



Quarterly Report

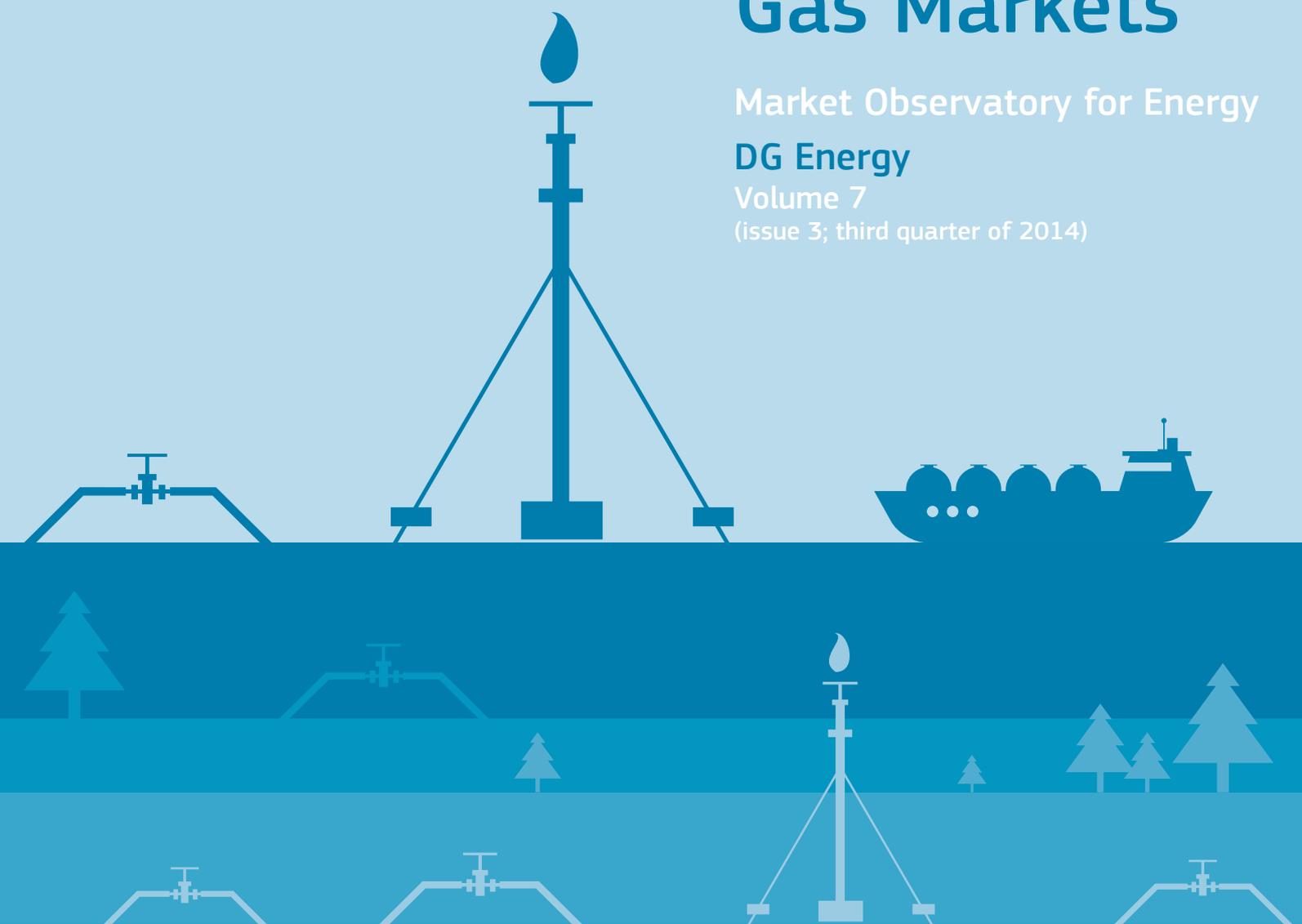
on European Gas Markets

Market Observatory for Energy

DG Energy

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Highlights of the report

- Market integration drives systematic price convergence on major gas hubs in the EU.
- Historically low hub prices over summer 2014 and a slight decrease in industrial retail prices in the EU.
- Major European wholesale price benchmarks at a level twice that of average US wholesale prices, down from a factor of three to four over 2012 and 2013. The fall in crude oil prices will be passing through oil-indexed contracts gradually.
- Low Asian prices incentivise LNG deliveries to the EU and contribute to narrowing the price gap between pipeline and LNG imports.
- The political situation in Ukraine has had no observable impact on import levels from Russia into the EU so far. Gas storage sites full at levels above those of recent years, holding higher overall volumes.
- Broad cooperation and proportionate and effective national security of supply measures are crucial for protecting households and minimising supply cuts during a possible serious disruption in gas supply from the East in the coming winter.

Executive summary

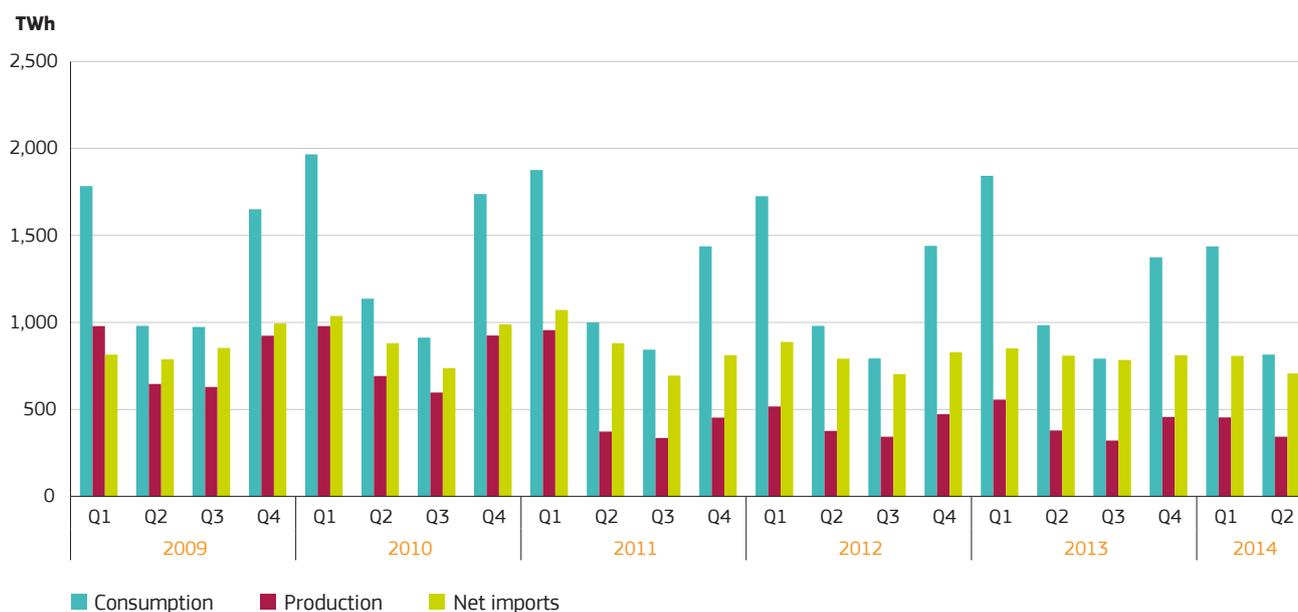
- **EU gas consumption declined by 20% in the first half of 2014** relative to the year before mainly driven by warm weather. Gas imports were down by 9% over the same period.
- While in recent years, high LNG prices in Asia contributed to a fall in LNG imports, **the downward spiral of ever greater decline in LNG imports may have reversed**, at least for Spain and the UK, the two largest LNG importers in the EU. While LNG imports to the EU as a whole were down by 7% in the first three quarters of 2014 relative to the same period of 2013, **LNG imports to the UK surged by 22%** and in **Spain LNG volumes were relatively stable**, after 3 years of decline.
- After the summer slump in LNG prices to pre-Fukushima levels, at the end of the third quarter **LNG prices started to recover, but stayed at levels around 10-15% below those seen a year earlier**. Subdued LNG demand, high storage levels in Asia and expectations of nuclear plant start-ups in Japan have been pulling down LNG prices, **prompting a convergence of LNG and pipeline prices** in the major LNG importing countries in the EU.
- **Spot prices at European gas hubs increased by 10-15% in the third quarter of 2014** relative to the historically low levels of summer 2014. Nevertheless, in September day-ahead prices were in the range of 20-23 Euro/MWh on most hubs, or **around 30% below the levels of a year ago**. Price convergence between hubs signals improving market integration.
- **Traded volumes on spot markets in the EU increased by 14% in the year to September**. The largest increase was on the **Dutch TTF**, which has now **surpassed the NBP in the UK in terms of spot volumes traded**. Growing liquidity entails increasing price transparency and decreasing transaction costs.
- Over the three quarters of 2014 **the average EU wholesale hub price has been trading at a level twice that of the average US wholesale hub price¹**. This compares to a much bigger difference during 2012 and 2013, when EU prices were three to four times higher than US prices. In the coming months, the **fall in crude oil prices** will be putting additional **downward pressure on oil-indexed prices in the EU for both pipeline gas and LNG**.
- Across the EU as a whole, **retail gas prices for industry decreased by 4% and those for households by 2%** between the first half of 2013 and the first half of 2014. **Differences in order of magnitude remain** in retail gas price levels in the EU though these have slightly decreased in the first half of 2014. Households in the most expensive Member States are paying around 4 times as much as those in the cheapest. For industries, the difference is in the order of magnitude of two².

1. Simple average of NBP day-ahead prices and German border prices as proxy for average EU wholesale prices. Henry Hub day-ahead as a proxy for wholesale prices in the US.
2. Excluding VAT and recoverable taxes

1. Gas Consumption – Production – Imports

- Gas consumption and net imports of gas in the EU declined respectively by 20% and 9%³ in the first half of 2014 in comparison to the same period in 2013. The decline in consumption was registered in all Member States, in some cases exceeding 30% (Germany, Slovakia, Portugal and Estonia). Much of this decrease in consumption resulted from an unusually mild winter in 2014 compared to a prolonged period of unseasonably cold weather in the winter and spring of 2013.
- In the first half of 2014, production of natural gas in the EU fell by 15% on a yearly basis. Dutch gas output continued to decrease (-24% over the first six months of the year relative to the same period in 2013), after having registered its lowest level on record in the first three months of the year. On 17 January 2014, the Dutch government introduced a 3-year cap on production in a bid to limit the intensity of tremors that have hit the Groningen area. European gas production is therefore expected to fall further in 2014.

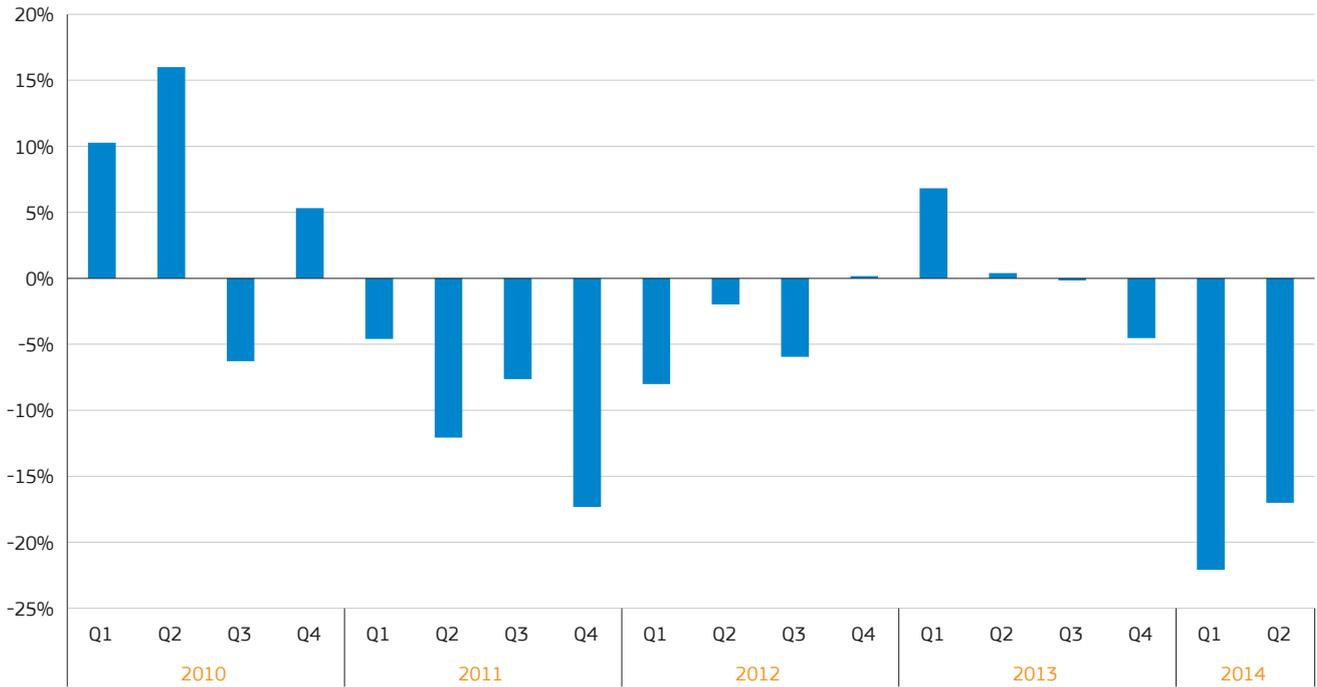
FIGURE 1 - EU GAS CONSUMPTION, IMPORTS AND PRODUCTION



Source: Eurostat, data as of 15 October 2014 from data series nrg_ind_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.

3. Eurostat data series nrg_103m as of 15 October 2014.

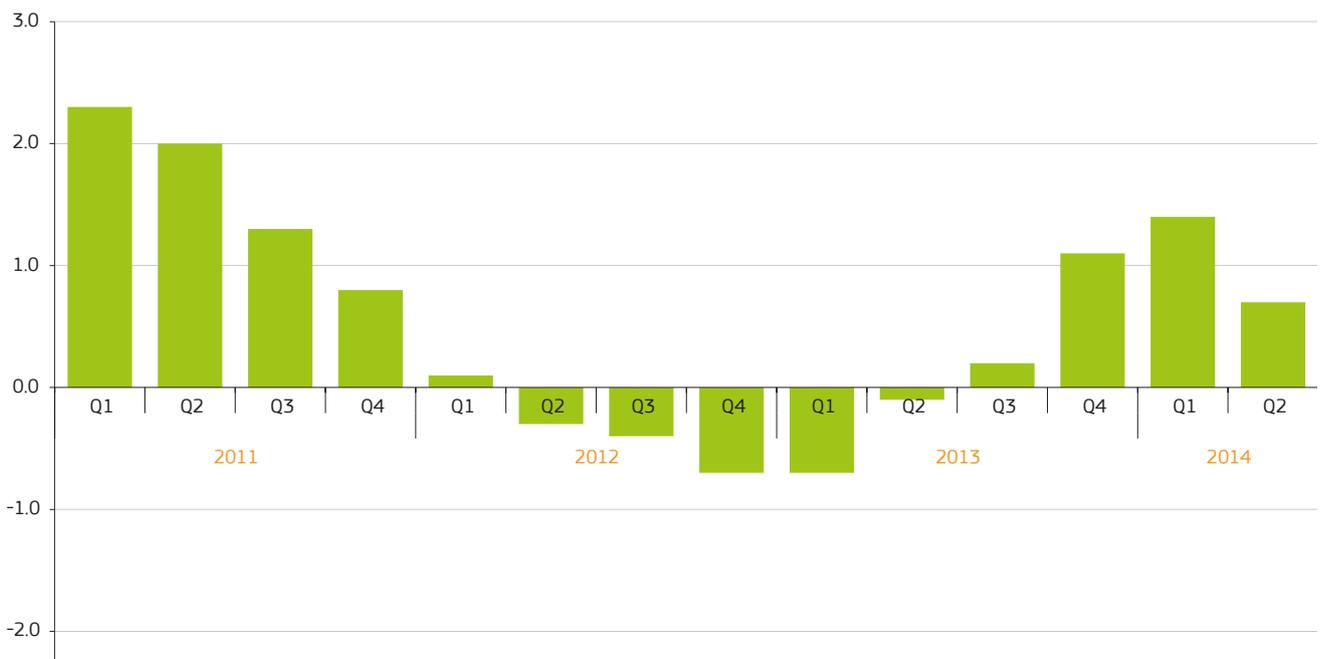
FIGURE 2 - EU GAS CONSUMPTION Q/Q-4 CHANGE (%)



Source: Eurostat, data as of 15 October 2014 from data series nrg_ind_103m

- In Q1 2014, the seasonally adjusted Gross Domestic Product (GDP) of the EU rose by 0.7% compared to the same quarter of the previous year, after growing by +1.4% and +1.1%, respectively, in the previous two quarters. Gross value added by manufacturing was up 1.4% in Q2 2014 compared with the same quarter of the previous year, after two consecutive quarters of growth (+2.1% in Q4 2013 and +2.6% in Q1 2014).

FIGURE 3 - EU GDP Q/Q-4 CHANGE (%)



Source: Eurostat as of 15 October 2014

- The main reasons for the falling share of gas in the electricity sector continues to be modest economic performance, falling electricity consumption and strong renewables output. Four of the five markets for which data is reported (Table 1) have seen a fall in the gas input to the power sector in the first three quarters of 2014, though at a lower rate than previously observed.
- The UK is a notable exception, having experienced an increase in gas consumption in the power sector from 9.9 bcm in the third quarter of 2013 to 10.6 bcm in the third quarter of 2014. The underlying reasons for this increase include the significant fall in spot prices for gas and the availability of cheap spot LNG eroding the competitive advantage of coal fired generation over gas, along with structural factors related to the electricity sector of the UK.
- In the third quarter of 2014, clean spark spreads in the UK - measuring the profitability of gas-fired generation – remained relatively stable at around 10 Euro/MWh, up from around 9 Euro/MWh in the second quarter. The underlying factors include stable carbon prices, along with increasing gas prices on the NBP hub relative to the previous quarter (though to levels well below those in the last three years), which have driven up power prices. The latest issue of the Quarterly Report on European Electricity Markets provides further analysis of the profitability of gas in power generation in the UK and Germany.

TABLE 1 - NATURAL GAS INTAKE IN THE POWER GENERATION SECTOR OF SELECTED EU COUNTRIES 2008-2014 (BCM)

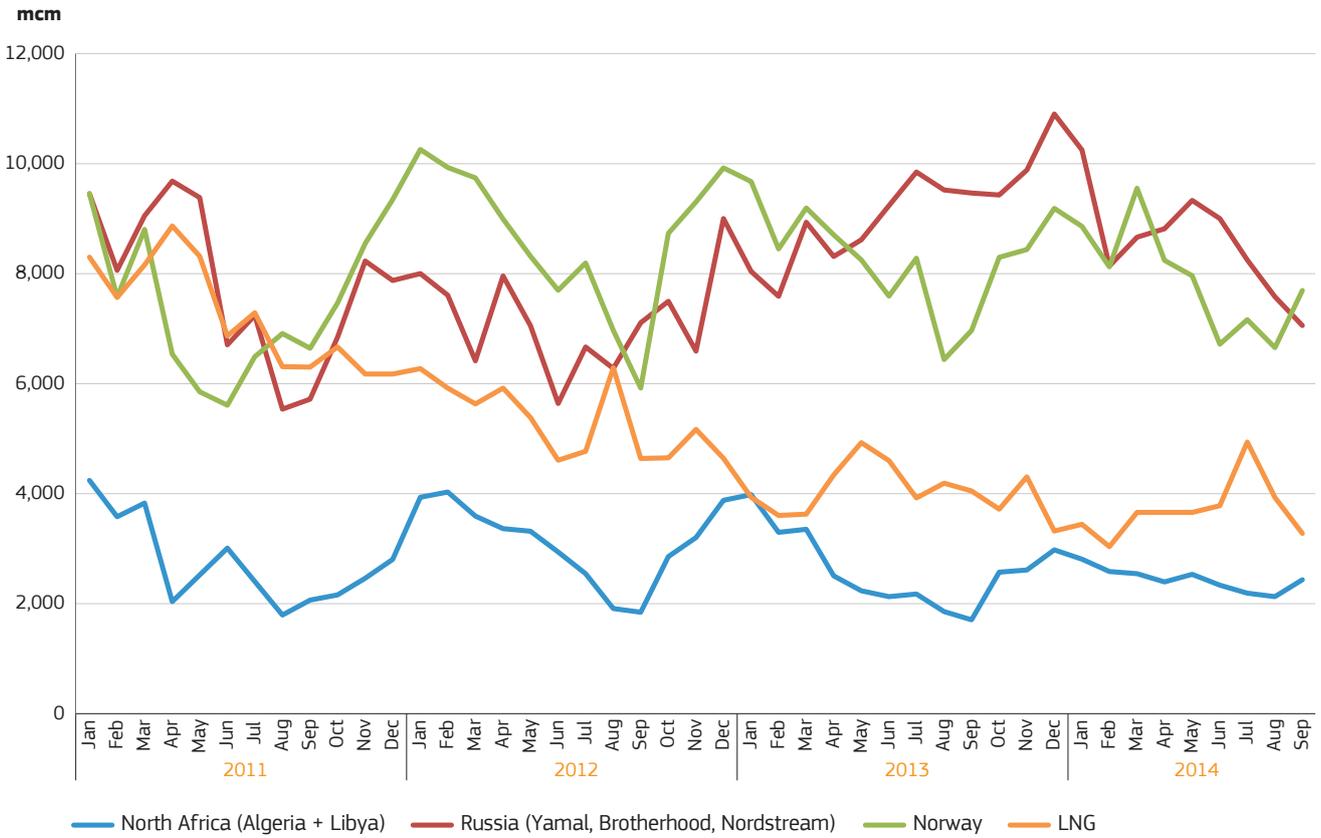
	2008	2009	2010	2011	2012	2013	Year-to-Date (YTD)
Italy	33.4	28.7	29.8	27.5	24.2	20.1	12.2
UK	24.8	23.1	25.3	19.5	13.2	13.1	10.6
Spain	16	13.7	11.6	9.4	7.2	4.8	3.1
Belgium	n.a.	n.a.	n.a.	7.1	8.4	7.4	5
France	n.a.	n.a.	2.2	2.5	1.5	1.2	0.26

Source: Bentek/Platts. Year-to-date refers to the period January-September 2014

- Recent years have seen a continuous shift of gas imports to the EU away from LNG and towards pipeline imports (see Figures 4, 5 and 6), driven by high LNG prices supported by booming demand for LNG in Asia and Latin America.
- This shift away from LNG was especially pronounced in 2013, when total pipeline flows increased by 6% over the first three quarters of the year compared to the same period in 2012; in contrast LNG volumes dropped by 25%. Russian imports registered 28% growth in 2013, while Norwegian imports peaked in 2012 and have decreased since then (-4% between 2012 and 2013)
- In 2014, the shift towards pipeline imports continued, but was much less pronounced: the first three quarters of 2014 saw a 3% reduction in pipeline imports versus a 10% drop in LNG import volumes. At the same time, the decline in consumption of gas was much more pronounced: 20% down in the first half of 2014 in comparison to the same period in 2013.
- With regard to pipeline imports, a closer look at the physical flow volumes of gas into the EU reveals that in the first three quarters of 2014 Russian and Norwegian imports fell (-3% and -4%, respectively in comparison to the same period in 2013) and North African imports were down by 6%.
- At the end of October, Lithuania's LNG import terminal (the Klaipeda – Independence - floating storage regasification unit) arrived at its destination port. The vessel can carry 145,000 m³ of LNG, convertible to approximately 59 mcm of natural gas in gaseous state. Norwegian supplier Statoil has a five-year supply agreement to provide six or seven cargo loads per year. The project will enable imports of 2-3 bcm/year, which is comparable to Lithuania's current total gas demand⁴.

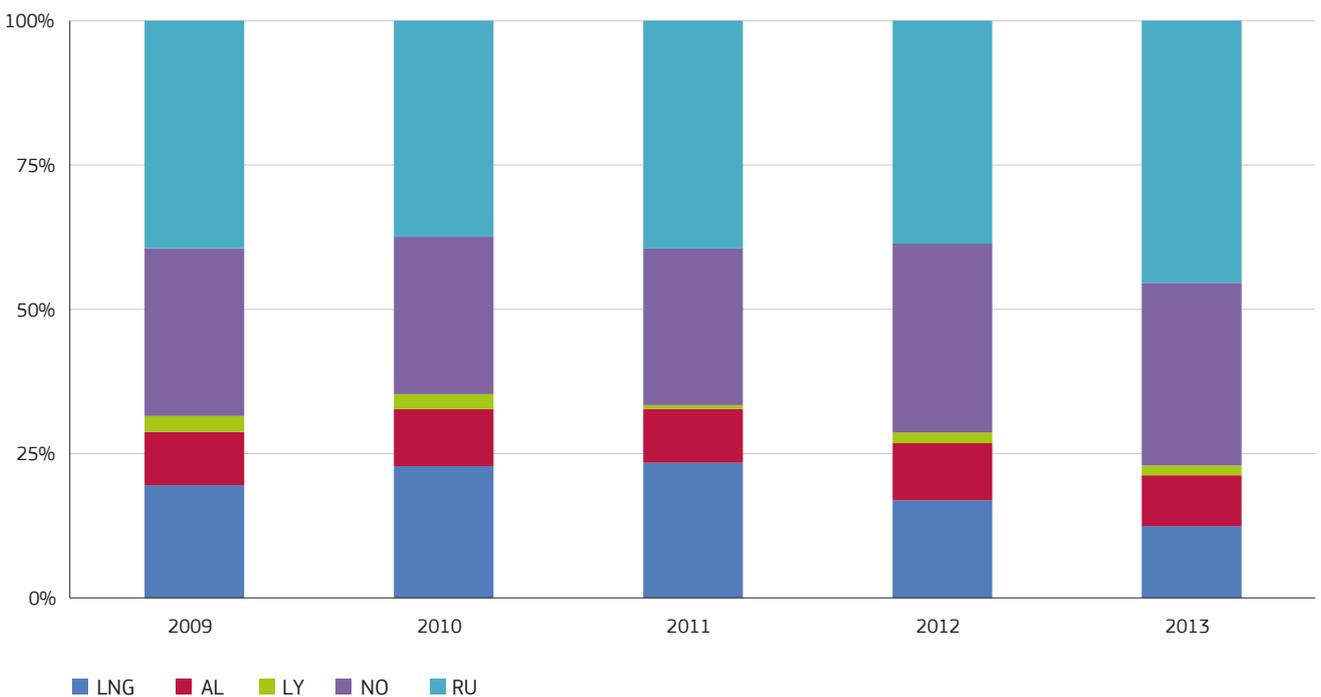
4. ICIS Heren, EGM news briefs, 31 October 2014.

FIGURE 4 - PHYSICAL PIPELINE FLOWS INTO THE EU



Source: Bentek/Platts, Thomson-Reuters Waterborne. Note: Russian flows include landing points Velke Kapusany, Drozdowicze, Wysokoe, Malinow, Greifswald-NEL, Nordstream Greifswald. Norwegian flows include landing points Zeebrugge, Dunkerque, Dornum, Emden, St Fergus and Easington. LNG imports to Spain, UK, France, Italy, Belgium, Portugal, Greece, and the Netherlands. Correction: The 2013 and 2014 flows reported as North African flows in the preceding issue of the report (volume 6 & 7 2014) refer to Algeria only. The numbers have been corrected to include flows from Algeria and Libya.

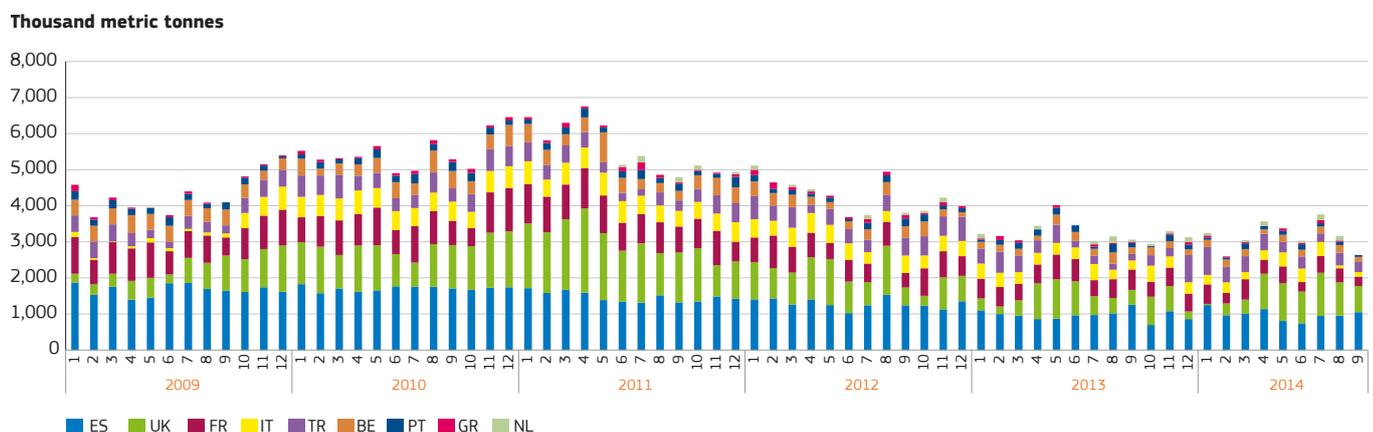
FIGURE 5 - IMPORTS OF NATURAL GAS BY SOURCE, 2009-2013



Source: Based on data from ENTSO-G

- During the first three quarters of 2014, the two largest EU LNG importers – Spain and the UK – experienced a reversal in what was a steep downward trend for LNG imports. The UK saw LNG imports surge by 22%, while after three years of falling volumes, LNG imports to Spain seem to have stabilized (-2% relative to the same period in 2013). The LNG volumes to the Gates terminal in the Netherlands grew by 7%, though from a relatively low base.
- The overall downward trend for LNG imports in Europe may change in the coming months with subdued LNG demand in Asia leading to falling LNG prices there and spot cargos looking to attract new buyers. These factors have prompted a price convergence between LNG and pipeline deliveries of gas for the first time since Fukushima set LNG spot prices on an upward trajectory⁵.
- As discussed later, Asian spot LNG prices have gone down by half this year compared to the previous year, as a result of mild weather and high stock levels, the authorisation of a first Japanese nuclear restart and the expectation of new plant start-ups. This has made Europe an LNG swing market of last resort – a change over the last few years when EU hub prices have been too low to attract more LNG cargos⁶.
- It can be expected that falling oil prices will pass through oil-indexed gas deliveries – both LNG and pipeline – in the coming months, which result in further fall in the price of gas in the EU.

FIGURE 6 - LNG IMPORTS TO EUROPE BY COUNTRY (THOUSAND METRIC TONNES)



Source: Thomson-Reuters, Waterborne

- Rerouting gas deliveries within the internal market and changing the direction of traditionally one-way transport routes are measures to respond to security of supply concerns or to use arbitrage opportunities. Physical bi-directional gas flows on existing cross-border pipelines can be an efficient and cost effective way of increasing entry capacity and potentially accessing new sources. As of 2014, 40% of all 53 cross-border interconnection points in the EU are bidirectional, up from a quarter in 2009.
- This improvement can certainly be regarded as an important success. Regulation 994/2010 on security of gas supply put an initial obligation on TSOs to enable permanent bi-directional capacity on all relevant cross-border points by December 2013. The majority of this development has come from commercial projects incentivized by the market demand. Nevertheless, Regulation 994/2010 has been instrumental in putting in place or speeding up physical reverse flows on some interconnections where voluntary market developments did not bring about the necessary results on time although reverse flows are crucial for security of supply reasons, such as on the Yamal pipeline between Poland and Germany, on the interconnection between Romania and Hungary and between Greece and Bulgaria.

5. Three of the world's biggest LNG buyers – Korea Gas Corp, Tokyo Electric Power and Chubu Electric – have withdrawn from spot LNG markets as ample reserves from the previous mild winter cater for current needs, see Thomson Reuters, «Europe to suck up surplus global LNG supplies as prices tumble», 21 November 2014.

6. ICIS Heren, November 2014.

- Reverse flows from Germany and Austria to the Czech Republic, Poland and Slovakia have been on the rise and are expected to continue to grow given ongoing developments aiming at enabling and enlarging bidirectional capacity. Below we analyse reverse flows at a selection of borders in Central Europe – mostly Germany, Czech republic and Slovakia. This type of analysis will be extended to cover other countries and borders as data availability and consistency improves.
- Countries in Central and Eastern Europe have long relied on a single gas supplier and a single gas supply route: the traditional flow of Russian gas through Belarus or Ukraine into the EU. Nord Stream has brought significant changes to this traditional flow route giving access of Russian gas to the large liquid hubs in North-West Europe, which has also resulted in changes in gas flow patterns in Central and Eastern Europe in recent years. We look at the case of the Czech republic and Slovakia.
- In the past, approximately half of the Russian gas entering the EU from Ukraine via Slovakia to the Czech Republic used to pass through the Lanzhot interconnection point (point 45 on the map below), with the remaining half going from Slovakia to Austria. This has changed with Nord Stream and with the Czech republic importing increasing quantities of Russian gas from Germany via the Gazela pipeline. As a result, at the Slovak-Czech border, there has been a gradual reduction of volumes passing at the Lanzhot interconnection point in the ‘traditional’ direction from Slovakia to the Czech republic and an increase of flows in the opposite direction – from the Czech republic to Slovakia.

MAP 1 - INTERCONNECTION POINTS IN CENTRAL EUROPE



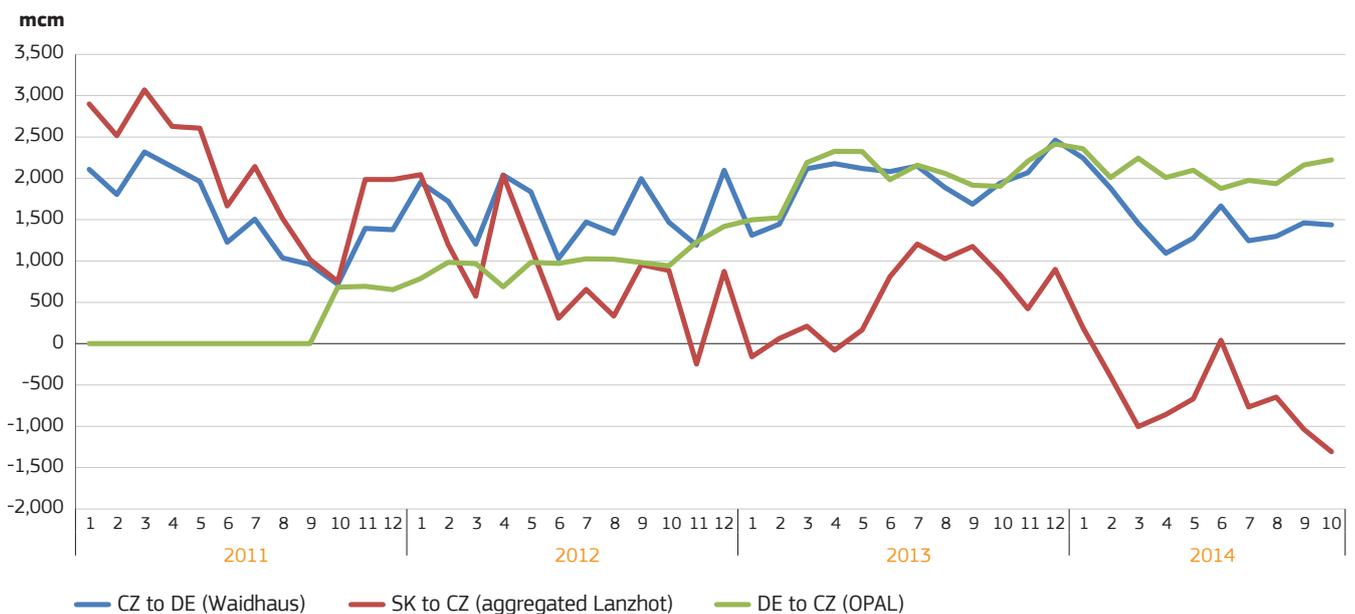
Source: The European natural gas network 2014, ENTSO-G

- Thus, at present gas flows entering Slovakia from the Czech republic are higher than those exiting Slovakia in the direction of the Czech republic (negative aggregated flows on Figure 7 denote this import balance). At the same time, and despite progress in recent years, contractual congestion remains an issue at Slovak interconnection points where Russian gas flows, as demonstrated by the divergence between contracted and utilised capacity. Contracted values are significantly determined by the annual peak utilisation levels anticipated by shippers; at Lanzhot peak capacity utilisation in 2013 was at about half the average firm contracted capacity⁷.

7. ACER. 2014 Market monitoring report.

- At the German-Czech border, a large part of the flows from Germany to the Czech republic are transits from Nord Stream via the OPAL pipeline to the Gazelle pipeline and back into Germany via the Waidhaus interconnection point (point 43 on the map above). Yet, there is an increasing tendency to flow gas from Germany to the Czech republic – Figure 7 shows that over 2014 the difference between the flows entering the Czech republic from Germany and the flows exiting the Czech republic towards Germany is increasing, indicating that an increasing share of gas entering from Germany is actually staying in the Czech republic.
- The reduced need for Russian gas transit through Ukraine and Slovakia onwards to the Czech republic and Germany, along with the gas dispute between Gazprom and Ukraine, have led to a reduction in the volumes flowing from Ukraine to Slovakia by 30% in the first three quarters of 2014 compared to the same period in 2013. At the same time, as in the case of Lanzhot, there remains a very sizeable gap between firm contracted capacity and average used capacity at the Velke Kapusany interconnection point between Ukraine and Slovakia (point 218 in the map above), largely as a result of reduced flows through this route in combination with high levels of booked capacity.
- At the Slovak-Austrian border, nominations in commercial reverse flow in the direction from Austria to Slovakia started at the Baumgarten border point as of mid-August 2014, with average values of around 13.5mcm/day. As a result, net flows in the traditional direction from Slovakia to Austria have decreased. In July, flows from Slovakia to Austria averaged 92 mcm/day but they dropped to 72.5 mcm/day in August and down to around 51 mcm/day in September and October.
- While these changes in gas flow patterns are very important developments for the security of supply in the region, much remains to be done to allow the physical transportation of gas from North-West European and Iberian markets to Central and Eastern Europe. The flexibility of the EU gas grid could be substantially increased if the major trunk pipelines between France and Germany, between the UK and the Netherlands and between Germany and the Czech republic would become bidirectional at Obergailbach (France-Germany), Waidhaus (Czech Republic-Germany) or on the BBL pipeline (Netherlands-UK).

FIGURE 7 - EVOLUTION OF SELECTED GAS FLOW ROUTES IN CENTRAL EUROPE



Source: Bentek

- In addition to changing flows in Central Europe, market actors have also grasped opportunities to sell gas to Ukraine, especially given low demand and full storage sites across the EU and the importance of Ukrainian storage for the transit of Russian gas to Europe in the winter.
- In September 2014 gas started to flow from Slovakia to Ukraine and total deliveries at the Budince nomination point on the Slovak network reached 0.8 bcm. The Slovak TSO Eustream announced an additional 4.5 mcm/day of interruptible capacity on the Vojany pipeline taking gas from Slovakia into Ukraine that has been allocated until 1 January 2015. Before the expansion the Vojany pipeline had a daily interruptible capacity of just over 26 mcm/day. The amount of capacity available on a firm basis will increase to 26mcm/day by March 2015, equating to roughly 10 bcm/year⁸.
- Flows from Hungary to Ukraine reached 0.7 bcm in September, while those from Poland stood at 2.7 bcm. The availability of interruptible transmission from Hungary into Ukraine has made it possible to transit spot-priced gas through Hungary to Ukraine. Deliveries from Hungary to Ukraine stopped on 26 September 2014 and have not resumed since. Hungarian operator FGSZ has cited an increase in nominations to flow gas into Hungary that had made eastbound flows technically impossible; this increase has coincided with increased storage injections. Slovakia and Poland are both continuing to export volumes of gas into Ukraine.

TABLE 2 - GAS FLOWS FROM THE EU TO UKRAINE, SEPTEMBER 2014

	Average daily flows in September 2014	Peak daily flows in September 2014	Total flows in September
PL -> UKR (Hermanowice)	40.7 GWh/d	43.2 GWh/d	1181 GWh
SK -> UKR (Budince)	232.8 GWh/d	280.5 GWh/d	2561 GWh
HU -> UKR (Beregdaroc)	38.3 GWh/d	51.5 GWh/d	957.3 GWh

Source: Data from ENTSOG Transparency Platform

* note: flows have been stable at 43.2 GWh throughout September, but dropped to 14.4 GWh/d on 10 September and to zero on 11 September.

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8. ICIS Heren news, 14 November 2014

FOCUS ON: THE ENERGY SECURITY STRESS TESTS

As a follow up to the European Energy Security Strategy the European Commission carried out the «Energy Security Stress Test» exercise⁹, aiming to gauge resilience of the European gas sector in a possible serious supply disruption from the East during the coming winter. In parallel, the Commission has been working to avert such gas disruption scenarios by continuing bi- and trilateral negotiations with Ukraine and Russia. These came to fruition with the signing of the «winter package» providing the basis for resuming Russian gas supplies to Ukraine on 30 October 2014.

The Stress Tests build on very comprehensive analysis that involved all Member States¹⁰, the Contracting Parties of the Energy Community and candidate Georgia, as well as Switzerland, Norway and Turkey. Work has also been carried out with the non-EU G7 partners and the IEA. The EU gas network operators (ENTSOG) did extensive modelling to better understand the impacts of such interruptions. There was good cooperation with all involved partners in the exercise during which short and long term scenarios for disruption of gas flows from Russia to Europe were modelled.

MAIN RESULTS

The analysis shows that protecting households and minimizing supply cuts during a possible serious gas supply disruption from the East in the coming winter can best be achieved by broad cooperation and proportionate and effective national security of supply measures. There are significant differences in the levels of exposure, with the Baltics and Finland, South-East-European Member States and Energy Community Contracting Parties being the most affected countries.

The analysis carried out by ENTSOG shows that in a 6-month disruption of Russian gas flows 9 bcm of gas would still be missing for the EU and Energy Community without Ukraine¹¹. This means that despite the significant additional LNG imports, a modest increase in imports via pipeline and domestic production and withdrawals from storage at maximum, a deficit of 9 bcm would still remain in compensating the 65 bcm of supplies from Russia that would be disrupted in a 6-month scenario. This deficit would have to be covered by other measures such as fuel switching, market-driven demand reductions and, ultimately, by gas curtailments to different categories of consumers. Although this shortfall figure is not very high, barely 3% of the estimated consumption over the period, it must be noted that the impact will be concentrated in a number of countries such as Finland, Estonia, Bulgaria, Bosnia and Herzegovina, Serbia and the former the former Yugoslav Republic of Macedonia, which can however be substantially alleviated by burden-sharing¹².

The Commission has assessed the reports submitted by Member States and the measures proposed by them to cope with a disruption. Storages are amongst the key tools to balance supply and demand. The level in EU storages during early October was very high¹³. Commercial strategies or simply a cold winter could lead to a quick reduction of this level, which would limit the contribution of storages to meet gas shortfalls in case of a disruption later in the winter season.

Other measures proposed include fuel switching, for which some Member States have alternative fuel stock obligations in place (from 72 hours in Estonia to 5 months in Finland) and demand side actions. The latter are mostly focussed on mandatory curtailments rather than market-based incentive-driven measures. These curtailments start with the more flexible demand, usually industrial consumers, and end, following Regulation 994/2010 on the security of gas supplies, with households and other protected customers such as hospitals, essential social services and district heating facilities when they provide heat to households and cannot switch fuel.

ENTSOG has also simulated a scenario in which Member States and Energy Community countries apply solidarity to the extent that shortfalls in gas are spread equally, a so-called cooperative scenario. This approach would mean the impacts in the most vulnerable Member States are significantly dampened, in particular Bulgaria, Estonia, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia and Serbia. At the same time, however, Greece and Latvia will also experience some non-negligible deficits. The maps below illustrate the difference in impacts between the cooperative and the non-cooperative scenario.

9. The Stress Tests consist of the Communication and several regional and related Staff working Documents as well as a Commission Recommendation (http://ec.europa.eu/energy/stress_tests_en.htm)

10. Except Cyprus and Malta

11. Out of an estimated consumption of 291 bcm

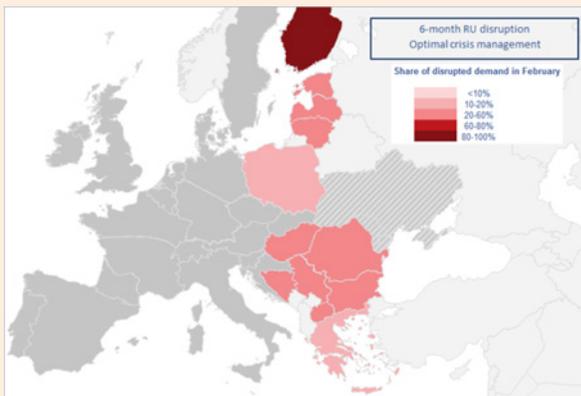
12. As there is no infrastructure connecting Finland to other Member States, there is no way to move gas from other Member States to it.

13. Around 90%

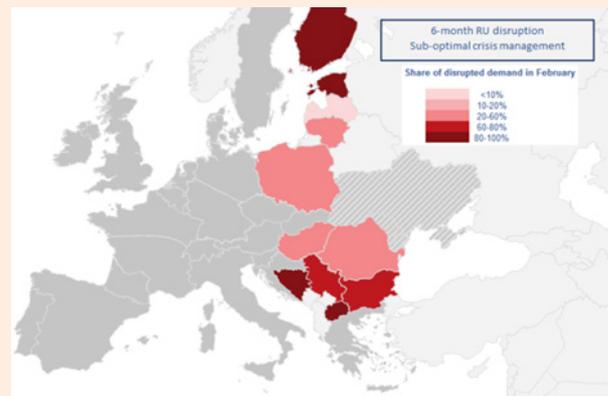
The maps below show that an enhanced cooperative approach can significantly improve the ability of Europe to face a severe disruption. This cooperation must however go beyond a mere consistency-check of national measures and be extended to include the identification of synergies and agreements on solidarity measures. Such an approach would result in efficiency gains, both in economic terms and also in terms of ensuring a very short term security of gas supply. A cooperative approach cannot be a one-way-street: in this context, it is crucial that most vulnerable countries design and sequence well in advance the measures they would resort to in preparing for and responding an emergency.

MAPS OF LIKELY SUPPLY INTERRUPTIONS – BEFORE FURTHER NATIONAL MEASURES – IN FEBRUARY AT THE END OF THE 6-MONTH RUSSIAN GAS SUPPLY DISRUPTION SCENARIO IN COOPERATIVE AND NON-COOPERATIVE SCENARIOS UNDER AVERAGE WINTER CONDITIONS

COOPERATIVE SCENARIO



NON-COOPERATIVE SCENARIO



Source: ENTSOG

The main **recommendations** from the stress tests are:

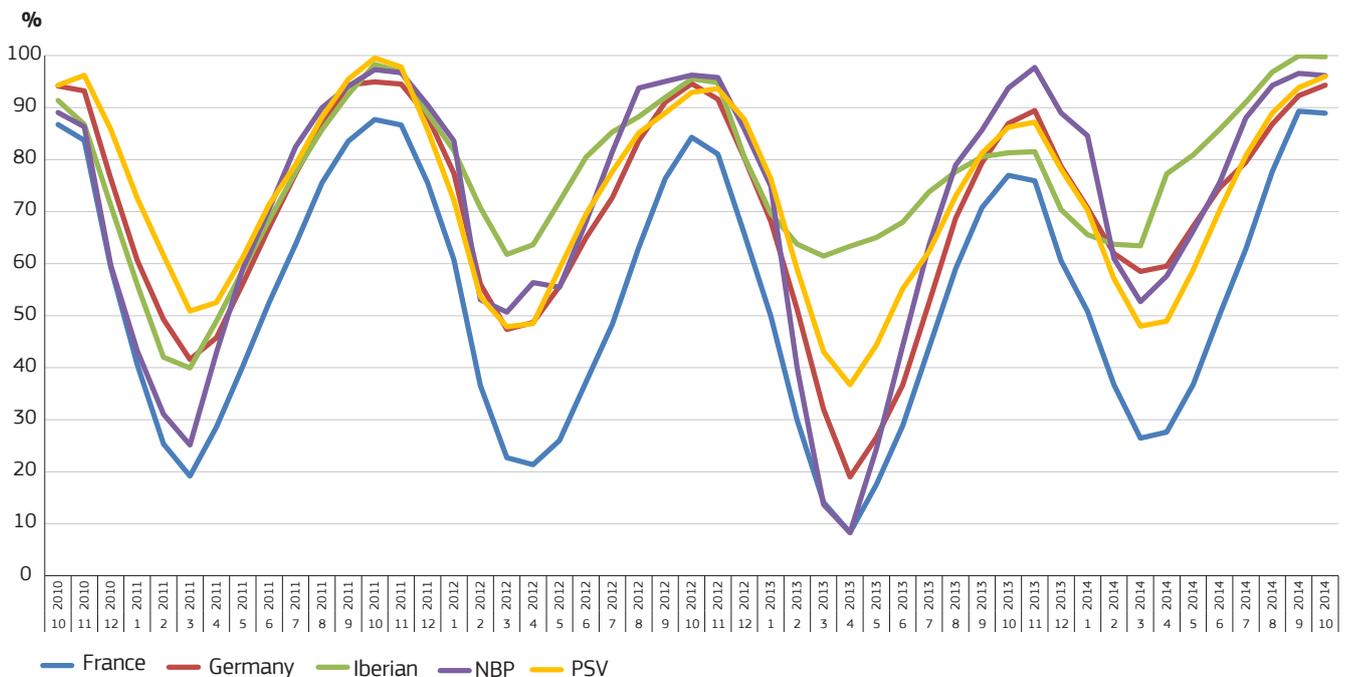
- when addressing security of supply concerns countries should follow a **market-based approach as long as possible**;
- countries should **increase coordination and cooperation ahead of and during disruptions** including through the maximisation of interconnector capacity and removal of restrictions to cross-border energy trade;
- most exposed countries should quickly **complete crucial energy infrastructure projects**;
- **short-term behavioural changes and investments** should be enacted to boost energy efficiency and lower demand;
- **the EU should continue its cooperation with key energy partners**, including LNG producers and consumers;

The Commission has also signalled in the Communication its intention to work closely together with Member States as regards the implementation of the recommendations as well as in parallel reviewing existing mechanisms to safeguard security of energy supply and propose their reinforcement, where necessary.

2. Gas Storage

- After a mild winter and despite the uncertainty surrounding the dispute between the Ukrainian government and Gazprom, storage sites in Europe are full at levels above those seen in the last two years. By the end of September 2014 there was about 11.35 bcm more gas in storage than for the same period in 2013. Storage sites in the countries with the highest capacities held significantly more in reserve compared to last year, with German sites up by 10 percentage points and Italian ones up 14 percentage points¹⁴.
- In many countries, temperatures during the third quarter of 2014 were above average, meaning heating demand did not pick up and storage injection continued also over October 2014.

FIGURE 8 - GAS STORAGE LEVELS AS % OF MAXIMUM GAS STORAGE CAPACITY

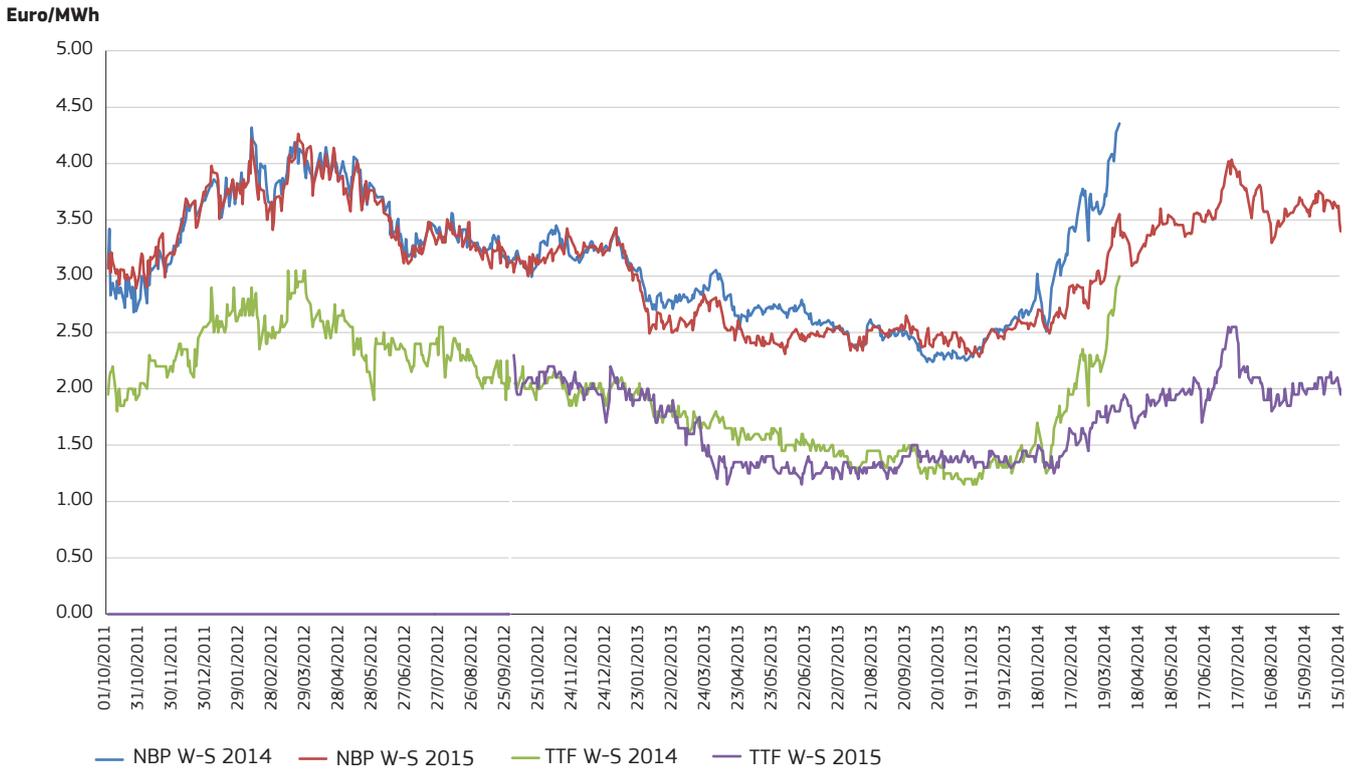


Source: Gas Storage Europe, Thomson-Reuters

- Data on the seasonal price spread between winter and summer contracts on the major hubs shows the financial incentive to inject gas into storage. Figure 9 shows that the seasonal price spread on contracts at the NBP and TTF, which fell over the course of 2013, went up in the first two quarter of 2014 along with falling summer 2014 gas prices and then went down over the third quarter as spot prices recovered.

14. British sites has higher overall volume in storage, but were less full than 2013 in % of capacity due to the increase in overall capacity. Data from Gas Storage Europe and ICIS Heren European Gas Markets, 15 October 2014. Hungary began injections later in the summer, but significant volumes were injected over Q3 2014.

FIGURE 9 - WINTER-SUMMER SPREADS IN THE DUTCH AND BRITISH GAS HUBS



Source: Platts

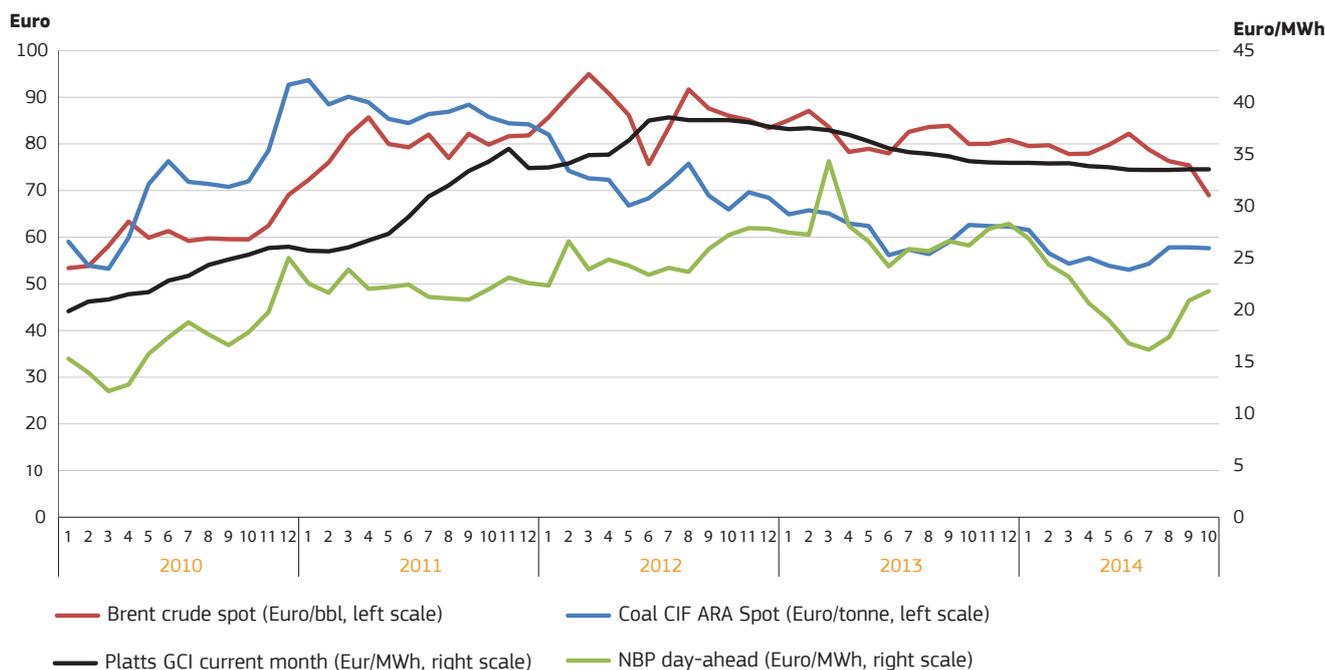
5. Wholesale Gas prices

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

- In the third quarter of 2014 in the EU, crude oil prices declined considerably while gas prices increased from historically low levels registered in the second quarter of 2014, even if they reached levels well below these of recent years. During the third quarter of 2014, prices for crude oil and for natural gas at the NBP were at levels last observed at the end of 2010, while coal was priced at levels seen at the beginning of 2010. Since 2010 natural gas at the NBP hub has shown the greatest price volatility among the benchmarks for the three commodities.
- While Europe as a whole has continuously been moving away from oil-indexation – accounting for 43% of total gas consumption in 2013 – the move towards gas-on-gas competition has not been universal across Europe, with oil-indexation still dominating Central Europe, the Mediterranean region and South-Eastern Europe¹⁵. Oil indexation – whereby contracted gas prices are linked to oil or oil product prices (e.g. gas oil and fuel oil) usually with a several month lag – means that the recent decline in crude oil prices will pass through to oil-indexed contracts gradually, starting from early 2015. Already in the third quarter of 2014 there was a 4% decline in the Platt's North West Europe Gas Contract Indicator (GCI) in comparison to the same period in 2014. GCI is a theoretical index showing what a gas price linked 100% to oil would be.
- The NBP gas spot price went as low as 17 Euro/MWh in July 2014, almost 10 Euro/MWh below its level at the start of the year. Between July and September, it went up to around 20 Euro/MWh. In total, day-ahead prices on NBP and all major European gas hubs in the third quarter of 2014 were approximately 30% below their value in the same period in 2013. Section 5.3.2 looks at the factors behind this.
- Finally, coal prices went up by 7% between the second and the third quarter of 2014. Over the last three years coal prices have experienced a steady decline as a result of oversupply that has led to mine closures in large exporting countries. In addition, China – the world's largest producer and importer of coal – has recently introduced tariffs on imported coal, reducing demand further. European coal prices by the third quarter of 2014 were at the same level as they were in the beginning of 2010.

15. See discussion on the evolution of wholesale price formation mechanism in the joint volume 6 and volume 7 edition of this report available at http://ec.europa.eu/energy/observatory/gas/doc/201410_q3-4_quarterly_report_gas_market.pdf

FIGURE 10 - SPOT PRICES OF OIL, COAL AND GAS IN THE EU



Sources: Platts

5.2 International gas markets

- The physical properties of gas make it more expensive to transport than other energy commodities: historically gas was produced and consumed locally or regionally with limited international trade. This explains why inter-regional wholesale price differentials remain significant, in contrast with the relatively narrow price range of energy commodities such as crude oil that are traded globally on liquid and transparent markets. Over time, wholesale gas price differentials could decrease depending on the development of liquid markets, growth in the LNG spot markets and expansion of infrastructure.
- As of 2013, interregional trade represented 17% of total demand for gas globally, or approximately 580 bcm out of 3500 bcm global demand. LNG accounted for 57% of interregional trade in 2013, down by one percentage point from the year before¹⁶. The EU as a whole is the largest importer of pipeline gas in the world and the second largest importer of LNG. It accounts for approximately half of the 710 bcm of pipeline imports globally¹⁷ and 13% of LNG imports¹⁸.
- Figure 11 shows an international comparison of wholesale gas prices. The average price at the Henry Hub¹⁹ is used for natural gas futures contracts traded on the New York Mercantile Exchange (NYMEX) and swaps traded on the Intercontinental Exchange.
- Another pricing location for gas in the US is the city gates: the locations at which distribution companies receive gas from a pipeline. At this delivery point, the natural gas is transferred from a transmission pipeline to the local gas utility which then delivers it through the distribution system to individual customer meters. The difference between Henry Hub prices and city gate prices is that the city gate prices include the price of the commodity plus the transportation cost of moving the gas on the interstate (transmission) pipelines from the wellhead to the city gates (distribution) network.

16. IEA. 2014 Mid-term gas market review

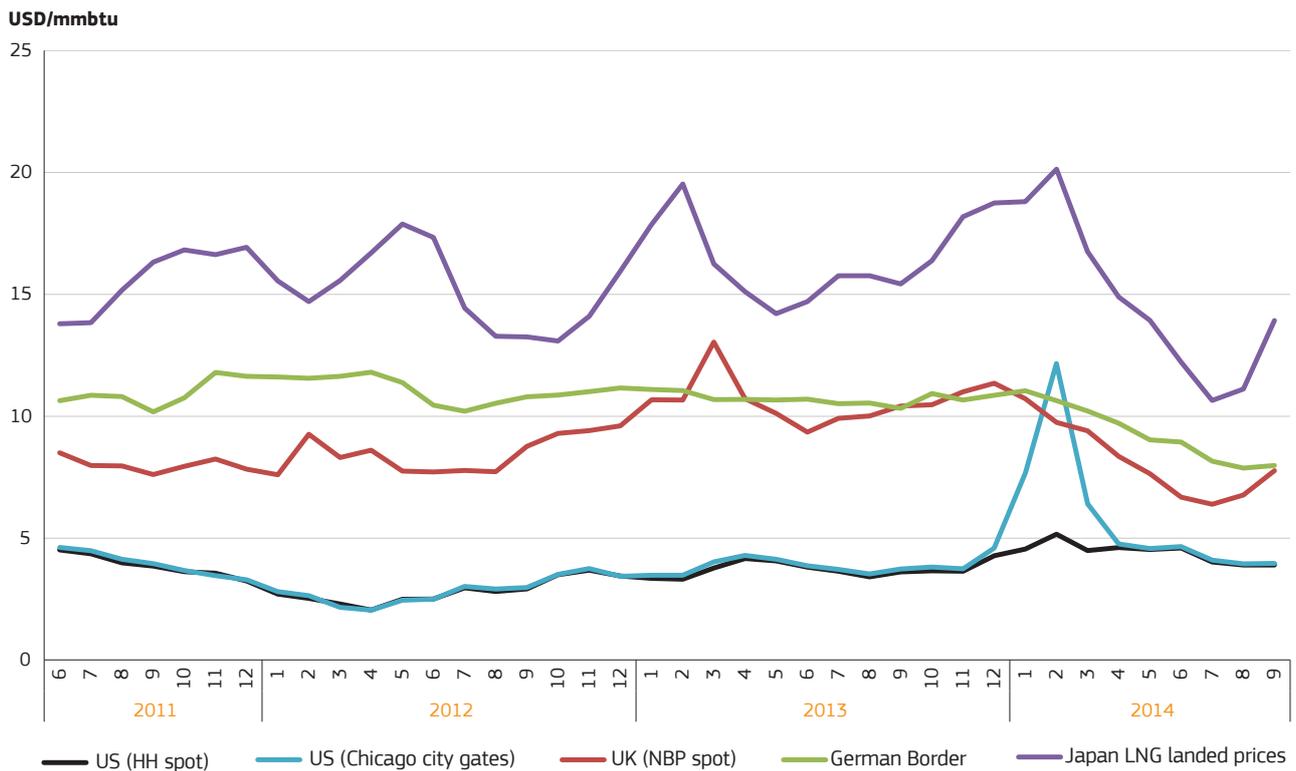
17. BP Statistical Review of World Energy 2014, data for 2013.

18. Thomson-Reuters, first seven months of 2014.

19. The benchmark US Henry Hub - a physical hub in South Louisiana that interconnects with 13 major pipeline systems and can transport more than 50 mcm/day - is regarded the best proxy available for the average market price of natural gas in the United States.

- Chicago City Gate is one such pricing location and is commonly used for pricing natural gas in the Midwest. As can be seen in Figure 11, Chicago city gate prices follow closely Henry hub prices, but experienced extreme volatility in early 2014. This spike was caused by severe cold weather in January and February, sending natural gas prices significantly upwards on those days. With much of the high priced gas destined for power generation, electricity prices also went up. During this price spike, prices at Chicago diverged substantially from prices at the Henry Hub and even surpassed wholesale prices in Europe.
- Over the first eight months of 2014, the NBP and German border prices were close to twice the levels of Henry Hub prices and one and a half times the levels of Chicago city gate prices. This is a marked improvement over the situation in 2013, when on average NBP and German border prices stood at 3 times the levels of Henry Hub and Chicago gate and over 2012 when this ratio was on average at 3.6²⁰.

FIGURE 11 - INTERNATIONAL COMPARISON OF WHOLESALE GAS PRICES



Sources: Platts, Thomson Reuters, BAFA

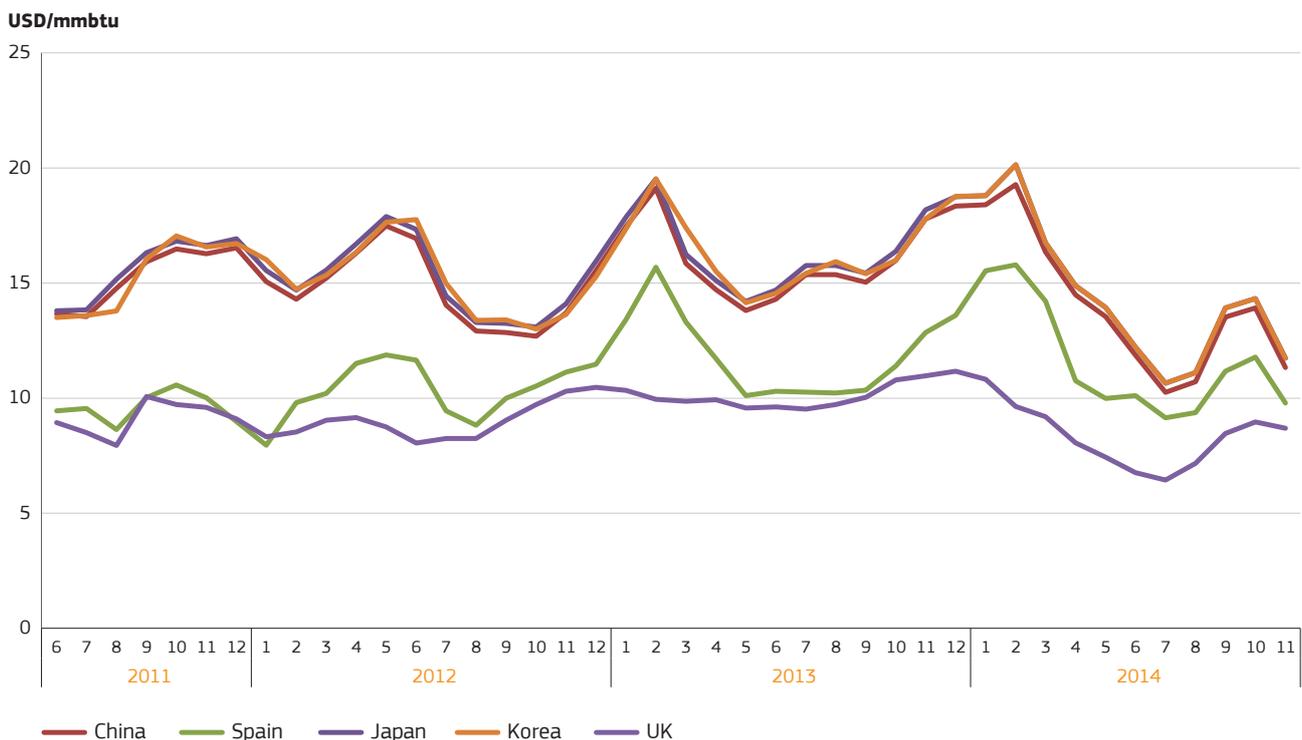
- While in recent years Europe has experienced an oversupply of gas and spot market prices have been below oil-indexed prices (see Figure 17 and Figure 18 later), the balance depends on factors such as the dynamics of gas supply and regional as well as global demand, interregional trade and global oil prices. Gas-on-gas competition in itself is not a guarantee for low prices and – as seen in the case of the price spike in the Chicago area in early 2014 – introduces an element of volatility.
- Furthermore, with Brent oil prices below 70 Euro/bbl (see Figure 10), some oil-indexed contracts in Europe could be selling gas at a cheaper price than the spot level in the coming months. Developments in spot LNG prices and volumes reaching Europe will be a factor weighing on European spot prices.

20. Simple average of the ratio of German border prices to Henry Hub and NBP to Henry Hub on monthly basis for the years in question.

5.2.1 LNG markets

- 2014 has been an eventful year for LNG markets globally. Over the summer of 2014, LNG spot prices fell to levels unseen since Fukushima: around 10 USD/mmbtu for Asian spot prices and below 8 USD/mmbtu in the UK and Spain.
- Spot prices recovered in the third quarter of 2014, especially in September. Yet, at the end of the third quarter of 2014, LNG spot prices for the UK and Belgium were around 20% below their values in the same period of 2013. The same was true for LNG spot prices in Asia. In the year to November, spot LNG prices were on average 10-15% below the values seen in the same period of 2013.

FIGURE 12 – LNG PRICES IN THE EU AND ASIA



Note: Landed prices for LNG.

Source: Thomson-Reuters Waterborne

- The fall in LNG prices has contributed to narrowing the gap between the prices of pipeline and LNG imports to the EU. Figure 13 shows the evolution of spot LNG prices paid in the UK and Spain vis-à-vis the evolution of estimated border prices for pipeline imports from Norway and Algeria, which account for the major part of pipeline imports to the UK and Spain, respectively. The evolution of the day-ahead prices on the NBP hub is also presented. As can be seen, over the course of 2013 and until early 2014, Algerian pipeline imports to Spain were consistently cheaper than spot LNG. Likewise, the price premium of LNG deliveries to the UK against Norwegian pipeline imports to the UK widened over the second half of 2012 and during 2013. This changed over the second and the third quarter of 2014, when a price convergence between LNG and pipeline deliveries to the UK and Spain could be observed²¹.
- While the large majority of LNG in the world is traded under oil-indexed contracts, 27% of LNG global deliveries in 2013 were spot and short-term – an increase by more than 10 percentage points over 3 years²². In the EU as a whole, only 2.5% of LNG imports in 2013 was received on spot and short-term basis, but big differences exist among European LNG importers. Spain and Portugal received the largest volume of spot and short-term volumes – respectively almost 3 million tonnes and 0.8 million tonnes in 2013. 40% of total quantities received by Portugal were spot and short-term²³.

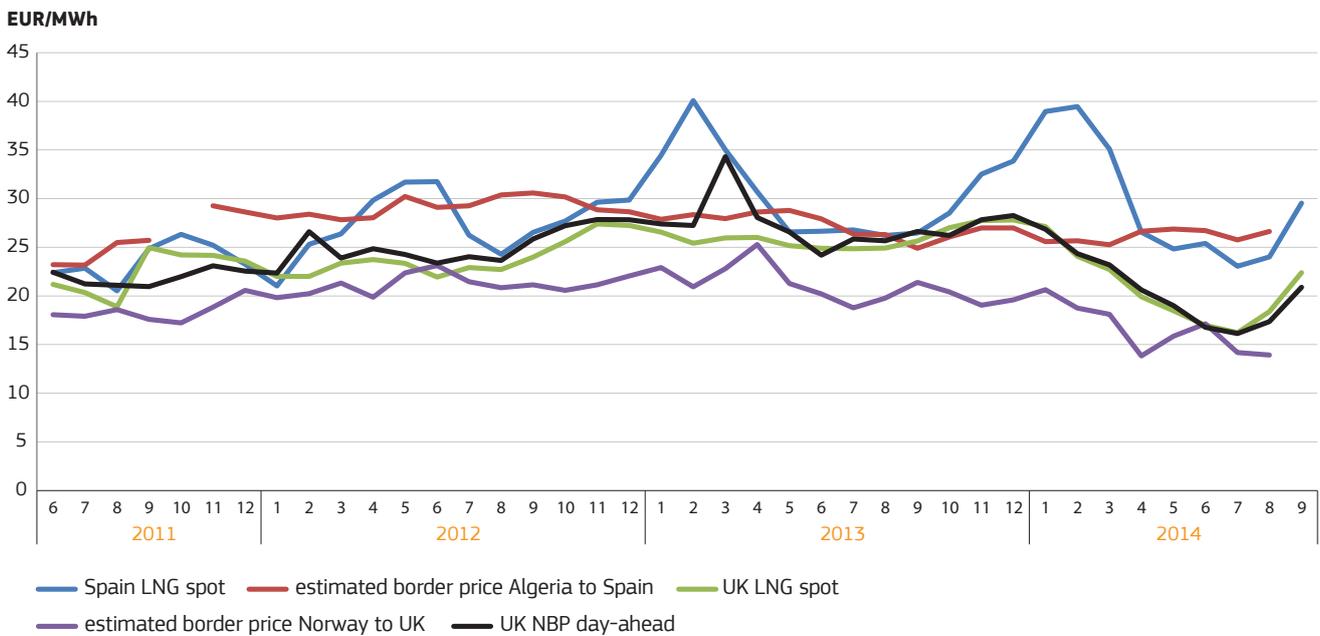
21. Note that a large share of LNG is oil-indexed; Figure 13 shows developments in landed prices.

22. Based on data by GIIGNL 2014. The LNG industry in 2013.

23. Based on data by GIIGNL on quantities received in 2013 and spot and short-term volumes.

- The recent subdued global demand for LNG has been driven by mild temperatures and modest economic performance in Asia, combined with well supplied Asian markets, high storage levels expectation of nuclear plant start-ups in Japan. Because the large majority of LNG trading is oil-indexed, typically with several month time lags, the current drop in crude oil prices can be expected to put downward pressure on oil-indexed LNG deliveries in early 2015. This may put a cap on LNG spot price recovery in the coming months even if demand for LNG picks up in the winter, with buyers using contract flexibility rather than buying spot cargos²⁴.

FIGURE 13 – 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

5.3 European gas markets

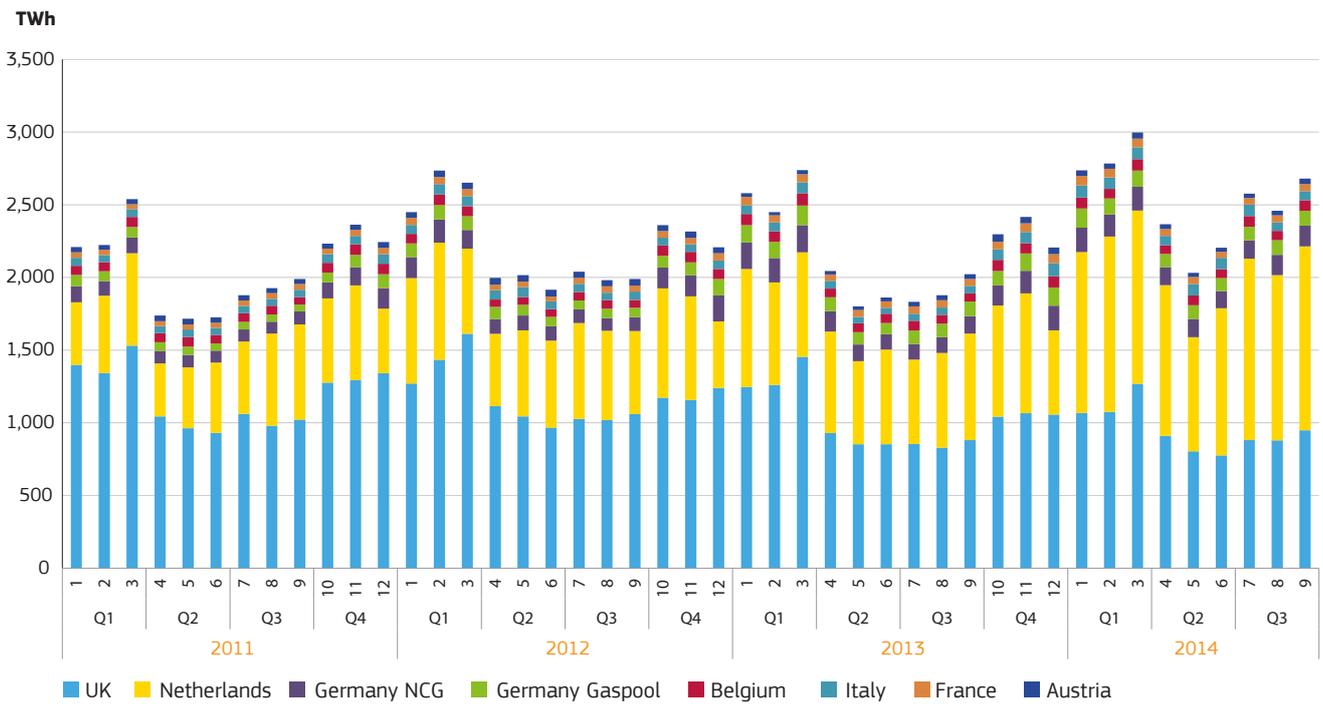
- Wholesale gas market participant such as producers, traders, consumers buy and sell gas for immediate or future physical delivery, settling transactions for the day or for some future date bilaterally or at an exchange. A hub serves as a market-place where gas wholesale trading is facilitated. A hub may be a pipeline junction with a significant amount of gas transactions (such as CEGH in Austria and Zeebrugge in Belgium) or a virtual hub that is a standard set of delivery points (such as NBP, TTF, Gaspool, NCG, PSV, the PEG and TIGF). As in other markets, increasing liquidity means increase in price transparency and decrease in transaction costs. Liquidity and market transparency in turn ensure reliability of hubs for portfolio management and optimisation increases and attract higher volumes.

24. See Timera Energy, A shift in LNG market balance.

5.3.1 Wholesale markets in the EU

- Gas hub liquidity in the EU has grown over the recent years, evolving around UK NBP and Dutch TTF virtual trading points. Spot liquidity has increased in all European hubs, while forward liquidity remains focussed on the NBP and TTF
- Total volumes of spot gas traded on European hubs in the twelve months to September 2014 increased by 14% on yearly basis to almost 30,000 TWh, with the biggest increase on the Dutch TTF (+51% to 12 150 TWh in the year to September 2014). TTF has surpassed the NBP in terms of spot volumes as traders have shifted volumes away from the NBP to mainland hubs and the Intercontinental Exchange (ICE). Traded volumes remained stable at the NCG in Germany (1,725 TWh in the year to September 2014) and increased by 6% on Gaspool (1,268 TWh).

FIGURE 14 – TRADED VOLUMES ON EUROPEAN GAS HUBS



The chart covers the following trading hubs: UK: NBP (National Balancing Point); Belgium: Zeebrugge beach; Netherlands: TTF (Title Transfer Facility); France: PEG (Point d'Echange Gaz); Italy: PSV (Punto di Scambio Virtuale); Germany: GASPOOL; Austria: CEGH (Central European Gas Hub)

Sources: National Grid (UK), GTS (Netherlands), Huberator (Belgium), Gaspool (Germany), NCG (Germany), GTTGaz (France), Snamrete (Italy), CEGH (Austria)

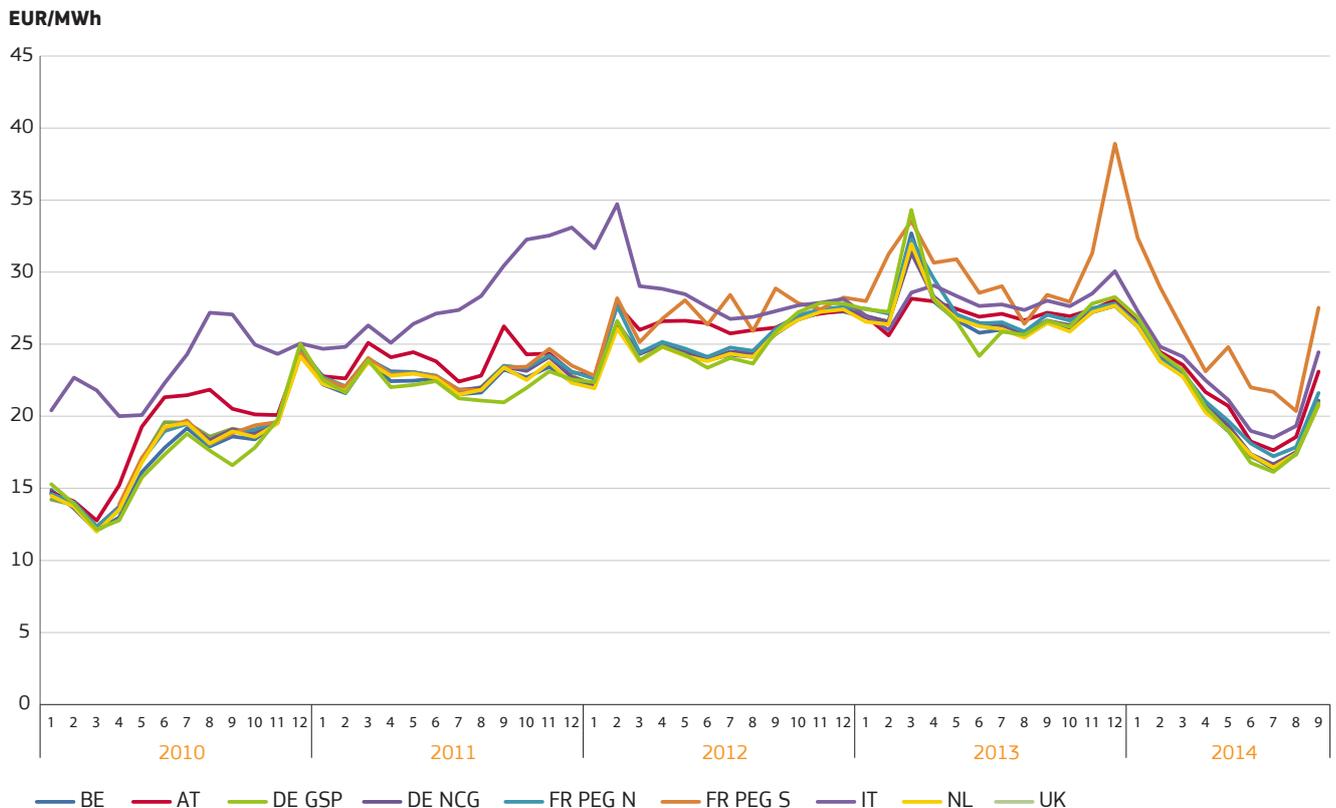
Note: CEGH volumes after January 2013 are not directly comparable with the values before that date due to the entry into force of entry/exit system. Previously TTF volumes were reported based on GTS nominations only; the figures have been now revised to also include OTC and exchange traded volumes.

5.3.2 Wholesale price developments in the EU

- The graph below presents the evolution of European hub day-ahead natural gas prices in the period from January 2009 until the end of September 2014, showing the increasing convergence in the day-ahead price on major European gas hubs.

- The difference between the highest and the lowest priced hub in North-West Europe has been on average at just around 2 Euro/MWh over 2013 and 2014²⁵. This price convergence is a result of market integration whereby improved transport capacity access has allowed price signals from larger and more liquid hubs in Northwest Europe to pass through to hubs in Central and Southern Europe.
- Apart from the stable convergence, day-ahead gas prices on European hubs started going up at the end of the third quarter relative to the historically low levels over the summer months. In September day-ahead prices were in the range of 20-23 Euro/MWh for most hubs.
- This is an increase of 10-15% for most hubs in comparison to the very low levels of the second quarter of 2014 as the market moved towards the new gas year starting October 1. The reasons for the very low price levels over summer 2014 have been discussed in the previous issue of this report and include weaker than usual demand for storage injection after a mild winter and spring across Europe, along with warm weather and weak LNG demand in Asia that has driven Asian prices down denting into the profitability of re-loads from Europe (see section 5.2.1. above on LNG).
- The continued risk that the conflict in Ukraine could lead to interruptions of Russian flows through Ukraine this winter was a factor in the increase of prices up in September²⁶. While day-ahead gas prices indeed increased at the end of the third quarter, they are still around 15-20% below levels observed in the third quarter of each of the preceding two years.
- After seven rounds of gas negotiations, a 4.6 billion USD winter package brokered by the European Commission was agreed by Russia and Ukraine on 30 October to secure gas for Ukraine and ultimately also for Europe²⁷. Russian deliveries to Ukraine were resumed on 8 December, following six months of disruption.
- Weak Asian prices have reduced arbitrage opportunities and are currently bringing a higher flow of LNG to Europe and into European gas hubs. This will allow the increasingly global LNG trade to influence European gas prices, a development that has not fully materialised so far due to the continuous drop in LNG flow to Europe.

FIGURE 15 – WHOLESALE DAY-AHEAD GAS PRICES ON GAS HUBS IN THE EU



Source: Platts

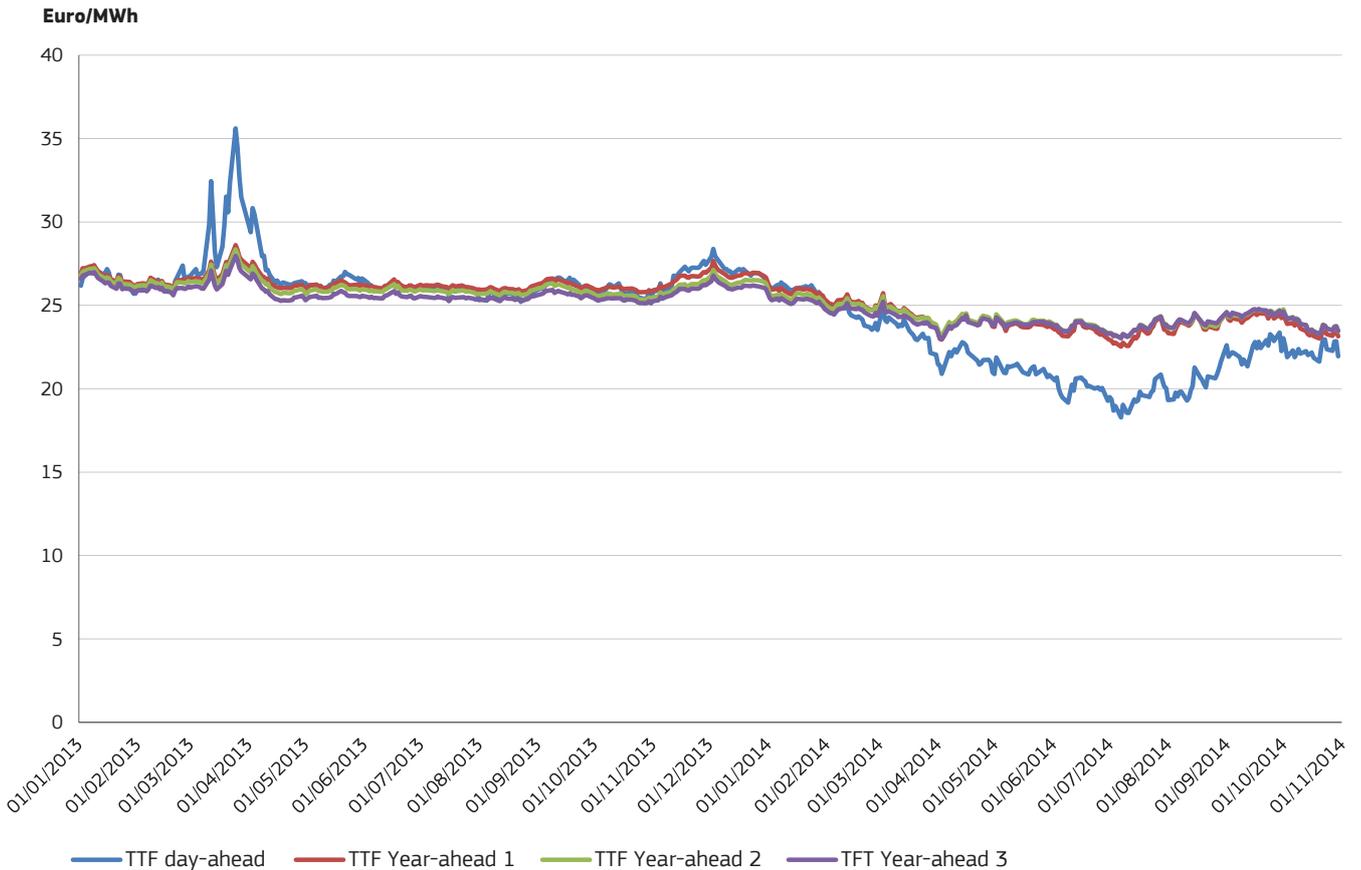
25. The French PEG Sud is not included as it remains an exception to this convergence. PEG Nord is well connected to Northwest Europe and prices have converged as a result. PEG Sud remains disconnected from North-West European markets due to a combination of factors such as constraints on the North-South link within France, flows through the French-Spanish and LNG import flows (the south of France relies more heavily on LNG than the north).

26. Platts, European Power Prices up 35% as Bear Run Broke in September, 9 October 2014.

27. http://europa.eu/rapid/press-release_IP-14-1238_en.htm

- Figure 16 looks at the development of forward prices one, two and three years ahead in comparison to the developments of day-ahead prices on the Dutch TTF. As can be seen, during the first half of 2014 contracts exhibited a pronounced contango, whereby closer to maturity contracts have a lower price than the contract which is longer to maturity on the forward curve. As spot prices began to fall at the start of the year, this was also observed forward on the curve. As spot prices continued to fall, the forward prices did not follow.
- This disconnect between spot and forward contracts signals to a substantial short-term physical oversupply of gas into North-West European hubs vis-à-vis remaining linkage to oil-indexed contract prices beyond the end of the year. It almost disappeared by the end of the third quarter of 2014²⁸.

FIGURE 16 – ONE YEAR FORWARD GAS PRICES ON THE DUTCH GAS HUB



Source: Platts

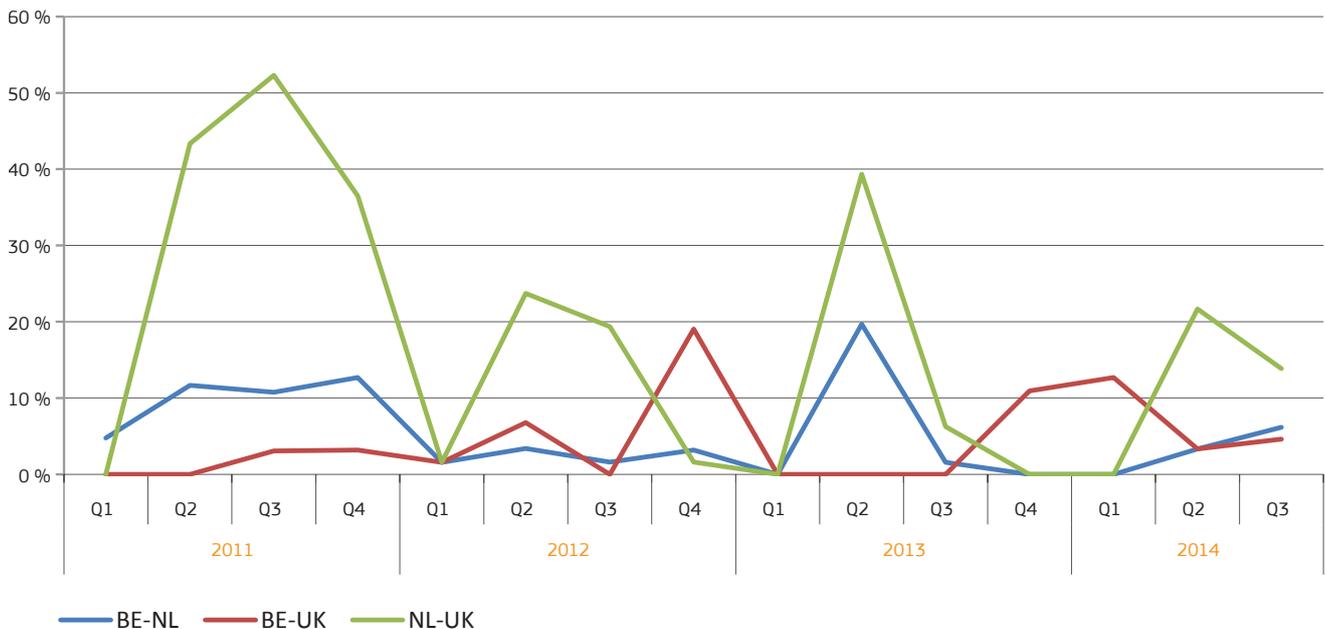
- The next chart traces the occurrence of adverse nominations – the so-called flow against price differential events (FAPD²⁹) – in North Western Europe (NWE) during the last 3 years. Day-ahead nominations of flows from a high price area to a low price area are not frequent for adjacent areas with active hub trading. There is also a clear decreasing tendency. In the first 3 quarters of 2011 there were 79 FAPD events in the NWE region (out of a total of 564 traded days for the three hubs). This number dropped to 41 in 2013 and to 33 in 2013. These developments illustrate the fact that in unconstrained systems market participants are shipping gas rationally, based on prevailing supply and demand conditions and the related pricing signals.

28. See Timera Energy. *Spot versus forward price dynamics: UK gas case study*, 17 November 2014.

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

- The offering of a backhaul virtual capacity on the BBL pipeline connecting the Netherlands and the UK gas systems has clearly decreased the occurrence of adverse nominations. The FAPD levels on that link have however remained higher than for interconnections with physical reverse flows. In the case of Belgium and the UK in Q3 2014, only 5% of the trading days were FAPD; during the same period on the Dutch – UK interconnector, roughly 16% of the trading days were under FAPD.
- Detailed case-by-case charts informing about the occurrence, relative share, welfare loss, break-down by price range and capacity utilization rates of FAPD events is available in a separate document³⁰.

FIGURE 17 – FAPD EVENTS IN THE NORTH-WESTERN EUROPEAN REGION



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

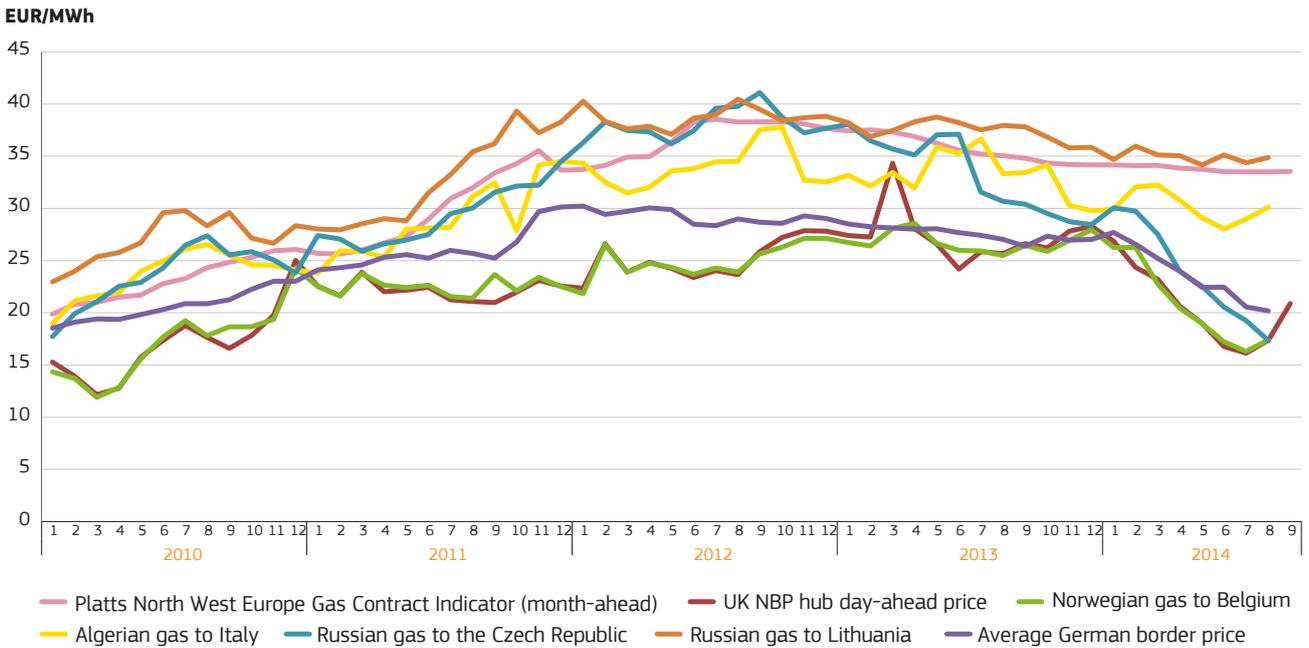
5.3.3 Comparing the prices of different contracts for gas in the EU

- A comparison of a selection of estimated border prices of gas deliveries from the main exporters to the EU – Norway, Russia, Algeria – shows a great deal of variation in price levels and, to a smaller extent, in price dynamics.
- Over the year to August 2014, prices of most of the contracts that we report on Figure 18 went down, with the most pronounced drop in Russian deliveries to the Czech republic (-32% on yearly basis) and Norwegian deliveries to Belgium (-23%), the latter largely mirroring the decline in spot prices (-25%). The German border price also went down (-15% in the year to August 2014), as did Russian deliveries to Lithuania (-8) and Algerian to Spain (-6%).
- Even though the price dynamics of these contracts is comparable, there remains significant price level divergence with Algerian deliveries to Spain at around 5.6 Euro/MWh and Russian deliveries to Lithuania at above 14 Euro/MWh above the levels of day-ahead prices on NBP over the first three quarters of 2014. Spot prices on the NBP are traditionally the lowest in Europe.
- On the other hand, price estimates of Norwegian deliveries to Belgium follow very closely the NBP day-ahead prices (difference of 0.16 Euro/MWh over 2014), while the estimated price gap between Russian deliveries to the Czech republic and NBP has gone down by half (from almost 6 Euro/MWh to around 3.3 Euro/MWh in the first nine months of 2014).
- There is also an increasing convergence between the German border price and spot prices on the NBP with German border prices at 3 Euro/MWh above the NBP in the year to September 2014 even against very low price levels over summer 2014 on gas hubs in general and on NBP in particular.

30. Available at http://ec.europa.eu/energy/observatory/gas/gas_en.htm

- In contrast, there was an increase in the divergence between the theoretical pure oil-indexed price for gas on the one hand (approximately 33.7 Euro/MWh in the first three quarters of 2014) and the price estimates for some higher priced deliveries on the other hand. Nowhere is this more visible than in the case of Russian deliveries to the Czech Republic that are now significantly below the theoretical pure oil-indexed contract.
- As already pointed out, the recent fall in crude oil prices will inevitably drag down long-term oil-indexed deliveries in the coming months. Hub and long-term contract prices may get much closer and the premium might switch.

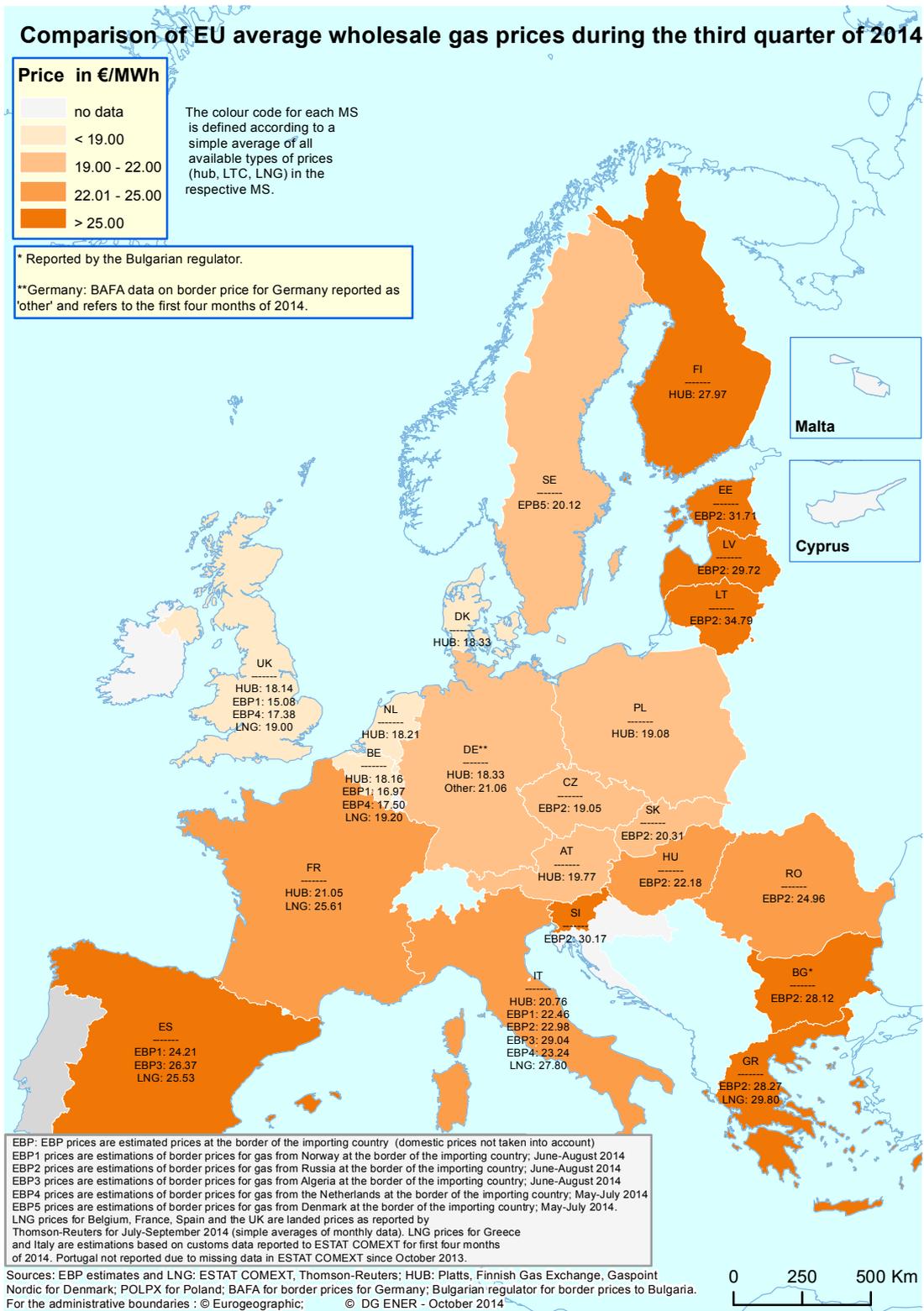
FIGURE 18 – COMPARISON OF EU WHOLESALE GAS PRICE ESTIMATIONS



Source: Eurostat COMEXT and European Commission estimations, BAFA, Platts, Bulgarian regulator (prices until end of 2013, European Commission estimates for Bulgaria for the first four months of 2014)

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 is deemed to be representative of long-term contracts.

FIGURE 19 – COMPARISON OF EU WHOLESALE GAS PRICES IN THE THIRD QUARTER OF 2014

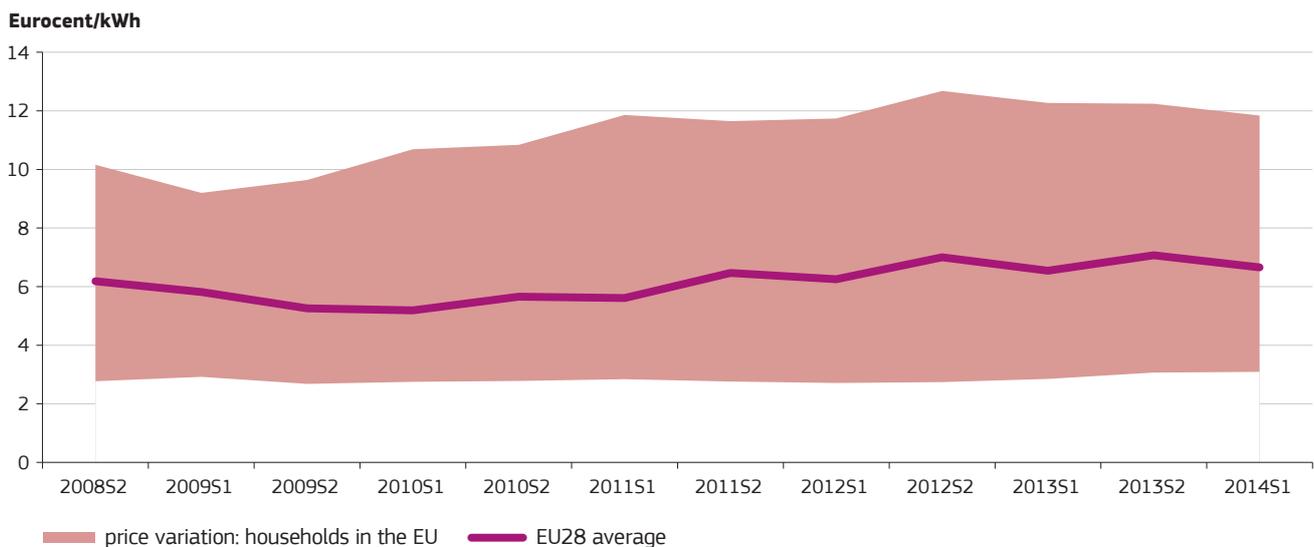


Note: Border prices are estimations of prices of piped gas imports paid at the border of the importing country, based on information collected by customs agencies, and is deemed to be representative of long-term gas contracts.

6. Retail gas prices in the EU

- Across the EU as a whole, retail gas prices for industry decreased by 4% between 2013³¹ and the first half of 2014 with decrease registered in all Member States. Eurostat data shows a double-digit decrease in retail prices (VAT and other recoverable taxes excluded) for industrial consumers in Croatia (-20%), Hungary (-19%), Denmark (-18%), Sweden (-2%) as well as Slovenia, Lithuania and Finland (-10% each).
- Likewise, across the EU as a whole, retail gas prices for households decreased by 2% between 2013 and the first half of 2014. The trends across countries are less uniform than in the case of industry ranging from a few percent increase to a few percent decrease.
- There are significant differences in retail gas prices across the EU, as illustrated in Figure 20 and Figure 21 and in the maps at the end of this chapter³². These persist even if one excludes taxation and, in the case of households, corrects for purchasing power parities.
- Between 2008 and 2014 the gap between the highest and the lowest price for an average household consumer in the EU stayed at around 8-9 Eurocent/kWh (including taxes and levies). The gap peaked at 9.9 Eurocent/kWh in the second half of 2012 and went down by 1 Eurocent/kWh in the first half of 2014, when households in Sweden paid 11.9 Eurocent/kWh and households in Romania paid 3.1 Eurocents/kWh.
- Looking at price ranges in purchasing power parities does not influence significantly the size of the gap between the highest and the lowest price (7.1 Eurocent/kWh in the first half of 2014), but does have an impact on the 'ranking' of the countries with, for example, Portugal having the highest retail gas prices in purchasing power (11.5 Eurocents/kWh in PPS) and Luxembourg having the lowest (4.3 Eurocent/kWh).

FIGURE 20 - DIVERGENCE OF HOUSEHOLD GAS PRICES IN THE EU, 2008-2014



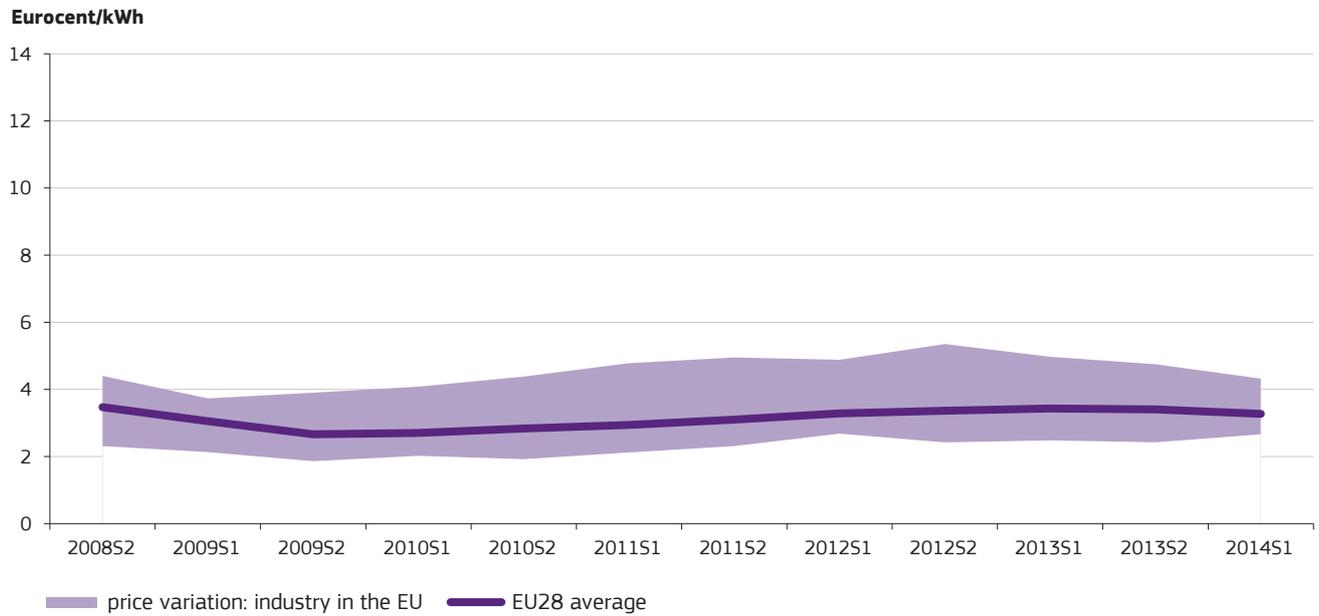
Note: all taxes included. Source: Eurostat, consumption band D2: 5.56 MWh < Consumption < 55.6 MWh. S1 and S2 refer to first and second half of each respective year. Source of data: Eurostat.

31. Arithmetic average of the two half-yearly data points

32. In Map 1 we provide a new estimate of household prices for gas correcting the last available half-yearly data from Eurostat (first half of 2014) with the gas price component of the harmonised index of consumer prices (HICP) to present data for August 2014.

- When it comes to industry, consumers in Romania paid 2.7 Eurocents/kWh in the first half of 2014 (VAT and other recoverable taxes excluded), which is around twice as little as the unit price for industrial consumers in Greece (4.5 Eurocent/kWh).
- While the ratio of lowest-to-highest gas retail prices in the EU remains significant – around 4 in the case of households and around 2 in the case of industry³³– the gap between the highest and the lowest prices paid across the EU has decreased slightly over the course of 2013 and in the first half of 2014, after peaking in 2012.

FIGURE 21 - DIVERGENCE IN INDUSTRIAL GAS PRICES IN THE EU, 2008-2014

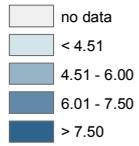


Note: Excluding VAT and other recoverable taxes. Consumption band I4 : 100 000 GJ < Consumption < 1 000 000 GJ. S1 and S2 refer to first and second half of each respective year. Source of data: Eurostat.

33. All taxes included in the case of households, excluding VAT and other recoverable taxes and levies in the case of industry. The ratio highest-to-lowest retail price in the EU changes across consumption bands – in the second half of 2013 it was between 3.7 and 5.4 in the case of households and between 1.89 and 2.85 in the case of industry (excluding the largest consumption band I6, where very few Member States report).

MAP 2 - RETAIL GAS PRICE ESTIMATES FOR HOUSEHOLDS IN THE EU - AUGUST 2014

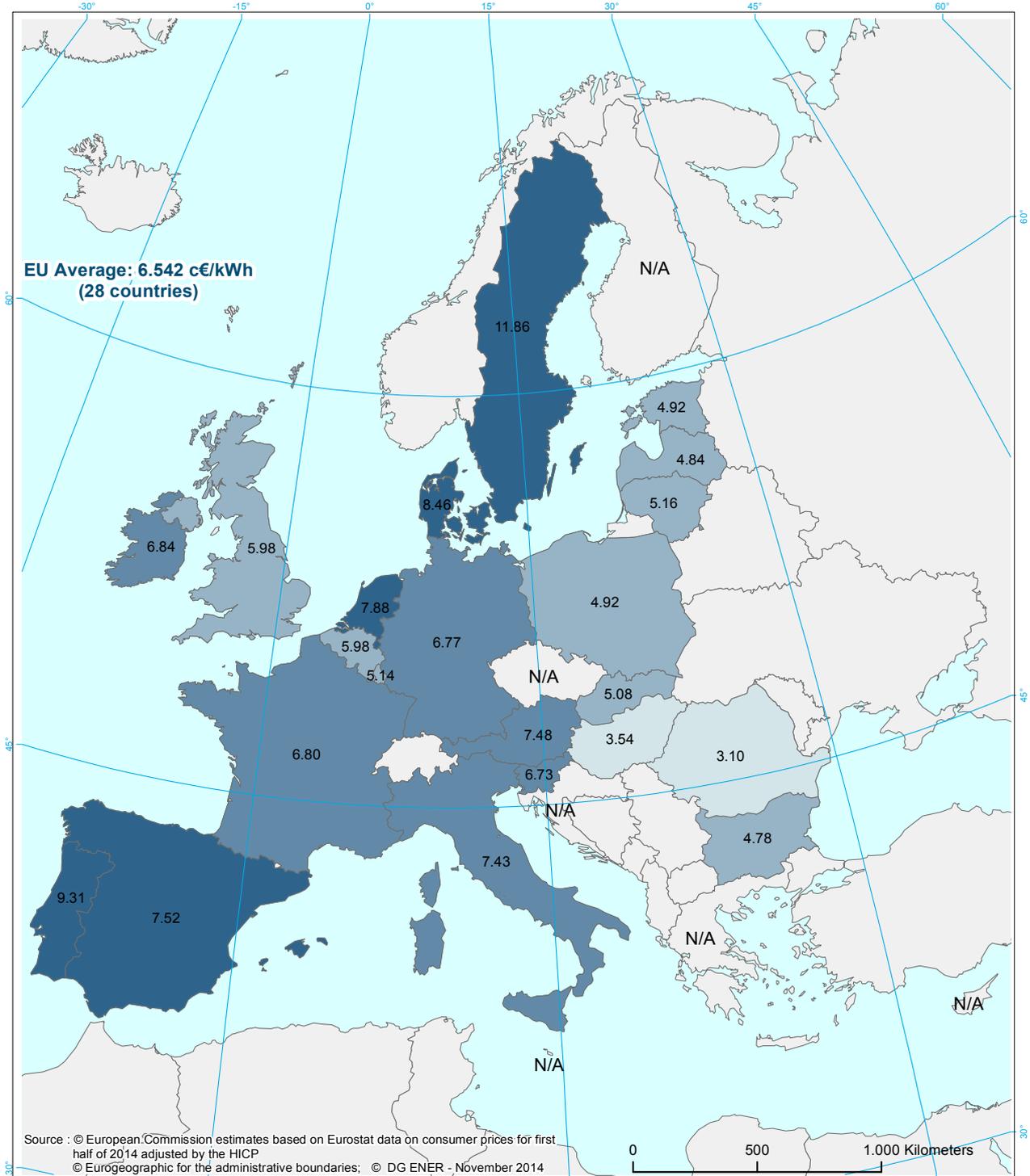
Prices in Eurocents/kWh



**GAS PRICES FOR DOMESTIC CONSUMERS
Estimates for August 2014**

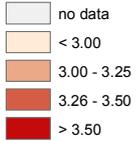
Including all taxes and levies

Band D2: 5.56 MWh < Consumption < 55.6 MWh



MAP 3 - RETAIL GAS PRICES IN EU MEMBER STATES FOR INDUSTRIAL CONSUMERS

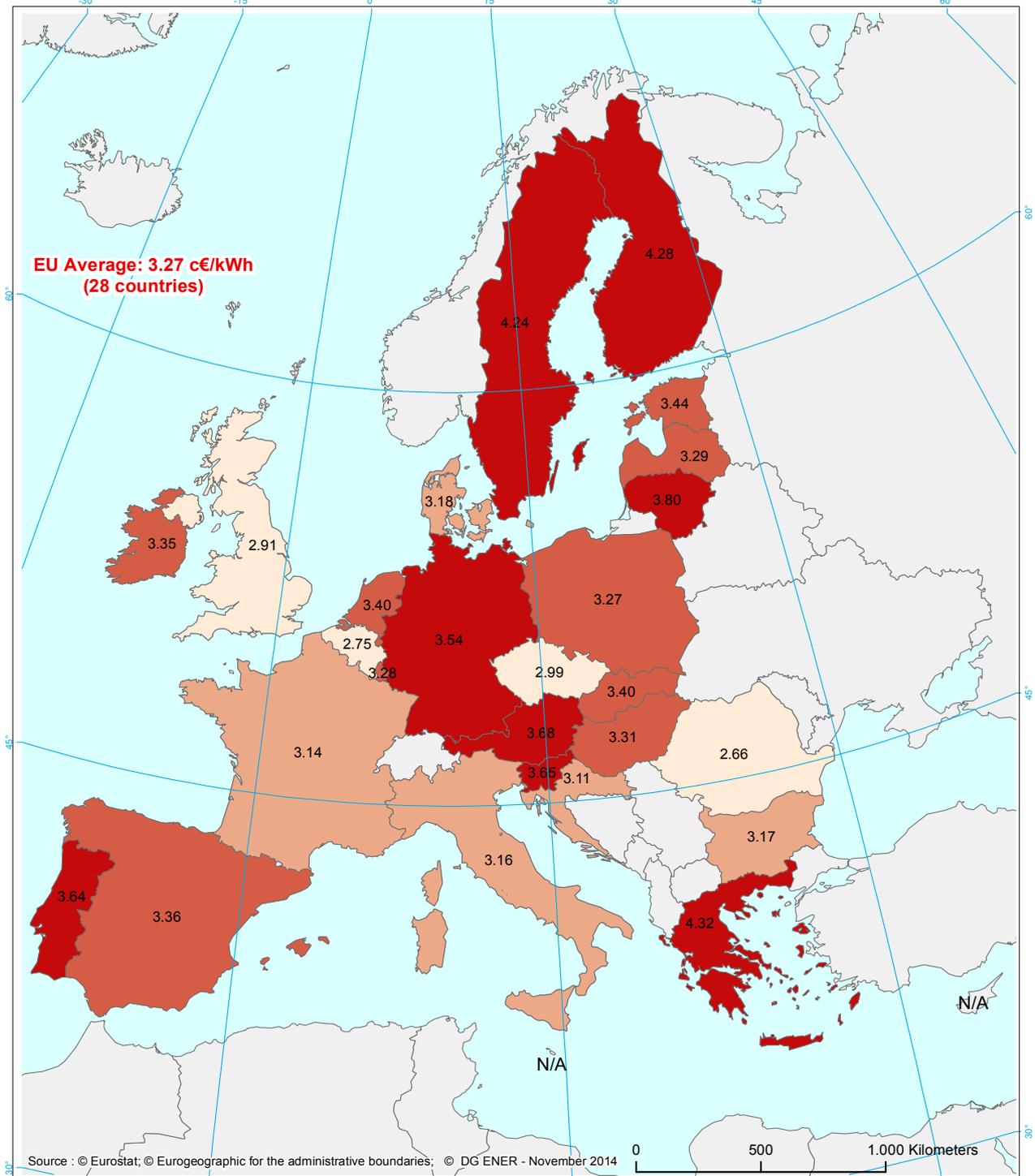
Prices in Eurocents/kWh



**GAS PRICES FOR INDUSTRIAL CONSUMERS
First Half of 2014**

Excluding VAT (value added tax) and other recoverable taxes

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



7. 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 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.

