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HIGHLIGHTS OF THE REPORT

- In the first quarter of 2019 EU gas consumption continued to decrease compared to the same quarter of 2018, primarily owing to mild winter weather, especially in February and March, albeit increasing gas use in electricity generation. Gas consumption in Q1 2019 in the EU was 163 bcm, down from 169 bcm a year earlier.

- Indigenous gas production in the EU fell by 8% in the first quarter of 2019 compared to Q1 2018, amounting to 31 bcm. Gas production decreased in all major EU producing countries, including the UK and the Netherlands. Production from the Groningen field in the Netherlands decreased compared to the last winter and during the whole gas year it might be below the target set by the Dutch government.

- Net gas imports increased by 15% year-on-year in the first quarter of 2019 in the EU, amid decreasing consumption and production. Russian pipeline supplies covered 40% of extra-EU gas imports, followed by Norway (31%), LNG imports (22%) and pipeline imports from North Africa (7%). Russia kept its share within the total EU gas imports and LNG imports increased mainly at the expense of pipeline imports from Algeria and Libya.

- The EU's estimated gas import bill was around 23 billion euros in the Q1 2019, only 1% less than a year earlier, as a result of increasing import volumes and decreasing import prices.

- EU LNG imports showed a huge increase, up by 126% year-on-year in the first quarter of 2019. Price premium of the Asian LNG markets to Europe practically disappeared in Q1 2019, enabling the acceleration of LNG influx to Europe. The three most important LNG suppliers to Europe were Qatar (22% of all LNG imports), Russia (21%) and the US (13%).

- Gas storage levels in the EU were on average 22% higher at the end of March 2019 than a year before. Withdrawals from the storages were much lower in Q1 2019 than a year before, owing to less heating related demand, abundant LNG imports and decreasing spot gas prices.

- Traded volume on the European gas hubs increased by 24% in the first quarter of 2019 in year on year comparison, and the share of trade on the Dutch TTF, which is the most liquid hub in the EU, rose to 64% among the observed hubs in Europe.

- Spot prices at European gas hubs continued their decreases in the first quarter of 2019. In Q1 2019 European gas hub prices were down by 6-16% in year-on-year comparison. Not only price differentials with Asian markets disappeared but premium over US Henry Hub also decreased amid falling European hub prices.

- Actors in the gas sector are supportive to increasing the role of the euro in the energy sector, as it turned out from the consultation on the role of the euro in energy, launched by the European Commission.

- Retail prices for both industrial and household customers showed a measurable increase in the EU, implying that recent price falls on the wholesale gas markets did not yet filter in the retail contracts.
EXECUTIVE SUMMARY

- In the first quarter of 2019 EU gas consumption was 4% less than in same period of 2018. This was the fourth quarter in a row when year-on-year gas consumption decreased. Although gas-fired electricity generation was significantly up (by 24%) in the EU, milder than usual winter weather, especially in February and March, lowered the heating related gas demand, contributing to the overall decrease in consumption. However, EU gas consumption in Q1 2019 remained in the range of the last five years. In absolute numbers, gas consumption in Q1 2019 amounted to 163 bcm, down from 169 bcm a year earlier.

- EU gas production fell by 8% year-on-year in the first quarter of 2019, amounting to 31 bcm. Gas production decreased in all major EU gas producing countries, including the Netherlands (-11%) and the UK (-5%). The largest gas field in the Netherlands, Groningen alone, produced 2.2 bcm less during the winter period of 2018, than a year earlier.

- In spite of decreasing consumption, EU gas net imports rose by 15% in the first quarter of 2019 compared to Q1 2018. Pipeline gas imports from Russia increased by 5% year-on-year in Q1 2019, while those from Norway decreased by 5%. Algerian pipeline gas imports fell steeply, by 41% compared to Q1 2018. In contrast, pipeline gas import from Libya rose by 10%. LNG imports in Q1 2019 more than doubled compared to Q1 2018 and ensured 22% of the total extra-EU gas imports. In Q1 2019 the total net EU gas import was 100 bcm.

- Russian pipeline supplies remained the main source of EU gas imports, covering 40% of extra-EU imports in Q1 2019, followed by Norwegian pipeline imports (31%), LNG imports (22%) and pipeline supplies from North Africa (7%). The share of LNG within the total gas imports was up by 10 percentage points compared to Q1 2018, mainly to the expense of Norwegian and Algerian pipeline imports. The EU’s estimated gas import bill was around 23 billion euros in the Q1 2019, just 1% less than a year earlier, as a result of increasing import volumes and decreasing import prices.

- In the first quarter of 2019, Ukraine was the main supply route of Russian gas to the EU, covering 40% of the total Russian supplies (around 16 bcm), up by 5 percentage points compared to in Q1 2018. The share of Nord Stream was 35% (14 bcm) while gas supplies transiting Belarus covered 25% (10 bcm) in the total EU imports from Russia.

- EU LNG imports showed a strong increase in the first quarter of 2019, up by 126% in year-on-year comparison. Price premium of the Asian LNG markets to Europe practically disappeared in Q1 2019 and this enabled the acceleration of LNG influx to Europe. Qatar remained the biggest LNG supplier to the EU, with 22% of the total imports, closely followed by Russia (21%) and the US (13%). In year-on-year comparison the two biggest contributors to increasing LNG flows to Europe were Russia and the US. France became the largest LNG importer in Q1 2019 in the EU (with 5.9 bcm), followed by the United Kingdom (4.3 bcm) and Spain (3.9 bcm).

- Gas storage levels in the EU were on average 22% higher at the end of March 2019 than a year before. Amid mild weather conditions, abundant LNG imports and steadily decreasing spot prices gas withdrawal in Q1 2019 amounted to 30% of the total storage capacity, as opposed to 46% in the first quarter of 2018. Data show that refilling of gas storages in Europe started earlier in March 2019 than in the previous year. Higher filling rates at the end of Q1 2019 might imply less intensive replenishing need in the following two quarters than in 2018.

- Spot prices at European gas hubs continued their decreases in the first quarter of 2019. Gas prices in Europe were mainly impacted by the mild weather and abundant LNG supply. In Q1 2019 European hub prices were down by 6-16% in year-on-year comparison. Oil-indexed gas prices remained mostly stable, as the recent oil price recovery was not yet reflected in these contracts. At international level, the gap between European and Asian gas contracts fell significantly, and falling EU prices had a shrinking premium to US Henry Hub as well.

- In the first quarter of 2019 trade volume on the European gas hubs increased by 24% in year-on-year comparison, and the total traded volume on the most liquid European hubs was more than 15 000 TWh, being 12 times as much as the gas consumption of the EU Member States these hubs are located in Q1 2019. In absolute trade volumes, most of the hubs showed an increase compared to Q1 2018. The share of the Dutch TTF hub in the total EU trade rose to 64%, which was almost three times the traded volume of the NBP hub in the UK. Liquidity growth might have been linked to hedging strategies stemming from differences between spot and curve prices.

- In January 2019 EU Member States voted on a Commission proposal to invest almost €800 million in key European energy infrastructure projects with major cross-border benefits. In the gas sector, the Connecting Europe Facility (CEF) will support, with nearly €215 million, the Baltic Pipe project, a new, bi-directional offshore gas interconnection between Poland and Denmark. This pipeline will be crucial for security of supply and market integration of the region.

- On 14 February 2019 the European Commission launched an online consultation after the workshop on the role of the euro in the energy sector, involving various stakeholders. Actors in the gas sector were particularly supportive on enhancing the role of the euro in their daily activities, also helped by the increasing trade on the euro-denominated and most liquid gas trading hub in Europe, the Dutch TTF.

- Retail gas prices for both household and industrial customers showed a significant increase in the first quarter of 2019 compared to Q1 2019 (respectively 17% and 14% in the EU on average), implying that recent decreases in wholesale gas prices did not yet filter in the retail prices. Increase in the final retail prices might also have been driven by non-market elements, such as network costs and taxes.
1. Gas market fundamentals

1.1 Consumption

- EU gas consumption in the first quarter of 2019 decreased by 4% in year-on-year comparison, showing a decline in the fourth consecutive quarter since Q2 2018. In absolute level, the quarterly gas consumption in Q1 2019 amounted to 163.1 bcm, down from 169.1 bcm in Q1 2018. Although gas-fired electricity generation showed a measurable increased in Q1 2019 in year-on-year comparison, the weather across Europe was generally milder than usual in the first quarter of 2019, resulting in lower heating needs and gas consumption. In the first quarter of 2019 gas consumption was only higher in January compared to the same month of 2018, while in February and March it was measurably lower. Compared to the range of the last five years however, gas consumption in Q1 2019 in the EU followed the usual pattern.

Figure 1. EU gas consumption

![Figure 1. EU gas consumption](image)

Source: Eurostat, data as of 22 May 2019 from data series nrg_103m. Data missing for the Netherlands in March 2019 are calculated by using short term monthly gas data (nrg_ind_343m) as proxy.

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

![Figure 2. Year-on-year change in EU gas consumption in each quarter (%)](image)

Source: Eurostat, data as of 22 May 2019 from data series nrg_103m. Data missing for the Netherlands in December 2018 are calculated by using short term monthly gas data (nrg_ind_343m) as proxy. Calculations of DG Energy, based on consumption measured in bcm.
In the first quarter of 2019, the biggest year-on-year increase in gas consumption could be observed in Greece (24%, representing a volume of 1.6 bcm in Q1 2019). Gas consumption increased in only two of the six largest consumers in the EU: in Germany (by 4%), and Spain (1%), while it decreased in the UK (13%), the Netherlands (8%), France (5%) and Italy (2%). The biggest year-on-year decrease occurred in Denmark (19%), Latvia (16%) and Estonia (15%). In the remaining 17 countries the year-on-year rate of decrease in gas consumption varied between 0.2% and 8.4% in Q1 2019.

In absolute numbers, gas consumption in Q1 2019 decreased by the most in the UK (3.7 bcm), the Netherlands (1.2 bcm), France (0.9 bcm), Italy (0.4 bcm) and Austria (0.3 bcm), if we compare to the first quarter of 2018. On the other hand, gas consumption increased in year-on-year comparison in Germany (1.2 bcm) and Greece (0.3 bcm). In the other Member States the change in gas consumption remained below 0.2 bcm over this period.

Figure 3 Year-on-year change in gas consumption in the first quarter of 2019

Source: Eurostat, data as of 22 May 2019 from data series nrg_103m. Data missing for the Netherlands in March 2019 are calculated by using short term monthly gas data (nrg_ind_343m,) as proxy.

Economic activity in the EU in the first quarter of 2019 was comparable with that in the previous quarter (Q4 2018), and GDP grew by 1.5% in year-on-year comparison¹. However, the rate of growth of value added in industrial sectors that consume significant amount of energy (e.g.: manufacturing, construction) showed acceleration in Q1 2019 (in manufacturing value added grew by 0.9% while in construction it went up by 4.1% in this quarter in year-on-year comparison). This might also have impacted the consumption of natural gas in Q1 2019 in the EU.

¹ Source: Eurostat, data as of 7 June 2019 from data series namq_10_a10; seasonally and calendar adjusted data
Figure 4 EU GDP Q/Q-4 change (%)

Source: Eurostat, data as of 7 June 2019 from data series namq_10_gdp - Seasonally and calendar adjusted data

Figure 5 shows the deviation of actual heating degree days (HDDs) from the long-term average\(^2\) in individual EU Member States in the first quarter of 2019. Although January 2019 was colder than usual in some countries of the EU, February was especially mild and in March 2019 temperatures were also higher in most of the EU countries compared to the seasonal averages. The generally mild weather implied lower-than-usual heating needs and residential demand for natural gas in the first quarter of 2019.

Figure 5 Deviation of actual heating degree days from the long-term average in the first quarter of 2019

Source: Joint Research Centre (JRC), European Commission

Based on data from ENTSO-E, gas-fired power generation was up by 24% in the first quarter of 2019 compared to the same period of 2018. Gas-fired generation was especially high in January 2019, when an additional amount of 20 TWh electricity was produced from this fuel at EU level, in comparison to January 2018. At the end of 2018 gas prices showed a strong downward correction, which was to a lesser extent, followed by declining coal prices. However, carbon prices still remained in the range of 18-

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\(^2\) Long term average temperatures and heating degree days refer to the period between 1975 and 2016
25 €/tCO₂ throughout the first quarter of 2019, which resulted in an increasing competitive advantage for gas vis-à-vis coal. Hydro and nuclear power generation decreased in Q1 2019 in year-on-year comparison in the EU, and renewables production only went up slightly, implying that increasing demand for electricity could mainly be satisfied from gas-fired generation.

- In Italy, Spain and France the amount of electricity generated from gas respectively increased by 62%, 27% and 14% in Q1 2019 in year-on-year comparison, owing to changes in the local power generation mixes. In Italy decreasing hydro and coal-fired generation was replaced by increasing gas use, in Spain coal, lignite, hydro and wind generation decreased, which had to be supplemented by gas-fired generation. In France gas filled in the gap left by receding coal, hydro and nuclear in the power generation mix in Q1 2019. In the other countries on Figure 6 quarterly gas consumption in Q1 2019 was up by 0.2-8% in year-on-year comparison.

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

![Gas-fuelled power generation in the EU](image)

Source: Based on data from the ENTSO-E Transparency Platform, data as of 3 June 2019.

- UK clean spark spreads – measuring the profitability of gas-fired generation by taking into account variable costs – averaged 14.1 €/MWh, in Q1 2019, up from 6.4 €/MWh in the fourth quarter of 2018, the highest since Q4 2016, implying that profitability of gas-fired generation in the UK improved in the first quarter of 2019 (see Figure 7). However, the amount of electricity generated from gas remained practically the same in Q1 2019 in year-on-year comparison, as renewable sources and electricity imports were more competitive alternatives to gas. The share of gas in power generation was 48.6% in the UK in the first quarter of 2019, measurably up compared to Q1 2018 (43.4%). This can mainly be explained by constant gas-fired generation amid decreasing total domestic generation.

- Clean spark spreads in Germany averaged 0.2 €/MWh in the first quarter of 2019 and in March they were in the negative range, in spite of decreasing gas prices, as wholesale electricity prices in the German market fell sharply in Q1 2019, showing that gas-fired generation was barely profitable in Q1 2019 in Germany.

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5 As electricity generation from gas is less carbon intensive than from coal, for the production of 1 MWh electricity.
5 Charts of clean spark spreads in Germany and the UK can also be found in the Quarterly Report of European Electricity Markets. Data on the share of gas in electricity generation come from the database of ENTSO-E.
6 Assuming an average gas power plant efficiency, see more in the Glossary.
1.2 Production

- In the first quarter of 2019 EU gas production was 30.8 bcm, 8% (2.7 bcm) less than in the same period of 2018 (See Figure 8). During the whole Q1 2019 gas output was below the 2014-2018 range, reinforcing the decreasing trend of domestic production in the EU. In the Netherlands natural gas production decreased by 11% (1.3 bcm) and in the UK it fell by 5% (0.5 bcm) in the first quarter of 2019 in year-on-year comparison. Looking at the following six largest producers, gas output decreased in Ireland (-23%, 0.2 bcm, in spite of measurable increases over the last couple of years), Denmark (-12%, 0.1 bcm), Italy (-7%, 0.1 bcm), Germany (-5%, 0.1 bcm), Romania (-3%, 0.1 bcm) and in Poland (-2%, 0.03 bcm).

- During the 2018 gas winter period (stretching from 1 October 2018 to 31 March 2019) gas production in the Dutch Groningen field amounted to 9.9 bcm, which was 2 bcm lower than in the previous gas winter period. Assuming that the output is the same during the summer period (until 30 September 2019) as in the same period of 2018, the total gas production from the Groningen field would be 25% less than the target set by the Dutch government. However, it is important to recall that other fields continue to produce gas and competitive LNG imports in the Netherlands ensured secure natural gas supply in Q1 2019.
1.3 Imports

- Contrary to the EU gas consumption, decreasing by 4% in the first quarter of 2019, Eurostat data show that net imports in this period increased by 15% compared to the same period of 2018. This measurable increase of 15% in the net gas imports was the highest quarterly growth since Q3 2017. In most of the EU countries net imports increased in Q1 2019 compared to the same period of the previous year (in the biggest EU gas consumer Germany it rose by 38%), however, among the bigger gas consumers it decreased in the United Kingdom (15%) and in France.

- In the first quarter of 2019 the total net EU gas imports reached 100 bcm, up from only 87 bcm in the same period of 2018 it was. The four biggest importers in the EU in Q1 2019 were Germany, Italy, the United Kingdom and France, respectively with net imports of 27 bcm, 18 bcm, 15 bcm and 11 bcm, representing together around two thirds of the total EU net gas imports in this quarter.

- According to ENTSO-G data, imports amounted to 1 149 TWh in the first quarter of 2019, which was 7% more than in Q1 2018. While imports from Russia and Libya increased in Q1 2019 in year-on-year comparison, imports from Norway decreased slightly and that from Algeria fell measurably. At the same time, LNG imports showed a huge increase, more than doubling since Q1 2018 and reaching 251 TWh in Q1 2019.

- Russia remained the top pipeline gas supplier of the EU, covering 40% of total extra-EU gas imports in the first quarter of 2019, which was 1 percentage point less than in the same period of 2018 and the lowest quarterly share since the first quarter of 2016. However, in Q1 2019 gas imports from Russia increased by 5% in year-on-year comparison.

- Imports from Norway, the EU’s second largest gas supplier, decreased by 5% year-on-year in the first quarter of 2019, and the country’s share in extra-EU gas imports also fell below 31% (from 35 in Q1 2018). In the first quarter of 2019, Norwegian gas production amounted to 20.2 bcm, 10% less than in the same period of the previous year.

- Imports from Algeria fell significantly, by 41% in the first quarter of 2019 compared to the same period of 2018, and the share of Algeria was barely 6% in the total extra-EU pipeline gas imports, being the second lowest share in the last five years. Imports from

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7 Net imports equal imports minus exports and do not account for stock changes.
8 Note that Norway to UK flows reported by ENTSO-G includes some gas from UK offshore fields, resulting in an overestimation of Norwegian imports.
Libya went up by 10% in Q1 2019, however, the share of Libya was only 1% in the total gas imports. Imports from both Algeria and Libya showed a great volatility over the last few years, reflecting the competitiveness of imports and supply availabilities in these two countries.

- According to several data sources, including ENTSO-G and Thomson-Reuters data, imports of LNG increased significantly in the first quarter of 2019 in year-on-year comparison, and covered almost 22% of total extra-EU gas imports, which was the highest quarterly share in the last five years. Comparing to Q1 2018, when the share of LNG was 12% in the total extra-EU gas imports, LNG grew mainly to the expense of the share of Norwegian and Algerian pipeline gas imports.

- Import volumes of natural gas increased from 1 041 TWh to 1 149 TWh in the first quarter of 2019 compared to the same period of 2018, while at the same time the estimated average import price decreased by 8%, from 21.5 €/MWh to 19.9 €/MWh. As a result, the EU’s estimated gas import bill decreased slightly, by 1% year-on-year, reaching around 22.9 billion euros in the first quarter of 2019.

Figure 9 EU imports of natural gas by source, 2016–2019

![Figure 9 EU imports of natural gas by source, 2016–2019](image)

Source: Based on data from the ENTSO-G Transparency Platform, data as of 22 May 2019.

Russian deliveries to Estonia and Latvia are reported for a limited period (Narva from 15 June 2015 to 10 December 2015, Värska and Misso Izborsk from 26 May 2015). Therefore currently exports to the Baltic-states and Finland are not included in the chart. Russia, Norway, Algeria and Libya include pipeline imports only; LNG imports coming from these countries are reported in the LNG category. Norway to UK flows reported by ENTSO-G include some gas from UK offshore fields, resulting in an overestimation of Norwegian imports.

- Figure 10 shows the breakdown of EU gas imports from Russia to the three main pipeline supply routes: Ukraine (which includes the Brotherhood Pipeline and the Balkan route), Belarus (mainly the Yamal pipeline) and Nord Stream.

- In the first quarter of 2019, the volume of Russian imports went up by 5%, if compared with the same period of 2018. Gas flows transiting Ukraine were almost 20% higher than in Q1 2018, while flows through Belarus decreased by 5% and the Nord Stream flows remained practically the same (-0.7%). As result, the share of the transit through Ukraine, being the main supply route of Russian gas to the EU, rose to 40% within the total Russian pipeline gas imports to Europe, whereas in Q1 2018 it was only 35%. The share of pipeline gas transit through the Nord Stream was 35% in Q1 2019 and the Belarus transit route represented 25%.

- Recalling that in Q1 2019 that Russian pipeline gas imports represented around 40% in the total net extra–EU gas imports, and at the same time the total net gas imports in the EU amounted to 100 bcm, it can be estimated that the Ukraine transit route represented 16% (16 bcm), the Nord Stream had a share of 14% (14 bcm), and the Belarus transit route ensured 10% (10 bcm) of the total net extra–EU gas imports in Q1 2019.
In the first quarter of 2019, Ukraine continued to rely on imports from the EU. However, gas flows coming from Hungary, Poland and Slovakia reached only 1 bcm in this period, 45% (or by 0.8 bcm) less than in the same period of 2018. Since mid-2016 gas imports from these countries to Ukraine follows a decreasing trend. During Q1 2019, the share of Poland decreased to 41% within the Ukrainian gas imports, while that of Slovakia and Hungary respectively rose to 31% and 29%. This might be related to high filling rates in Ukrainian gas storages and to the ramp up in domestic gas production in the country. Increase in Hungarian exports to Ukraine was helped by beneficial export tariffs, compared to the costs of exports from Slovakia and Poland.

Figure 10 EU imports of natural gas from Russia by supply route, 2016-2019

Source: Based on data from the ENTSO-G Transparency Platform, data as of 22 May 2019.
Deliveries to Estonia, Finland and Latvia are not included; transit volumes to the Former Yugoslav Republic of Macedonia, Serbia and Turkey are excluded.

On 23 January 2019 EU Member States voted on a Commission proposal to invest almost €800 million in key European energy infrastructure projects with major cross-border benefits. The EU funding comes from the Connecting Europe Facility (CEF), the European support programme for trans-European infrastructure. In the gas sector, the CEF will support, with nearly €215 million, the Baltic Pipe project, a new, bi-directional offshore gas interconnection between Poland and Denmark. This pipeline will be crucial for security of supply and market integration of the region.

On 14 February 2019 the European Commission organised a workshop on the international role of the euro in the energy sector, following the publication of a recommendation in this field in December 2018. Parallel to the workshop an online consultation was launched on the euro in the energy sector, involving various stakeholders. Actors in the gas sector were particularly supportive on enhancing the role of the euro in their daily activities, also helped by the increasing role of the TTF platform, which is the most liquid gas hub in the EU and where contracts are traded in euro.

On 15 April 2019 the Council of the European Union adopted the proposal for amendment of the Gas Directive (2009/73/EC) on the extension of EU rules to pipelines to from third countries. The overall objective of the amendment to the gas directive is to ensure that the rules governing the EU’s internal gas market apply to gas transmission lines between a member state and a third country, up to the border of the member state’s territory and territorial sea. The new directive was published in the Official Journal of the European Union on 3 May. Member states will have 9 months from entry into force to transpose the new rules into national law (implying a transposition deadline of February 2020). This might have implications on some ongoing gas pipeline projects.

10 Based on data from the ENTSO-G Transparency Platform, data as of 22 May 2019.
11 https://ec.europa.eu/info/consultations/consultation-role-euro-field-energy_en
EU LNG imports registered a huge increase in Q1 2019, reaching 26 bcm, up by 126% compared to the first quarter of 2018. With the exception of countries importing LNG in small quantities (Lithuania, Sweden and Malta), where slight decreases could be observed, all European LNG importing countries showed double or triple digit increases compared to Q1 2018. In the Netherlands the imported LNG amount in Q1 2019 was seven and half as much as in Q1 2018, while in the UK a six fold increase could be observed. In Belgium the year-on-year increase rate was 537%, while in Greece and France LNG imports respectively rose by 120% and 115%. In Q1 2019 France became the largest LNG importer, with a quarterly volume of 5.9 bcm, followed by the United Kingdom (4.3 bcm) and Spain (3.9 bcm).

In the first quarter of 2019, primarily owing to unusually mild winter in East-Asia, the price premium of Far Eastern LNG markets to Europe became insignificant (see Figure 19 and Figure 20), implying that Europe offered a competitive destination for LNG cargos, especially if shipment costs are also taken into account (in the case of cargos from the Atlantic Basin and the Middle East).

**Figure 11 LNG imports to the EU by Member State**

Source: Commission calculations based on tanker movements reported by Thomson Reuters

*Other* includes Finland, Malta.

In the first quarter of 2019, Qatar remained the largest LNG supplier of the EU, keeping its market share at 22%, similarly to the previous quarter. Russia continued to increase its share within the total EU LNG imports, reaching 21% in Q1 2019. The third most important LNG source was the United States, ensuring 13% of the total EU LNG imports. The share of Nigeria shrunk further to 12% (from 14% in the previous quarter). Among other LNG sources Algeria (9%), Trinidad and Tobago (6%) and Norway (5%) are worth to be mentioned.

In the first quarter of 2019, Qatar was the biggest import source in Belgium (75% of the total imports), its share was close to 50% in Poland and Italy, and it ensured 35% of the UK LNG imports. Russia was an important supplier to the Netherlands (54%), France (43%), and the UK (28%). The US ensured 38% of the LNG imports in Poland and 28% of the Portuguese imports. Nigeria was the biggest LNG supplier in Greece (49%), Portugal (46%) and Spain (30%). Norway was the sole LNG supplier of Lithuania, Sweden and Finland. Albeit exporting only a small quantity, Trinidad and Tobago was the sole LNG supplier of Malta in Q1 2019.
In the first quarter of 2019 35 LNG cargoes arrived from the US, unloading 3.4 bcm of LNG (in re-gasified form). Both the number of cargos and LNG import volumes were up by several magnitudes compared to Q1 2018 (in that quarter only 2 cargos arrived, carrying only 180 mcm LNG). LNG exports to the EU represented 32% of total US LNG exports in Q1 2019. In the first quarter of 2019 the five most important EU destinations of the US LNG exports were Spain, the United Kingdom, France, Italy and Portugal. However, other countries, such as the Netherlands, Poland and Greece also imported LNG from the US, showing the diversification of US LNG exports to Europe.
On 25 March 2019 the US House passed a bill called ‘European Energy Security and Diversification Act of 2019’ with the aim of encouraging European countries to diversify their energy sources and supply routes, increase European countries’ energy security, and help the United States achieve its global energy security goals. An identical bill was introduced in the Senate on 7 March. This move could indicate that the US is looking at LNG trade with Europe, beyond commercial aspects, also from a national security and geopolitical point of view.

On 2 May 2019, following European Commission President Juncker and US President Trump agreement on strengthening the strategic cooperation with respect to energy in July 2018, top energy business executives from both sides of the Atlantic met in Brussels at the 1st EU-U.S. Energy Council B2B Energy Forum. The principal aim of the forum was to discuss further ways to enhance LNG trade, the role that competitively-priced U.S.-LNG can play on the EU market, and the growing opportunities for using LNG in the transport sector. Topics discussed ranged from new infrastructure for upstream development, liquefaction and re-gasification to pipeline network distribution as well as new business models and financial instruments in a changing market. It also provided for U.S. and European decision-makers and companies in the LNG sector with match-making and deal-making opportunities.

Figure 14 EU LNG imports from the US

Source: Commission calculations based on tanker movements reported by Thomson Reuters

1.4 Storage

Figure 15 shows EU stock levels as the percentage of storage capacity in gas years 2018 and 2019, compared to the 5-year range of gas years 2014-2018. According to figures published by Gas Infrastructure Europe, EU storage capacity amounted to 1,131 TWh (roughly 100 bcm) by the end of 2018.

On average, net withdrawals made during the first quarter of 2019 were equivalent to 29.9% of storage capacity, which was less than that of 46.4% in the same period of 2018: the average filling rate decreased from 70.4% on 31 December 2018 to 40.4% on 31 March 2019. As result, at the end of March 2019 the average filling rate in the EU was 22% higher than a year before, implying less intensive storage refilling needs in the course of summer 2019, as the refilling period has already started in March 2019, contrary to the last year.

As it was mentioned before, the weather was milder than usual during most of Q1 2019 across the European countries, which resulted in lower than usual heating related gas demand and less withdrawal from gas storages. The withdrawal season ended at the end of March.

13 https://www.congress.gov/bill/116th-congress/house-bill/1453/text?q=%7B%22search%22%3A%5B%5B%22actionDate%3A%5C%222017-03-16%5C%22%5D%7D%5B%22AND%5B%22billIsReserved%3A%5C%22N%5C%22%5D%7D%5B%22type%22%3A%5C%22AMENDMENT%5C%22%5D%7D
• Besides mild weather conditions, increasing LNG imports in Europe and high send-outs to the gas grid in many countries resulted in less reliance on storage withdrawals, as competitively priced LNG was disposable to satisfy the need for natural gas. Decreasing spot market prices in Q1 2019 and abundant supply also made a reasonable choice for market operators to prefer relying on the spot market to storage volumes, injected at higher costs in the previous quarters.

Figure 15 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 28 May 2019. 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.

• However, as Figure 16 shows, there was a significant variation among Member States in terms of both the starting position (the filling rate at the end of December 2018) and the pace of withdrawals. Although the average change in the filling rate over Q1 2019 was 29.9%, in the UK, France and Bulgaria the decrease in the storage filling rates exceeded 40% and in Croatia, Czechia, Romania and in the Netherlands it was above 30%. The decrease in the filling rate was also exceeded 10% in Belgium, Austria and Spain.

• Interestingly, in the storage filling rate in Portugal was 79%, being the highest in all Europe and showing an unusual increase during the heating season, up by more than 10% compared to the end of December of 2018. This must have been related to high LNG imports in Q1 2019, being at the same magnitude of the quarterly gas consumption in the country (1.3 bcm). However, it is worth noting that storage capacities in Portugal only amount to 0.4 bcm.

• Besides Portugal, Spain had the highest filling rate on 31 March 2019 (close to 60% of its capacity). On the other hand, storage levels were only between 5 and 15% in Sweden, Romania and Latvia.
On the NBP, seasonal spreads (the difference between summer and winter 2019 contracts) showed a significant increase over the first quarter of 2019: while in December 2018 the 2019 winter spread was 2.5 €/MWh, in March 2019 it rose to 5.5 €/MWh. At the same time the average 2019 seasonal spread on the TTF, went up from 1.2 €/MWh to 3.7 €/MWh. Looking at the 2020 seasonal spreads, in the UK it grew from 2.5 €/MWh to 3.8 €/MWh in Q1 2019, while the 2020 TTF spreads grew only moderately, from 1.2 €/MWh to 2 €/MWh between December 2018 and March 2019.

Increasing 2019 summer-winter spreads over the Q1 2019 could be observed in many other European gas markets, as spot prices showed a huge decrease, owing to low gas demand (worth to recall mild temperatures) and high LNG send-outs. However, contracts on the curve were less influenced by current market conditions, widening the spread with spot prices. The 2019 season spread contracts ran out at the end of March, and from this time on the 2020 spreads will serve as seasonal indicator. High LNG imports might lead to a situation where Europe functions as LNG buyer-balancing market on the global LNG stage, which will lead to use of storages different from the current season driven filling and withdrawals.

As in the UK there is 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 spreads developed a perceivable premium to the continent over the last few years, which was reinforced by the decommissioning of some storage facilities (e.g.: Rough) in the country.
Figure 17 Winter-summer spreads in the Dutch and British gas hubs

Euro/MWh

Source: S&P Global Platts

W-S 2018 refers to the difference between the winter 2018-19 price and the summer 2018 price; 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.
2. Wholesale gas markets

2.1 EU energy commodity markets

- The price of Brent crude, after undergoing a steep fall in Q4 2018, showed a steady recovery in the first quarter of 2019. While at the end of December 2018 the daily Brent quotations were barely above 50 USD/bbl (44 €/bbl) at the end of March the crude oil price reached 68 USD/bbl (61 €/bbl). In early December 2018 the main oil producers (OPEC and non-OPEC members) agreed in a reduction of daily oil production by 1.2 million barrels per day as effective of January 2019. Increasing compliance with production quota cuts over Q1 2019 gradually eliminated the over-supply from the oil market, and decreasing exports from Iran, ahead of the end of the waiver period set by the United, also added to the upward pressure on the price of crude oil.

- By March 2019 the TTF spot gas price averaged 15.7 €/MWh, which was the lowest since July 2017, and fell measurably compared to December 2018 (when it stood at 23.8 €/MWh). On the demand side decreasing EU gas consumption, owing to mild weather conditions, put a lid on heating related gas demand in Q1 2019, and other the supply side abundant LNG imports in the EU, all contributed to the measurable decrease in the European gas hub prices in the first quarter of 2019.

- Although crude oil prices in Q1 2019 started to recover, oil-indexed gas contracts, in line with the typical 6-9 month time lag used in the pricing formula, reached a peak in January 2019 and since then a slight decrease could be observed. However, looking at the recent increase in the crude oil price it is likely that oil-indexed contracts will go up again. In Q1 2019 Platt’s North West Europe Gas Contract Indicator (GCI), a theoretical index showing what a gas price, linked 100% to oil would be, averaged 28 €/MWh, showing an increasing premium (almost 10 €/MWh, in comparison to 1.5 €/MWh in Q4 2018) to the spot TTF, which was mainly the result of the fall in TTF prices amid the negligible decrease in the GCI contract.

- Spot coal prices fell to 53 €/Mt by the end of March 2019 from 75 €/Mt in at the end of December 2018, which was the lowest since September 2016, as coal stocks at the Dutch import terminals remained close to multi-year maximums and low prices of gas (a direct competitor fuel in the European electricity production) resulted in falling demand for coal in electricity generation in Europe. Prices also were pushed down by Russian suppliers, ready to offer significant discounts to keep their market share.

Figure 18 Spot prices of oil, coal and gas in the EU

Source: S&P Global Platts
2.2 International gas markets

- Figure 19 displays the international comparison of wholesale gas prices. Over the last two winters (2016-2017 and 2017-2018) Asian markets showed a measurable premium to Europe between December and February. Since autumn 2018 the premium of Japanese and Chinese landed LNG prices started to shrink vis-à-vis the European peers, and by March 2019 Asian premiums to the TTF and Spanish LNG prices practically disappeared. Bearing also in mind lower transportation costs to Europe than to Asia, this meant a great opportunity to LNG exporters in the Atlantic Basin and the Middle East to direct their cargos towards the European markets in Q1 2019, continuing the trend of the last months of 2018.

- Asian prices showed a measurable decrease in Q1 2019 compared to the previous quarter (and especially to the several years' high in September 2018). The average Japanese LNG price was 6.9 USD/mmbtu in Q1 2019, down from 10.1 USD/mmbtu in Q4 2018 and by 26% compared to same quarter of 2018. The Japanese premium above the Dutch TTF hub was on average 0.8 USD/mmbtu in the first quarter of 2019, down from 1.9 USD/mmbtu in Q4 2018. On quarterly average, LNG import prices in China were comparable with their Japanese peers (6.9 USD/mmbtu) in Q1 2019.

- The average import price of Chinese pipeline imports in Q1 2019 was 7.6 USD/mmbtu, which was above the Asian LNG reference prices, and show a slightly increase over Q1 2019, contrasting the falling LNG prices and reflecting the time-lag impact of oil price escalation, which is still dominant in pipeline gas contracts in Asia.

- After the temporary upturn at the end of 2018, the Henry Hub price fell back again in the first quarter of 2019, and in March 2019 the monthly average price was 2.9 USD/mmbtu (down from 4.0 USD/mmbtu in December 2018), and in early April it fell further to levels not seen since mid-2016. On quarterly average the Henry Hub contract reached 2.9 USD/mmbtu, which was 5% lower than in Q1 2018. However, as the euro-dollar exchange rate changed Q1 2019 over time, (1.23 in Q1 2019 vs. 1.14 in Q1 2018), implying that changes in the gas price euro in Q1 2019 year-on-year was negligible, as the depreciating euro eliminated the impact of the price decrease in dollars.

- In the first quarter of 2019, TTF averaged at 6.1 USD/mmbtu (18.4 €/MWh). The average German border price was somewhat higher (6.6 USD/mmbtu or 20 €/MWh).

- Over the course of the first quarter of 2019 differentials in international price contracts decreased, as traditionally lower US prices only slightly decreased and European and Asian contracts fell significantly. The ratio of the Japanese LNG price and US Henry Hub was 2.4 in the first quarter of 2019, down from 2.7 in the Q4 2018 and from 3.1 in Q1 2018.

- The average TTF/Henry Hub ratio decreased to 2.1 in the first quarter of 2019 from 2.5 in the same period of 2018. In absolute terms, the price spread between Henry Hub and TTF was 3.2 USD/mmbtu in the first quarter of 2019, which compares to an average of 4.6 USD/mmbtu in the same period of 2018. By March 2019 the price differential between Henry Hub in the US and the TTF in the Netherlands (2.3 USD/mmbtu) was the lowest since mid-2017.

Figure 19 International comparison of wholesale gas prices

Sources: S&P Global Platts, Thomson-Reuters, BAFA, CEIC
2.2.1 LNG markets

- In the first quarter of 2019, spot prices averaged 6.1 USD/mmbtu in the Netherlands, 6.5 USD/mmbtu in Spain and 6.9 USD/mmbtu in Japan and China.

- JCC (Japanese Crude Cocktail), the Japanese benchmark of oil-indexed LNG prices averaged around 10.6 USD/mmbtu in the first quarter of 2019, which was measurably higher than the average spot price (6.9 USD/mmbtu), reflecting the slow responsiveness (time-lag in the oil indexation) to the spot market price decrease of this oil-indexed contract.

- LNG imports in the first quarter of 2019 increased measurably in China (+26% year-on-year). However, LNG imports decreased significantly in Korea (-21.8%), India (-11%) and Japan (-10%)16. In the case of China increasing gas demand might have been driven by the electricity sector, while in the other countries mild winter weather conditions might also have played a role.

- Global LNG supply continued to expand in the first quarter of 2019: and LNG trade amounted to 116 bcm, 10% more than in the same quarter of 2018 (108 bcm).

Figure 20: Spot LNG landed prices in the EU and Asia

Figure 20 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 the major part of pipeline imports in the UK and Spain, respectively. The evolution of the day-ahead prices on the NL TTF hub is also presented.

- In the first quarter of 2019, the estimated Algerian pipeline import price in Spain, following the time lag impact of the oil-indexed contracts, reached the peak (23 €/MWh) reflecting the high crude oil prices in earlier periods, and started to decrease slightly in February and March. In contrast, the estimated Norwegian import price contract in the UK, similarly to the other hub based contracts and LNG prices, continued to decrease and by March 2019 it fell below 16 €/MWh, the lowest since September 2017. As result, in the first quarter of 2018 the different contracts on Figure 20, with the exception of the Algerian contract, converged well, and the March 2019 average monthly prices fell in the range of 15.5-17 €/MWh. With the exception of the Algerian import contract, the quarterly average prices in Q1 2019 were 5-15% lower than in the first quarter of 2018.

- Spot LNG prices in Spain and the UK were mainly influenced by the strong LNG inflow in Europe, as in the consequence of the vanishing Asian price premium more LNG cargos were sent to Europe, increasing the natural gas supply in the market. Although following closely the TTF hub prices, both UK and Spanish LNG import prices had a slight premium (0.5-2 €/MWh) over the TTF hub in Q1 2019.

16 Source: Commission calculations based on tanker movements reported by Thomson Reuters.
2.3 European gas markets

2.3.1. Wholesale markets in the EU

- As Figure 22 and Figure 23 show, liquidity on the main European gas hubs increased in the first quarter of 2019: total traded volumes amounted to around 15 619 TWh (equivalent to around 1 476 bcm), 24% more than in the same period of 2018. This was around 12 times more than the gas consumption in the seven Member States covered by the analysis in Q1 2019. Over the course of the three months in Q1 2019 traded volume of gas on the European hubs showed accelerating increase in year-on-year comparison (in January by 17%, in February by 21% and in March by 33%).

- Traded volumes in the first quarter of 2019 increased year-on-year in the Italian (57%), Dutch (42%), German (39%), French (12%), and Austrian (11%) hubs, while in the UK (-13%) and Belgium (-9%) traded volumes decreased compared to Q1 2018.

- The significant increase on the TTF hub further reinforced the leading role of TTF in Europe, providing for a liquid continental benchmark, having the advantage of euro-denomination, and benefiting from its good connection to various supply sources. On the other hand, decrease on the NBP hub further signalled a shift from once Europe’s most liquid market, where the quarterly traded volume in Q1 2019 was down by 13% compared to the first quarter of 2018 and was only one third of that on TTF in Q1 2019. Four years earlier, in Q1 2015 the traded volume on the NBP was 27% higher than on that on the TTF, which shows how dramatically the ranking of the European hubs changed, just over four years’ time.

- Low spot prices amid high LNG send-outs played an important role in increasing traded volumes on the European gas hubs, as traders profited from low prices by concluding contracts for Q2 2019 and the summer periods (as curve contracts had a measurable premium to the spot contracts), and amid high level of the European storages, storage-backed hedging strategies also contributed to high trading volumes on the markets.

- Following the creation of the new single market in France (TRF - Trading Region France) in last November, the volume was still up in Q1 2019 (by 12% year-on-year), however, the increase in the volume slowed down compared to Q4 2018. Although traded volumes on Zeebrugge in Belgium was still down in Q1 2019 compared to the same quarter of 2018, flows from the UK on the Belgian-UK interconnector showed an increase at the end of March, due to price premium on the Zeebrugge hub, ahead of the maintenance closure of the interconnector in the second half of April 2019.

17 Netherlands, UK, Germany, France, Italy, Belgium, Austria
On the UK NBP hub, 46% of the total traded volumes were executed directly on an exchange in the first quarter of 2019, which was the highest share in Europe. This share was only 25% on the Dutch TTF hub, 18% at Austrian hub and 12% for both on the French and the German hubs, and respectively only 2% and 0.5% for the Belgian and Italian hubs. On the TTF hub the share of exchange trade went up by 6 percentage points compared to Q1 2018, while on the TRF hub in France and the hubs in Germany it respectively decreased by 8 and 7 percentage points.

**Figure 22 Traded volumes on the main European gas hubs in the first quarter of 2018 and 2019**

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

Source: Trayport Euro Commodities Market Dynamics Report

**Figure 23 Traded volumes on the main European gas hubs**

"Other" includes the following trading hubs: Germany: NCG (NetConnect Germany) and Gaspool; ; France: TRF (Trading Region France); Italy: PSV (Punto di Scambio Virtuale); Belgium: Zeebrugge beach. 1 bcm is equivalent to 10.580 TWh.

Source: Trayport Euro Commodities Market Dynamics Report

On the European hubs as whole, 65% of the total trade was OTC bilateral, 7% was OTC cleared and 28% was exchange executed, showing little change in Q1 2019 compared to the same period of the 2018 (a 2 percentage point decrease in the OTC bilateral trade and a similar increase in exchange executed contracts).
The total OTC traded volume (bilateral and cleared together) rose by more than 21% in Q1 2019 in year-on-year, and exchange executed volumes increased by 30% in the same period. Liquidity was driven by the OTC market in the EU gas hubs, given its size advantage over exchange executed contracts.

**Figure 24 Share of traded volumes on the main European gas hubs**

The chart covers the following trading hubs: UK: NBP (National Balancing Point); 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).

Source: Trayport Euro Commodities Market Dynamics Report

### 2.3.2. Wholesale price developments in the EU

- European hub prices were averaging around 18-21 €/MWh in the first quarter of 2019, which was lower than the range in Q4 2018 (24-26 €/MWh), as well as the range in Q1 2018 (20-23 €/MWh). In fact, in the first quarter of 2019 hub prices were down by 6-16% in year-on-year comparison. The average TTF hub price fell by 15% in Q1 2019.

- Wholesale gas prices in the first quarter of 2019 were the generally impacted by the same factors as in the previous quarter: decreasing consumption owing to milder than usual weather conditions, implying less heating needs, and abundant LNG inflows owing to disappearing price premiums at the Asian LNG markets over Europe. Although crude oil prices started to recover in Q1 2019 from the lows at the end of 2018, this could not yet exert influence on oil-indexed contracts, due to the several months’ time-lag impact.
UK and German benchmarks were well-aligned with the Dutch TTF in the first quarter of 2019, showing only a minor premium (0.3–0.4 €/MWh) on quarterly average. During the winter period the UK market normally shows a premium to its continental peers, as opposed to the summer, when it shows discount (during wintertime import demand for gas increasing in the UK due to limited local storage capacities).

The price premium of the Italian hub increased again in Q1 2019 compared to the previous quarter and reached 2.5 €/MWh, returning to the average of the last few years. This widening premium might have been the result of uncertainties over import sources from Algeria (big year-on-year decrease), as the country had to rely on more other sources, such as the interconnection to Western Europe. However, abundant LNG send-outs mitigated the tightness of the market. The Austrian gas hub showed a minor premium (1 €/MWh), while the Belgian hub showed a minor price discount (0.2 €/MWh) to the TTF in Q1 2019 on average. The French TRS hub prices remained well aligned to the TTF over the whole Q1 2019, in March sometimes even turning to discount to TTF owing to the mild weather and abundant LNG supply in France.
• Figure 27 looks at the development of forward prices one, two and three years ahead in comparison to the development of the day-ahead price on the Dutch TTF.

• In January 2019 spot prices on the TTF hub were still higher than forward contracts (otherwise saying, the gas price curve was in backwardation – See the definition in the Glossary), similarly to the previous two quarters, reflecting the anticipation of market participants on lower prices in the future. However, as the high spot price period of the preceding months was over, primarily owing to rapidly increasing LNG imports pushing down the spot contract, at the beginning of February 2019 the price curve switched back to contango and by the end of March forward contracts had a premium higher than 2 €/MWh over the spot price.

• At the end of March 2019 the spot TTF gas price (16.2 €/MWh), while year-ahead and two and three years-ahead contracts respectively reached 18 €/MWh and 18.2 €/MWh. Depending on gas imports and the needs on replenishing the storages in the two quarters to come, the gap between spot and curve prices might shrink again.

2.3.3. Comparing the prices of different contracts for gas in the EU

• Figure 28 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.

• Over the last few years, most of the European gas contracts remained well aligned, however, in the periods of rapid price falls or rises on the energy markets (e.g.: falls at the end of 2015 and at the beginning of 2019, rise in the second half of 2018), resulting in increasing price volatility, price differentials among different contracts tended to increase as well. This mainly stems from slower responsiveness in time of oil-indexed contracts to market developments, compared to hub-based pricing.

• In the first quarter of 2019 the oil-indexed prices of Algerian import contract in Italy remained stable, while in the case of Russian gas imports in Latvia and the Czechia, some price decreases could be observed, implying a move-away from pure oil-indexation to hub-based price formation in these contracts.

• Hub based contracts, such as the Norwegian import, or hub prices, showed measurable falls in the first quarter of 2019. Reported German border prices, after remaining stable over the general price increase in the previous two quarters, turned down similarly to most of the hub-based and oil-indexed contracts. Oil-indexed contracts proved to the most expensive prices during Q1 2019, as they could not fully reflect the latest gas hub developments.
In March 2019, the difference between the highest and lowest price depicted on Figure 27 rose to 8.8 €/MWh from 6.8 €/MWh measured in December 2018, reaching the highest differential since December 2015. On quarterly average, in Q1 2019 the price differential was 5.7 €/MWh, being similar to that in the fourth quarter of 2018.

**Figure 28 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 first quarter of 2019

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 29 and Figure 31 show the degree of convergence of retail gas prices for household and industrial consumers, 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 second half of 2018) and Harmonised Consumer Price Indices (HICP) for both the household prices and industrial consumers.

- For household consumers, the estimated average retail price in the EU (including all taxes) showed an overall increasing trend from 2016 to 2019. In the first quarter of 2019 retail gas prices for household customers in the EU increased compared to the previous quarter. In the most typical consumption band, D2, the estimated average price (including all taxes) in the first quarter of 2019 was 6.95 Eurocents/kWh. (See the estimated household prices on Map 2).

- Retail prices for households showed an overall increasingly diverging trend from 2016 to 2019, as shown by the increase of the relative standard deviation in Figure 29. Price divergence for middle and higher level consumption decreased during 2018. Moreover, for lower consumption alternating periods of price convergence and price divergence are also visible. 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.

- There are still significant differences in retail gas prices across the EU: in the first quarter of 2019, the estimated household price in consumption band D2 varied between 3.50 Eurocent/kWh in Hungary and 12.35 Eurocent/kWh in Sweden, resulting in a price differential ratio of 3.5 between the cheapest and the most expensive Member State. This ratio gradually decreased from 4.8 in the second quarter of 2012 to stabilising around 3.6 since the third quarter of 2014.

**Figure 29 Relative standard deviation of gas prices paid by household customers in EU Member States**

![Graph showing relative standard deviation of gas prices](image)

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

- Figure 30 shows the level and the breakdown of residential end-user gas prices paid by typical households in 25 European capitals in March 2019. On average, 46% of the price covered the energy component, while the rest covered distribution/storage costs (28%), energy taxes (9%) and VAT (17%).

- There were significant differences across Member States, with the share of energy cost ranging from 25% (Copenhagen) to 67% (London), the share of distribution/storage costs ranging from 8% (Tallinn) to 45% (Sofia) and the share of taxes ranging from 2% (Riga) to 37% (Amsterdam). For 7 of the 25 capitals covered, the price does not include an energy tax component. While there were considerable differences across Member States in the relative share of network costs and taxes, Figure 30 also shows that even

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18 Note that these are arithmetic averages.
the energy component is very variable in absolute terms: it was more than five times higher in Stockholm than in Budapest in March 2019.

- In 20 out of the 25 capitals prices were higher in March 2019 compared to the previous year, with the biggest relative increase in Riga (25%), driven by a 25% growth of the energy component and a 32% growth of the network component. In March 2019 Budapest remained the cheapest capital in the EU in terms of gas prices for household consumers. At the same time prices decreased compared to March 2018 by 5% in Copenhagen, by 2% in Warsaw and in by 1% in Prague and Budapest.

**Figure 30 Breakdown of gas price paid by typical household customers in European capitals, March 2019**

- After relatively stable prices from 2016 to the first half of 2018, retail gas prices for industrial customers began to increase in Q3 2018 on EU average. This trend continues in the first quarter of 2019. The average estimated price (VAT and other recoverable taxes excluded) in consumption band I₄ was 2.72 Eurocent/kWh in the first quarter of 2019, 14% more than in the same period of 2018. (See the estimated industrial prices on Map 3.) Prices increased in Q1 2019 year-on-year in all EU Member States, implying that recent price decreases on the wholesale gas markets did not yet filtered in retail prices neither for industrial nor for household customers.

- Figure 31 shows that, for industrial customers the relative standard deviation was lower than for private households, indicating smaller price differences across Member States. In most consumption bands the standard deviation was fairly stable from 2017 and in the first half of 2018, and started to decrease slightly in the second half of 2018. This decreasing trend intensified in the first quarter of 2019 with the strongest decrease in price divergence in the Band I₅.

- In the first quarter of 2019, the United Kingdom had the lowest estimated industrial price in consumption band I₄ (2.1 Eurocent/kWh), while the highest price was observed in Sweden (4.4 Eurocent/kWh), resulting in a price ratio of 2.1 across the EU. The price differential ratio between the cheapest and the most expensive Member State has been fluctuating between 1.6 and 2.4 since the beginning of 2008.
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 first quarter of 2019 retail gas prices for industrial customers were higher in Brazil, China and Korea compared to the EU average, however, in the United States and Russia retail gas prices were lower compared to the EU.

Maps 2 and 3 on the next two pages show the estimated retail gas prices paid by households and industrial customers in the first quarter of 2019.
Map 2. Retail gas price estimates for households in the EU – First quarter of 2019

Source: Eurostat
Map 3. Retail gas price estimates for industrial consumers in the EU – First quarter of 2019

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.

**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. The FAPD chart provides detailed information on adverse flows. It has two panels: The first panel estimates the ratio of the number of days with adverse flows to the total number of trading days in a given period. It also estimates the monetary value of energy exchanged under adverse flow conditions (mark-up) compared to the total value of energy exchanged across the border. The mark-up is also referred to as ‘welfare loss’. A colour code informs about the relative size of FAPD events in the observed sample, going from green if less than 10% of traded days in a given period are FAPDs to red if more than 50% of the days are FAPDs. The second panel gives the split of FAPDs by sub-category of pre-established intervals of price differentials. It represents the average exchanged energy and relative importance of each sub-category on two vertical axes.

**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 comparisons.** In the case of the 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.