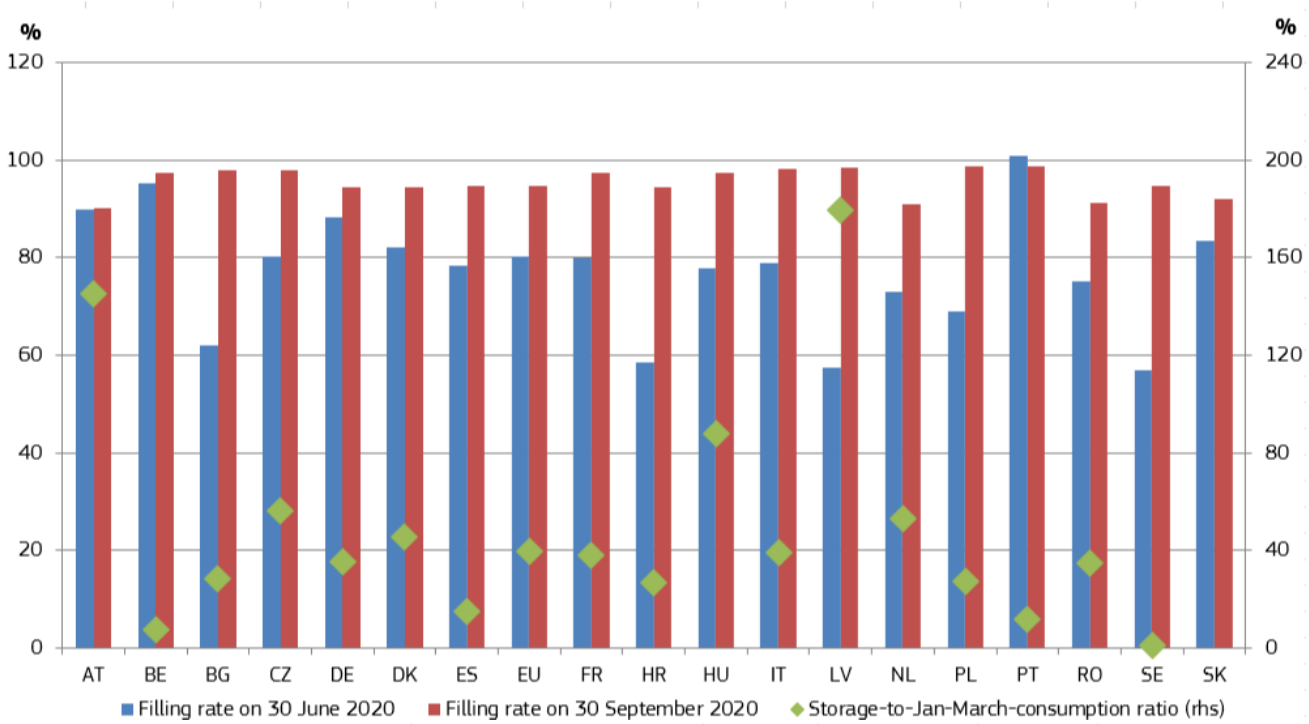
- As Figure 22 shows, there was significant variation across Member States in terms of both the starting position (the filling rate at the end of June 2020) and the pace of injections. Although the change in the filling rate over Q3 2020 was 14% on EU average, in Latvia, Sweden, Croatia, Bulgaria and Poland filling rates respectively increased by 41%, 38% and 36% (for both Croatia and Bulgaria), and 30% over this period. At the same time filling rates rose only by 0.3% in Austria and 2% in Belgium, and in Portugal, as only country in the EU, filling rates went down by 2%. It is worth noting that filling rates in these countries were above 90% or close to 100% even at the end of the second quarter of 2020. At the end of September 2020 storage filling rates were above 90% in all EU Member States with available data, whereas storage levels in the UK stood at 65%.

- Figure 22 also shows the relation between actual storage filling rates on 30 September 2020 and the average gas consumption of the last five winters (between 1 October and 31 March). As it turned out, around 40% of the winter gas consumption could be

[29] Gas year always starts on the 1 October of a given year, for example, gas year 2019 started on 1 October 2019 and ended on 30 September 2020
[30] https://www.gie.eu/maps_data/downloads/2018/Storage_DB_Dec2018.xlsx
[31] See more in the Quarterly Report on European Gas Markets, Vol 12, issue 4 (4th quarter of 2019)

covered from the storages at the beginning of the winter season, with great variation across the EU Member States. In Latvia, Austria and Slovakia the actual storage level could cover the whole local winter gas consumption (though it is worth to recall here that on a single EU gas market local storages may also cover partly the consumption of neighbouring countries, which is important from security of gas supply perspective), in Hungary it would cover almost 90%. At the same time, in countries like Sweden, Belgium, Portugal and Spain actual storages could cover at best 15% of the winter gas consumption.

Figure 22 Gas storage levels as percentage of maximum gas storage capacity and actual storage levels compared to average winter consumption at the end of the third quarter of 2020 by Member State



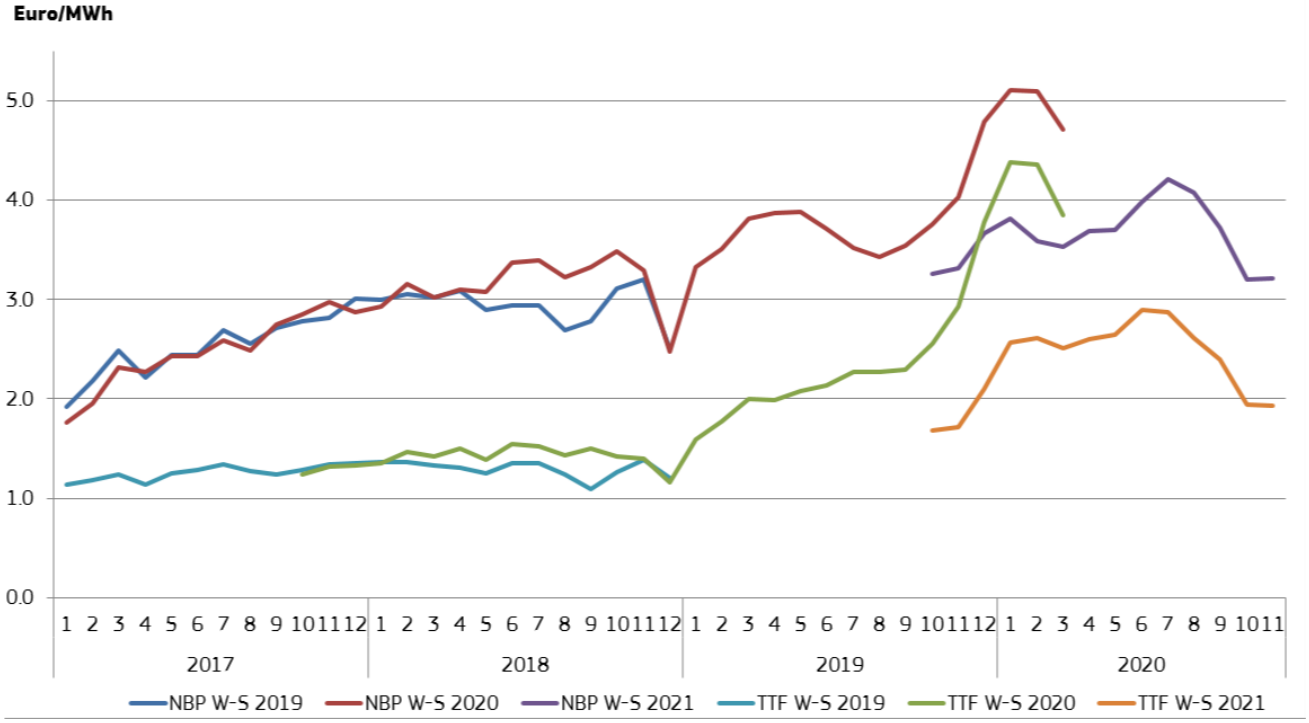
Source: Gas Storage Europe AGSI+ Aggregated Gas Storage Inventory, extracted on 9 December 2020. See explanations on data coverage at https://agsi.gie.eu/#/faq. Injection level data in Sweden changed significantly for the first time since the first data reporting period in March 2017. Nevertheless, the Swedish storage facility has a limited capacity (10 mcm), mainly used for LNG storage.

- The next chart (Figure 23) shows the winter-summer spreads, as depicted by the difference in the 2021 summer and winter contracts. The 2021 seasonal spread on the TTF reached its peak in June and July 2020 (averaging 2.9€/MWh) and by September it fell back to 2.4€/MWh. On the NBP, 2021 seasonal spreads reached 4.2 €/MWh in July and fell back to 3.7 €/MWh.

- By the end of the second quarter and beginning of the third quarter of 2020 the forward gas curve was in a strong contango, owing to low spot prices and expectations that amid almost full storages demand for winter contracts will be low, implying low prices for this contract type. As of July however, the near-end of the gas curve started to increase and this drove up spot and near forward prices (including the winter contracts), thus reducing the premium of summer to winter contracts.

- UK exhibits a structural gas oversupply during the summer and tighter market during the winter, owing to less storage capacities in comparison to continental Europe. The UK seasonal (winter-summer) spreads developed a perceivable premium to the continental spreads (in this case: TTF) over the last few years (amounting to 1.4 €/MWh for the 2021 spreads in Q3 2020).

Figure 23 Winter-summer spreads in the Dutch and British gas hubs



Source: S&P Global Platts
W-S 2019 refers to the difference between the winter 2019-20 price and the summer 2019 price, W-S 2020 refers to the difference between the winter 2020-21 price and the summer 2020 price, W-S 2021 refers to the difference between the winter 2021-22 price and the summer 2021 price.

1.6 Focus on: The impact of Covid-19 on the global LNG market in 2020 and its potential contribution to transforming the market in the forthcoming years

- The Covid-19 pandemic has inevitably resulted in an energy demand destruction, especially in the second quarter of 2020, at the height of the lockdowns of major energy consumer countries in Europe, North America and Asia. The 2020 IEA World Energy Outlook[32] forecasts a drop in the global energy demand of more than 5% in 2020 in year-on year comparison, which translates to different numbers for different energy carriers (e.g. oil and petroleum products: 8.5%, coal: 6.7%, nuclear: 4.5% and natural gas by 3.3%). For 2021 the IEA predicts a recovery in global gas demand, increasing by 3% compared to 2020.

- In the case of natural gas, LNG played an important role in adjusting supply to steeply falling demand, in the first half of 2020 global LNG exports were down by 17% as IEA data shows, whereas in September global LNG exports were still down by more than 7% compared to the pre-Covid-19 period. However, as the LNG market was characterised by a significant oversupply even in 2019, global gas market rebalancing was achieved by falling LNG exports, whereas imports in LNG importing countries decreased less (in November 2020 for example, global LNG imports were down by 3.5% year-on-year, as data from Bloomberg show). However, the effects of COVID-19 are largely expected to cut global LNG demand by as much 8 percent in 2020[33], and a rapid return to the pre-pandemic level of demand will not likely to happen quickly.

- Owing to the aforementioned global oversupply, LNG prices in Europe, North America and Asia started to decrease even in 2019, well before the Covid-19 pandemic, and price differentials between these three regions became less important. This development contributed to increasing LNG imports in Europe, which plays a balancing market role between LNG producer countries (like the US, Qatar and Australia) and the principal consumers in Asia.

- The energy demand destruction exacerbated the trend that could be observed over the last decade, notably, LNG became cheaper compared to other energy sources. Looking at the relative LNG prices compared to other fuels, from 2000 to 2018, LNG was priced at a small discount relative to oil (based on energy content) - values varied between contracts - but savings of 10 to 20 percent were typical. That discount has roughly doubled for contracts signed during the past two to three years, and short-term LNG supplies available in the spot markets in 2020 have offered as much as 50 to 70 percent savings relative to the prevailing oil price (McKinsey)[34]. Comparing LNG prices to coal, they were three times the coal prices before 2018, whereas in 2020 LNG and coal prices were practically equal. As energy demand is likely to rebound after the end of the pandemic (though temporary lockdowns might occur in different parts of the world in the forthcoming months), LNG prices premiums vis-à-vis oil and coal might return, however, not to the extent we could see prior 2018, as significant LNG export capacities are capable to ensure abundant global LNG supply.

- LNG markets on the seller side were traditionally dominated by long-term contracts, involving point-to-point sales (with no or limited reselling options for the buyers), and the applied pricing formulae had high share of oil indexation. On the buyer side, it was also convenient to have fix terms for longer period, ensuring market stability. However, over the last decade, similarly to other gas markets, LNG markets underwent a transformation leading to more flexibility on both seller and buyer sides. As buyers face less predictability on demand, owing to liberalisation of gas markets, increasing share of renewables in power generation and increasing pressure to shift towards a more decarbonised energy sector, suppliers had to adapt to changes by concluding shorter contracts with more flexibility, moving away from oil indexation and embracing local market pricing or another gas benchmarks.

- Between 2015 and 2019, the share of long-term LNG contracts fell from 73% to 66%, while the share of oil indexed contracts decreased from 66% to 59%. Furthermore, a recent 2020 survey done by McKinsey[3] showed that buyers aim for contracts longer than five years make up only a little more than 40 percent of their future supply mix, with the remainder met by spot and short-term contracts.

- As the Covid-19 pandemic resulted in low LNG prices across the globe, these trends will likely to be reinforced in the new economic situation, and will prompt more and more emerging countries to opt for natural gas, to replace coal in their energy mix, while in the developed markets green policies will likely have a stronger impact. A decade ago, only 23 countries imported LNG around the world, while in 2019 this number reached 43.

- Building LNG re-gasification terminals are costly, but if it is manageable to reduce capital expenditure costs per processed energy unit during the lifetime of the facility, LNG would be a realistic solution for even more emerging countries. As low profit margins stemming from low wholesale prices are likely to prevail even after the pandemic, innovative solutions (including floating regasification facilities) that enable higher cost efficiency will be inevitable.

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[32] https://www.iea.org/reports/world-energy-outlook-2020

[33] Source: Drilling Down: KPMG, LNG market outlook post-COVID-19 (https://home.kpmg/xx/en/home/insights/2020/10/lng-market-outlook-post-covid-19.html)

[34] Source: McKinsey: future of liquefied natural gas: Opportunities for growth (https://www.mckinsey.com/industries/oil-and-gas/our-insights/the-future-of-liquefied-natural-gas-opportunities-for-growth)

Low gas prices will likely keep up the pressure on LNG sellers to enable more spot and short-term contracts, with more focus on gas hub pricing in the contracts and reselling opportunities for the buyers. Squeezed LNG margins will probably prompt LNG suppliers to invest in the downstream business (LNG terminals, pipelines, ports, etc.), and to optimise their supply chains by putting together flexible LNG portfolios and reducing transport costs. The LNG sector will also face decarbonisation issues, especially in developed regions like Europe, as it might be more seen as 'polluting fuel'[35] in the future than the guarantee of security of gas supply and diversification. On the longer run, alternative fuels, such as hydrogen, will probably leave a lower share for gas in the energy mix, whether it is pipeline gas or LNG.

2. Wholesale gas markets

2.1 EU energy commodity markets

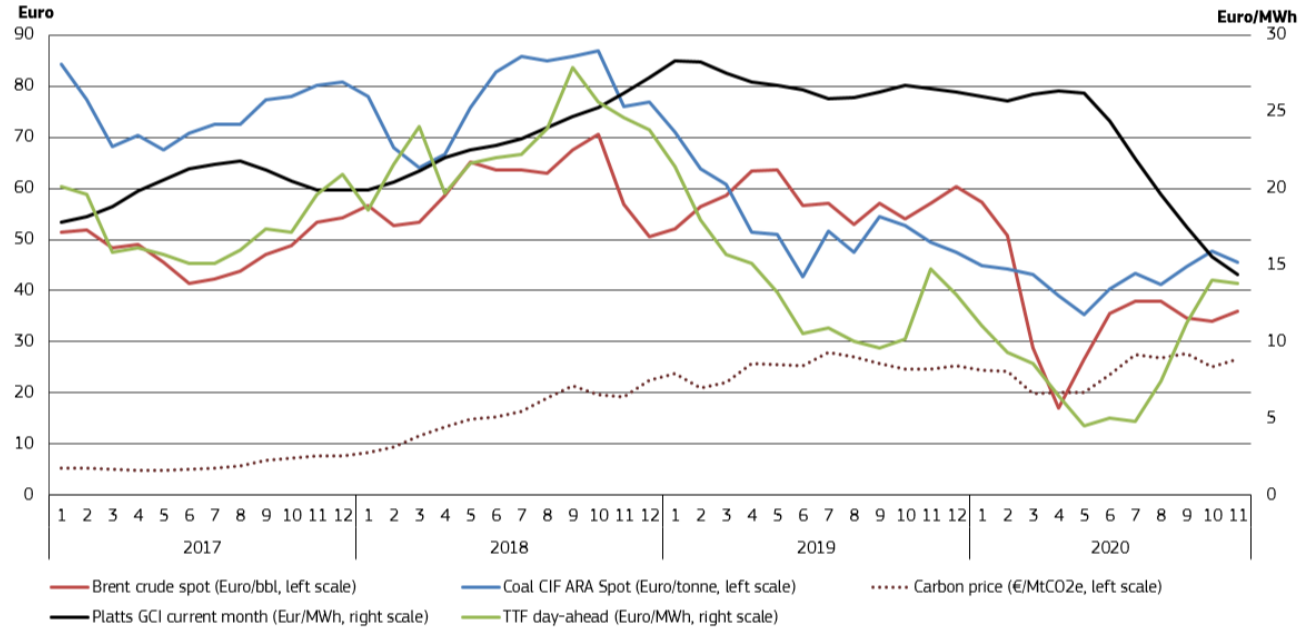
- After the steep price fall seen in Q1 2020 and the recovery in Q2 2020, the dated Brent crude price remained relatively stable in Q3 2020, and was in a range of 40-45 USD/bbl (32-38 €/bbl) during most of the time. The significant discount of the dated Brent to the year-ahead contract was narrower in Q3 2020 than in the previous quarter, amounting to only 3-4 USD/bbl (2.8-3.6 €/bbl). Following the provisions of the OPEC+ agreement in April[36], production cuts were rolled back in July and August 2020, in parallel with increasing economic activity after lifting the confinement measures at the beginning of the summer, and increasing oil demand and supply created an equilibrium on the market. In September however, news on a potentially new wave of Covid-19 increased the price volatility on the crude oil market.

- The Dutch TTF spot gas price started July 2020 at 5.6 €/MWh and rose as high as 12.4 €/MWh by the end of September, which was not seen since the end of 2019. Since 21 May 2020 when the TTF spot price reached historic low (3.1 €/MWh), the spot gas price practically quadrupled. This significant increase was owing to one hand on a general correction in energy commodity prices as spot price lows registered on the oil and gas markets could not be justified by market fundamentals. On the demand side, the re-opening the economy after lifting the confinement measures also added to gas demand, however, high storage filling rates and good renewable availability in most of the EU power generation mixes put a lid on gas consumption in Q3 2020. On the supply side, as of the beginning of summer a number of LNG cargos were cancelled to accommodate gas supply to the lower demand, especially in June, July and August 2020. Furthermore, as of mid-August maintenance works on some Norwegian gas fields reduced gas imports in Europe, giving a further support to the increase in spot gas hub prices.

- Normally crude oil price changes appear in the oil-indexed contracts with a time lag of 6-9 months, and as of early summer, though a bit earlier than expected, the oil price fall of spring seemed to filter in these contracts. In June 2020 Platt's North West Europe Gas Contract Indicator (GCI), a theoretical index showing what a gas price, linked 100% to oil, would be, was at 24.4 €/MWh, whereas by September it fell to 17.5€/MWh. This was still higher than the TTF spot in the same month (11.2 €/MWh), however, compared to the last few quarters the difference decreased between the two, implying to slightly improving competitiveness of oil-indexed contracts vis-à-vis hub prices. Nevertheless, if demand for energy (and particularly for oil products) is to increase in the forthcoming period, oil indexed contracts will be more expensive.

[35] https://www.spglobal.com/platts/en/market-insights/podcasts/oil/120320-platts-crude-wti-midland-inclusion-dated-brent
[36] https://edition.cnn.com/2020/04/12/energy/opec-deal-production-cut/index.html

Figure 24 Spot prices of oil, coal and gas in the EU



Source: S&P Global Platts

- Spot coal prices started July 2020 at 44.5 €/Mt, and by the end of August they gradually decreased to 38€/MWh. In September however, prices started to turn up again and by the end of the month they reached 48-49 €/MWh. On one hand, this might have been related to the general increasing trend of energy prices, however, on the other hand, albeit coal has a decreasing role in the EU power generation, in Asia demand for steam coal increased in September, which might influenced the CIF ARA benchmark as well.

- Carbon prices remained relatively stable over Q3 2020 and were in the range of 25-30€/MtCO2e. It seems that the market strongly believes the intention of European policy makers on continuing the energy transition, even amid the economic crisis, which reinforces the role of the Emission Trading System.

2.2 LNG and international gas markets

- Figure 25 displays the international comparison of wholesale gas prices. In Q3 2020 prices of European, Japanese and Chinese landed LNG showed signs of divergence, as prices recovered from the lows in Q2 2020, though the difference between European and Asian peers were less than differences with the US Henry Hub benchmark. However, the Asian price premium did not reach the levels measured last time in 2017/2018, which would have been sufficient to prompt redirection of LNG cargoes towards Asia.

- The average Japanese LNG price was 3.5 USD/mmbtu in Q3 2020, increasing from 2.2 USD/mmbtu in Q2 2020, but down from 4.6 USD/mmbtu in the third quarter of 2019, implying a price fall of 25% year-on-year, but an increase of 61% compared to the previous quarter. The Japanese premium above the Dutch TTF hub was on average 0.8 USD/mmbtu in the third quarter of 2020, slightly up from 0.4 USD/mmbtu in Q2 2020, but down from 1.3 USD/mmbtu in Q3 2019. On quarterly average, LNG import prices in China were comparable with their Japanese peers (3.5 USD/mmbtu in Q3 2020). These numbers show that price differentials between European and Asian LNG contracts reappeared in Q3 2020 amid the general price recovery of the major regional benchmarks.

- The average price of Chinese pipeline gas imports, albeit decreasing in Q3 2020, remained high (5.7 USD/mmbtu), being above the Asian LNG reference prices, by more than 2.2 USD/mmbtu. Decreasing premium of the pipeline imports to LNG benchmark reflects decreasing oil prices in earlier periods, with oil-indexation time lag. In the previous quarter (Q2 2020) the pipeline premium over the Asian LNG reference was higher, 4 USD/mmbtu.

- The Henry Hub price rose to 2 USD/mmbtu in Q3 2020, and as Figure 26 shows, it re-developed its discount to the TTF as of September. In July and August the TTF and Henry hub were moving close to each other, while as of September both the TTF and the Asian JKM benchmark developed a measurable premium over Henry Hub, with a diverging trend. Given that the EUR appreciated against the USD in Q3 2020 (in June 2020 the exchange rate was 1.12 while in September it was 1.18), divergence between the TTF and the Henry Hub was even bigger measured in euros.

- In the third quarter of 2020, TTF averaged at 2.7 USD/mmbtu (7.8 €/MWh). The average German border price was by around a third higher (3.6 USD/mmbtu or 10.4 €/MWh), reflecting the impact of still existing oil-indexed contracts in the German gas import mix, implying higher average prices compared to hub prices, even amid the current price-decreasing impact of oil-indexation.

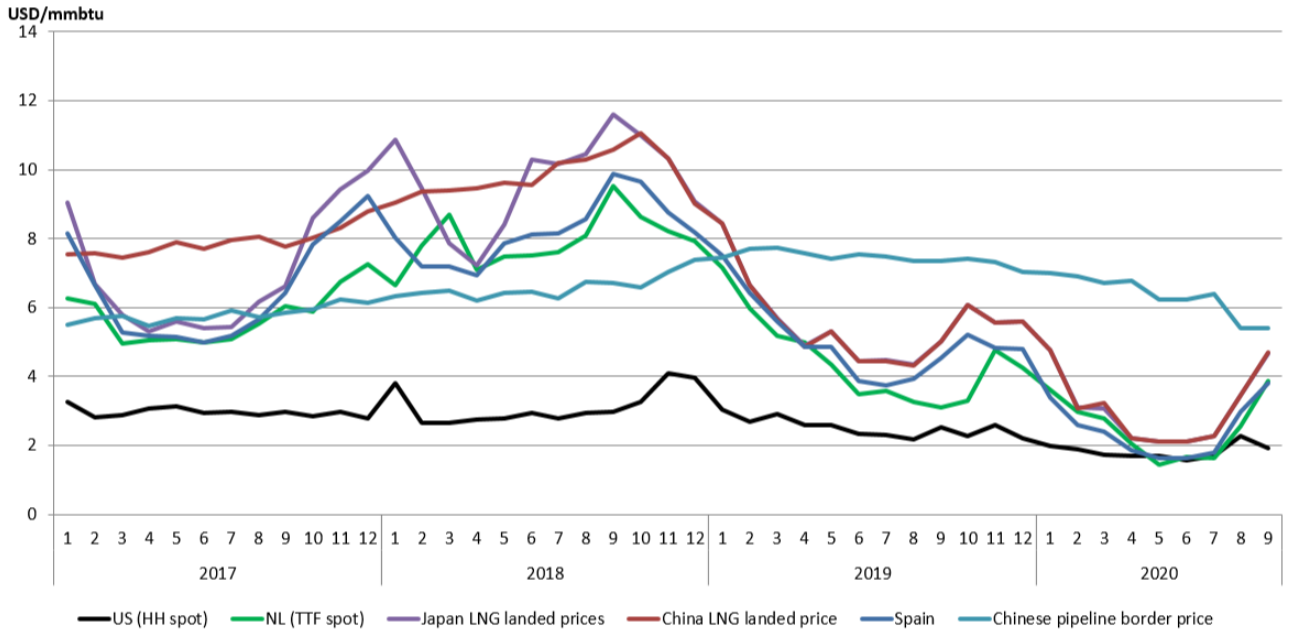
- Over the course of the third quarter of 2020, differentials in international price contracts showed measurable increases, amid gas price recovery. The ratio of the Japanese LNG price and US Henry Hub was 1.8 in the third quarter of 2020, up from 1.3 in Q2 2020, but still lower than in Q3 2019 (2.0). However, the average price ratio of the Japanese LNG prices and the TTF was 1.3 in Q3 2020, similar to Q2 2020, which implies a stronger correlation of TTF and Asian benchmark than these two indexes with Henry Hub.

- The average TTF/Henry Hub ratio rose to 1.4 in Q3 2020, after being close to 1 in Q2 2020, to similar levels as in Q3 2019. In July 2020 the TTF was in a slight discount to the Henry hub (-0.1 USD/mmbtu), however, in August this turned to a premium (0.3 USD/mmbtu) and in September this premium rose further, to 1.9 USD/mmbtu. TTF discount to Henry Hub resulted in a number of LNG cargo cancellations at the beginning of summer 2020.

- In the third quarter of 2020, spot prices averaged 2.7 USD/mmbtu in the Netherlands, 2.9 USD/mmbtu in Spain, 3.5 USD/mmbtu in China and Japan.

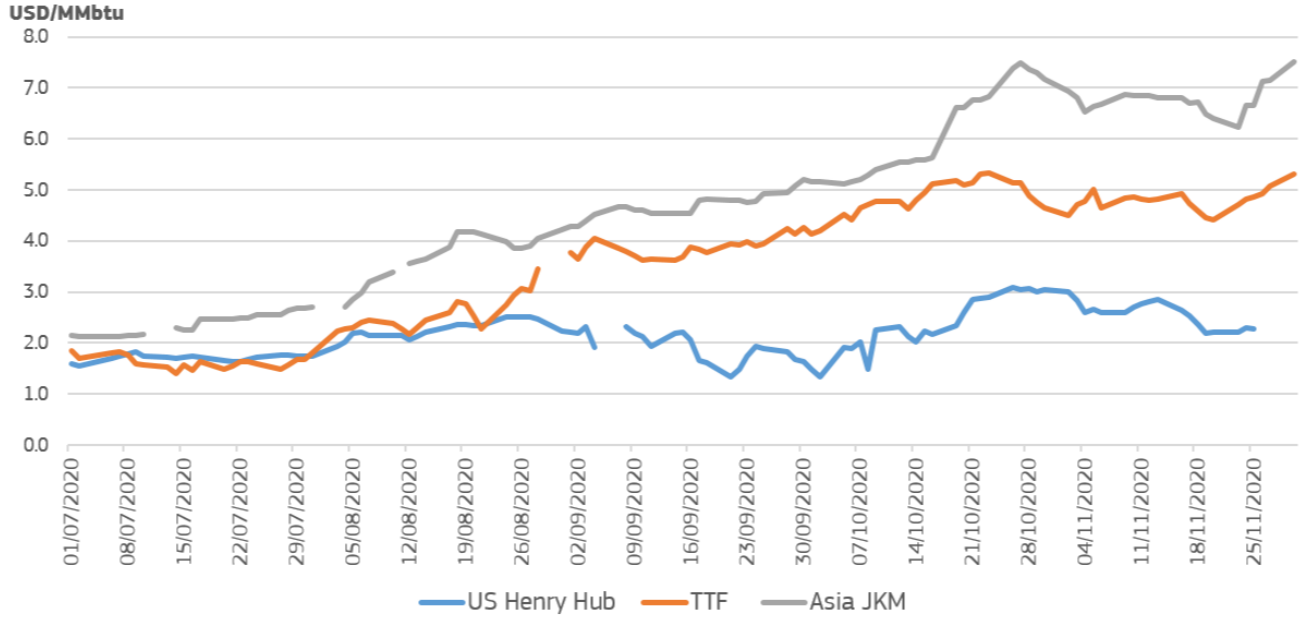
- The JCC (Japanese Crude Cocktail) contracts reached 7.2 USD/mmbtu on average in Q3 2020, more than twice as high as the average spot price (3.5 USD/mmbtu), reflecting the slow responsiveness (time-lag in the oil indexation) to the spot market prices of this oil-indexed contract. However, in Q3 2020 we could see the impact of time-lagged falling oil prices in the JCC index.

Figure 25 International comparison of wholesale gas prices



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

Figure 26 – Daily average prices on the TTF (Dutch), the US Henry hub and the JKM Asian reference index



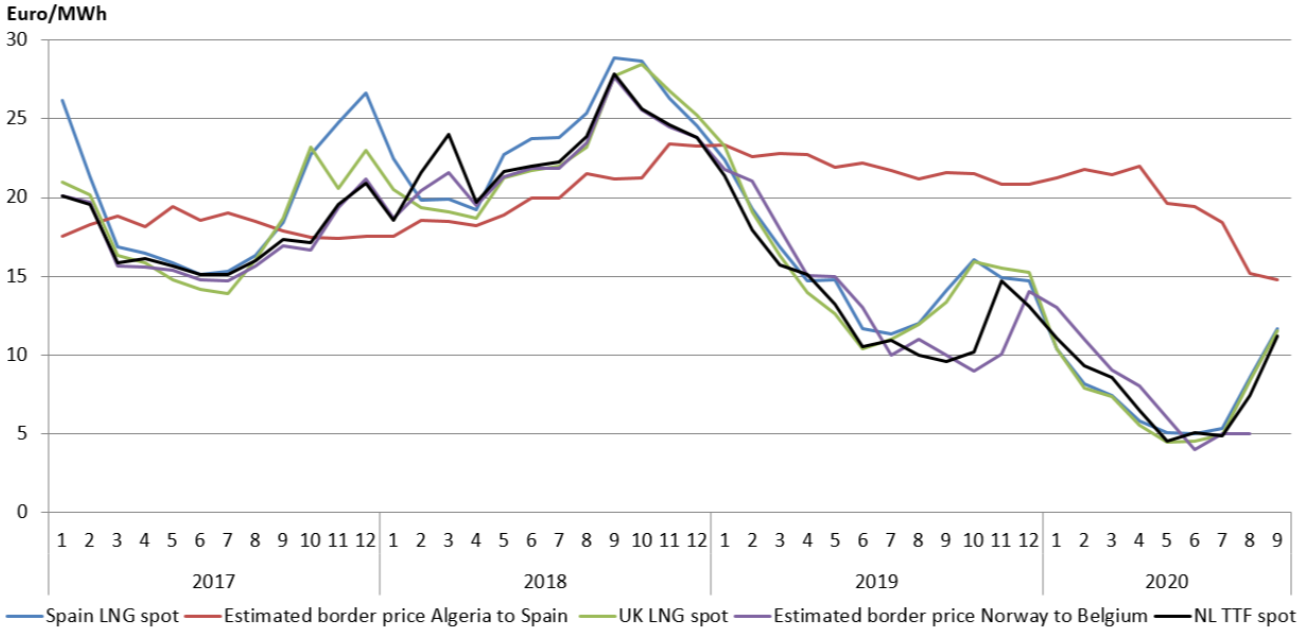
Sources: S&P Global Platts

- Figure 27 displays the evolution of spot LNG prices paid in the UK and Spain and estimated border prices for pipeline imports from Norway and Algeria, which account for important part of pipeline imports in the Belgium and Spain, respectively. The evolution of the day-ahead prices on the Dutch TTF hub can also be followed.

- In the third quarter of 2020, the estimated Algerian pipeline import price in Spain fell to 16.1 €/MWh, decreasing measurably (by 21%), compared to the previous quarter, and was down by 25% compared to Q3 2019. By September 2020 it fell to the lowest (14.8 €/MWh) since October 2016, clearly reflecting the time-lagged impact of decreasing crude oil prices. However, in September 2020 the average estimated Algerian import price in Spain was still higher than Spanish LNG import price (by around 3 €/MWh), but this premium was down from 15 €/MWh measured in Q2 2020. Probably owing to its decreasing price premium and annual contractual obligations on volumes to be shipped to EU customers, pipeline gas imports in the EU from Algeria was up by 26% in Q3 2020 year-on-year (See Chapter 1.3 Imports).

- In the third quarter of 2020 hub prices and hub-based import price contracts in western Europe remained well aligned, and in September 2020 the differentials between these prices were less than 1 €/MWh (between 10 €/MWh and 11 €/MWh). The quarterly average prices showed a significant increase of 45-70% compared to the previous quarter, Q2 2020, reflecting the significant price upturn on wholesale gas markets and import contracts. In year-on-year comparison, these contracts were down by 20-30% in Q3 2020.

Figure 27. Price developments of LNG and pipeline gas in the UK and Spain



Note: Landed prices for LNG. Source: S&P Global Platts, Refinitiv, European Commission estimates based on Eurostat COMEXT data, retrieved on 9 December 2020.

2.3 European gas markets

2.3.1. Gas trade on the EU hubs

- As Figure 28 shows, for the first time since several years, liquidity on the main European gas hubs decreased year-on-year in the third quarter of 2020: the total traded volume amounted to around 13 235 TWh (equivalent to around 1 105 bcm and in monetary terms representing €110 billion[37]), 8% less in volume than in Q3 2019. In Q2 2020 the year-on-year increase in traded volumes were 7%, following a rate of 32% in Q1 2020, which in Q3 2020 turned into decrease. The Q3 2020 traded volume however was around 19 times more than the gas consumption in the seven Member States[38] covered by the analysis in July-September 2020.

- Traded volumes in Q3 2020 remained practically unchanged year-on-year on the most-liquid European hub Dutch TTF. On two German hubs (Gaspool and NGC) together traded volumes fell by 17% over the same period. In Italy (PSV) the volume decreased by 23%, and in Austria on the VTP hub traded volumes went down by 21%. Traded volume on the French TRF fell by 16%. The steepest fall in traded volumes could be observed on the Belgian Zeebrugge hub (by 70%) in Q3 2020 year-on-year, and total volumes amounted only to 31 TWh (whereas on the TTF volumes reached 9 715 TWh). At the same time, traded volumes on British NBP hub, still the second biggest hub on the broader European market, underwent a fall of 28% compared to Q3 2019.

- In contrast to the other hubs in Europe, where significant drops occurred in traded volumes, trade on the TTF hub managed to preserve the volumes year-on-year, implying that the share of TTF increased further among the observed hubs in Europe, reaching 73% in Q3 2020 (a year earlier its share in Q3 2020 was 67%). If looking at only the EU countries, its share is even bigger, 88%). TTF has emerged to a liquid continental benchmark, having the advantage of euro-denomination, and benefiting from its good connection to various supply sources and access to seasonal storage as well. On the other hand, decrease on the NBP hub signalled a further shift from once Europe's most liquid market. The traded volume in Q3 2020 fell by 28% compared to the same period of 2019, and the share of NBP in Q3 2020 fell to 16% in the total European observed trade, down from 21% in Q3 2019.

- Other markets had lower shares: Germany (NGC and Gaspool together) had a share of 5.2%, while the Italian PSV only had 1.9%, whereas VTP, TRF and Zeebrugge respectively had shares of 1.7%, 1.2% and 0.2% in Q3 2020.

- In the third quarter of 2020 LNG imports fell by 15% in the EU year-on-year, which, combined with the decrease of overall gas imports, resulted in a decrease in volumes on most of the European hubs. Gas trade was largely impacted by the cancellation of

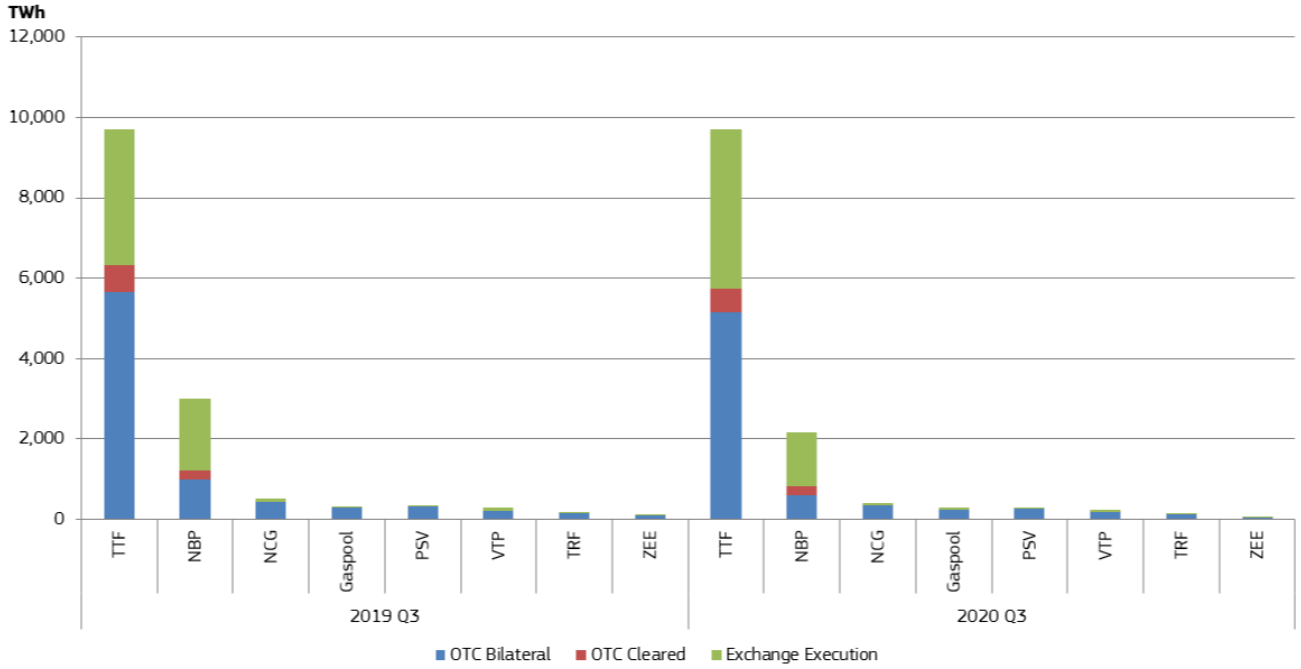
[37] Assuming that all trade was carried out on the quarterly average spot price

[38] Netherlands, UK, Germany, France, Italy, Belgium, Austria 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. Comparing to the EU as a whole, traded volume in Q3 2020 represents 15 times the total EU-27 gas consumption in this period.

significant number of LNG cargoes, which peaked in the summer months of 2020. At the beginning of Q3 2020 wholesale gas prices were still low, however in August and September they rose, which helped in increasing the volume of trade compared to the July lows. However, Q3 2020 was characterised by uncertainties on gas demand, which impacted the overall trade. Given that gas storage levels were higher than usual in whole Europe, the lack of demand from this segment also acted counter-intuitively to the gas trade.

- The share of exchange executed contracts on the Dutch TTF hub was 41% in Q3 2020, which was the highest among the observed EU countries, and was up by 6 percentage points compared to Q3 2019. On the French TRF it amounted to 19%, up by 2 percentage points since Q3 2019. On the VTP hub in Austria this share was 15%, equalling that in the same period of 2019, and was 14% on the two German hubs together, down by 1 percentage point year-on-year. On Zeebrugge the share of exchange-executed contracts was much lower, only 2%, whereas it was the lowest on the Italian PSV, amounting to barely 1%. On the NBP hub in the UK, the share of exchange trade was still the highest among all observed markets, amounting to 63% in Q3 2020, even up by 3 percentage points compared to Q3 2019.

Figure 28 Traded volumes on the main European gas hubs in the third quarter of 2019 and 2020

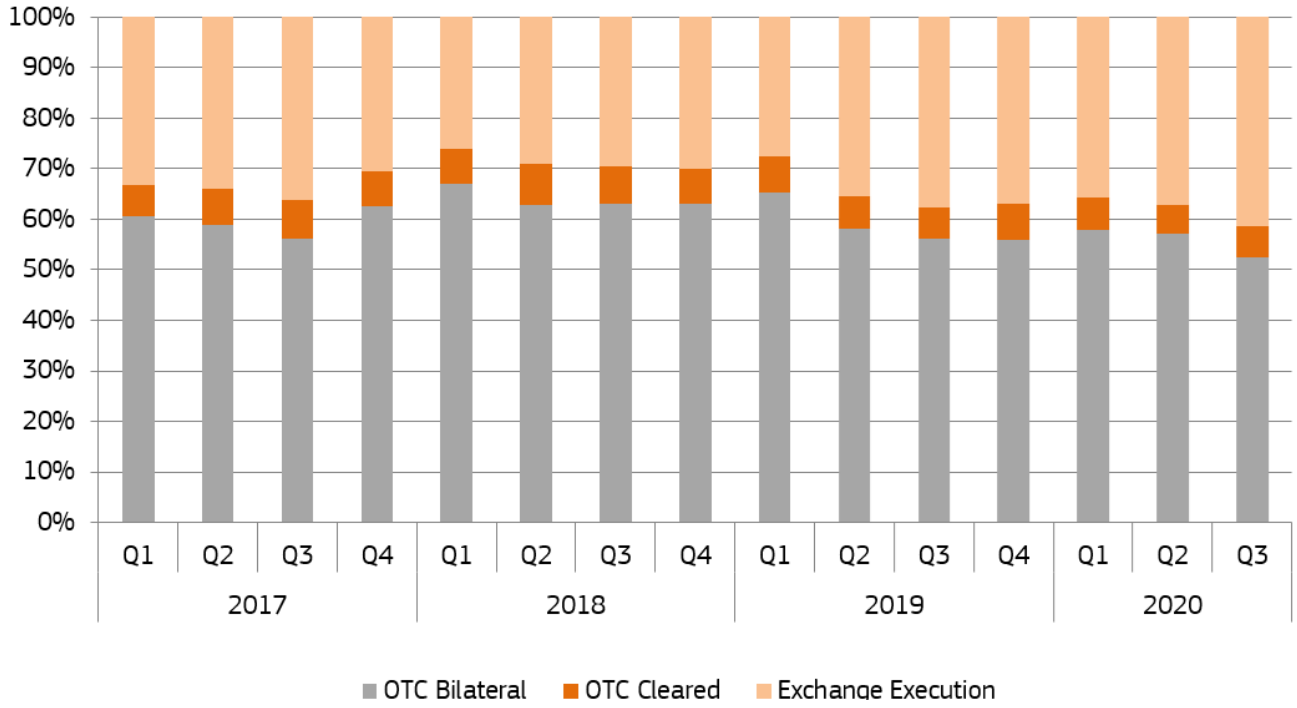


The chart covers the following trading hubs: Netherlands: TTF (Title Transfer Facility); Germany: NCG (NetConnect Germany) and Gaspool; France: TRF (Trading Region France); Italy: PSV (Punto di Scambio Virtuale); Austria: Virtual Trading Point (VTP); Belgium: Zeebrugge beach; UK: NBP (National Balancing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

- On the European hubs as whole, in Q3 2020 53% of the total trade was OTC bilateral, 6% was OTC cleared, whereas the share of exchange-executed contracts was a 41%. The share of exchange-executed contracts went up by 4 percentage points year-on-year in Q3 2020, whereas the share of OTC bilateral went down by than 3 percentage points, and that of OTC cleared by 1 percentage point.

- In spite of the general decrease in traded volumes (8% in Q3 2020 year-on-year), exchange executed volumes increased by 1% in this period in year-on-year comparison on the observed European markets. In the same period, the total OTC traded volume (bilateral and cleared together) went down by more than 14%. This underlines the increasing importance of exchange-executed contracts in the gas trade on the major European hubs.

Figure 29 Share of traded volumes on the main European gas hubs



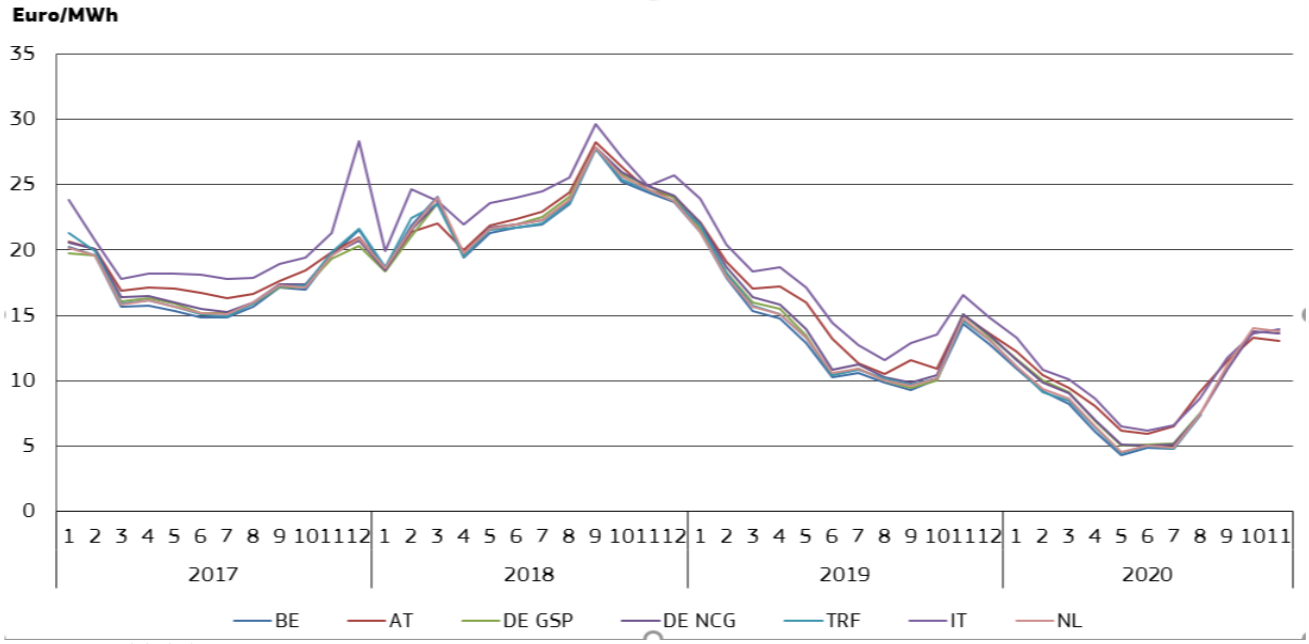
The chart covers the following trading hubs: Netherlands: TTF (Title Transfer Facility); Germany: NCG (NetConnect Germany) and Gaspool; France: PEG (Point d'Echange Gaz); Italy: PSV (Punto di Scambio Virtuale); Belgium: Zeebrugge beach, Austria: Virtual Trading Point (VTP); UK: NBP (National Balancing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

2.3.2. Wholesale price developments in the EU

- European hub prices were averaging around 7.6–9 €/MWh in the third quarter of 2020, measurably higher than in the previous quarter, Q2 2020 (4.9-7.1 €/MWh) but definitively lower than in the same quarter of the previous year, Q3 2019 (9.9-12.4 €/MWh). To put it in percentage change, in the third quarter of 2020 hub prices in Europe were up by 34-61% compared to the lows measured in Q2 2020, however, they were still down by 19-27% in year-on-year comparison. The average TTF hub price was 7.8 €/MWh in Q3 2020, falling by 23% in year-on-year comparison. In July, August and September 2020 wholesale gas prices started to recover, in consequence of decreasing oversupply on the gas market (largely owing to cancellation of significant number of LNG shipments and maintenance works on some important gas field infrastructure in Norway). By the end of September 2020, the TTF spot price reached 12€/MWh, the highest since the end of 2019.

- Wholesale gas prices in Q3 2020 were largely impacted by the general positive mood on energy commodity markets, after the end of lockdown periods in Europe demand for energy increased. At the same time, the oversupply on gas markets decreased due to the reasons mentioned in the previous paragraph. Wholesale gas prices on the TTF hub developed a measurable premium to the US Henry Hub as of August, which indicated increasing profitability of LNG exports from the US, and this will probably be observable in the following quarters in the form of recovery in imported LNG volumes in the EU.

Figure 30 Wholesale day-ahead gas prices on gas hubs in the EU



Source: S&P Global Platts

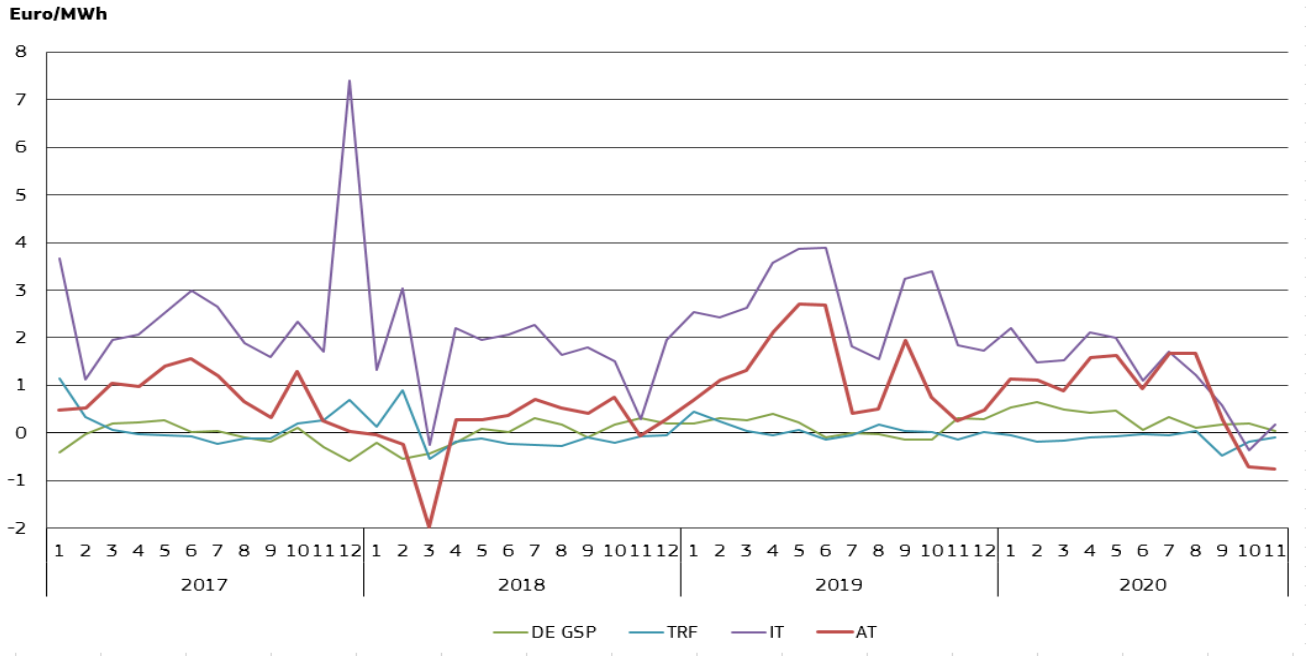
- As Figure 31 and Figure 32 show, the French TRF market was closely aligned with the TTF market during July and August 2020, and in September the French price was lower than the TTF benchmark, probably owing to less exposure to lower gas flows from Norway (maintenance works on some infrastructure). Good renewable generation contributed to counter-balancing the impact of lower than usual nuclear availability in France in July and August, thus this did not increase demand for gas. Cold temperatures at the end of September had lower impact in France (owing to higher share of electric heating).

- The German Gaspool remained well-aligned with the TTF in Q3 2020, however in July, owing to maintenance works on the Yamal and the Nord Stream pipelines and in September, owing to some lower than expected LNG send-outs in the Netherlands occasional price premiums could be observed.

- The Austrian and Italian hubs showed a measurable price premium to the TTF in July and August 2020, principally owing to high temperatures resulting in increasing cooling needs and gas-fired electricity generation. In July the aforementioned outage on Nord Stream had an impact on gas supply in the region, this also contributed to higher pricing. In mid-September high temperatures still managed to keep Austrian and Italian prices at high levels, however, in Italy LNG send-out increased by the end of September 2020 contributed to decreasing price premiums to TTF. It is worth to note that in high demand periods storages switched to withdrawal several times in Q3 2020 in Austria, which is quite unusual in this time of the year, as the third quarter is normally an injection period.

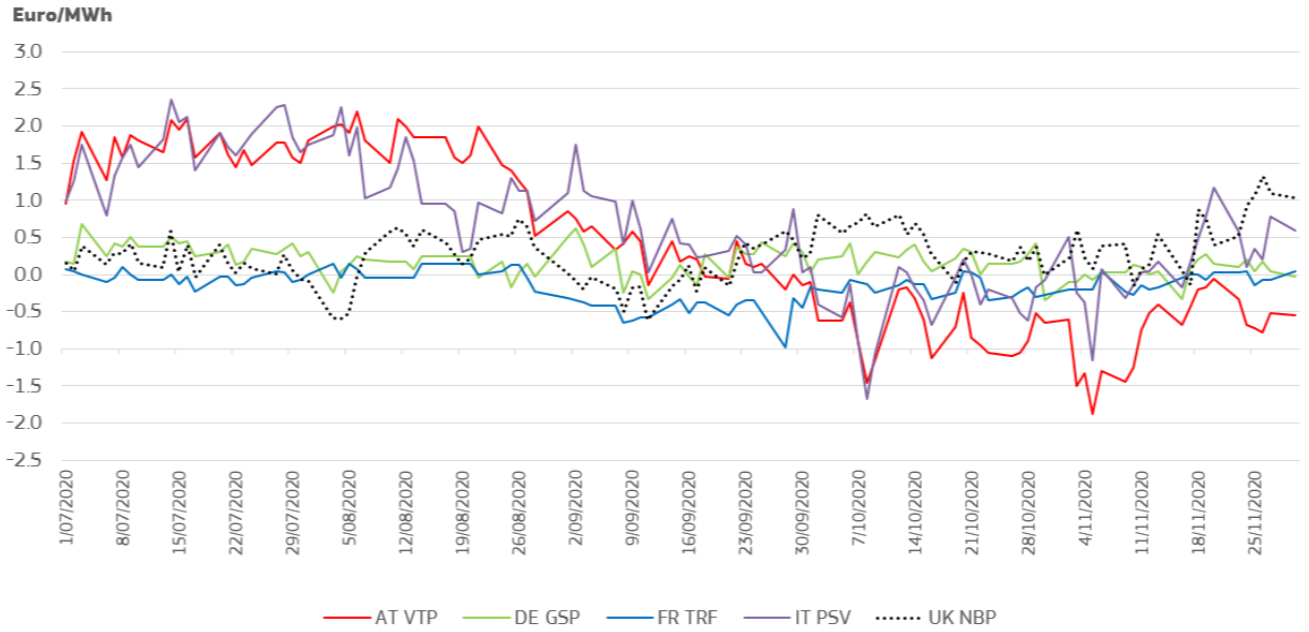
- In July 2020 the NBP hub price was many times below the TTF benchmark, as low LNG send-outs were compensated by abundant imports from Norway. However, as of mid-August, as maintenance works began on some important Norwegian field infrastructure, gas imports from Norway decreased and this contributed to occasional price premiums (around 0.5€/MWh on some trading days) to the TTF. This was further aggravated by some heat waves in the UK, especially in August 2020.

Figure 31 Premium of monthly average wholesale day-ahead gas prices at selected hubs compared to TTF



Source: S&P Global Platts, European Commission computations

Figure 32 Premium of daily average wholesale day-ahead gas prices at selected hubs compared to TTF

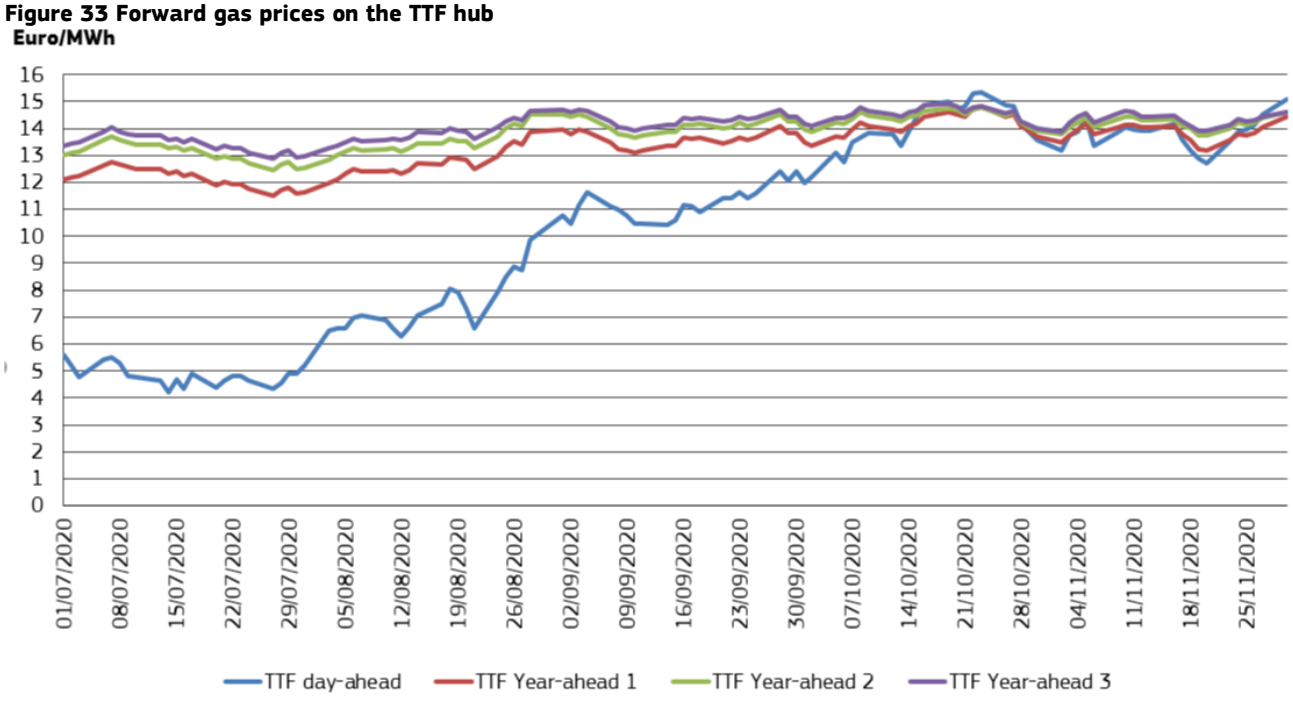


Source: S&P Global Platts, European Commission computations

- Figure 33 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 underwent a significant recovery in Q3 2020, starting July 2020 just at 5.6€/MWh, whereas by the end of September they rose to 12 €/MWh, reaching the highest since the end of 2019. At the same time, one-year, two-year and three-year ahead contracts showed less intensive increases (the year-ahead went up from 12.1€/MWh to 13.8€/MWh, the two-year ahead contract from 13 €/MWh to 14.3 €/MWh and the three year-ahead contract from 13.4 €/MWh to 14.4€/MWh), implying that the intensity of spot price fall in Q2 2020 and than the swift recovery in Q3 2020 was less accentuated in the forward contracts. Spot prices had a discount of 6-8 €/MWh at the beginning of July, whereas this shrunk to 2-2.5€/MWh by the end of September 2020. In October and November 2020 the difference between spot and forward contracts practically disappeared and different contracts remained well-aligned.

Figure 33 Forward gas prices on the TTF hub



Source: S&P Global Platts

2.3.3. Prices of different contracts for gas in the EU

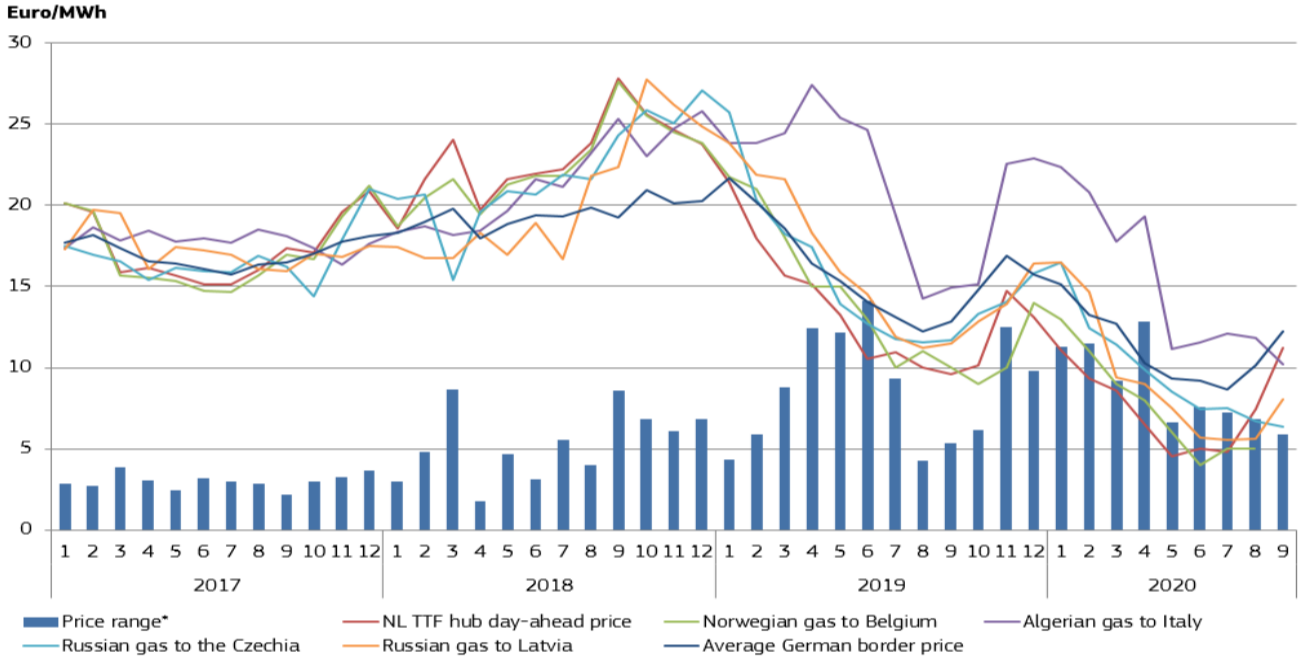
- Figure 34 compares a selection of estimated border prices of gas deliveries from the main exporters to the EU: Russia, Norway, and Algeria. For comparison, the evolution of the day-ahead prices on the Dutch TTF hub is also presented on the chart.

- Prices of European gas contracts showed signs of slight convergence in Q3 2020, as the difference between the cheapest and most expensive contract decreased again, from 7.6 €/MWh in June to 6 €/MWh in September 2020. In contrast to the previous quarters, this time it was not the Algerian imported gas in Italy, which was the most expensive of all, largely owing to the time-lag impact of the falling oil prices in spring 2020. In September 2020 the Algerian import price in Italy was 10.2€/MWh, even falling below the level of the TTF hub (11.2 €/MWh) and was below the German average import price (11.4 €/MWh).

- Hub based contracts and hub prices themselves, took an upturn in the third quarter of 2020, leaving behind the lows measured in Q2 2020. Reported German border prices also increased, similarly to most of the hub-based contracts, however the increase was less intense than in the case of hub prices, probably owing to the existence of oil-indexation in some import sources to Germany.

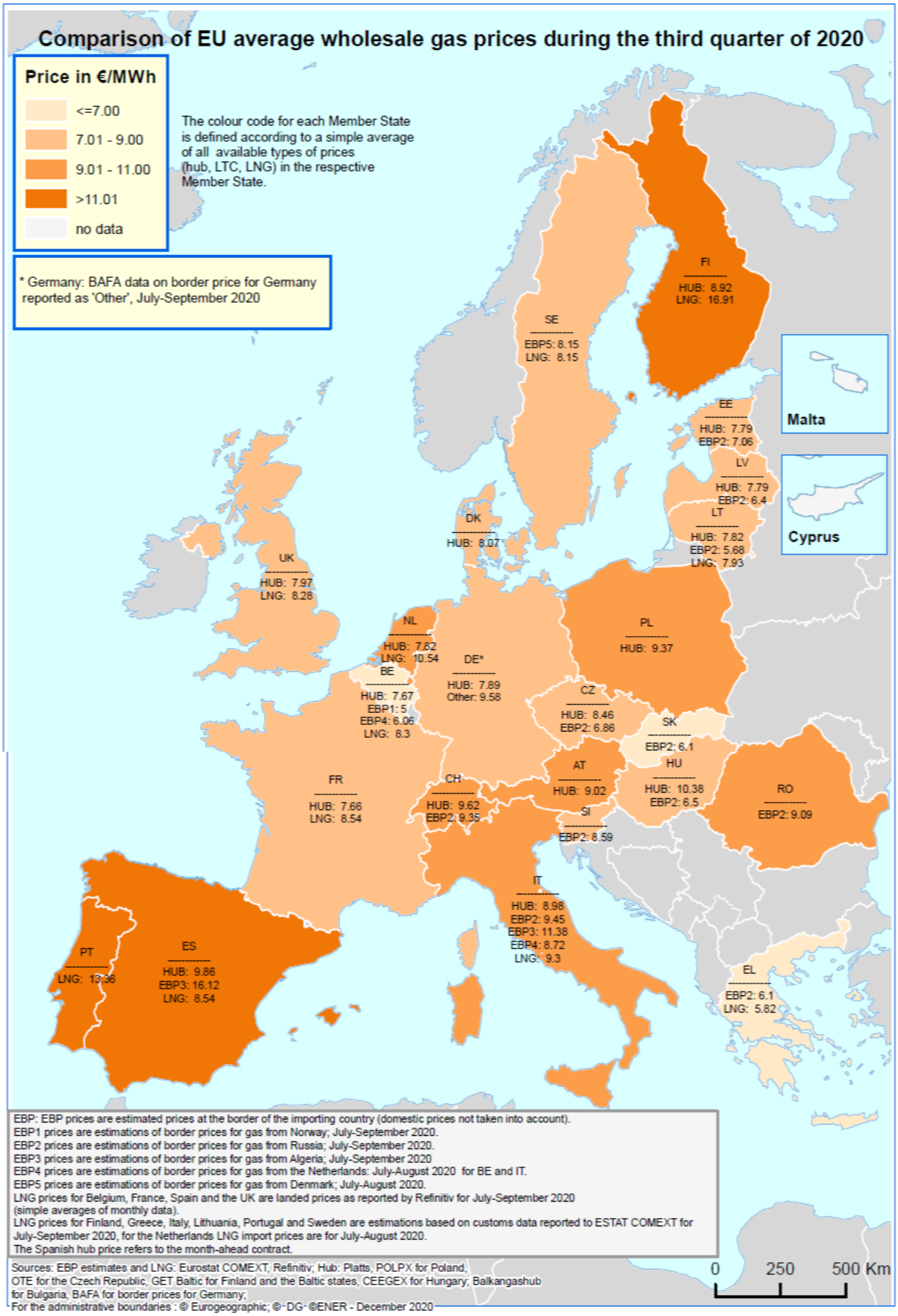
- In September 2020 Algerian gas import price in Spain reached almost 15 €/MWh, whereas in Italy it was slightly more than 10 €/MWh, implying significantly different pricing formula in the two markets, with probably higher importance of hub pricing elements in the Italian contract in comparison to the contract with Spain. Russian gas imports prices in Latvia increased slightly, whereas Russian gas import prices in Czechia decreased further, implying different pricing practices in the two markets, though there was not too big difference in September 2020 between Czech and Latvian gas import prices of Russian origin (6.3 €/MWh vs. 8.1 €/MWh).

Figure 34 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. Comparison of EU wholesale gas prices in the third quarter of 2020



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.

3. Retail gas markets in the EU and outside Europe

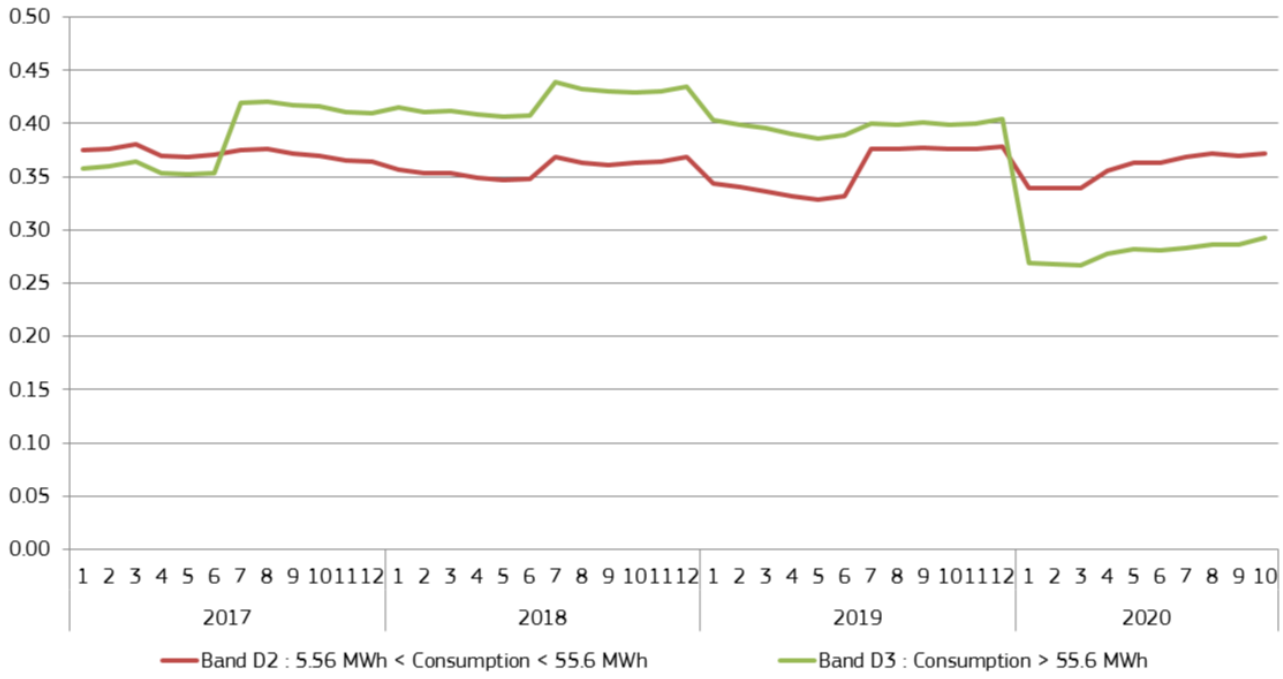
- Figure 35 and Figure 37 show the degree of convergence (or divergence) of retail gas prices for household and industrial customers, using as metric the relative standard deviation of the prices in individual Member States. Monthly retail prices are estimated by using half-yearly prices from Eurostat (with the latest available figures relating to the first half of 2020) and Harmonised Consumer Price Indices (HICP) for both the household prices and industrial consumers.

- For household consumers, the estimated average retail price in Q3 2020 in the EU (including all taxes) extended the decreases of the previous two quarters. In the most typical consumption Band, D2, in the third quarter of 2020 the estimated average price (including all taxes) was 6.3 Eurocents/kWh, down up by 12% compared to 7.2 Eurocents/kWh in Q3 2019 (See the estimated household prices on Map 2).

- Retail prices for households showed an improving convergence at the beginning of 2020, however, in the second and the third quarters of 2020 the relative standard deviation of prices in consumption Band D2 and D3 rose again, implying that prices started to slightly diverge, as Figure 35 shows. Standard deviation for Band D3 prices were lower since the beginning of 2020 than for Band D2. Observed price differences are normally higher for the consumers with lower annual consumption, primarily owing to the higher share of fixed elements (not related to the actual consumption) in the final consumer bills.

- In the third quarter of 2020, there were still significant differences in retail gas prices across the EU. The lowest estimated household prices in consumption Band D2 could be observed in Hungary and Latvia (both 2.9 Eurocent/kWh), Romania (3.1 Eurocent/kWh), and Bulgaria and Lithuania (both 3.4 Eurocent/kWh), whereas the highest prices could be measured in the Netherlands (9.9 Eurocent/kWh), Sweden (9.7 Eurocent/kWh), France (7.6 Eurocent/kWh) and Denmark (7.1 Eurocent/kWh). The price differential ratio between the cheapest and the most expensive Member State was 3.4. Since the first quarter of 2017, when this ratio was 4.0, price differentials decreased, and in Q1 2020 the ratio fell to 3.0, however, since then it rose slightly.

Figure 35 Relative standard deviation of gas prices paid by household customers in EU Member States



Note: all taxes included.
Source: European Commission estimates based on Eurostat data on consumer prices adjusted by the HICP

- Figure 36 shows the level and the breakdown of residential end-user gas prices paid by typical households in European capitals in September 2020. On average, 42% of the price covered the energy component, while the rest covered distribution/storage costs (30%), energy taxes (12%) and VAT (16%).[39]

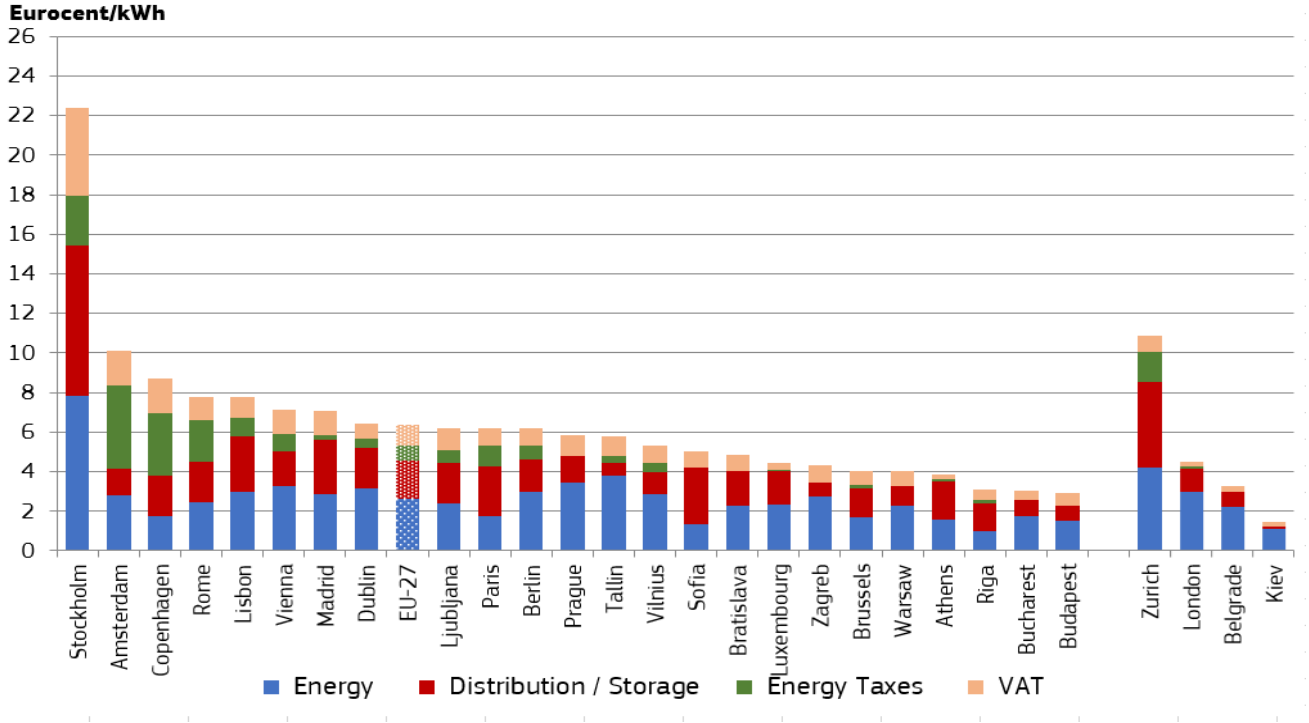
[39] Note that these are arithmetic averages. No data are available for Helsinki (Finland), Nicosia (Cyprus), and Valetta (Malta).

- There were significant differences in September 2020 in the share of energy costs, distribution costs and taxes within the total prices across Member States. The share of energy costs ranged from 20% (Copenhagen), Amsterdam and Paris (both 28%) to Tallinn (66%) and Zagreb (63%). The share of distribution/storage costs ranged from 11% (Tallinn) and Amsterdam (13%) to 57% (Sofia) and Athens (50%). The share of energy taxes ranged from 2% (Luxembourg) and 3% (Madrid) to 42% (Amsterdam) and 37% (Copenhagen). For 7 of the 24 capitals covered, the price does not include an energy tax component. VAT content in the total gas price also varied a lot across the EU – from 6% in Athens to 21% in Budapest.

- Figure 36 also shows that even the energy component is very variable in absolute terms: it was 7.9 times higher in Stockholm than in Riga in September 2020. There were also considerable differences across Member States in the relative share of network costs and taxes. The ratio of highest and lowest network components across the EU was 12 (between Tallinn and Stockholm), and highest-lowest tax component ratio (taking energy taxes and VAT together) was 19 (Athens and Stockholm) in September 2020.

- With the exception of only one EU capital out of the observed 24, prices were lower in September 2020 compared to the same month of the previous year. The biggest decrease occurred in Athens (33%), Sofia and Brussels (both 21%) and Riga (20%), driven mainly by the decrease in energy costs and to a lesser extent, network costs. In Vilnius retail gas prices remained stable and there was not a single EU capital where price increase could be observed. It seems that price falls of the first half of 2020 on wholesale gas markets largely filtered in the final retail household prices in most of the EU capital cities in the third quarter of 2020. In September 2020 Budapest remained the cheapest capital in the EU in terms of gas prices for household consumers, followed by Bucharest and Riga, whereas Stockholm, Amsterdam and Copenhagen were the three most expensive capital cities.

Figure 36 Breakdown of gas price paid by typical household customers in European capitals, September 2020



Source: VaasaETT

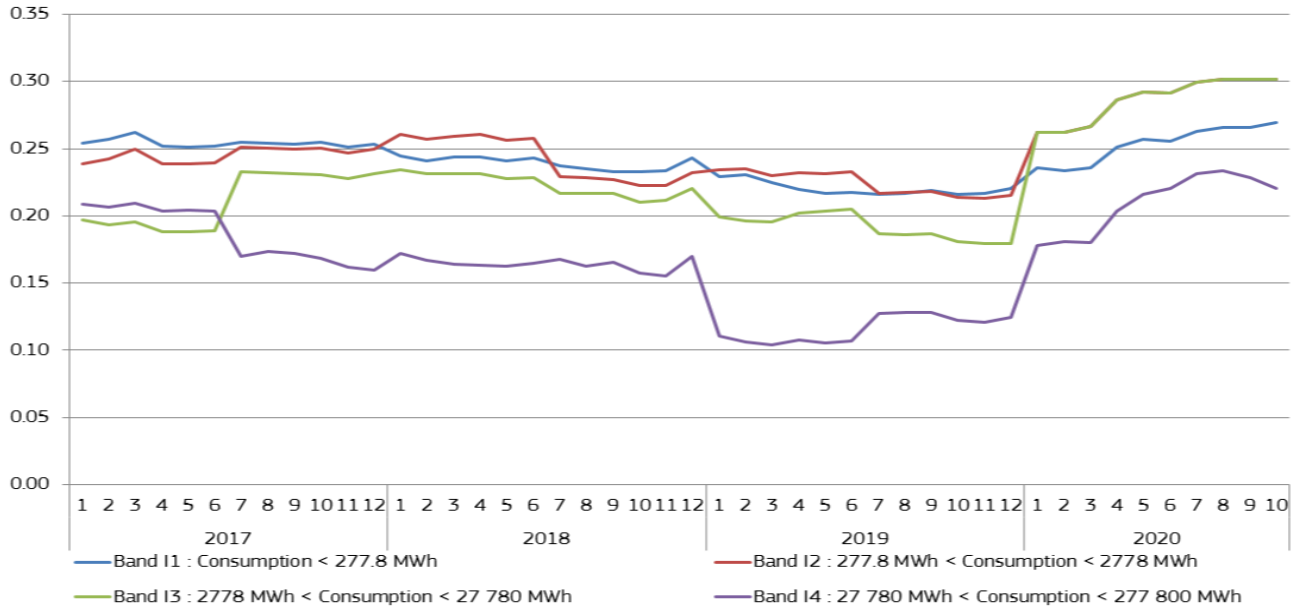
- Retail gas prices for industrial customers decreased by 6% in Q3 2020 year-on-year in the EU on average, and the average estimated price (VAT and other recoverable taxes excluded) in consumption Band I4 was 2.3 Eurocent/kWh, down from 2.36 in Q2 2020 and down from 2.45 in Q3 2019. (See the estimated industrial prices on Map 3.) There were only three countries in the EU (Netherlands, Sweden and Croatia) where industrial gas prices increased in year-on-year comparison in Q3 2020, while in the other 21 observed countries (data were not available for Cyprus, Finland and Malta) decreases could be observed. It seems that price decreases of the first half of 2020 on the wholesale gas markets already appeared in retail prices for industrial customers in Q3 2020, having average consumption. Decreases could also be observed for industrials having larger annual gas consumption (9% decrease in both Band I5 and Band I6 in Q3 2020 year-on-year).

- Figure 37 shows that in the case of industrial customers the relative standard deviation was lower than for private households, indicating smaller price differences across Member States. After measuring decreases in the relative standard deviation in 2018 and 2019, especially in the case of prices in Band I4, in the first half of 2020 divergence generally increased across different consumption bands, however, this came to halt in Q3 2020.

- In the third quarter of 2020 Bulgaria, Belgium and Luxembourg had the lowest estimated industrial price in consumption Band I4 (respectively 1.5 Eurocent/kWh, 1.6 Eurocent/kWh and 1.7 Eurocent/kWh), while the highest prices could be observed in the

Netherlands (3.7 Eurocent/kWh), Sweden (3.6 Eurocent/kWh) and Croatia (2.6 Eurocent/kWh). In Q3 2020 the price ratio of the cheapest and the most expensive country in the EU was 2.5. This price differential was lower compared to the first quarter of 2017, when it was 2.8, but higher compared to the second quarter of 2019, when it was only 1.7.

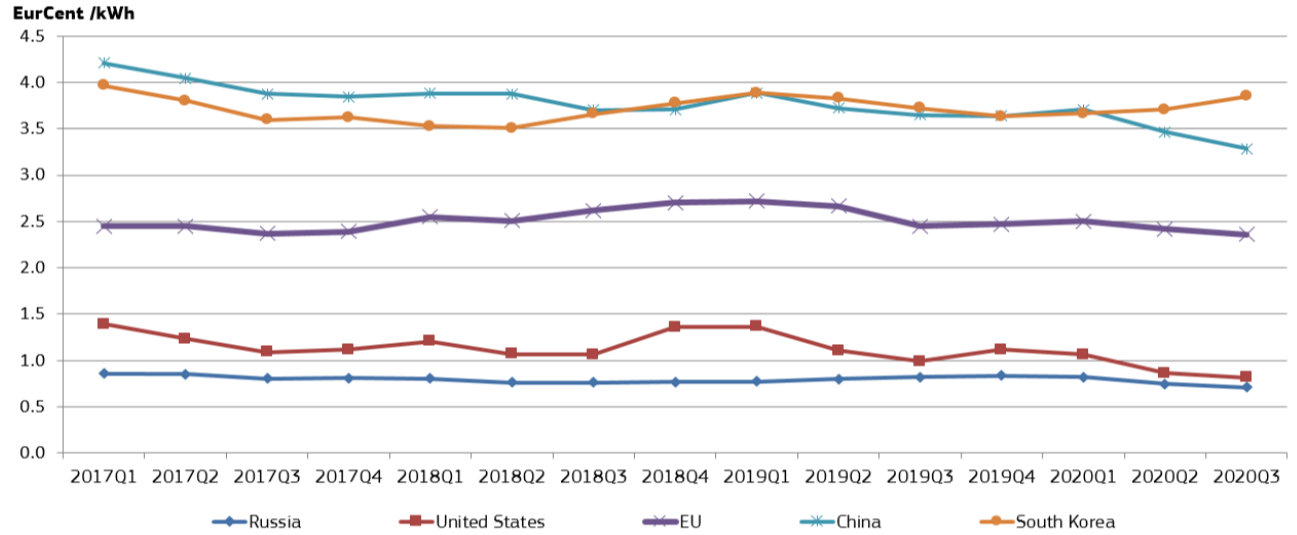
Figure 37 Relative standard deviation of gas prices paid by industrial customers in EU Member States



Note: Excluding VAT and other recoverable taxes.
Source of data: European Commission estimates based on Eurostat data on industrial prices adjusted by the HICP

- The next Figure 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 2020, retail gas prices for industrial customers in China and Korea had a price premium to the EU average (respectively 43% and 67%). On the other hand, retail gas prices in the United States were 65% less than in the EU and in Russia gas prices had a discount of almost 70% to the EU average. Compared to Q3 2019, the biggest decrease in industrial gas retail prices could be observed in the United States (17%), while prices in Russia went down by 14%, in China prices decreased by 10% and in Korea they were down by 3%, in comparison with the EU average (a decrease of 6%).

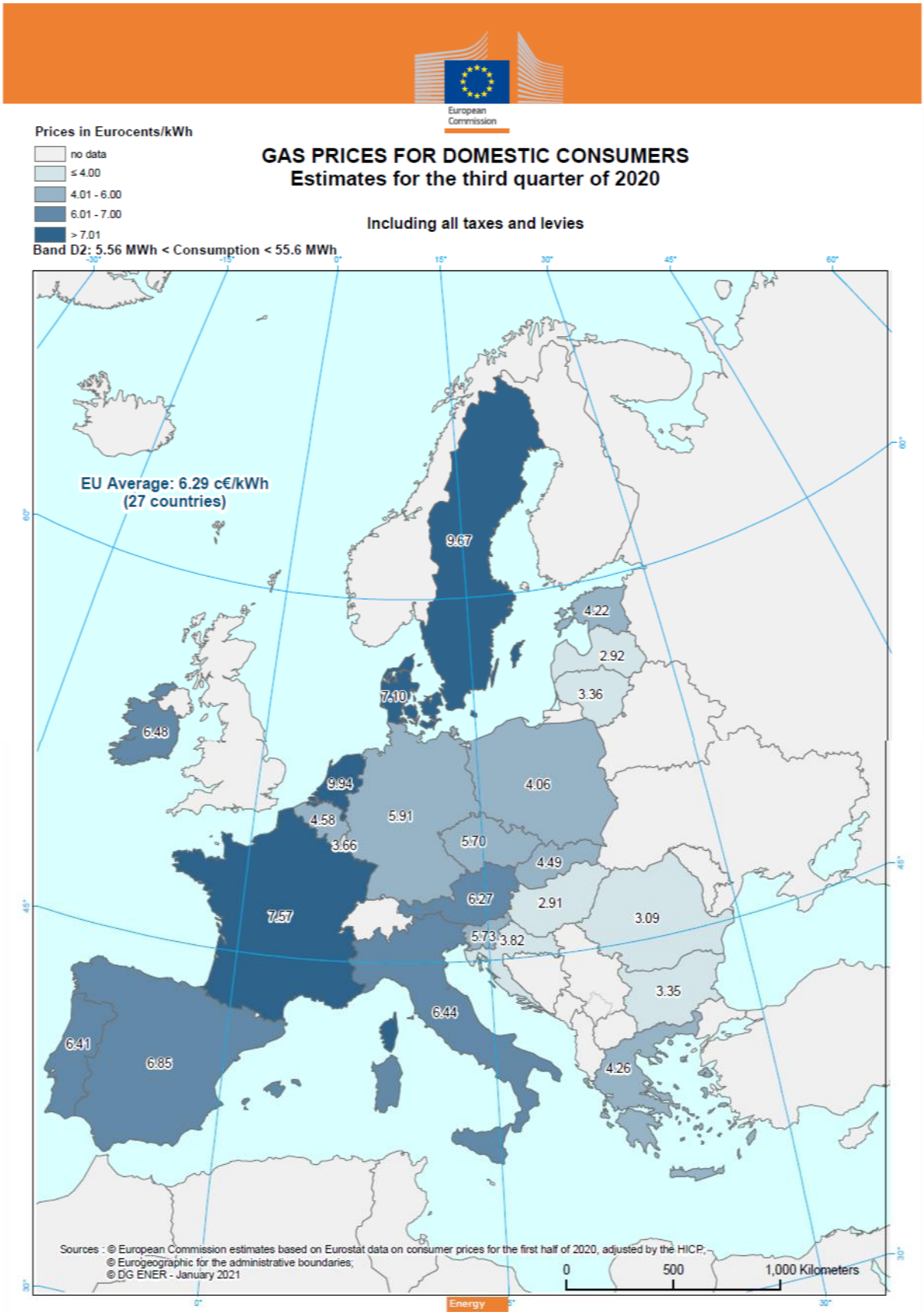
Figure 38 The EU average industrial retail gas price in comparison with the prices of some important trade partners of the EU



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

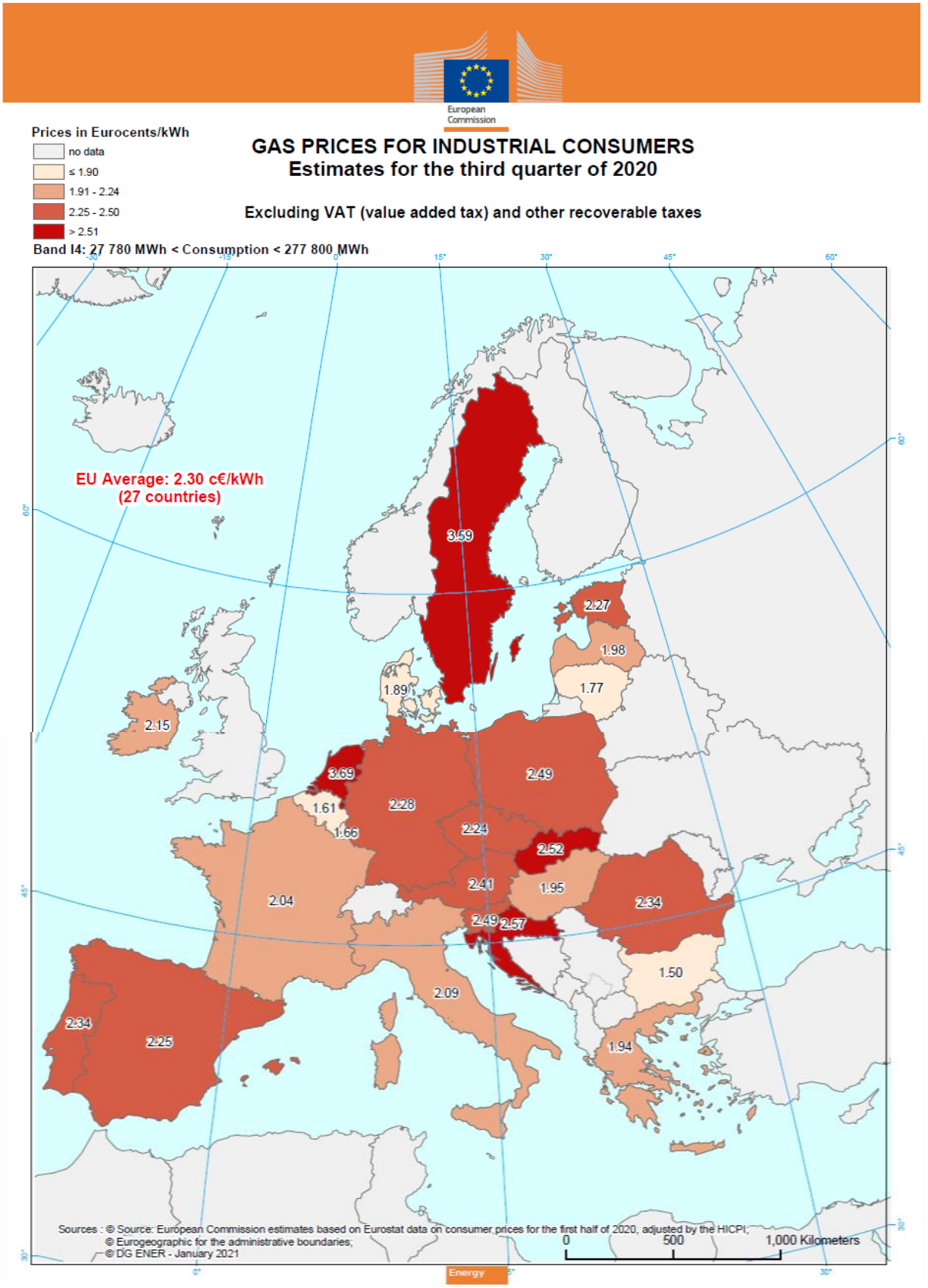
- Maps 2 and 3 on the next two pages show the estimated retail gas prices paid by households and industrial customers in the third quarter of 2020.

Map 2. Retail gas price estimates for households in the EU – Third quarter of 2020



Source: Eurostat

Map 3. Retail gas price estimates for industrial consumers in the EU – Third quarter of 2020



Source: Eurostat

4. 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 1975-2016) 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.