



# Quarterly Report

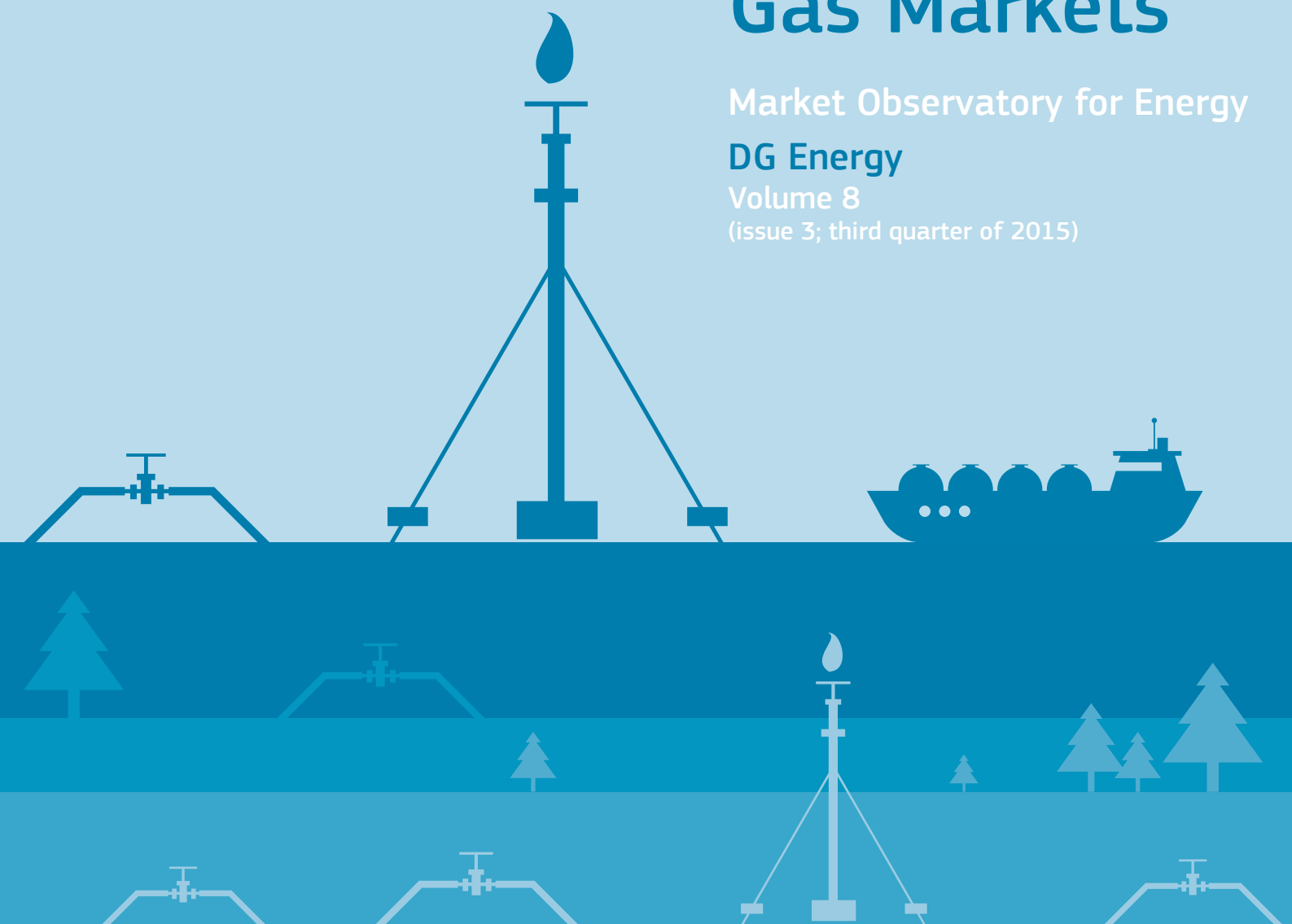
## on European Gas Markets

Market Observatory for Energy

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# Highlights of the report

- After a 12% increase in the first quarter, EU gas consumption grew by 5% in the second quarter of 2015, both on a year-on-year basis. Last year's demand was however exceptionally low because of mild weather. According to preliminary data, consumption was flat in the third quarter.
- The reduced production cap for the Groningen field had a noticeable impact on Dutch production, which decreased by 44% in the second quarter. This contributed to an accelerated decrease in EU gas production, which fell by 14% year-on-year.
- Imports were unusually high in the third quarter, with double-digit growth in Russian, Norwegian and Algerian deliveries compared to the same period of 2014. In contrast, LNG imports fell by 7% year-on-year. Almost half of Russian imports arrived via Ukraine, the highest share observed in 2014-2015.
- As a result of falling gas prices, it is expected that the EU's gas import bill will decrease to around 71 billion euros in 2015, compared to close to 74 billion euros in 2014.
- Falling oil-indexed prices and increasing imports contributed to increased storage injections in the third quarter though Europe started the winter season with lower stock levels than the previous year. On 30 September 2015, the average utilisation of storage capacities was 11 percentage point lower than a year earlier.
- International gas prices slightly decreased in the third quarter of 2015. While European prices remain well above those in the US, the premium of Asian LNG prices over European hub prices is much smaller than in recent years.
- European hub prices showed a slightly decreasing trend as low oil prices, steady LNG supply and increasing pipeline imports put downward pressure on prices. Gas prices have reached new lows. Excepting the temporary price drop in the summer of 2014, the average NBP price in October 2015 was the lowest since 2010.
- The continued weakness in oil prices means that oil-indexed gas prices are set to remain low, contributing to convergence in hub prices and oil-indexed prices.
- Trading activity on European hubs decreased by 2% year-on-year in the second quarter.
- Retail prices for both households and industrial consumers showed a slight decline in 2015, though this was well short of the decrease in wholesale prices.

# Executive summary

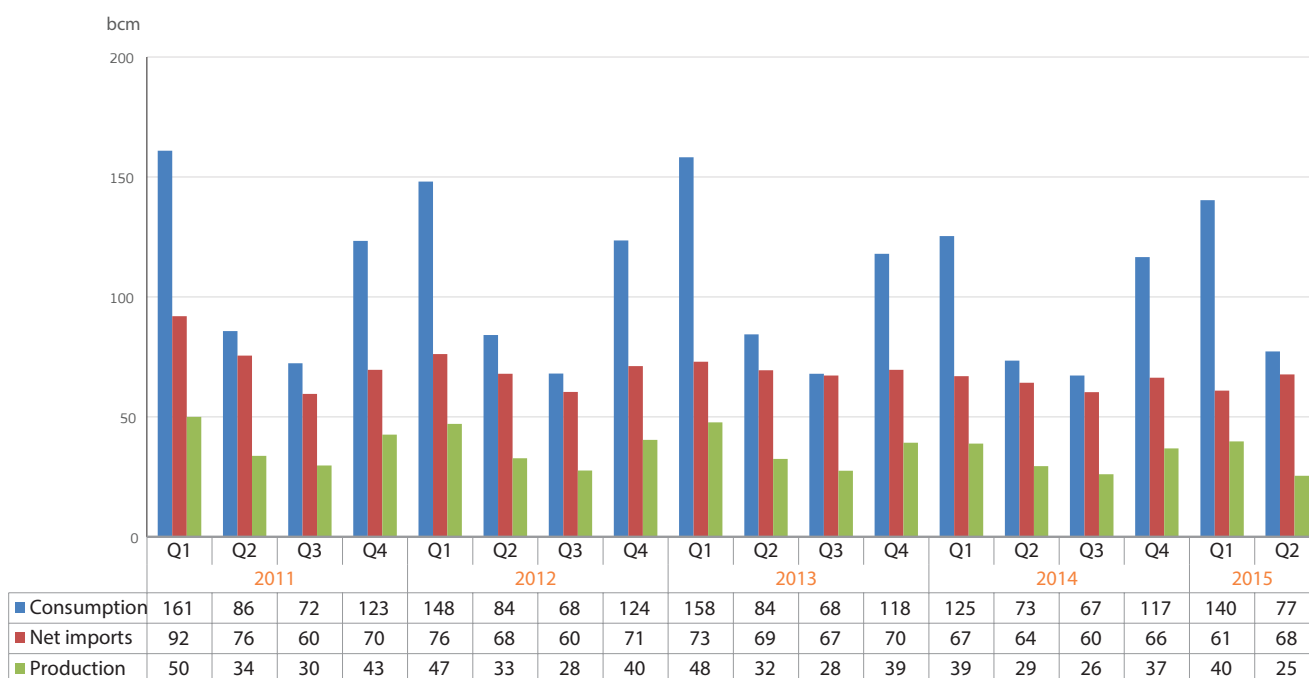
- **EU gas consumption increased by 5% in the second quarter of 2015** compared to the same period in 2014. In the first half of the year, consumption increased by 9% year-on-year, mainly driven by colder weather.
- Preliminary Eurostat data show that **consumption in the third quarter was flat** compared to the same period of 2014.
- **Production in the second quarter was down by 14%** year-on-year, while net imports increased by 5%. Gas output in the Netherlands was 44% lower than in the same period of 2014. Because of the reduced production cap for the Groningen field, Dutch gas production will be significantly lower this year than in 2014.
- **EU gas imports were unusually high in the third quarter**, 26% more than in the same period of 2014. The three main suppliers, Russia, Norway and Algeria all registered double-digit growth. In contrast, LNG imports slightly decreased.
- **Imports from Russia remained robust in the third quarter of 2015, up by 18%** year-on-year, facilitated by the fall of oil-indexed prices. Russian gas represented 41% of total imports. Although the utilisation of Nord Stream remained high, the share of Ukrainian transit increased to 47%. Gazprom held its first gas auction in September and envisages an increasing role for this new sales mechanism in the coming years.
- **Imports from Norway and Algeria increased by 26% and 35%, respectively** in the third quarter, compared to the same period of 2014, helped by increasing gas production in the two countries.
- **LNG imports decreased by 7%** year-on-year but still covered 13% of total EU imports in the third quarter. Imports decreased for the two main LNG buyers, Spain and the UK and this was only partly offset by increasing imports into the other markets, in particular Italy. Qatar remained the top LNG supplier to the EU, covering 56% of total LNG imports in the third quarter of 2015.
- In spite of increasing import volumes, **falling prices are expected to reduce the EU's gas import bill** to around 71 billion euros in 2015 from close to 74 billion euros in 2014. The estimated import bill amounted to 18 billion euros in the third quarter of 2015.
- In the third quarter of 2015, **Ukraine imported gas only from Slovakia**. Imports from Russia resumed in October, after the two countries and the European Commission agreed on the terms of a binding protocol to secure gas supplies for the coming winter. Russian gas imports were suspended again in late November.
- Europe finished the 2014/2015 winter with rather low stock levels and, in the second quarter, injections have been relatively muted as expectations of decreasing prices provided an incentive to delay replenishment of stocks. In the third quarter, **falling oil-indexed prices and increasing imports helped injections to pick up but** at the end of September **the utilisation level of storage capacities fell short of those observed a year earlier** (81%, compared to 92% in 2014).
- **International gas prices fell slightly** in the third quarter of 2015, except for the temporary surge of Asian LNG prices in August. While European prices were 2.3 times higher than those in the US, the premium of Asian LNG prices over European hub prices was 1.2 USD/mmbtu.
- **Spot prices at European gas hubs** were in the 19–22 Euro/MWh range for most of the third quarter **and continued a slightly decreasing trend** as low oil prices, steady LNG supply and increasing pipeline imports put downward pressure on European hub prices. Average hub prices were about 25% lower than in the same period of 2013.
- Since August, oil prices have remained in the 40–50 USD/barrel range, ensuring that **oil-indexed prices will remain depressed** during the coming winter. This should help the convergence of hub prices and oil-indexed prices in Europe although the difference between Platt's North West Europe Gas Contract Indicator (GCI) and the NBP day-ahead price increased since July.
- After the record liquidity seen in the first quarter of 2015, **trading activity has been relatively muted on European gas hubs** in the second and third quarters, falling short of trading volumes observed in the same periods of 2014. Total traded volumes reached 9,000 TWh in the third quarter, a 2% decrease compared to the same period of 2014. The UK and Dutch hubs continued to dominate gas trade in Europe, covering 88% of hub-traded volumes. The share of exchange-traded volumes slightly increased since 2014.
- **The number of the so-called flow against price differential events** in North Western Europe (NWE) has been rather volatile in recent years but **significantly decreased in the third quarter** of 2015.
- **Retail prices for both households and industry decreased in the last 12 months** but not as much as wholesale prices. While some long-term convergence can be observed for industrial prices, there are still significant price differences across Member States in the case of households.

# 1. Gas Consumption – Production – Imports

## 1.1 Consumption

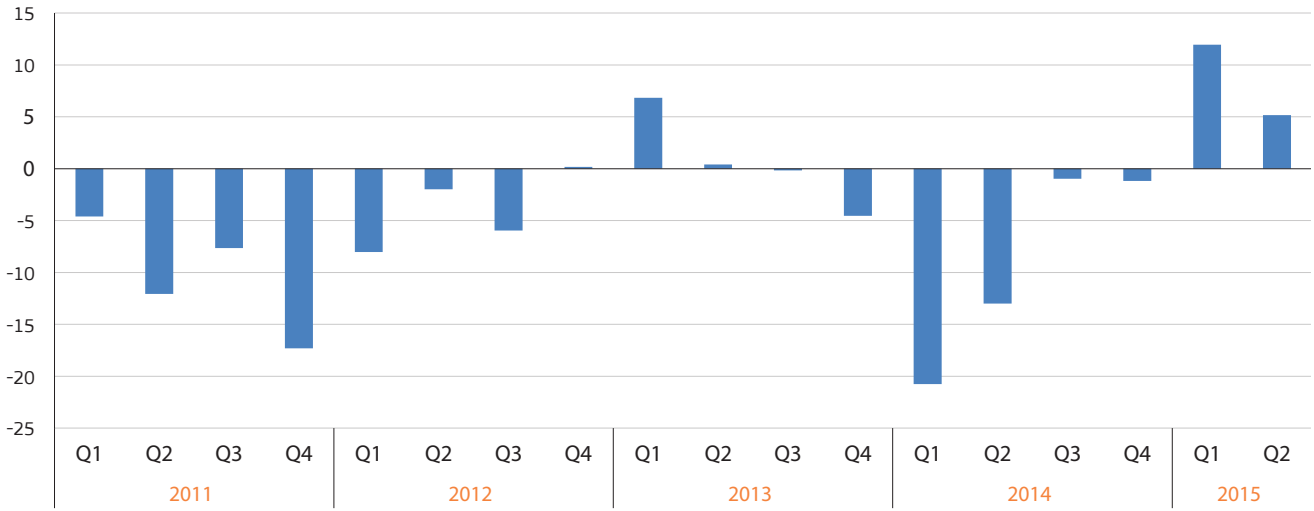
- After a 12% year-on-year increase in the first quarter of 2015, EU gas demand continued to grow in the second quarter: consumption increased by 5% compared to the same period of 2014, reaching around 77 bcm. Germany, the largest gas market, continued to experience a double-digit growth rate, similarly to Bulgaria, Croatia, the Czech Republic, Lithuania, Portugal and Slovakia. In contrast, consumption decreased by 10% or more in Finland, Greece, Luxembourg, Romania and Sweden.
- In the first half of 2015, consumption was around 218 bcm, 9% more than in the same period of 2014. In spite of that increase, consumption in the first two quarters of 2015 was lower than in any year in the 2009-2013 period, as can be seen in Figure 3.
- The increase in consumption was mostly due to the weather. In most parts of Europe, temperatures were significantly lower than in the same period in 2014, especially in the first quarter of the year.
- According to preliminary Eurostat data, third quarter consumption was around 67 bcm, flat compared to the same period of 2014, with German consumption decreasing by 8%. This would result in a 7% year-on-year growth of EU gas consumption for the first 9 months of 2015.
- Based on a sample of nine Member States covering about two-thirds of EU consumption (but excluding Germany), Societe Generale estimates that consumption increased by 3% in the third quarter of 2015, year-on-year.<sup>(1)</sup>

**FIGURE 1 - EU GAS CONSUMPTION, IMPORTS AND PRODUCTION**



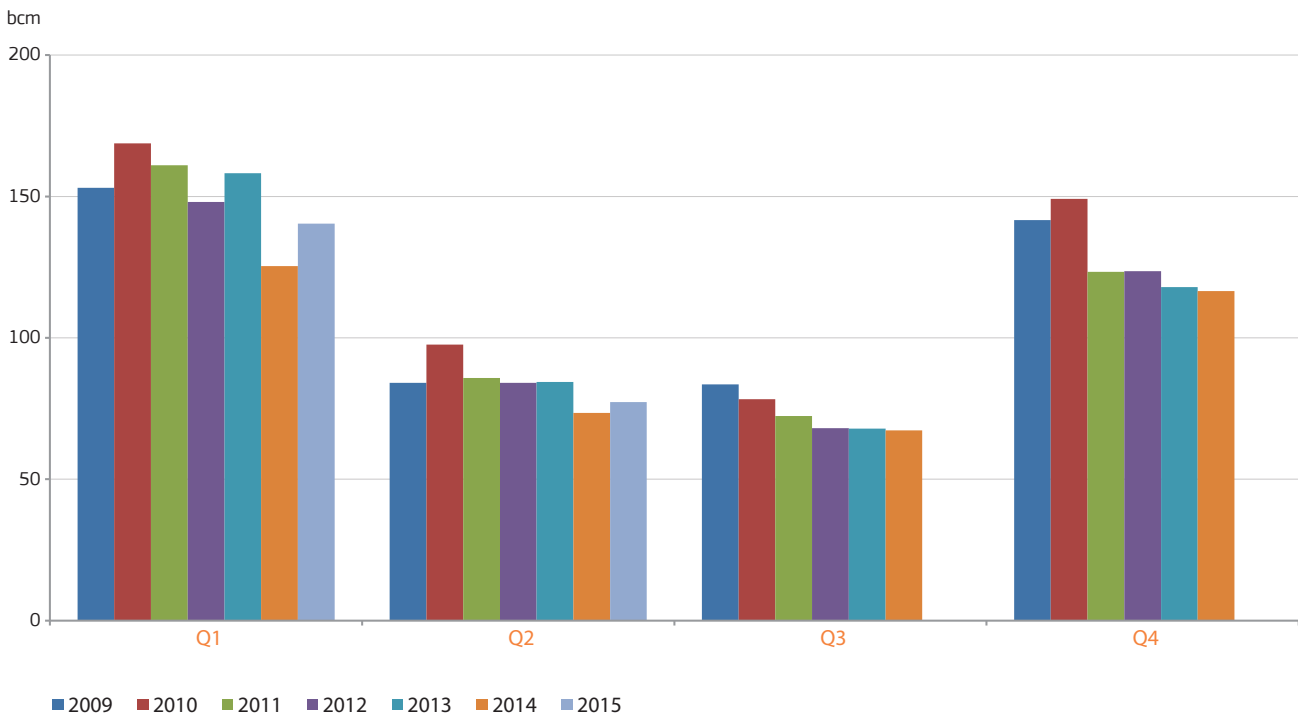
Source: Eurostat, data as of 18 November 2015 from data series nrg\_103m. Net imports refer to imports minus exports. Note: Eurostat methodological change in reporting import volumes effective as of January 2013. Before January 2013 monthly import volumes of gas were reported on country-of-origin basis. After this date, they are reported on border basis.

**FIGURE 2 - EU GAS CONSUMPTION Q/Q-4 CHANGE (%)**



Source: Eurostat, data as of 18 November 2015 from data series nrg\_103m; calculations of DG Energy

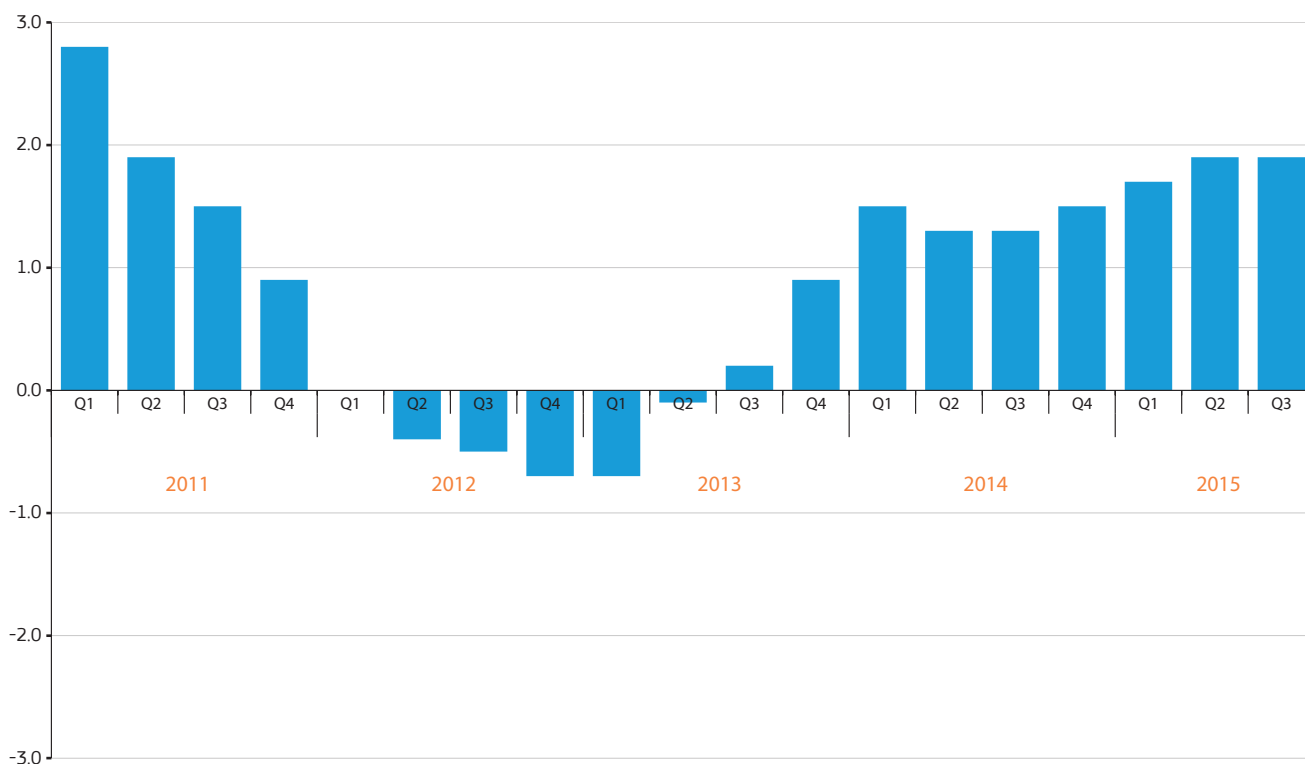
**FIGURE 3 - QUARTERLY GAS CONSUMPTION IN THE EU IN 2011-2015**



Source: Eurostat, data as of 18 November 2015 from data series nrg\_103m

- In both the second and third quarters of 2015, the seasonally adjusted Gross Domestic Product (GDP) of the EU rose by 1.9% compared to the same quarter of the previous year which is the highest growth rate since 2011. In addition to the weather, the economic recovery is likely to have contributed to the increase of gas consumption in 2015, especially in the context of gas use by industry.

**FIGURE 4 - EU GDP Q/Q-4 CHANGE (%)**



Source: Eurostat

- From the five markets for which data are reported (Table 1), gas use in power generation in Italy, Spain and France, increased year-on-year in the first, second and third quarters of 2015. In the third quarter, the growth rate was 32% in Italy, 15% in Spain and, from a low base, 265% in France.
- In contrast, Belgium and the UK experienced a decreasing trend; in these countries, gas use in the power sector decreased by 53% and 19%, respectively, in the third quarter of 2015, compared to the same period of 2014.
- Hub prices, LNG prices and oil-indexed prices all decreased during the first three quarters of 2015 (see details in section 3), theoretically improving the competitiveness of gas. However, prices of other fuels, in particular coal, also decreased. Muted growth in electricity consumption (electricity consumption in the EU-28 increased by 0.3% in the first eight months of 2015 compared to the same period of the previous year) and the continuing penetration of renewables has also limited growth in the share of gas in European power generation.
- UK clean spark spreads – measuring the profitability of gas-fired generation – fluctuated around 15 €/MWh in the third quarter of 2015 but remained negative in Germany (where wholesale electricity prices are lower), implying that German gas-fired generation was unprofitable.<sup>(2)</sup> In Germany, gas use in electricity production continued to decrease in the third quarter (by 20% year on-year) and its share fell below 5%.<sup>(3)</sup>

2. Charts of clean spark spreads in Germany and the UK can be found in the Quarterly Report of European Electricity Markets

3. <https://www.destatis.de/EN/FactsFigures/EconomicSectors/Energy/Production/Tables/ElectricityProductionSupply.html>



**TABLE 1 - NATURAL GAS INTAKE IN THE POWER GENERATION SECTOR OF SELECTED EU COUNTRIES (BCM)**

	2011	2012	2013	2014	2015Q1	2015Q2	2015Q3
<b>Italy</b>	27.5	24.2	20.1	16.8	5.0	3.7	5.6
<b>UK</b>	19.5	13.2	13.1	14.2	3.2	3.0	3.4
<b>Spain</b>	9.4	7.2	4.8	4.4	1.2	1.1	1.5
<b>Belgium</b>	7.1	8.4	7.4	6.4	1.1	0.8	0.9
<b>France</b>	2.5	1.5	1.2	0.7	0.6	0.1	0.2

Source: Bentek/Platts

## 1.2 Production

- EU gas production grew by 2% in the first quarter of 2015. It occurred as temperatures dropped but was only temporary, as in the second quarter, production returned to the usual downward trend: output was around 25 bcm, 14% less than in the same period of 2014. While output increased in Denmark (7%) and the UK (10%), this was more than offset by decreases in the Netherlands (-44%) and Romania (-4%). In the first half of the year, EU gas output was 5% lower than in the same period of 2014.
- In the Netherlands, most of the decrease was due to the production cap at Groningen, Europe's largest gas field. The cap for 2015 (30 bcm) is 29% lower than the actual production of the field in 2014. In the UK, both oil and gas output have stabilised recently and even showed some increase, as new project starts offset decreasing output from mature fields. However, low oil and gas prices are likely to lead to project delays and lower production in the medium term.
- As far as shale gas is concerned, the two countries follow a different approach. In July, the Dutch government announced that no drilling for shale gas would take place in the country during the current cabinet term. The cabinet will decide at the end of the year whether or not it is desirable to keep shale gas as a broad option for the Netherlands in the future.<sup>(4)</sup> In the UK, shale gas planning applications will be fast-tracked through a new, dedicated planning process, under measures announced in August. The government can intervene in local authority decisions in order to speed up authorisations.<sup>(5)</sup>
- Although production in Romania is slightly decreasing, it is expected that falling consumption from large industrial consumers will allow the country to stop imports from 2016.<sup>(6)</sup>

## 1.3 Imports

- According to Eurostat data, growing consumption and falling indigenous production led to a 5% year-on-year increase of net imports in the second quarter of 2015, reaching around 68 bcm. This compares to a 9% year-on-year decrease in the first quarter when high storage withdrawals offset unusually low Russian imports.
- Gas imports typically show a seasonal drop in the second and third quarters of the year but this was not the case in 2015: according to ENTSO-G data, imports gradually increased between the first and third quarters. Imports were unusually high in the third quarter, 26% more than in the same period of 2014.

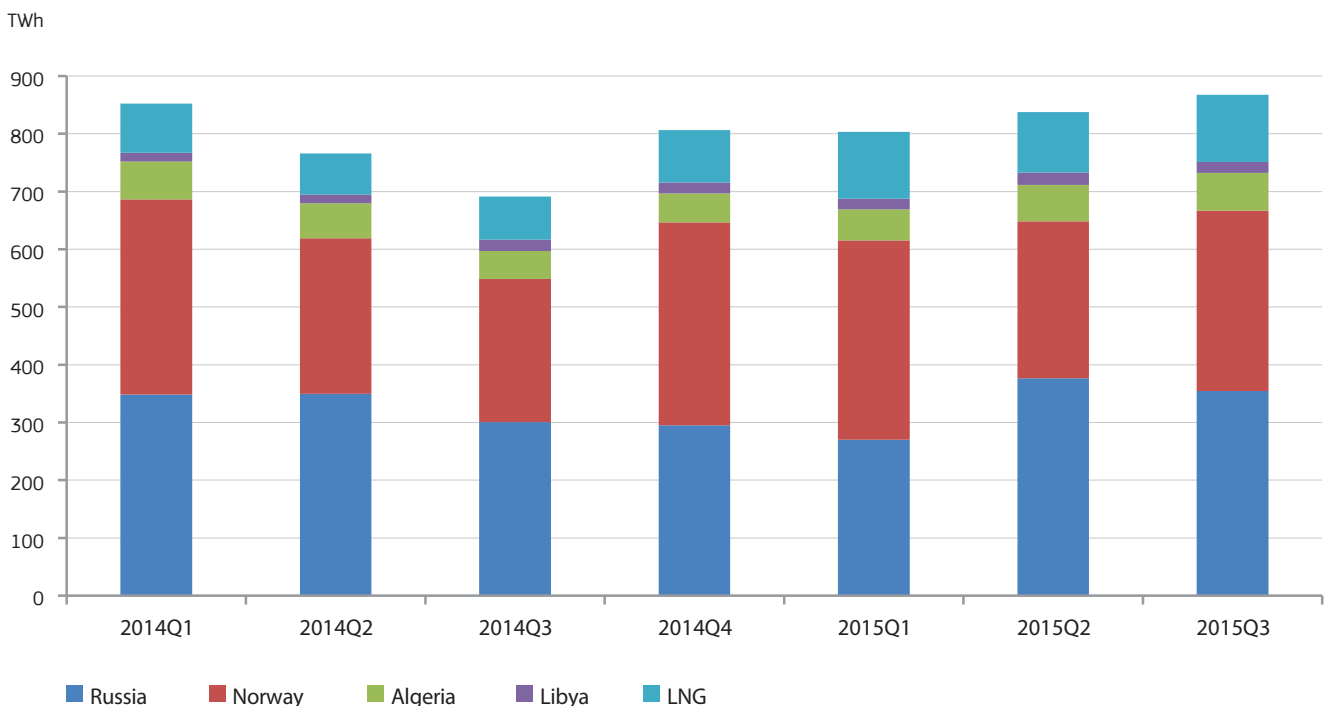
4. <https://www.government.nl/ministries/ministry-of-economic-affairs/news/2015/07/10/no-extraction-of-shale-gas-during-the-next-five-years>

5. <https://www.gov.uk/government/news/faster-decision-making-on-shale-gas-for-economic-growth-and-energy-security>

6. ICIS Heren European Gas Markets, 30 September 2015

- In the first 9 months of the year, imports from Russia were at the same level as for the comparable period of 2014 but the distribution of volumes throughout this period was markedly different: year-on-year, imports decreased by 22% in the first quarter, followed by 8% growth in the second quarter and 18% growth in the third quarter. The share of Russia from total extra-EU imports were 41% in the third quarter. This is lower than in the previous quarter (45%) but Russia remained the EU's top supplier.
- Long-term contracts typically allow buyers to vary monthly/quarterly purchases. Taking advantage of this flexibility, buyers of Russian gas gradually increased nominations as oil-indexed contracts became cheaper. With oil-indexed prices set to remain depressed, imports from Russia are expected to remain high during the coming winter.
- An auction was held in September by Russian company Gazprom which seems to indicate a shift towards hub pricing. The first of its kind, the auction covered 3.24 bcm of gas in 127 lots, to be supplied during the 2015/2016 winter period to selected delivery points in Europe.<sup>(7)</sup> Gazprom envisages an increasing role for this new sales mechanism in the coming years.<sup>(8)</sup>
- Imports from Norway were more or less stable year-on-year in the first half of the year but in the third quarter imports were 26% higher than in the same period in 2014. The end of maintenance in the Troll field facilitated increasing gas production and exports. As a result, the share of Norway increased to 36% of total extra-EU imports.
- Pipeline imports from North Africa were also robust in the third quarter, showing a 24% year-on-year increase. The increase was driven by Algeria: volumes coming from the country grew by 35% compared to same period of 2014 and reached the highest level of the last two years. The combined share of Algeria and Libya remained at 10% of total extra-EU imports.
- Imports of LNG covered 13% of total gas imports in the third quarter of 2015; the share was the same in the first nine months of the year. For comparison, the share for the full year 2014 was 10%.
- As a result of falling volumes and prices, the estimated gas import bill of the EU decreased from around 95 billion euros in 2013 to around 74 billion euros in 2014. As prices continue to fall in 2015, the import bill is expected to decrease further, to around 71 billion euros, in spite of the growing volumes. The estimated import bill was around 18 billion euros in each of the first, second and third quarters of 2015. While import volumes increased over the year, this was offset by falling prices.

**FIGURE 5 - EU IMPORTS OF NATURAL GAS BY SOURCE, 2014-2015**



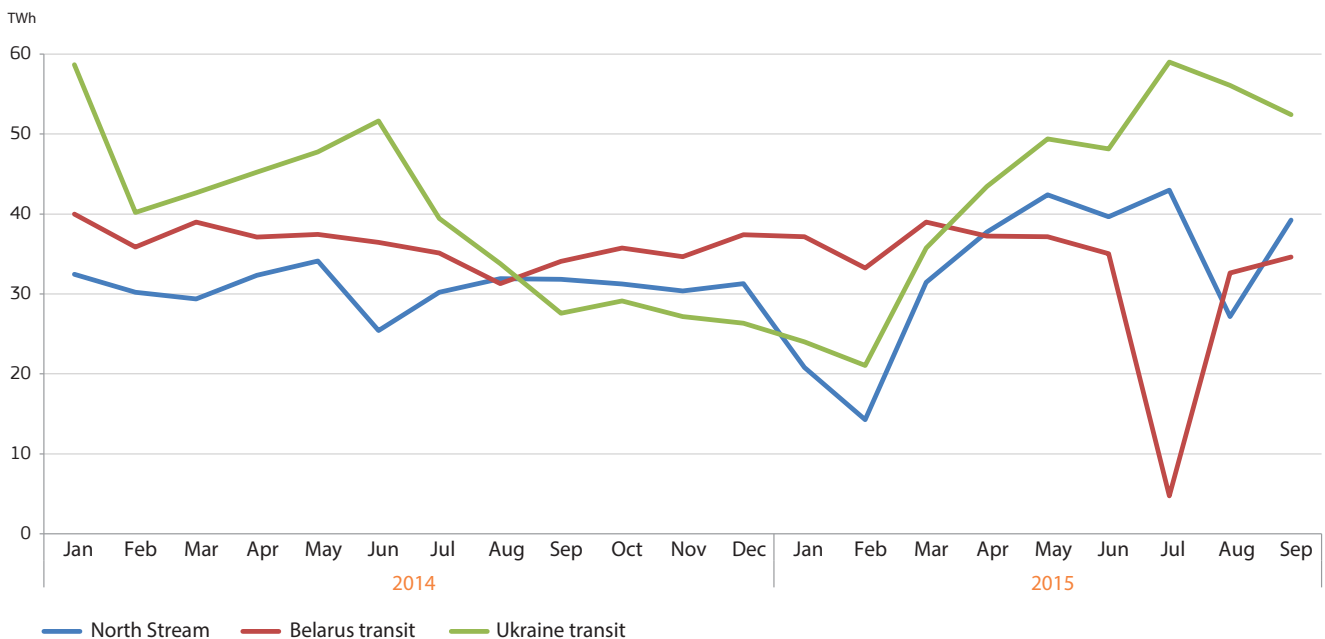
Source: Based on data from the ENTSO-G Transparency Platform  
 Russian deliveries to Estonia and Latvia are not included

7. <http://www.gazprom.com/about/subsidiaries/news/2015/september/article246095/>

8. <http://www.gazprom.com/f/posts/64/652090/2015-09-14-verbatim-press-conference-en.pdf>

- Looking at the main supply routes of Russian gas imports, there has been significant volatility in the third quarter of 2015, mainly because of maintenance activities.
- Gas flows transiting Belarus almost disappeared in July due to the planned maintenance of the Yamal pipeline. No flows at all were reported at the Kondratki (Belarus/Poland) interconnection point from 1 to 31 July. As a result, imports arriving through Belarus decreased by 28% in the third quarter compared to the same period of 2014.
- Volumes arriving through Ukraine (which includes the Brotherhood Pipeline and the Balkan route), traditionally the main supply route of Russian gas to the EU, significantly declined in the second half of 2014 but recovered in mid-2015. In the third quarter of 2015, volumes were 66% higher than in the same period of 2014.
- After the drop in January and February 2015, gas flows on the Nord Stream pipeline increased in the second quarter. Utilisation of the pipeline remained high in the third quarter, except for a drop in August: the twin pipelines were closed for planned maintenance from 12 to 19 August. Nevertheless, in the third quarter volumes increased by 16% year-on-year.
- In the third quarter of 2015, Ukraine continued to be the main supply route, covering 47% of total Russian imports (up from 29% in the last quarter of 2014), followed by the Nord Stream (31%) and Belarus (20%) routes.

**FIGURE 6 - EU IMPORTS OF NATURAL GAS FROM RUSSIA BY SUPPLY ROUTE, 2014-2015**



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

Deliveries to Estonia, Finland and Latvia are not included; transit volumes to the Former Yugoslav Republic of Macedonia, Serbia and Turkey are excluded

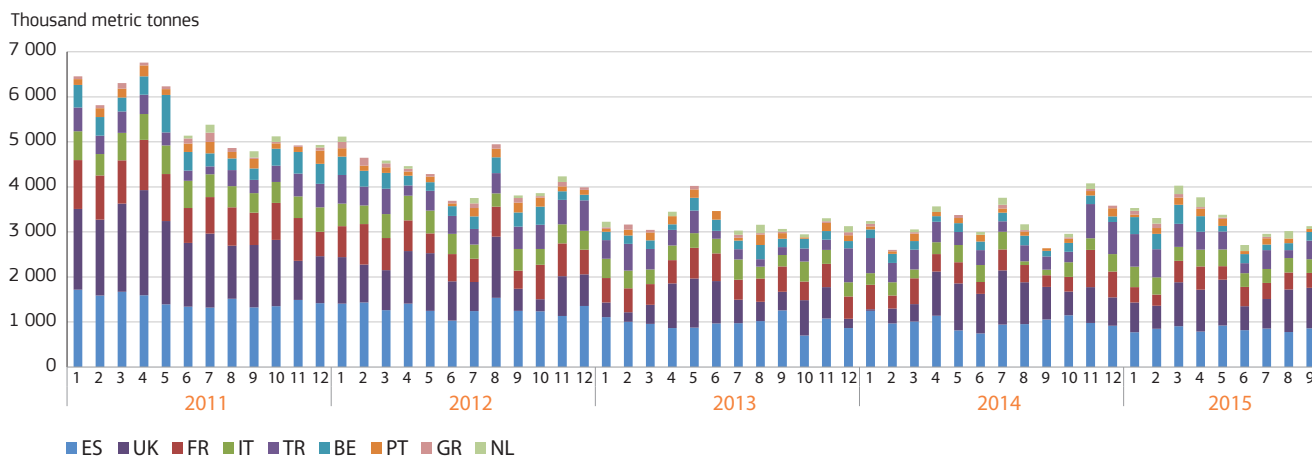
- European LNG imports started to rise in the last quarter of 2014, facilitated by subdued demand in Asia and increasing global supplies. The convergence of Asian and European prices has made Europe a more attractive destination for LNG cargoes. In the first half of 2015, LNG imports increased by 11% year-on-year.
- In the third quarter of 2015, LNG imports were 7% lower than in the same period of 2014. Deliveries decreased to the two main LNG buyers, Spain and the UK (-16% and -12%, respectively) which was only partly offset by increasing imports to the other markets, in particular Italy (+55%). For the first time since the second quarter of 2014, the UK overtook Spain and became the largest LNG importer in the EU. Imports to Greece fell by 74%; no deliveries were reported in August and September.
- Pipeline imports from Russia, Norway and Algeria were unusually robust in the third quarter, justifying the relatively modest LNG imports in this period.
- Poland's 5 bcm/year terminal at Świnoujście will receive the first LNG delivery from Qatar in December 2015. These supplies will be used in the commissioning and cool-down of the plant.<sup>(9)</sup> The terminal is expected to be commercially operational from the second quarter of 2016.<sup>(10)</sup> Polish gas group PGNiG booked 65% of the site's capacity.<sup>(11)</sup>

9. <http://en.pgnig.pl/news/-/news-list/id//lng-tanker-al-nuaman-on-its-way-from-qatar-to-poland/newsGroupId/18252>

10. <http://en.polskielng.pl/press-centre/news/news/artykul/201408/>

- In addition to the building of the new LNG facilities in Lithuania and Poland, the gas supply security of the Baltic Sea region received another boost in October when the grant agreement on the Gas Interconnector Poland-Lithuania was signed. The pipeline, to be finalised by the end of 2019, will end the long lasting isolation of the three Baltic States from the rest of the EU and allow the further diversification of gas supplies.<sup>(12)</sup>

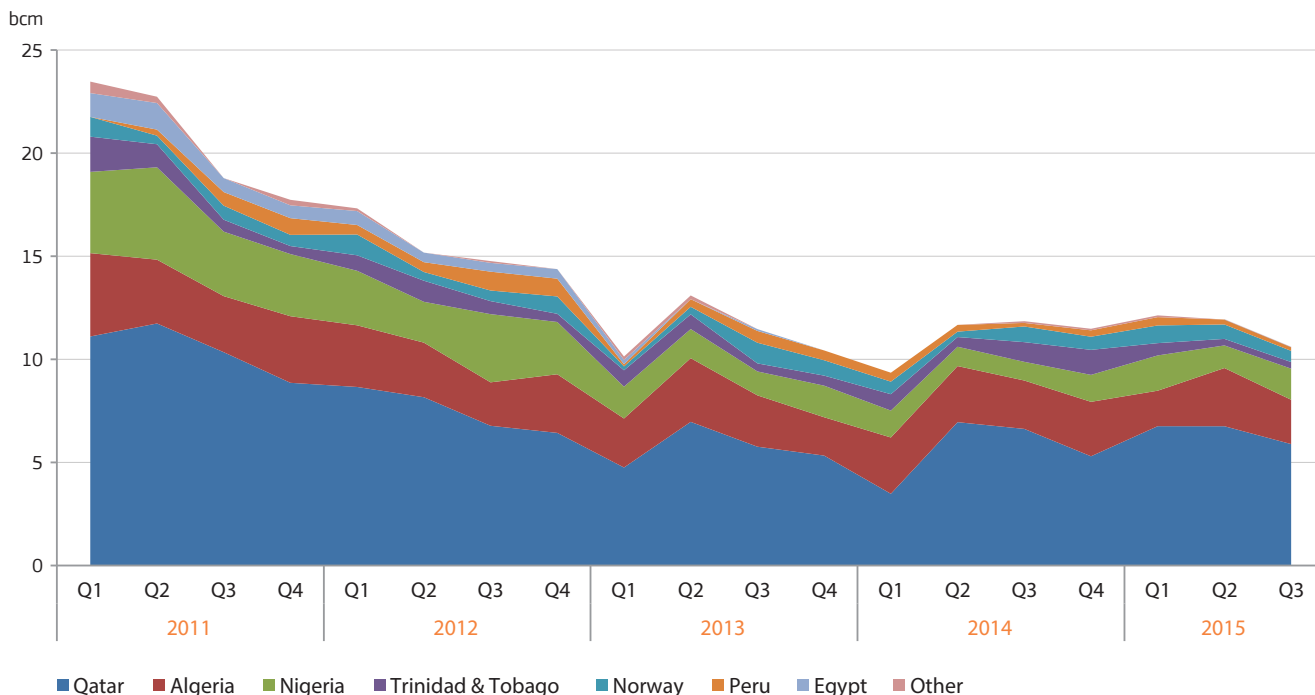
**FIGURE 7 - IMPORTS OF LNG INTO EUROPE BY COUNTRY**



Source: Thomson-Reuters Waterborne  
Lithuania is not included

- In the third quarter of 2015, Qatar remained the main LNG supplier of the EU (56%), followed by Algeria (24%), Nigeria (14%), Norway (5%), Trinidad & Tobago (3%) and Peru (2%).
- In the third quarter, Qatar had a dominant role in the Belgian, Italian and UK markets. Algeria was the principal supplier of France and Greece. Portugal's main supplier was Nigeria while the Netherlands imported most of its LNG from Norway. Spain had the highest number of suppliers (6) and was the only country with no single supplier covering more than 50% of LNG imports.

**FIGURE 8 - LNG IMPORTS TO THE EU BY SUPPLIER**



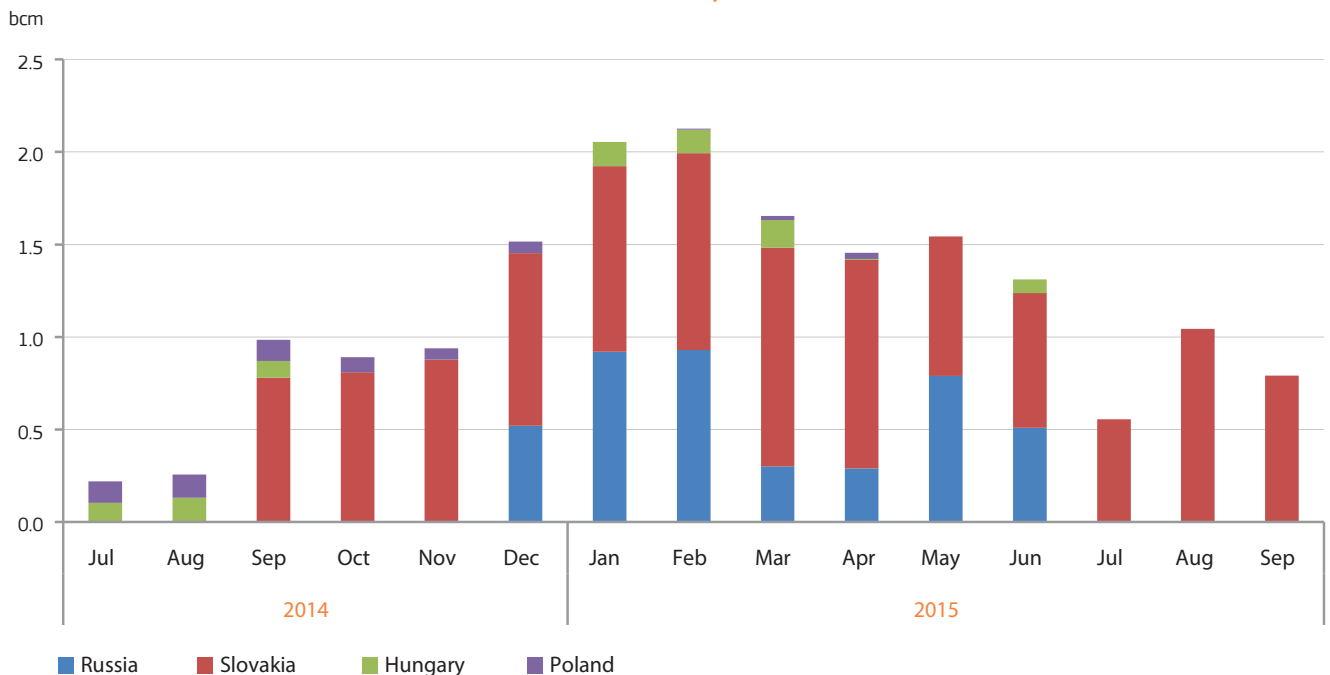
Source: Bloomberg/Poten & Partners  
Imports to Lithuania are not included

11. ICIS Heren European Gas Markets, 31 July 2015  
12. [http://europa.eu/rapid/press-release\\_IP-15-5844\\_en.htm](http://europa.eu/rapid/press-release_IP-15-5844_en.htm)

## 1.4 Ukraine

- The trilateral discussions between Russia, Ukraine and the European Commission failed to reach an agreement for the third quarter and from 1 July 2015 Naftogaz halted Russian gas imports. In the third quarter of 2015, Ukrainian imported no gas from Russia. As deliveries coming from Hungary and Poland were also suspended, Ukraine imported gas during this period only from Slovakia.
- Although the interruption had no impact on the transit flows to the EU, it raised concerns about Ukraine's ability to fill storages and ensure smooth transit during the upcoming winter.
- On 25 September 2015, the European Commission, Russia and Ukraine agreed on the terms of gas deliveries to Ukraine for the period from 1 October 2015 until 31 March 2016. The new Winter Package should ensure that Ukraine has sufficient gas supplies in the coming winter and that there is no threat to gas transit from Russia to the EU.<sup>(13)</sup> As a result of the agreement, Ukraine resumed imports from Russia on 12 October. Imports from Hungary and Poland also restarted in October.
- Russian gas imports were suspended again on 26 November. Ukraine claimed this was because it did not need any more Russian gas. In fact, because of the rapid fall in Ukrainian gas demand, the country's import dependency has significantly decreased. According to analysts, Ukraine already has more than enough gas to meet demand during the 2015/2016 winter without any additional imports from Russia and Europe, even in a cold winter scenario.<sup>(14)</sup>
- According to Gas Storage Europe, on 30 September 2015 Ukraine had 15.7 bcm of gas in storage, 1.0 bcm less than in 2014. Injections continued throughout October and stock levels exceeded 17 bcm. On 30 November, stock levels were at 16.2 bcm, 2.2 bcm higher than a year earlier.

**FIGURE 9 - GAS IMPORTS TO UKRAINE FROM RUSSIA AND THE EU, JULY 2014 – SEPTEMBER 2015**



Source: Data from ENTSO-G Transparency Platform and Naftogaz

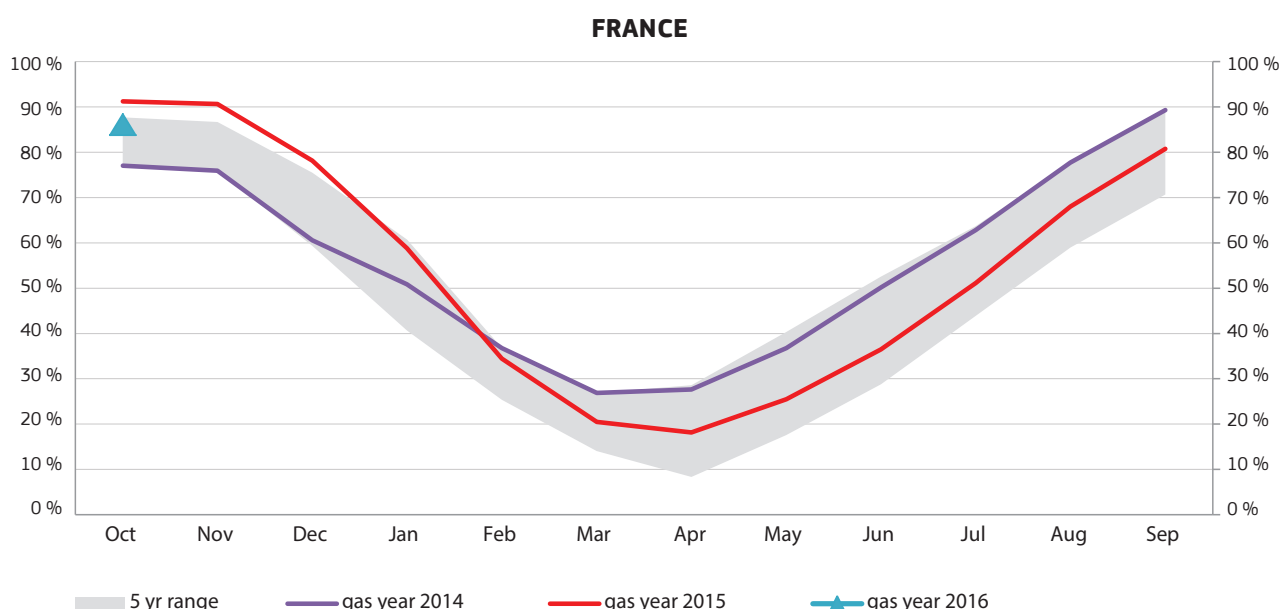
13. [http://europa.eu/rapid/press-release\\_STATEMENT-15-5724\\_en.htm](http://europa.eu/rapid/press-release_STATEMENT-15-5724_en.htm)

14. Platts European Gas Daily, 1 December 2015

# 2. Gas Storage

- Europe started the 2014/2015 winter with record storage levels but withdrawals were higher and continued for longer than usual because of the cold weather, relatively high hub prices and expectations of falling oil-indexed prices. Storage levels bottomed out in April at 25% of storage capacity. From the biggest markets, German and UK storage levels were particularly low when compared to 2014.
- Expectations of decreasing prices also provided an incentive to delay storage injections. As a result, in the second quarter injections were relatively muted. Injections were expected to accelerate in August and September as the imports of cheaper oil-indexed gas from Russia increased. However, in spite of the growing Russian supplies, in many hubs day-ahead prices remained above the front month, incentivising operators to delay injections further. In fact, injections continued into the first half of October.
- Other factors contributing to the slow pace of injections include the relaxation of mandated storage injection schedules in France and increased confidence in other flexibility tools, like LNG and cross-border flows.<sup>(15)</sup>
- On 30 September 2015, the EU's storage level stood at 75 bcm, equivalent to 81% of storage capacity, compared to 92% at that time last year. Storage levels in most countries were still below year-ago levels. For example, German and UK stock levels were about 20% lower than the same date in 2014 but some smaller markets (Austria, Belgium, Hungary, Portugal, Slovakia) had an even bigger «backlog».
- NAM's Grijpskerk and Norg (Langelo) storage facilities appear in Gas Storage Europe's transparency platform only from January 2015, therefore Dutch stock levels show a significant year-on-year increase from 0.5 bcm to 8.7 bcm. The Netherlands will probably need higher stock levels this winter to compensate for the reduced flexibility that the Groningen field can provide (see section 1.2).
- In the UK, the Oil and Gas Authority's approval to increase working capacity at the Rough storage facility by about 0.4 bcm resulted in a jump in UK stock levels on 22 July 2015.<sup>(16)</sup>

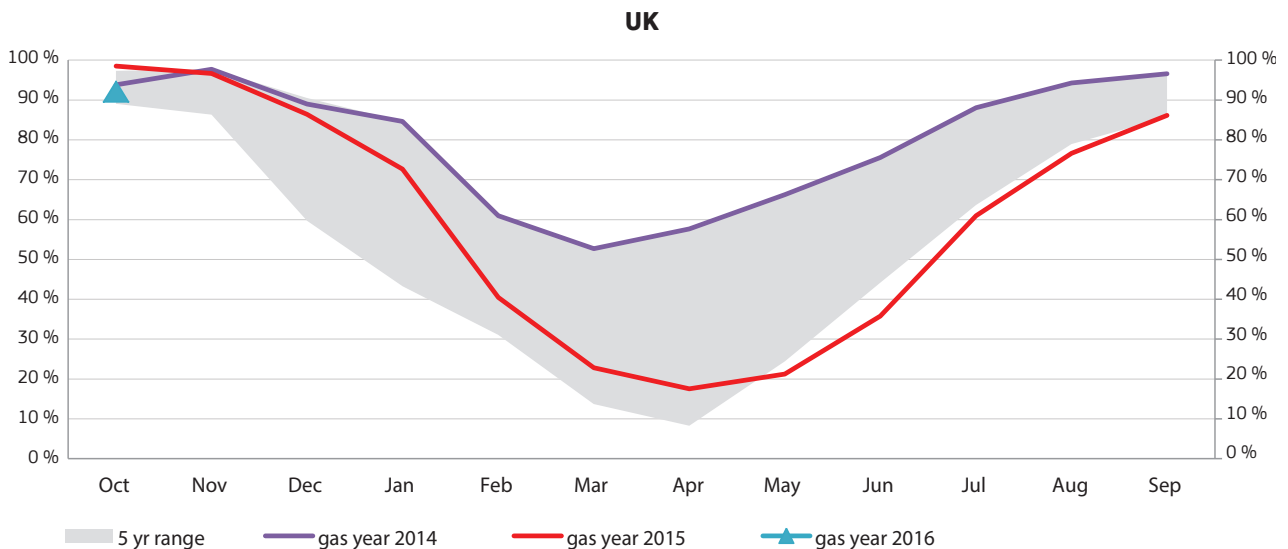
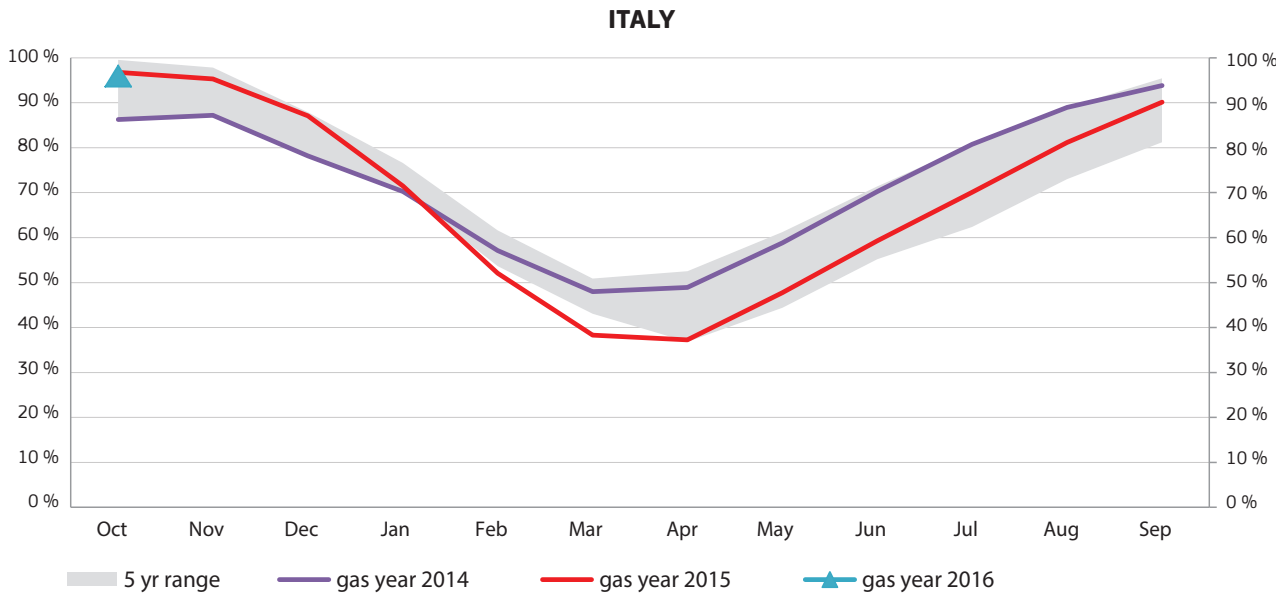
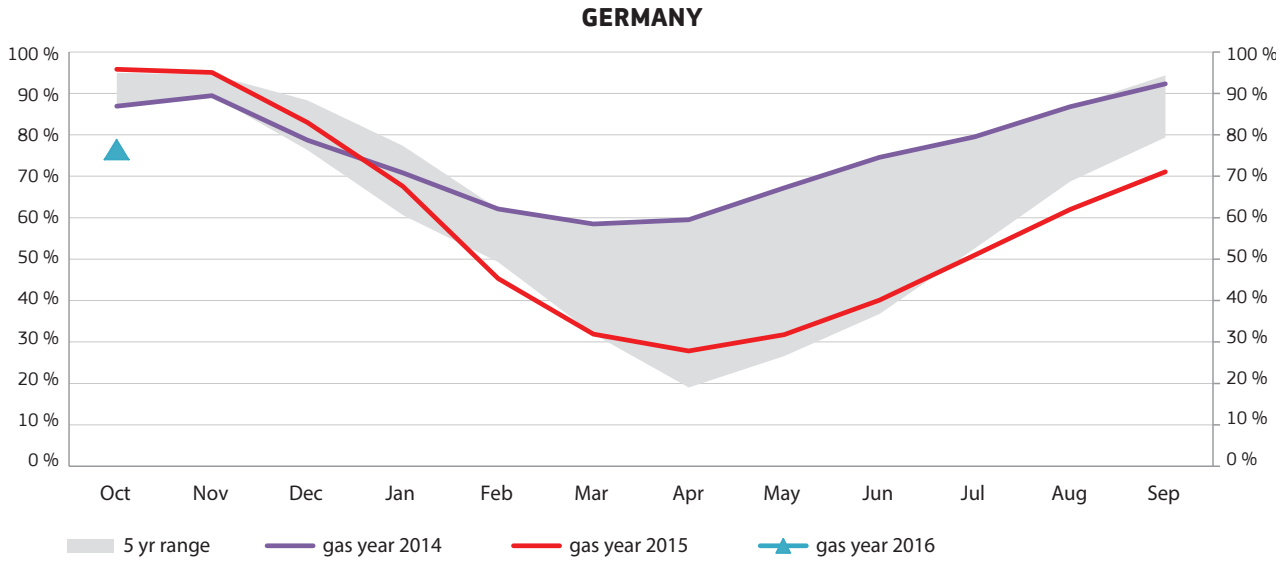
**FIGURE 10 - GAS STORAGE LEVELS AS % OF MAXIMUM GAS STORAGE CAPACITY IN SELECTED COUNTRIES**



15. ICIS Heren European Gas Markets, 31 July 2015

16. <http://www.centrica-sl.co.uk/index.asp?PageID=22&Year=Latest&NewsID=200>

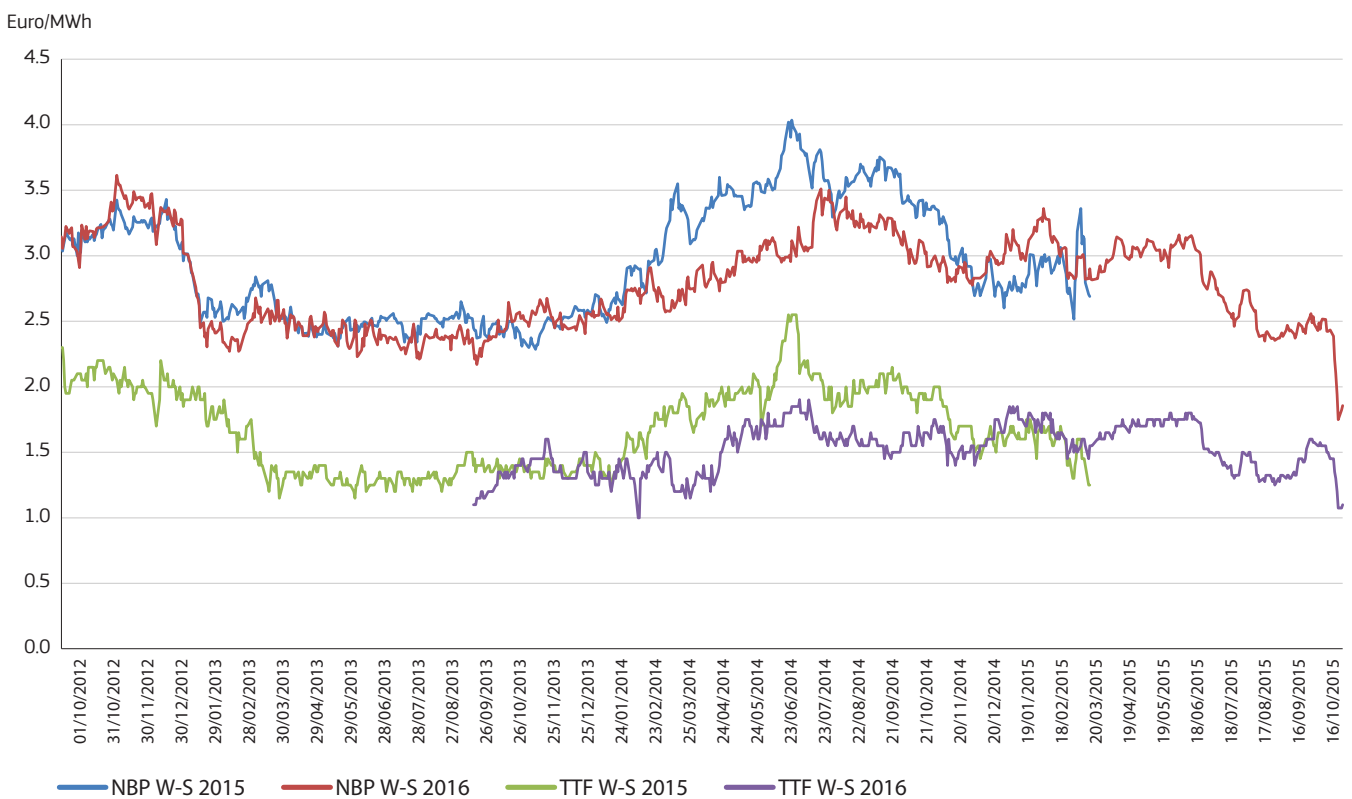
**FIGURE 10 - GAS STORAGE LEVELS AS % OF MAXIMUM GAS STORAGE CAPACITY IN SELECTED COUNTRIES**



Source: Gas Storage Europe, Thomson-Reuters

- A high seasonal price spread between winter and summer contracts on the major hubs indicates a financial incentive to inject gas into storage. Figure 11 shows that seasonal spreads significantly increased in the first half of 2014, in line with the falling spot prices in the summer of 2014 and concerns about winter supplies in the wake of the Ukrainian crisis. This contributed to the high storage levels seen in 2014. In the second half of 2014, as spot prices recovered, spreads decreased again but remained higher than in 2013.
- In the first half of 2015, seasonal price spreads remained relatively stable at around 3.0 Euro/MWh on the UK hub and around 1.7 Euro/MWh on the Dutch TTF. The winter-summer spreads started to fall again in July and in the third quarter averaged 2.6 Euro/MWh on the NBP and 1.4 Euro/MWh on the TTF. Low seasonal price spreads probably contributed to the muted storage injections in 2015.
- Early November spreads decreased further and were as low as 1.7 Euro/MWh on the NBP (the lowest level in the last 3 years) and 1.1 Euro/MWh on the TTF.

**FIGURE 11 - WINTER-SUMMER SPREADS IN THE DUTCH AND BRITISH GAS HUBS**



Source: Platts



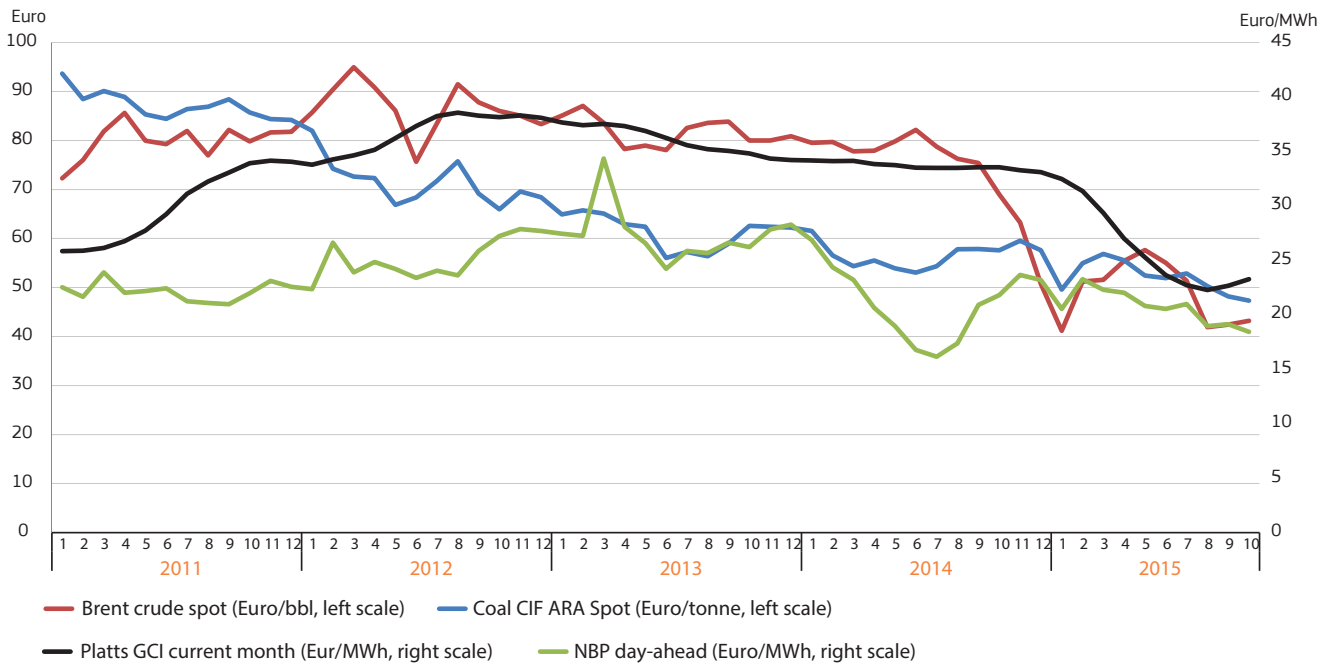


# 3. Wholesale Gas markets

## 3.1 The broader energy commodity picture: comparisons between oil, gas and coal prices in the EU

- After dropping to 45 USD/barrel in mid-January 2015, Brent bounced back to the 50-70 USD/barrel range as the falling number of active rigs in the US and the news about oil companies cutting upstream spending had raised expectations that supply growth could soon ease. Over the summer, however, oil prices started to decrease again and on 24 August Brent reached a new 6-year low at 42 USD/barrel. It takes more time for low prices to affect supply than most analysts expected at the beginning of the year. In addition to the continuing over-supply in the global market, the Iran nuclear deal signed in July, the Greek debt crisis and concerns over China's growth prospects all contributed to the price drop. Since August, Brent has been trading in a 40-50 USD/barrel range. The continuing abundance of supply suggests that oil prices will remain relatively low for some time to come.
- The NBP spot price shows a clear decreasing trend in 2015: it fell from an average 23.3 Euro/MWh in February to 18.4 Euro/MWh in October. Falling oil prices and steady LNG supply put downward pressure on European hub prices. In the third quarter, NBP has been fluctuating in the 17-22 Euro/MWh range and averaged 19.7 Euro/MWh, 9% more than a year earlier. Apart from the price slump seen in mid-2014, this is the lowest quarterly average price since 2010. In August, the NBP price fell by more than 10% in a single week as a result of the surge in LNG imports in the UK. Section 5.3.2 looks at European wholesale gas prices in more detail.
- Falling oil prices directly affect oil-indexed gas prices, albeit with a 6-9 month time lag. Oil-indexed prices started to increase in September but the repeated oil price drop since mid-2015 means that in the coming months they are set to decrease again. Platt's North West Europe Gas Contract Indicator (GCI), a theoretical index showing what a gas price linked 100% to oil would be, averaged 22.6 Euro/MWh in the third quarter. Its premium over NBP was less than 2 Euro/MWh in July, the lowest level since December 2010, but has been increasing since then.
- Coal prices have been on a declining trend since 2011, driven by global over-supply. This trend continued in 2014-2015 but the decline was not as spectacular as in the case of crude oil. In the third quarter of 2015, the CIF ARA spot price was 11% lower than in the same period in the previous year and in October the average price dropped below 48 USD/ton for the first time since 2009. Since late 2014, the development of European spot prices of coal and gas show a remarkable similarity, suggesting that the relative competitiveness of the two fuels has stabilized.

**FIGURE 12 - SPOT PRICES OF OIL, COAL AND GAS IN THE EU**

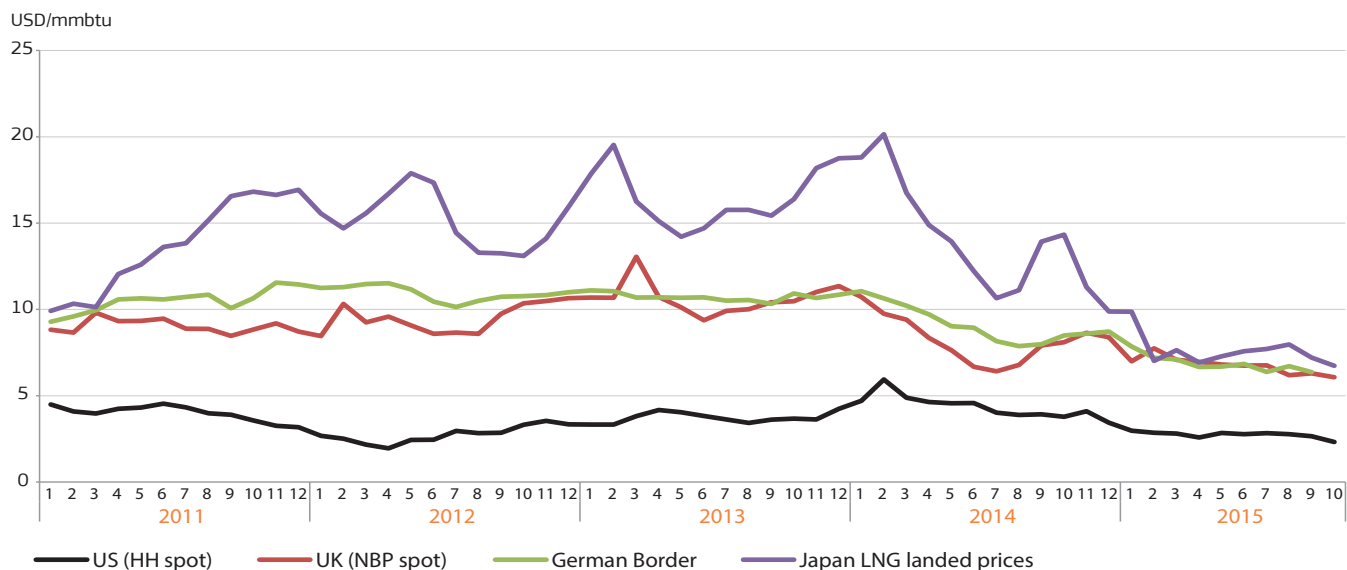


Sources: Platts

### 3.2 International gas markets

- Figure 13 displays an international comparison of wholesale gas prices. After the significant decrease observed in 2014 and early 2015, wholesale prices have been relatively stable since February.
- In 2014 and early 2015, Asian spot LNG prices decreased significantly due to weak demand and increasing supply. During the spring of 2015, LNG traded at around 7 USD/mmbtu, more or less on a par with the price at NBP, the UK gas hub. This happened for the first time since the Fukushima accident in 2011. From May 2015, LNG prices slightly increased, reaching 8.0 USD/mmbtu in August, traditionally the peak of the summer season due to high electricity demand for air conditioning. Japanese landed prices averaged 7.6 USD/mmbtu in the third quarter, resulting in an average premium of 1.2 USD/mmbtu over NBP in this period.
- European gas prices decreased slowly in the course of 2015 and, from May onwards, have been below those for spot LNG in Asia. In the third quarter, NBP averaged 6.4 USD/mmbtu (19.7 €/MWh). Measured in USD, the price at the NBP fell to its lowest level since 2010. The average German border price was 6.5 USD/mmbtu (19.9 Euro/MWh) in the third quarter, having followed a similar development to the NBP spot price in 2015 which seems to indicate that Germany's gas trading partners have turned to hub-based pricing.
- The Henry Hub price remained below 3 USD/mmbtu in the third quarter of 2015, averaging 2.7 USD/mmbtu. In October the average price was only 2.3 USD/mmbtu, the lowest level since April 2012. Stocks are well above year-ago levels which helped to keep prices down.
- After the convergence experienced in 2014 and early 2015, the ratio of international wholesale prices stabilized. The ratio of the Japanese LNG price and US Henry Hub was 2.8 in the third quarter, unchanged from the first half of 2015 but well below the 4-5 range seen in 2013. The average NBP/Henry Hub ratio was 2.3 in the third quarter, slightly lower than in the first half of the year (2.5). While the euro significantly weakened compared to the US dollar over 2014 and the first quarter of 2015 (thereby lowering European prices expressed in dollars), it slightly strengthened in the second and third quarters.

**FIGURE 13 - INTERNATIONAL COMPARISON OF WHOLESALE GAS PRICES**

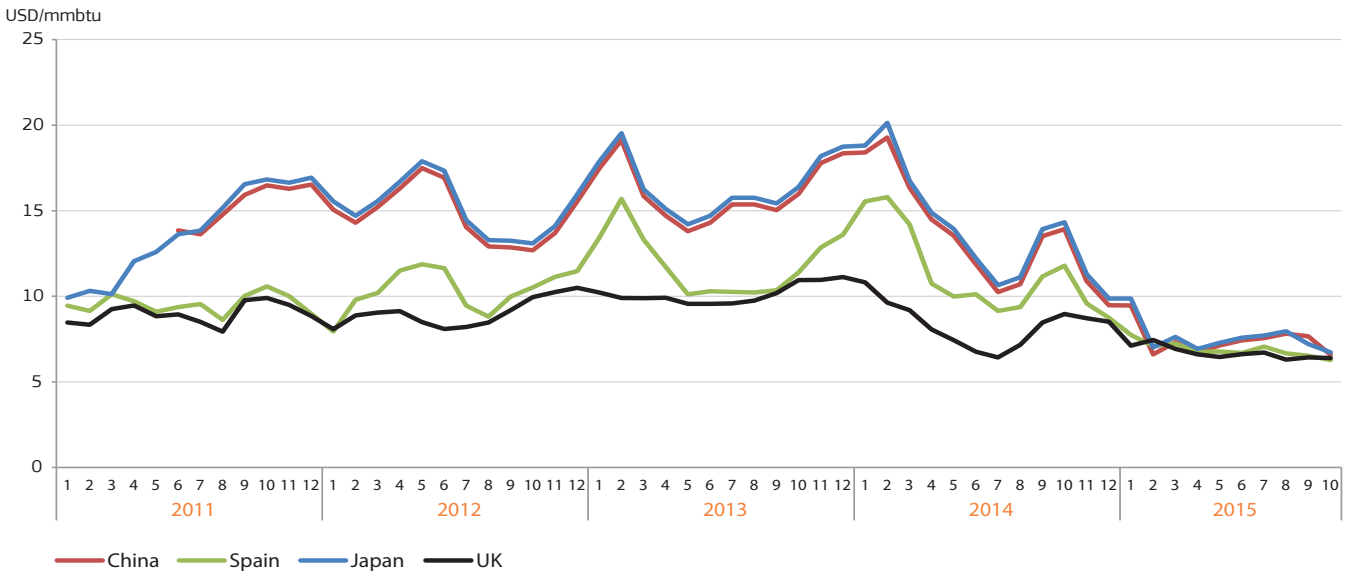


Sources: Platts, Thomson Reuters, BAFA

### 3.2.1 LNG markets

- Spot LNG prices decreased significantly in 2014 and early 2015 in both Asia and Europe, driven by weak demand in Asia and increasing global supplies, and compounded by the fall of oil prices. The decrease was steeper in Asia and, as a result, the premium of Asian LNG prices over European ones, which regularly exceeded 5 USD/mmbtu in previous years, practically disappeared.
- Since February 2015, spot LNG prices have been relatively stable, moving in the 6-8 USD/mmbtu range. In the third quarter, Asian prices slightly increased while European prices were flat. In August, when summer demand peaks in Asia, the average spot price in Japan was 1.7 USD/mmbtu higher than in the UK. In the third quarter, UK and Spanish spot prices averaged 6.6 USD/mmbtu while the average price in Japan and China was 7.7 USD/mmbtu. JCC, the Japanese benchmark of oil-indexed LNG prices, was somewhat higher, moving in the 8.5-9 USD/mmbtu range in the third quarter. The previously significant difference between Spanish and UK prices practically disappeared in 2015.
- In the third quarter of 2015, demand in Asia was flat year-on-year. Compared to the same period of 2014, LNG imports increased in India, Korea and Thailand but this was offset by the decreased deliveries into Japan. Chinese imports were unchanged from the third quarter of 2014. Latin American imports decreased, contributing to the weak global demand picture.
- Imports to Japan, the world's largest LNG market, were 6% lower in the third quarter of 2015 than in the same period of 2014. Although the first nuclear plant was restarted in August, it is unlikely that this had a notable impact on LNG imports.
- With weak demand in Asia and Latin America, demand growth has been shifting to the Middle East and Africa where some new LNG buyers appeared in 2015.
- New volumes are entering the market from Australia, where the Gladstone project started in September while the Australia Pacific LNG project should be commencing production in late November. The Sabine Pass project in the US should be operational from December. However, increasing supply is partly counterbalanced by the outage of Yemen's LNG plant. In the coming years, supply will increase further as additional Australian and US liquefaction facilities come on stream. More LNG will therefore be available for Europe.

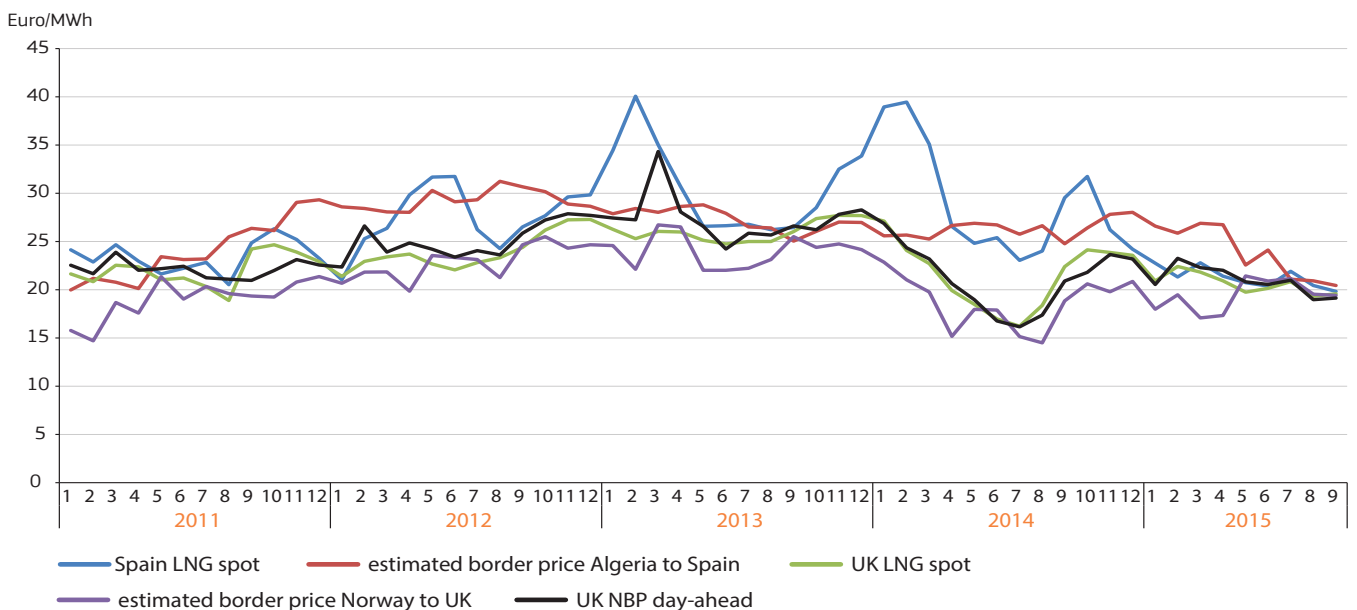
**FIGURE 14 – SPOT LNG PRICES IN THE EU AND ASIA**



Note: Landed prices for LNG  
 Source: Thomson-Reuters Waterborne

- Figure 15 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 UK NBP hub is also presented. The fall in LNG prices has helped to narrow the gap between the prices of pipeline and LNG imports in the EU, the significant differences seen in previous years having disappeared in the third quarter of 2015.
- In the UK, spot LNG prices closely follow the NBP price and for most of the time have been above the estimated price of Norwegian imports. However, since May 2015, the estimated price of Norwegian gas slightly exceeded both the NBP and the spot LNG price.
- In Spain, there appears to have been some seasonal differences in the price development of Algerian pipeline imports and spot LNG: in previous years, LNG had a high premium during the winter months but was cheaper than Algerian pipeline gas in the summer. In the 2014-2015 winter, however, LNG prices plummeted and, until June 2015, remained consistently below the price of Algerian pipeline imports. In the third quarter of 2015, the difference disappeared.

**FIGURE 15 – PRICE DEVELOPMENTS OF LNG AND PIPELINE GAS IN THE UK AND SPAIN**



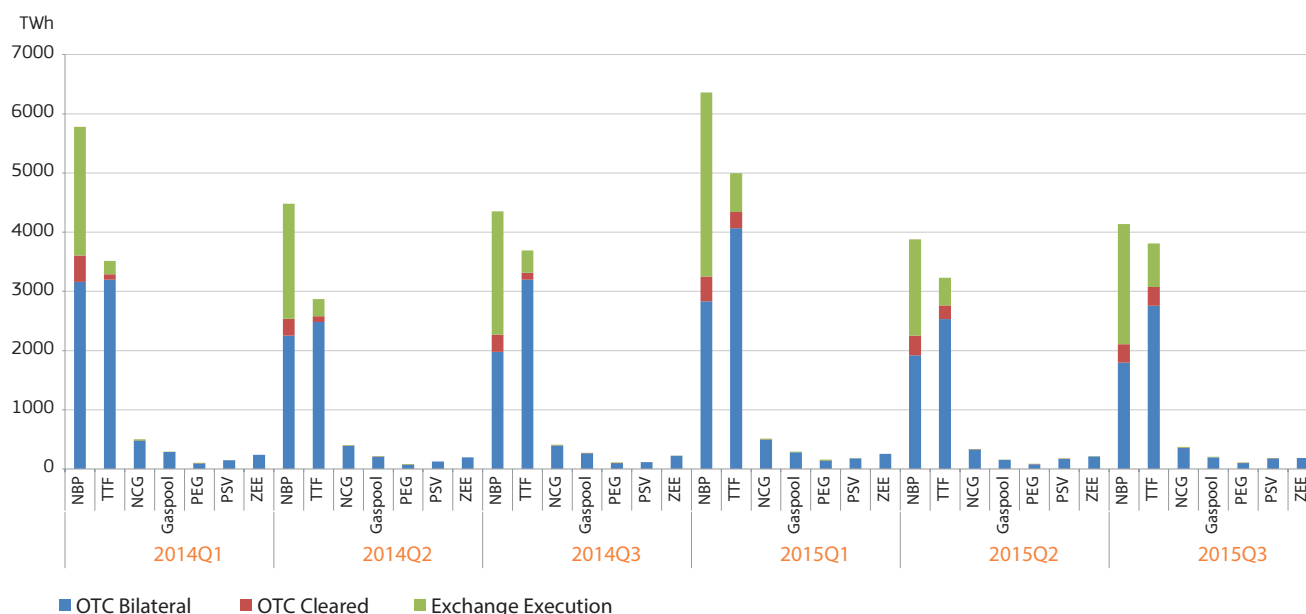
Note: Landed prices for LNG.  
 Source: Platts, Thomson Reuters, European Commission estimates based on Eurostat COMEXT data

## 3.3 European gas markets

### 3.3.1 Wholesale markets in the EU

- Since the previous issue of this report, the monthly Trayport Euro Commodities Market Dynamics Reports has been used as a source on the development of traded volumes in European gas hubs. The reports distinguish three sorts of trades: broker (OTC) bilateral, broker (OTC) cleared and exchange execution. Brokered volumes include spot volumes but exchange volumes do not.
- Total volumes traded on the main European gas hubs were just under 8,100 TWh in the second quarter (a 3% decrease compared to the same period of 2014). In the third quarter, trading activity increased to 9,000 TWh but remained below year-ago levels (-2%). In 2014, instability in Ukraine and concerns about Russian supplies to Europe resulted in comparatively high trading volumes.
- The UK and Dutch virtual trading points dominate gas trade in Europe, covering 88% of hub traded volumes in the third quarter of 2015. This share has not changed since last year; it was the same in the third quarter of 2014. Volumes at the NBP decreased by 5% year-on-year while TTF volumes increased by 3%. As in the previous quarter, the Italian PSV showed the biggest year-on-year increase (59%).
- OTC markets had a 69% share of total traded volumes in the third quarter of 2015, down from 73% in the same period of 2014. 10% of OTC volumes was cleared at a clearinghouse; one year ago this share was only 6%.
- On the UK NBP hub, 49% of total traded volumes were executed directly on an exchange in the third quarter of 2015. This share was 19% on the Dutch TTF hub and around 5% on the German and French hubs.

**FIGURE 16 – TRADED VOLUMES ON EUROPEAN GAS HUBS**

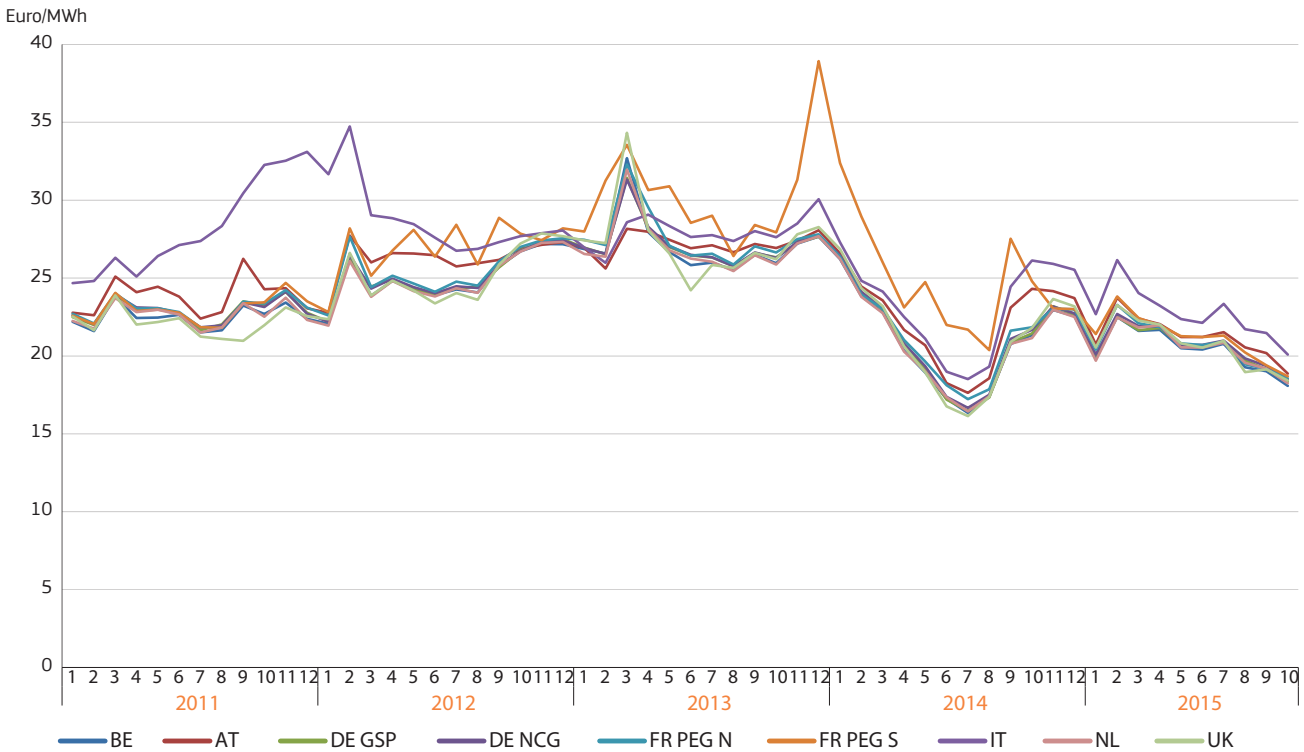


The chart covers the following trading hubs: UK: NBP (National Balancing Point); Netherlands: TTF (Title Transfer Facility); Germany: NCG (Net-Connect Germany) and Gaspool; France: PEG (Point d'Echange Gaz); Italy: PSV (Punto di Scambio Virtuale); Belgium: Zeebrugge beach. OTC volumes include spot volume but exchange volumes do not. Source: Trayport Euro Commodities Market Dynamics Report

### 3.3.2 Wholesale price developments in the EU

- From February 2015, hub prices showed a decreasing trend as low oil prices and steady LNG supply put downward pressure on European hub prices. LNG flows were more muted in the third quarter but Russian, Norwegian and Algerian pipeline imports were rather strong in this period, putting downward pressure on prices.
- In the third quarter, prices at most hubs moved in the 19-22 Euro/MWh range. Average day-ahead gas prices were about 5% higher than in the same period of 2014. If the price slump experienced in mid-2014 is disregarded, hub prices have not been as low since 2010.
- The interruption of Russian gas deliveries to Ukraine in the third quarter of 2015 had no impact on the transit flows to the EU. Nevertheless, it provided some support to European hub prices, contributing to the small price surge in July. In late September, the agreement between Russia and Ukraine (see section 1.4) alleviated concerns about transit flows to Europe and weakened expectations of gas flows from Europe to Ukraine, and therefore also contributed to decreasing hub prices.
- Prices at the Italian PSV hub remained relatively high in the third quarter, with an average premium of 2.3 Euro/MWh above TTF, the Dutch hub. Italian prices were particularly high in July when high temperatures led to increased power demand. If Italy is not taken into account, the difference between the highest and the lowest priced hub in North-West Europe was 0.8-1.6 Euro/MWh in the third quarter, up from the 0.4-0.8 Euro/MWh difference experienced in the second quarter.
- In the second half of August, the price at the UK NBP hub fell by more than 10% in a single week as a result of the surge in LNG imports in the UK; other European hub prices has not showed such a volatility in this period. As a result, on 28 August 2015 the price at the NBP was 1.8 Euro/MWh lower than at TTF although, typically, NBP is slightly more expensive than TTF.
- In France, the average premium of TRS over PEG Nord was only 0.46 Euro/MWh in the third quarter. However, the spread was volatile, reflecting changes in the north-south gas flow restrictions and LNG imports in the southern part of the country. Unusually, the average price at PEG Nord was slightly below TTF in August and September, helped by relatively high storage levels in France compared to other European countries.

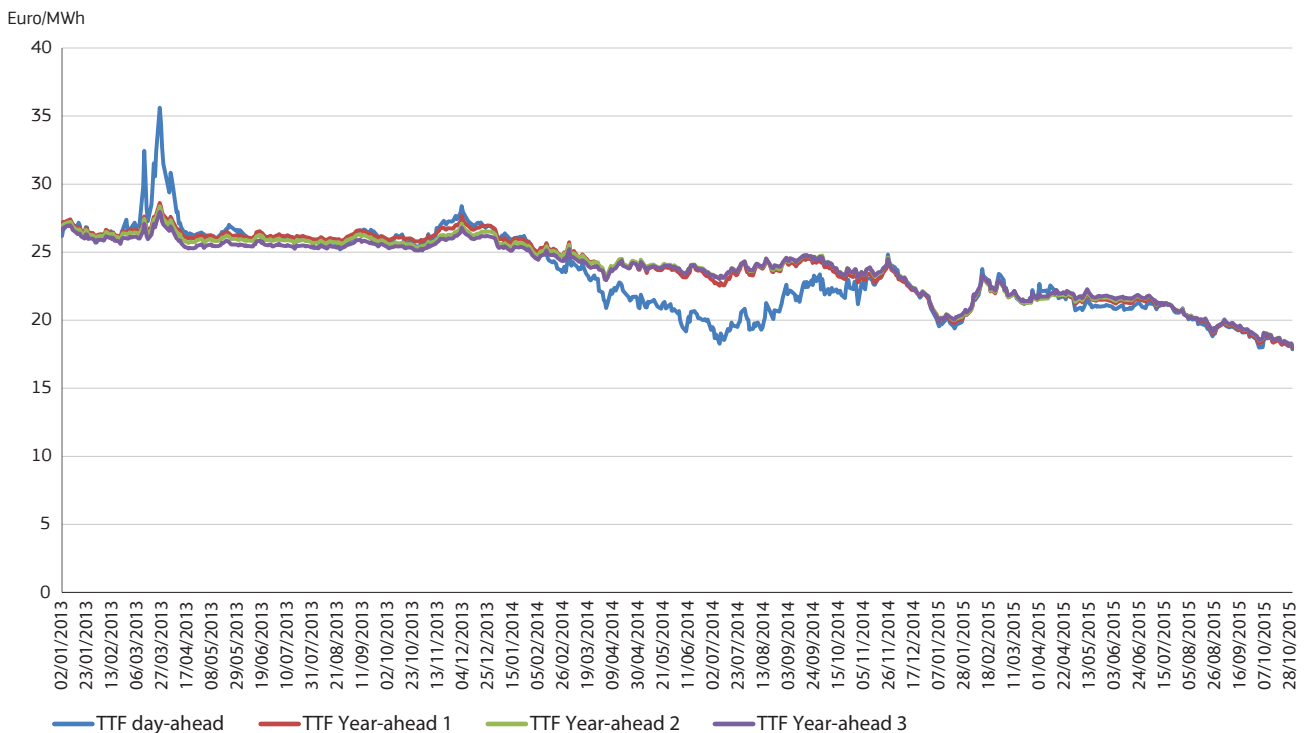
**FIGURE 17 – WHOLESALE DAY-AHEAD GAS PRICES ON GAS HUBS IN THE EU**



Source: Platts

- Figure 18 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. For most of 2014, there has been a situation of contango<sup>17)</sup>, whereby closer to the present date prices are lower than prices for future deliveries. With seasonally high stock levels and ample physical supply, spot prices significantly decreased in the first half of the year, while higher forward prices reflected the general uncertainty about future developments, in particular the Russia-Ukraine conflict.
- Since the end of 2014, day-ahead and forward prices have been more or less at parity. In the third quarter of 2015, the year-ahead price was on average 0.10 Euro/MWh more expensive than the day-ahead price.

**FIGURE 18 – FORWARD GAS PRICES ON THE DUTCH GAS HUB**



Source: Platts

- Figure 19 traces the occurrence of adverse nominations – the so-called flow against price differential events (FAPD)<sup>18)</sup> – in North Western Europe (NWE) since 2011. Day-ahead nominations of flows from a high price area to a low price area are not frequent for adjacent areas with active hub trading. The number of FAPD events in the NWE region has been rather volatile in recent years but significantly decreased in the third quarter of 2015.
- There have been no FAPD events between the Netherlands and the UK in the third quarter of 2015. In fact, unusually low amounts of gas were flowing on the BBL pipeline connecting the two countries with volumes recorded only on 11 days in this period. The pipeline can physically transport gas only from the Netherlands to the UK but virtual reverse flows are possible. Virtual reverse flow nominations typically peak in the summer months when UK gas demand is low while storage injection demand is high in continental Europe.<sup>19)</sup>
- In contrast, the pipelines between Belgium and the Netherlands were busy in the third quarter. However, no FAPD events were registered on this route either.
- In the third quarter of 2015, a single FAPD event was observed on the bi-directional pipeline between Belgium and the UK; this is a significant decrease from the previous three quarters. Throughout the period, net flows were going from the UK to Belgium. Flows were particularly robust in August, helped by lower prices in the UK (see section 3.3.2).

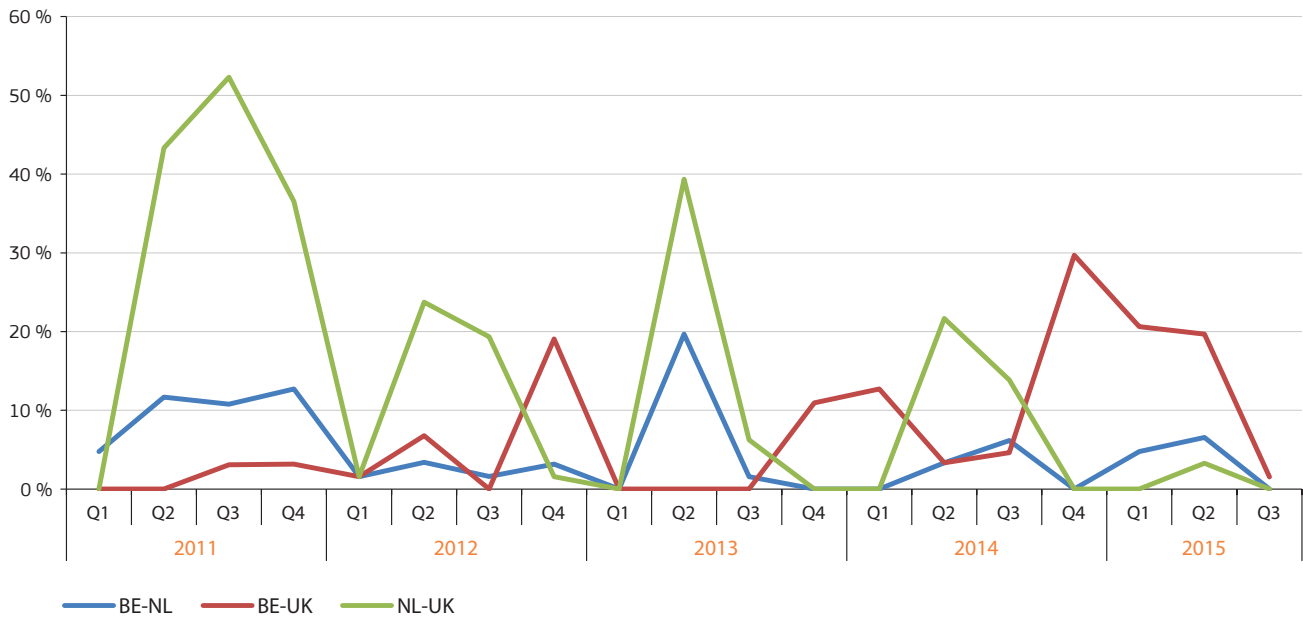
17. See the glossary for a definition of contango

18. See the glossary for a definition of the FAPD event.

19. ICIS Heren European Gas Markets, 31 July 2015



**FIGURE 19 – FAPD EVENTS IN THE NORTH-WESTERN EUROPEAN REGION**

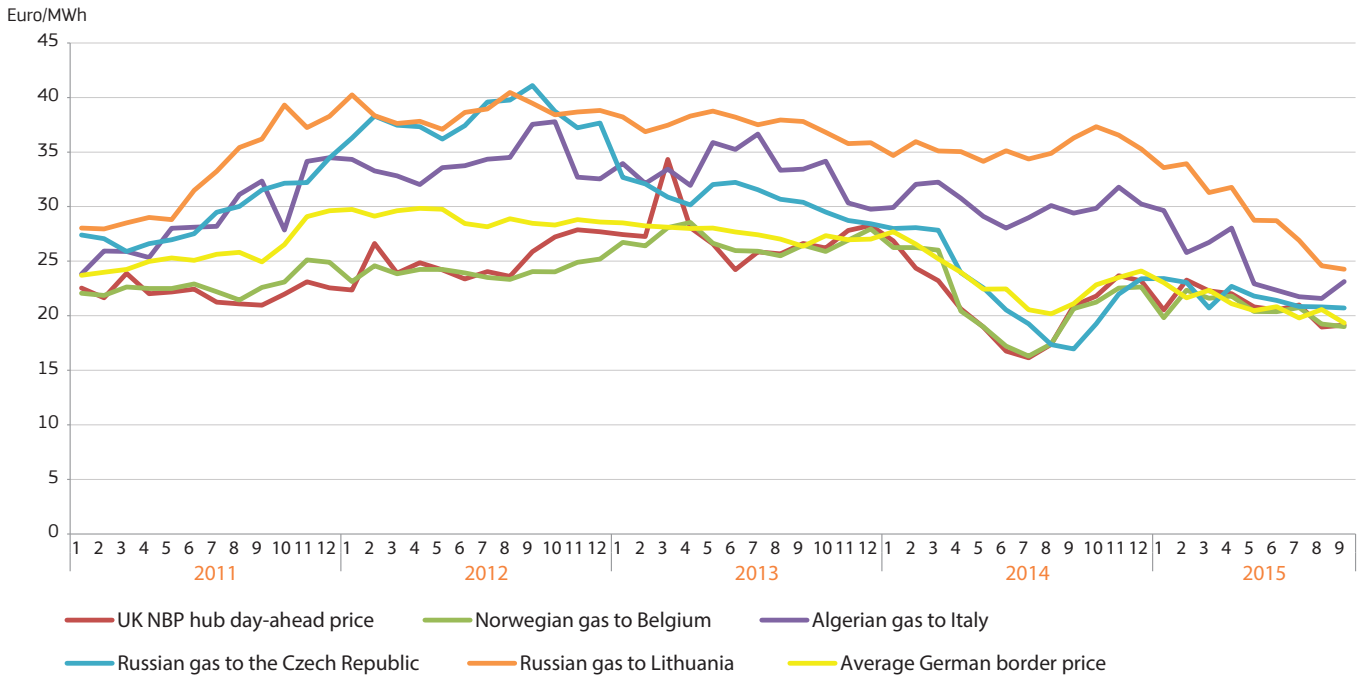


Sources. (1) Price data: Platts; (2) Flow nomination data: Fluxys, BBL

### 3.3.3 Comparing the prices of different contracts for gas in the EU

- A comparison of a selection of estimated border prices of gas deliveries from the main exporters to the EU – Russia, Norway, and Algeria – shows significant variation in terms of price levels and, to a smaller extent, in terms of price dynamics.
- Compared to large variations experienced in 2014, hub-based prices were relatively stable in the first nine months of 2015, showing a slow decreasing trend. On the other hand, oil-indexed prices fell significantly in line with the oil price drop observed in the second half of 2014. The estimated price level of Russian gas to Lithuania remained the highest but its premium to the other – mainly hub-based – prices shrunk. The estimated price of Algerian gas to Italy decreased until August but surged in September. The other contracts more or less followed the movement of the NBP price, albeit in some cases with a delay.
- The difference between the estimated prices of Russian gas delivered to the Czech Republic and Lithuania remained high but decreased in 2015 due to falling oil prices. In August 2015, the estimated price in Lithuania was about 4 Euro/MWh higher than in the Czech Republic while in the first quarter of 2015 this difference was more than 10 Euro/MWh. Since mid-2013, estimated Czech prices have been well below the theoretical pure oil-indexed contract, indicating that the Czech-Russian contract now has a significant hub pricing element. In July, the estimated price of Russian gas in Lithuania was 0.5 Euro/MWh lower than the estimated price of imported LNG.
- As a result of falling oil-indexed prices, the differentials across European wholesale prices have substantially narrowed in the course of 2015. The renewed oil price drop experienced since mid-2015 suggest that oil-indexed prices will continue the decreasing trend in the coming months. As a result, price convergence is likely to continue.

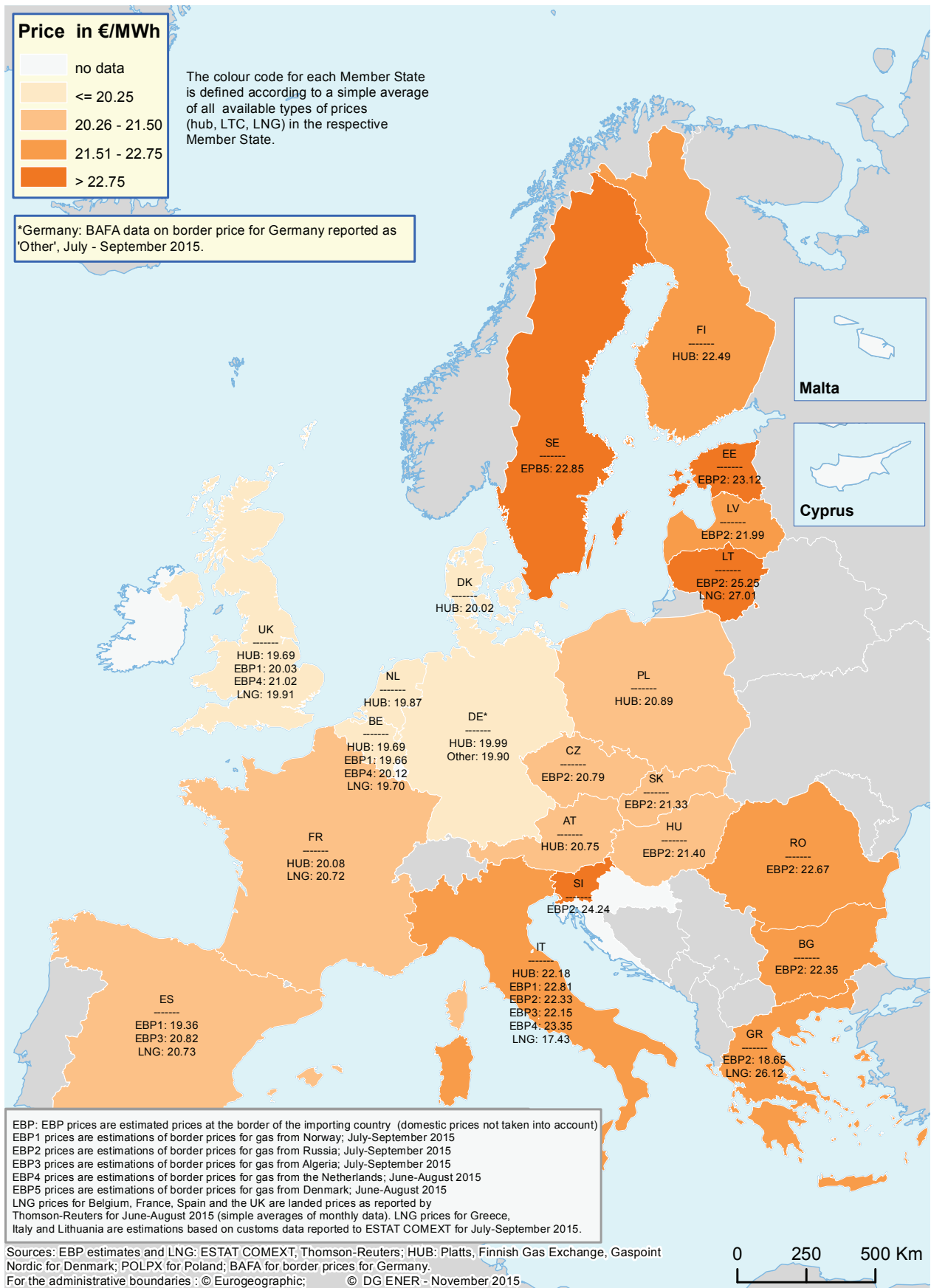
**FIGURE 20 – COMPARISON OF EU WHOLESALE GAS PRICE ESTIMATIONS**



Source: Eurostat COMEXT and European Commission estimations, BAFA, Platts

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 2015**

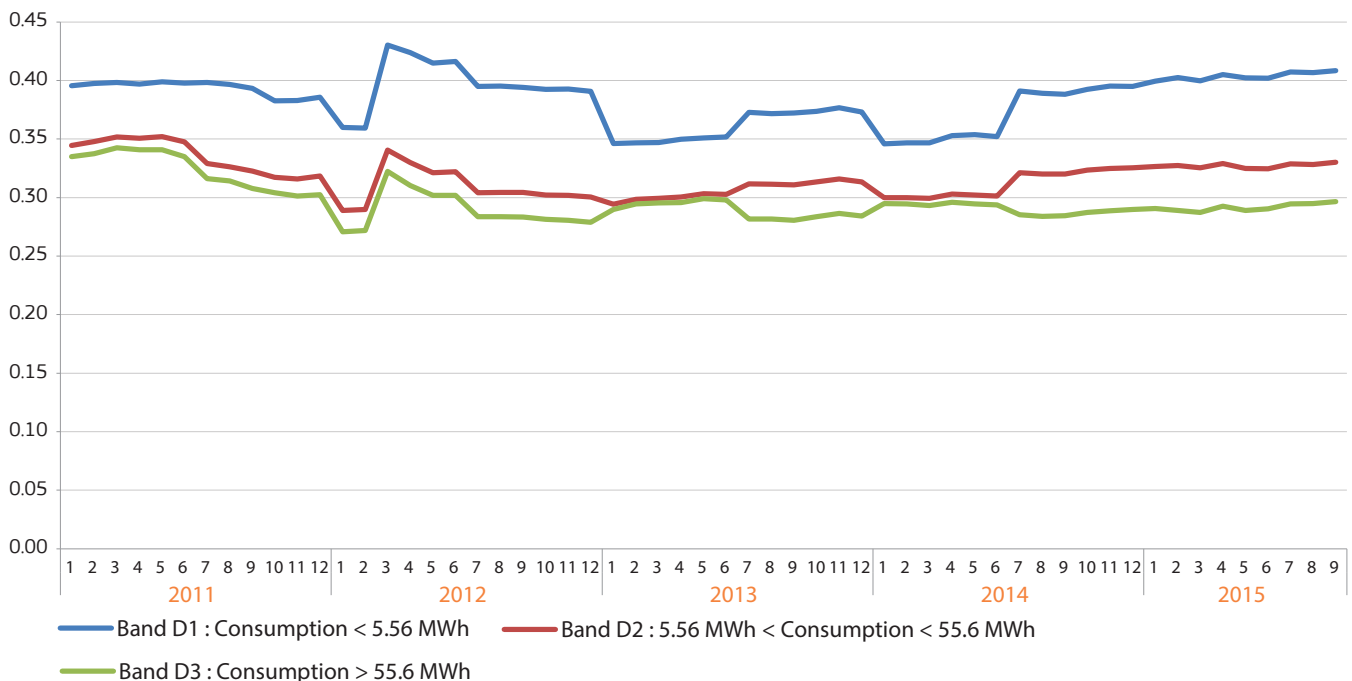


Note: Border prices are estimations of prices of piped gas imports paid at the border of the importing country, based on information collected by customs agencies, and are deemed to be representative of long-term gas contracts.

# 4. Retail gas prices in the EU

- Figures 21 and 22 show the convergence of retail gas prices for household and industrial consumers, using as a metric the relative standard deviation<sup>(20)</sup> 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 2015) and Harmonised Consumer Price Indices (HICP) for the household prices and Producer Price Indices (PPI) for industrial consumers.
- For household consumers, the estimated average retail price (including all taxes) showed an increasing trend since 2010 but a slight decrease can be observed since the end of 2014. In the most typical consumption band, D2, the estimated average price in September 2015 was 3% lower than in September 2014. There are only 4 Member States where estimated prices increased in this period. In spite of a price increase of 4.5%, Romania remained the cheapest country.
- The relative standard deviation has been relatively stable over the last five years, indicating a lack of price convergence. There are still significant differences in retail gas prices across the EU: in September 2015, the lowest estimated household price in consumption band D2 could be observed in Romania (3.33 Eurocent/kWh), while the highest price was recorded in Sweden (11.42 Eurocent/kWh), resulting in a price differential ratio of 3.4 between the cheapest and the most expensive Member State in the EU. While this ratio is rather high, it shows a declining trend since March 2012 when it was 4.8.

**FIGURE 21 - RELATIVE STANDARD DEVIATION OF GAS PRICES PAID BY HOUSEHOLD CONSUMERS IN EU MEMBER STATES**



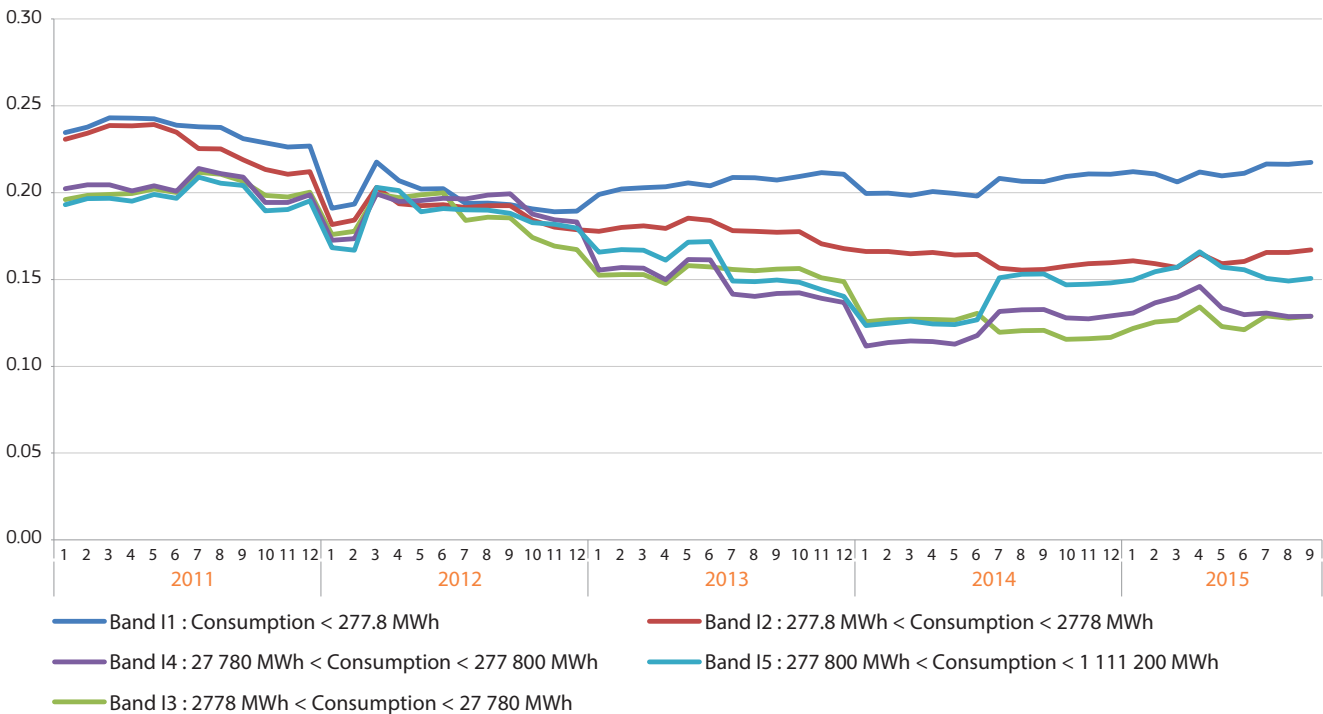
Note: all taxes included.

Source: European Commission estimates based on Eurostat data on consumer prices adjusted by the HICP

20. The relative standard deviation is calculated by dividing the standard deviation with the average. It shows the extent of variability in relation to the mean of the sample.

- Estimated industrial prices have been decreasing in the last two years, with the average September 2015 price (VAT and other recoverable taxes excluded) in consumption band I4 being 13% below the December 2013 level. Between September 2014 and September 2015, the estimated average price in this consumption band decreased by 3%. Prices decreased in this period in all but four Member States, with the most significant decrease in Estonia (-19%).
- For industrial customers, the relative standard deviation has been significantly lower than in the case of households, indicating smaller price differences across Member States. Furthermore, with the exception of consumption band I1, there is a noticeable decreasing trend, demonstrating a convergence of prices. However, price convergence seems to have stalled in 2014-2015.
- In September 2015, Belgium had the lowest estimated industrial price in consumption band I4 (2.58 Eurocent/kWh), while the highest price was observed in Greece (4.06 Eurocent/kWh), resulting in a price differential ratio of 1.6 between the cheapest and the most expensive Member State of the EU. In 2012, this ratio reached up to 2.3 but no real improvement can be observed in 2014 and 2015.

**FIGURE 22 - RELATIVE STANDARD DEVIATION OF GAS PRICES PAID BY INDUSTRIAL CONSUMERS IN EU MEMBER STATES**



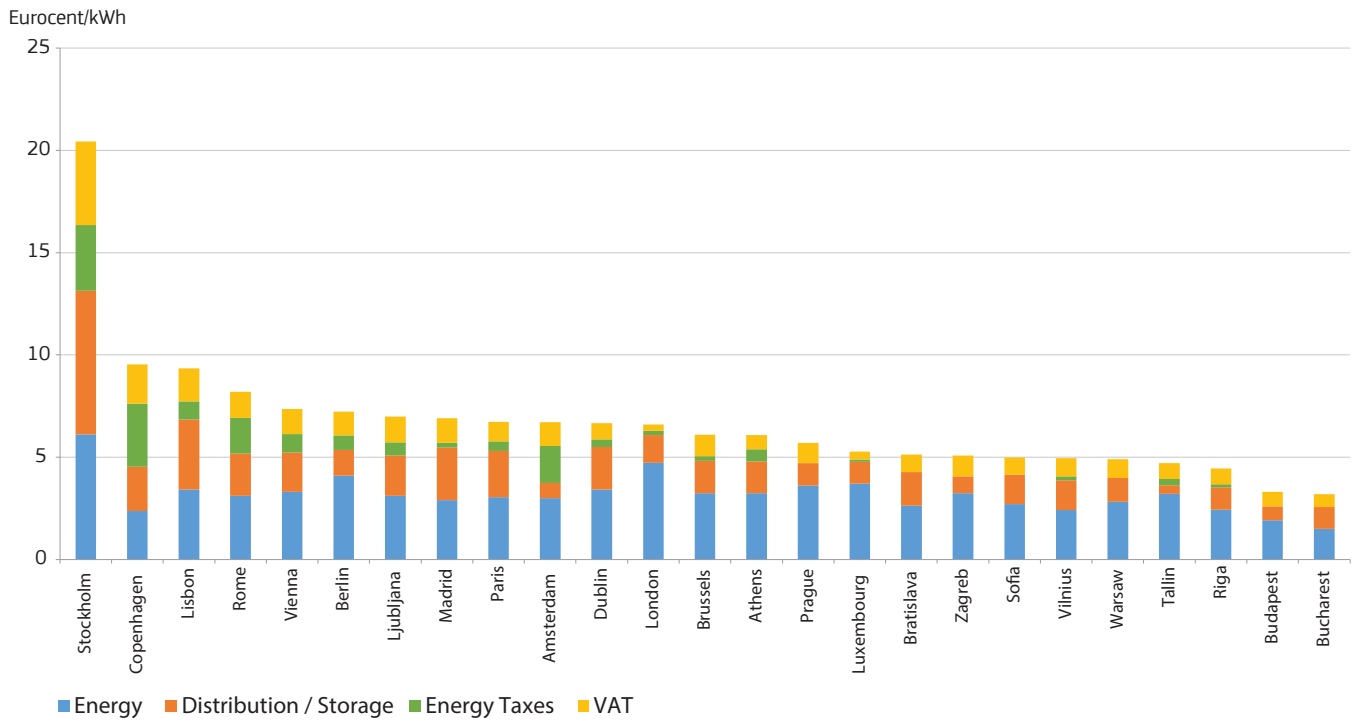
Note: Excluding VAT and other recoverable taxes.

Source of data: European Commission estimates based on Eurostat data on industrial prices adjusted by the PPI

- Figure 23 shows the level and the breakdown of residential end-user gas prices paid by typical households in 25 European capitals in September 2015. On average, 51% of the price covers the gas itself, while the rest covers distribution/storage costs (25%), energy taxes (7%) and VAT (16%).<sup>(21)</sup>
- There are significant differences across Member States, with the share of energy cost ranging from 25 to 72%, the share of distribution/storage costs ranging from 9 to 37% and the share of taxes ranging from 8 to 53%. In Copenhagen, taxes make up more than half of the price while in London and Luxembourg their share is less than 10%. For 7 of the 25 capitals covered, the price does not include an energy tax component.

21. Note that these are arithmetic averages.

**FIGURE 23 - THE BREAKDOWN OF GAS PRICE PAID BY TYPICAL HOUSEHOLD CUSTOMERS IN EUROPEAN CAPITALS, SEPTEMBER 2015**

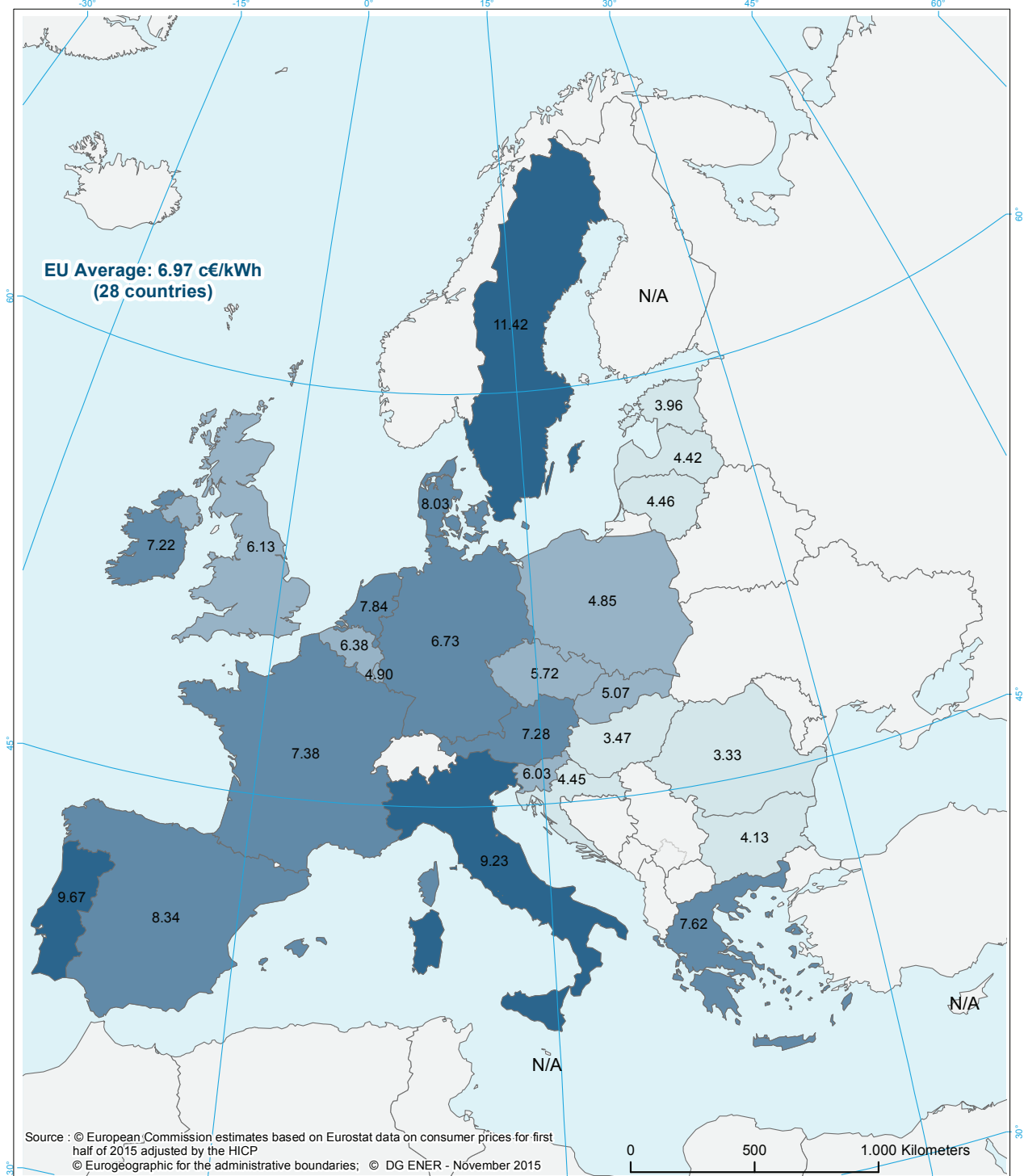


Note: VaasaETT

- Maps 2 and 3 show the estimated retail gas prices paid by households and industrial consumers in the third quarter of 2015.

**MAP 2 - RETAIL GAS PRICE ESTIMATES FOR HOUSEHOLDS IN THE EU – 3RD QUARTER OF 2015**

Band D2: 5.56 MWh < Consumption < 55.6 MWh

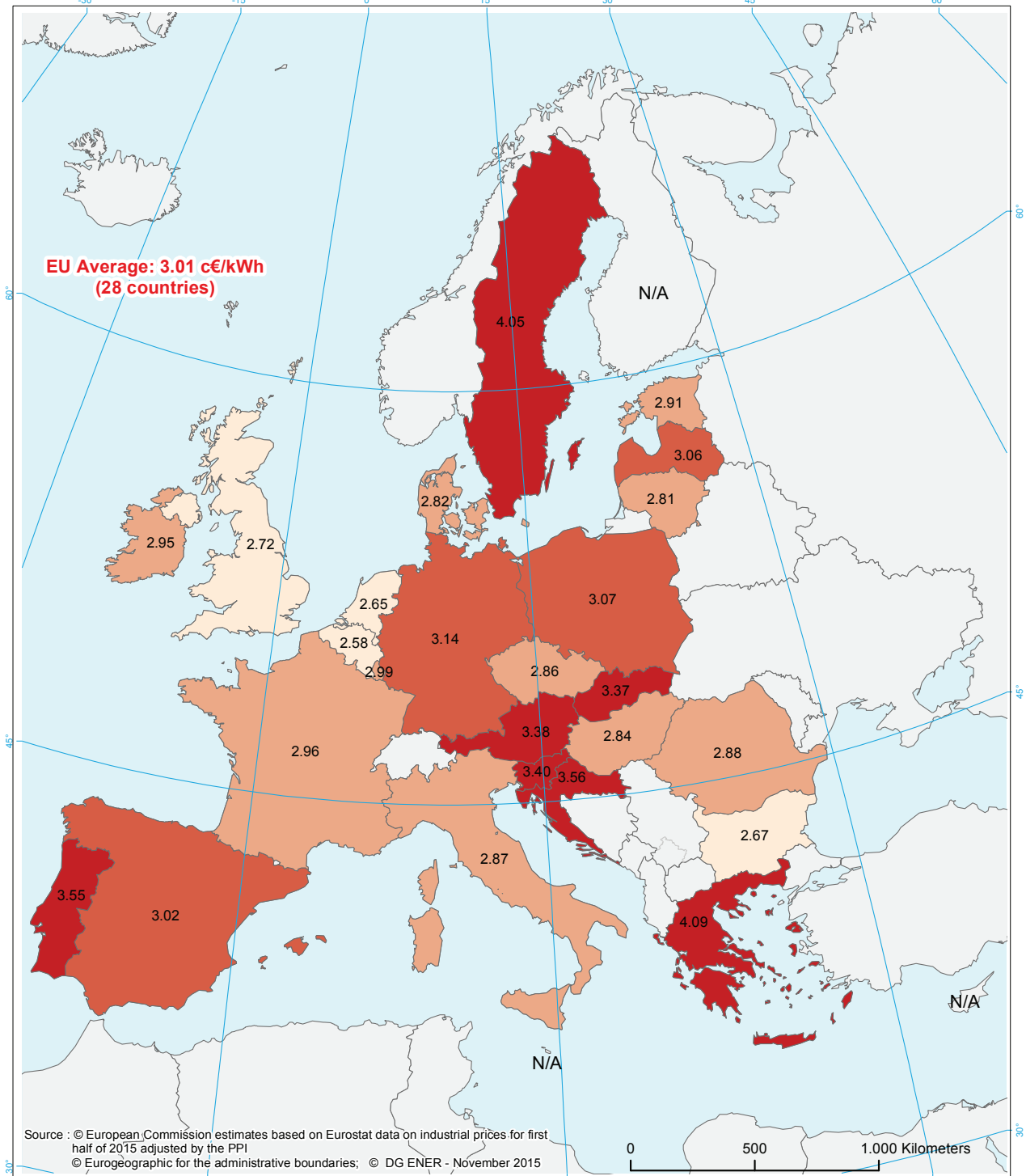


Prices in Eurocents/kWh, including all taxes and levies

- no data
- < 4.50
- 4.50 - 6.50
- 6.51 - 8.50
- > 8.50

**MAP 3 - RETAIL GAS PRICE ESTIMATES FOR INDUSTRIAL CONSUMERS IN THE EU - 3RD QUARTER OF 2015**

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



**Prices in Eurocents/kWh, excluding VAT and other recoverable taxes**

- no data
- < 2.75
- 2.75 - 3.00
- 3.01 - 3.25
- > 3.25





# 5. Glossary

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

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

