



Brussels, 30.11.2016  
SWD(2016) 420 final

PART 2/13

**COMMISSION STAFF WORKING DOCUMENT**  
*Accompanying the document*

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE  
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE  
COMMITTEE OF THE REGIONS**

**Energy prices and costs in Europe**

{ COM(2016) 769 final }

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## 2 Gas prices

### 2.1 Wholesale gas prices

In this chapter, the evolution of wholesale gas prices between 2008 and mid-2016 and the main price drivers are analysed.

#### Main findings

- European wholesale gas prices plummeted in the wake of the 2008-2009 financial crises but recovered by 2011-2013, helped by the economic recovery and the Fukushima accident which increased global LNG demand. Since 2014, prices are on a declining trajectory as low oil prices and increasing global LNG supplies, coupled with weak demand are putting pressure on European gas prices.
- While there seems to be a long-term correlation between gas, oil and coal prices, in shorter periods price trends can diverge.
- Regional price differences persist in Europe, mainly driven by the level of competition although falling oil prices contributed to a convergence of prices in 2015-2016. In general, markets with higher levels of competition show a lower price level than markets with only one supply source.
- Northwest Europe is characterised by developed and liquid wholesale gas markets which are supplied by a diverse range of supply sources, resulting in relatively low prices compared to other regions. Prices in more peripheral markets (Austria, Southern France, Italy) are generally higher, mainly because of infrastructure bottlenecks and lower liquidity.
- In a large part of the EU, gas hubs are non-existent or are at an initial stage of development. In such cases, the analysis of estimated border prices allows us to see whether import prices in a given Member State are based on hub prices or are oil-indexed (or, possibly, a combination of the two).
- Oil-indexed prices have a diminishing role in the European market but continue to be the dominant pricing mechanism in certain regions, in particular in Southeast Europe and the Baltics. On the other hand, hub prices gained significant ground in Central Europe: wholesale prices in this region are more and more aligned with Northwest European hub prices, rather than with oil-indexed prices.
- Econometric analysis confirmed that the influence of crude oil price on wholesale gas prices is divergent across different regions: the impact is moderate in Northwest Europe while oil prices remained an important price driver in the Mediterranean, the Baltics and Southeast Europe. In case of Central Europe, crude oil prices had a markedly weaker impact in 2013-2015 than in 2009-2012. Other factors like the weather (heating degree days) and the US Henry Hub price were also found to have an impact on wholesale gas prices.

### 2.1.1 Price development

There have been significant fluctuations in European wholesale gas prices since 2008.

European gas prices peaked in mid-2008, with the spot (day-ahead) price at the NBP, the UK gas hub, reaching 30 €/MWh in September. Practically all commodities (including oil and coal) reached record levels in 2008, driven by the growing demand of the Asian emerging economies.

In the wake of the 2008-2009 financial crisis, the NBP price plummeted below 10 €/MWh in the third quarter of 2009. This was followed by years of increase, with the price gradually recovering to pre-crisis levels: in 2013, the annual average price exceeded 27 €/MWh. In addition to the economic recovery, the price rise was supported by the Fukushima accident in 2011: in the wake of the accident, Japan closed its nuclear power stations and replaced them with gas-fired power plants. The resulting increase in Japanese LNG imports raised Asian LNG prices and the decreasing availability of LNG cargoes also put pressure on European markets.

Since 2014, the price is again on a declining trajectory: in August 2016, the average price was just above 12 €/MWh, the lowest level since the end of 2009. Lowering oil prices and increasing global LNG supplies, coupled with weak demand are putting pressure on European gas prices in recent years.

As it can be seen on the below graph, over the long term, one can observe a clear correlation between the prices of the main fossil fuels, oil, gas and coal. The correlation between oil and gas prices is to a significant extent explained by the prevalence of the so-called oil-indexation used in many gas contracts (see below). In shorter periods, such a correlation does not necessarily exist, especially in the most recent years. For example, in the second part of 2014, when oil prices started their recent fall, NBP was moving in the opposite direction.

Figure 1 - Comparison of gas, oil and coal prices in Europe



Source: Platts

## 2.1.2 Regional differences

While NBP is often considered as the main gas price benchmark in Europe, it is not representative for the whole EU. In fact, there can be significant price differences between different Member States, depending on – inter alia – the type of contracts used (spot or long-term), the way of pricing (hub-based or oil-indexed) and, crucially, the level of competition. In general, markets with higher levels of competition show a lower price level than markets with only one supply source.

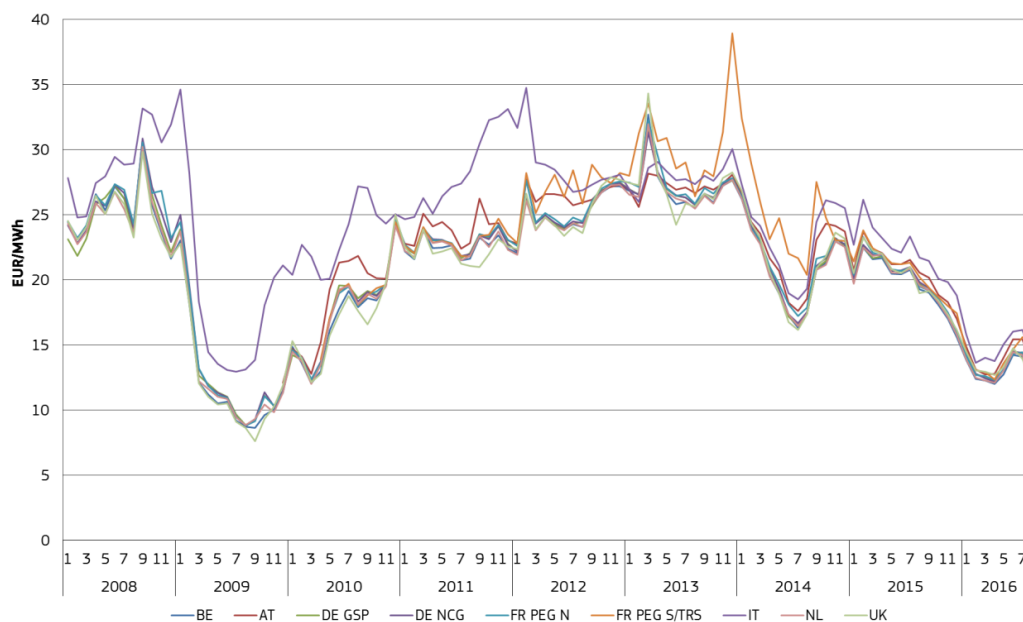
The three factors mentioned above are closely interlinked: long-term contracts are the most prevalent in Member States with limited supply sources (i.e. no or limited competition) and often apply oil-indexed prices.

In 2008, hub prices existed in the UK, the Netherlands, Belgium, Germany, the Netherlands and Italy. Subsequently, Austria and France also established gas hubs.

Northwest Europe is characterised by developed and liquid wholesale gas markets which are supplied by a diverse range of supply sources (indigenous gas in the Netherlands and the UK, supplies from storage facilities, pipeline imports from Norway and Russia and LNG imports from around the world). These well-connected and integrated markets show a significant convergence of prices, with price differences between the main hubs (NBP in the UK, TTF in the Netherlands, Zeebrugge in Belgium, Gaspool and NCG in Germany, PEG Nord in France) rarely increasing above 1 €/MWh. In terms of liquidity, the Dutch and the UK hub have a dominant role in the region.

More peripheral markets like Austria, Southern France and Italy also have established hubs but prices are generally higher than in Northwest Europe, mainly because of infrastructure bottlenecks and lower liquidity. Nevertheless, the price premia of these markets show a decreasing trend. More recently, Denmark, Finland and Poland have also established national hubs and corresponding marker prices (but are not depicted in the below graph).

Figure 2 - Gas hub prices in Europe



Source: Platts

The considerable impact of infrastructure constraints is well represented by the price difference between Northern and Southern France. Northern France has access to the diverse supply sources available in Northwest Europe while Southern France is largely relying on the LNG terminals on its Mediterranean coast. Constraints on the North-South link within France mean that prices can be quite divergent. For example, the premium of PEG Sud over PEG Nord averaged 4 Euro/MWh in January-October 2014; in December 2013 the difference exceeded 10 €/MWh. However, the price difference has almost disappeared during the 2014/2015 winter as a result of falling LNG prices and the high volume of incoming LNG to the southern terminals at Fos. In addition to the increasing LNG flows, high storage levels and relatively weak demand also helped to reduce congestion of the North-South link.

Figure 3 - Comparison of gas hub prices in Northern and Southern France



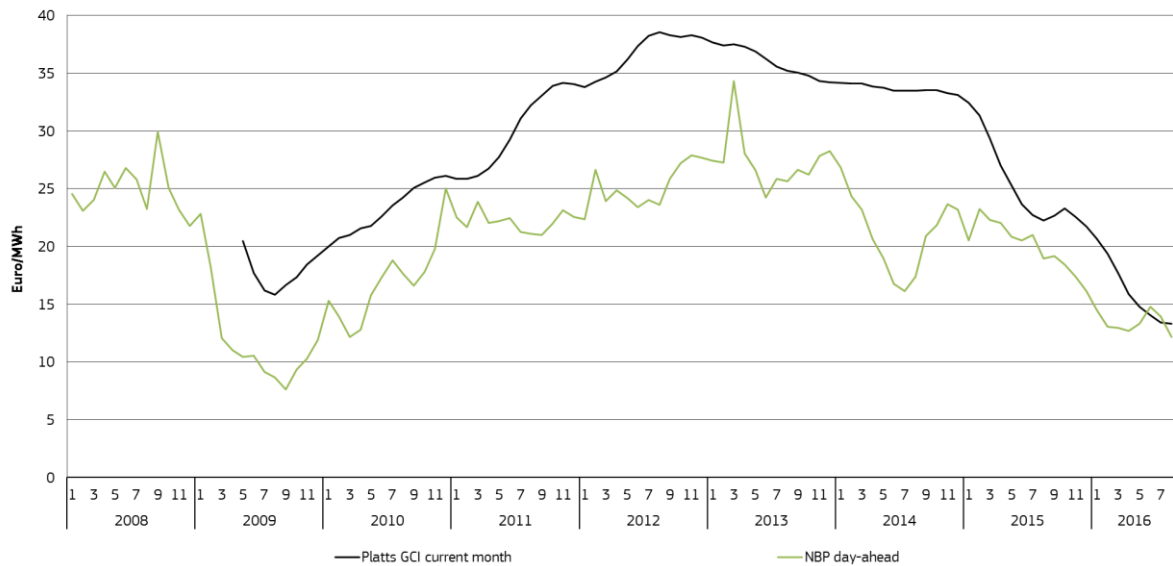
Source: Platts

In other parts of Europe we cannot really speak of gas hubs, accordingly there are no public hub prices. The exact price formulas of long-term contracts are not known either. As a proxy for wholesale prices, for these countries we are using the estimated border prices, i.e. the average price of imports. These countries generally rely on a low number of suppliers, often a single one. The import price is often based on the price of oil products (usually gas oil and/or fuel oil), applying a 6-9 month time lag.

Platt’s North West Europe Gas Contract Indicator (GCI), reported since May 2009 and depicted in the below graph, is a theoretical index showing what a gas price linked 100% to oil would be. Of course not all contracts use the same price formula but this indicator gives a good idea about the development of oil-indexed prices. Such "oil-indexed" prices show less volatility than hub prices but their absolute level is considerably higher. Falling oil prices contributed to a convergence of hub-based and oil-indexed prices in 2015-2016: the premium of oil-indexed prices has significantly decreased and practically disappeared in the summer of 2016.

Figure 4 - Comparison of the UK gas hub (NBP) price with a theoretical oil-indexed price





Source: Platts

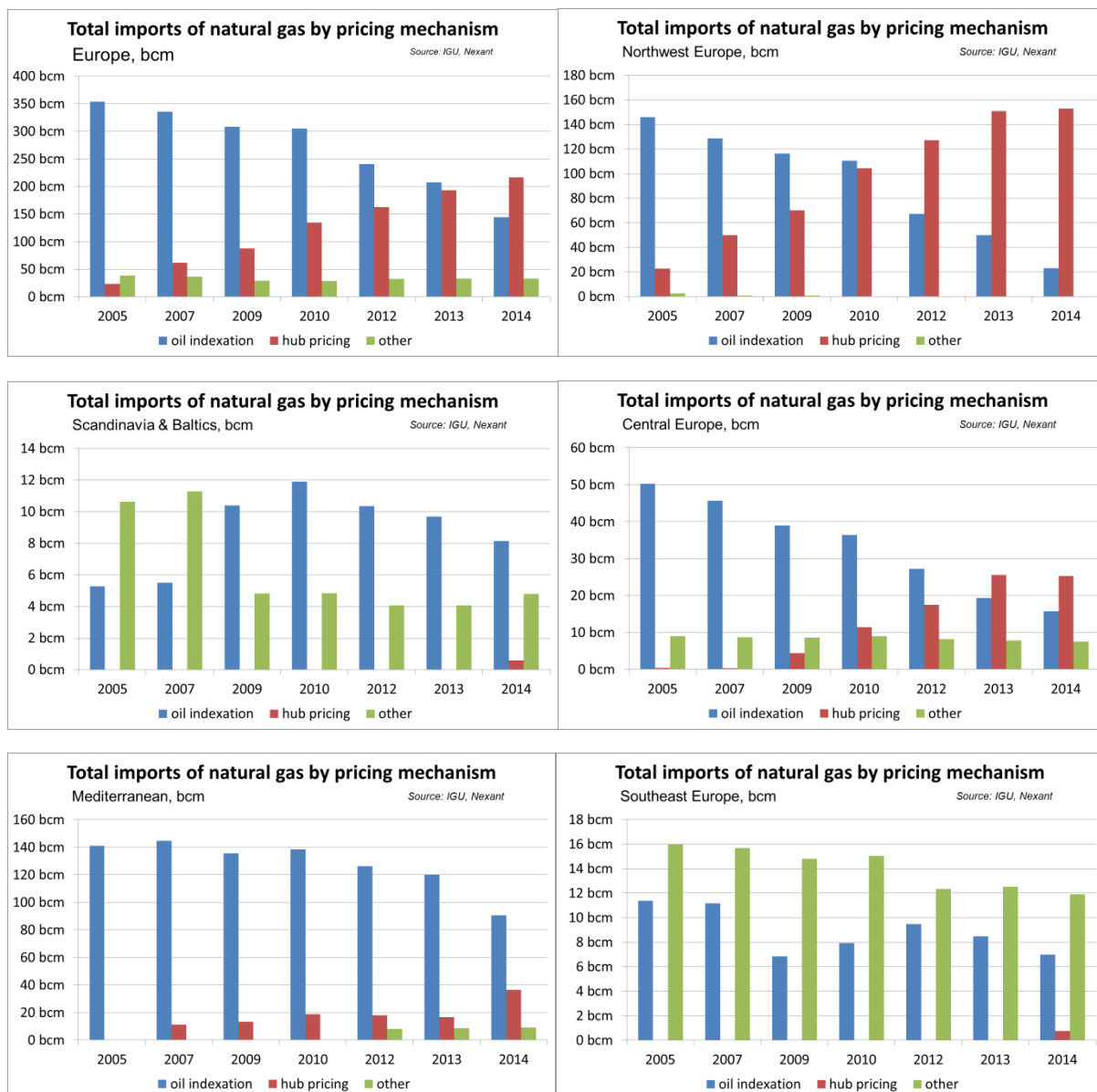
Oil-indexed prices have an important but diminishing role in the European market: according to a report of the International Gas Union<sup>1</sup>, oil-indexation accounted for 39% of gas imports in 2014, down from 78% in 2009.

There are important regional differences within Europe. In Northwest Europe, the share of oil-indexed-contracts from imports was only 13% in 2014. This represents a very significant decrease from 2009 when it was still 62%. Considering the increasing role of hub pricing in this region, hub prices well represent wholesale prices in these countries.

The role of oil-indexation also decreased significantly in Central Europe (from 90% of imports in 2009 to 38% in 2014), reflecting increased imports of spot gas, but remain dominant in other parts of Europe, in particular the Mediterranean and the Baltics/Scandinavia where gas-indexed components haven't been introduced to the major share of long term contracts yet.

<sup>1</sup> Wholesale Gas Price Survey - 2015 Edition

Figure 5 - Gas imports by pricing mechanisms



Source: IGU, Nexant

Northwest Europe: Belgium, Denmark, France, Germany, Ireland, Netherlands, UK

Central Europe: Austria, Czech Republic, Hungary, Poland, Slovakia, Switzerland

Scandinavia & Baltics: Estonia, Finland, Latvia, Lithuania, Norway, Sweden

Mediterranean: Greece, Italy, Portugal, Spain, Turkey

Southeast Europe: Bosnia, Bulgaria, Croatia, FYROM, Romania, Serbia, Slovenia

As mentioned above, in case of Member States with no established gas hubs, we use estimated border prices as a proxy. Border prices are estimated based on customs data (value and quantity of gas imports) which is available in Eurostat trade statistics (COMEXT database). This data is publicly available on Eurostat's website but for confidentiality reasons certain Member States are missing, in particular Austria, Germany and Poland. In case of Germany, we can use the average border price reported by the Federal Office for Economic Affairs and Export Control (BAFA). BAFA does not report the import price by supplier; the reported price is the weighted average of all gas imports.

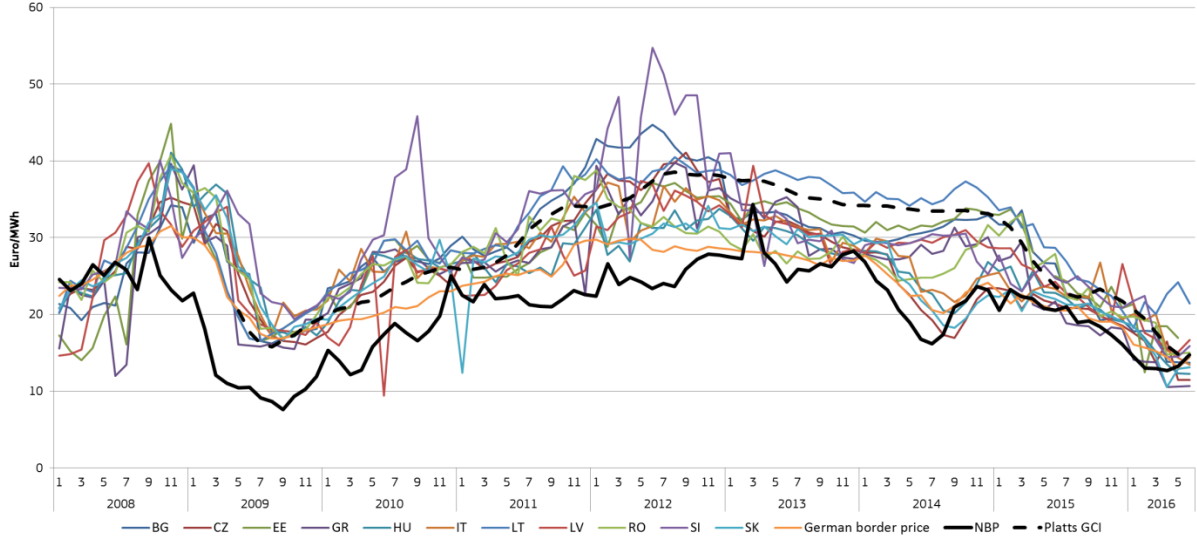
When comparing the curve of the estimated border price with those of the NBP and the GCI, one can infer whether import prices in the given Member State are based on hub prices or are oil-indexed (or, possibly, a combination of the two).

Looking at estimated border prices of gas imports from Russia, by 2012 these seem to follow the GCI, i.e. the oil-indexed price indicator, suggesting that the pricing formula used in the contracts was based on oil product prices. On the other hand, there have been significant variations in the absolute values of the prices, suggesting that the exact price formulas were different.

From 2013, however, estimated border prices seem to follow different trajectories; this is most visible in mid-2014 when the NBP fell to 16 €/MWh while GCI remained above 30 €/MWh. Prices in the Baltic States and Southeast Europe continued to follow the trend of GCI but in Central Europe (Czech Republic, Hungary, Slovakia) and Italy they moved closer to the NBP price, indicating that these contract now has a significant hub pricing element and are no longer (purely) indexed on oil products. This finding confirms the result of the IGU analysis mentioned above, according to which hub prices gained significant ground in Central Europe but have only a minimal role in the Baltics and Southeast Europe. The average German border price (reflecting all imported gas, not only Russian) also seems to follow the trend of the NBP from 2013.

Apparently, in the years of high oil prices and decreasing European demand, several buyers of Russian gas managed to renegotiate their contracts with Gazprom, resulting in lower prices. This happened in countries having access to alternative supply sources and/or routes, proving the importance of competition as a price driver.

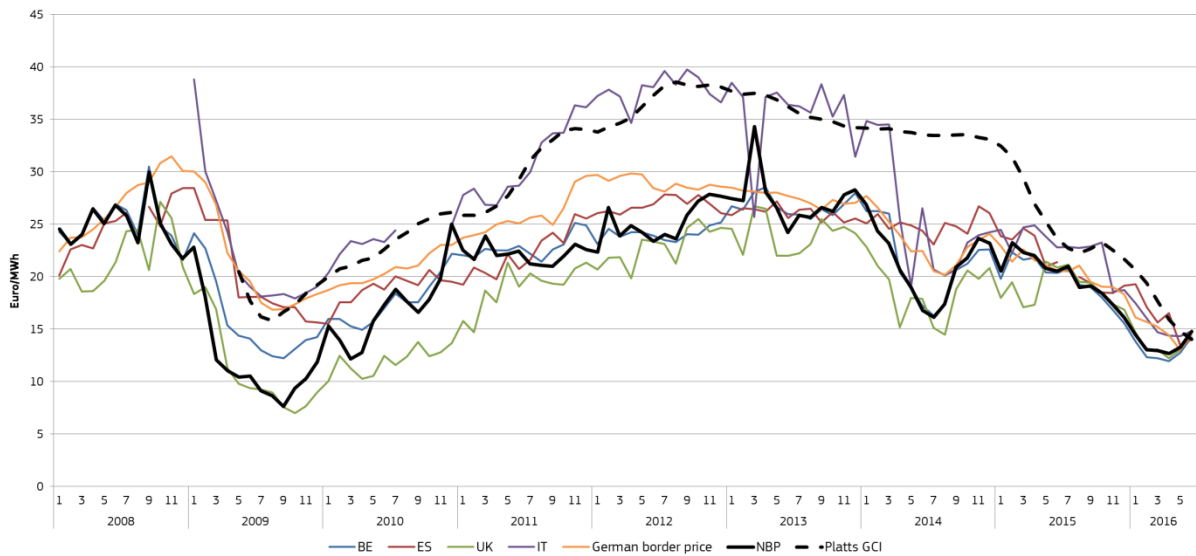
Figure 6 - Estimated border prices of gas imports from Russia



Source: Platts, BAFA, Eurostat COMEXT

When it comes to Norwegian imports, estimated border prices show that the switch from oil-indexation to hub-based pricing happened earlier. In case of Belgium and the UK, already in 2008 the border price seems to follow the NBP curve. In case of Spain, the switch happened later, around 2010 while in case of Italy only in 2014, reflected by a prominent fall of the estimated border price between March to May (by 15 €/MWh).

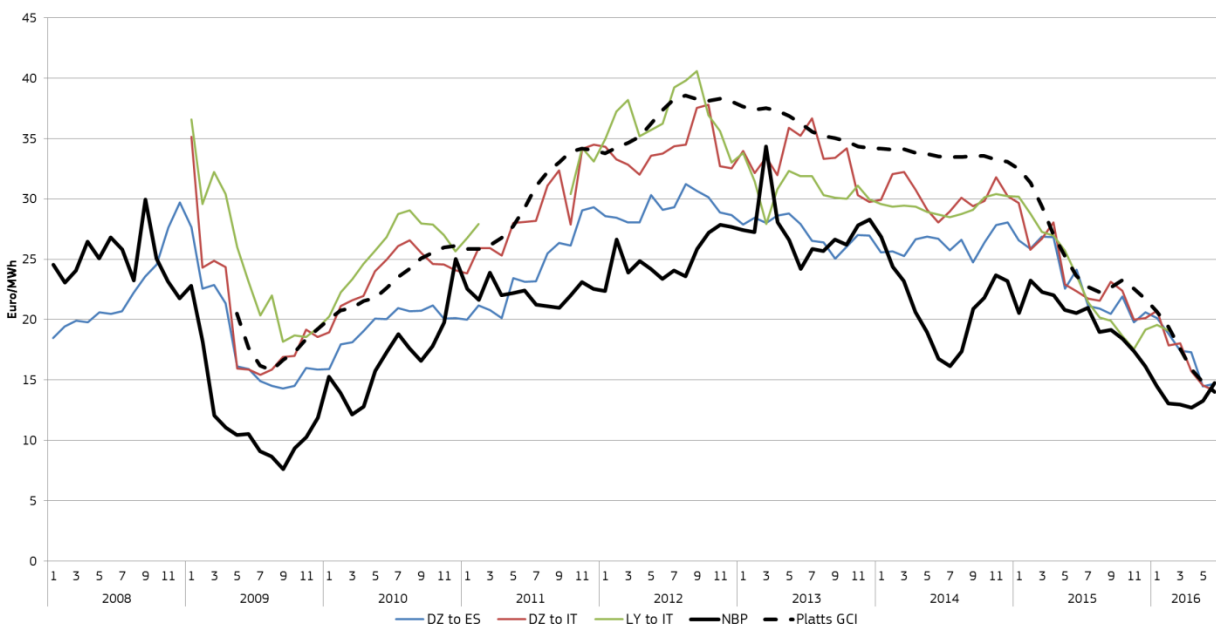
Figure 7 - Estimated border prices of gas imports from Norway



Source: Platts, BAFA, Eurostat COMEXT

Finally, in case of pipeline imports from North Africa, the estimated border prices provide no real evidence of a shift to hub-based pricing. Prices seem to follow the trend of the GCI indicator, suggesting a continuation of oil-indexation, although in recent years the absolute level of the prices has been considerably lower than the GCI, especially in 2014.

Figure 8 - Estimated border prices of (pipeline) gas imports from North Africa



Source: Platts, Eurostat COMEXT

## 2.1.3 Drivers of wholesale gas prices

In the report on *Prices and costs of EU energy*<sup>2</sup>, an econometric analysis has been presented in order to assess the influence of different factors (including heating degree days, crude oil prices, the US Henry Hub price, domestic gas production and the availability of gas storage capacity) on wholesale gas prices in different regions of the EU.

Gas is often used for space heating and, as a result, gas demand often shows a high degree of seasonality which can have an impact on prices, in particular if temperatures deviate from the normal seasonal pattern (e.g. unusually mild winters vs. cold spells). The econometric analysis indeed found that heating degree days have a significant positive impact on prices, with the strongest impact seen in the UK. However, during the past (2015/2016) winter, hub prices in Northwest Europe have hardly shown any seasonality; in fact, prices showed a continuous decreasing trend since early 2015. Heating degree days were also found to have an impact on LNG prices.

In addition, hub prices are also influenced by the oil-indexed prices of long-term contracts. Econometric analysis indeed found that crude oil prices influence Northwest European hub prices although this impact is moderate and declining with time. (Hub prices in Northwest Europe had been strongly coupled to the oil-indexed prices of long-term contracts before 2009; afterwards, they started to deviate from the oil-indexed prices.) The impact is stronger if a lag is applied; this is consistent with the fact that oil-indexed prices are based on the oil product prices of 6-9 months ago. In case of decreasing oil prices for example, as seen in the last 2 years, falling oil-indexed prices put downward pressure on hub prices.

In case of Central Europe, crude oil prices had a markedly stronger impact on the border prices in the first part of the study period (2009-2012); in 2013-2015, as the pricing shifted away from oil indexation, this impact significantly decreased. In turn, the impact of Northwest European hub prices has significantly increased. In 2013-2015, there has been a very strong correlation between NBP and the border prices in Central Europe. The increasing share of hub-based pricing clearly had a negative impact on prices in the region,

In the Baltics and Southeast Europe, oil-indexed prices continue to have a dominant role. This was confirmed by the econometric analysis which found only a small decrease in the impact of crude oil prices in 2013-2015 compared to 2009-2012. In this region, crude oil price remained an important price driver while the role of the NBP price proved to be minimal.

In the Mediterranean, in particular Spain, LNG imports play an important role. In this region, LNG prices show a modest correlation with oil prices, suggesting that most contracts still use some oil-indexation. (In turn, LNG prices in Northwest Europe closely follow the local hub prices)

It was found that the evolution of the US wholesale price (Henry Hub) also has an impact on European hub prices and in fact this impact proved to be stronger than that of the crude oil price.

The hypothesis that a higher share of domestically produced gas would result in lower prices was refuted in case of Northwest Europe: it was found that this factor has no significant impact on the hub prices. On the other hand, in the Baltics and Southeast Europe (where Romania is an important gas producer) the share of domestic production proved to be a driver, having a significant negative impact on border prices.

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<sup>2</sup> Report on Prices and costs of EU done by Ecofys for the European Commission

According to the analysis, the availability of gas storage capacity has no significant impact on prices.

## 2.2 Retail gas prices

The composition and drivers of natural gas retail prices are analysed based on a data collection designed and conducted by DG Energy of the European Commission. The gathered data set has distinct features:

- Cost elements are allocated to harmonized main components, facilitating the targeted identification of price increase drivers on EU and national levels.
- The component "taxes & levies" is further disaggregated into 10 sub-components, facilitating the quantification of the impact of specific policies and fiscal measures.
- The component "network" is further decomposed into transmission and distribution costs.
- Energy policy relevant levies and not- earmarked taxes are distinguished.

### Summary

Natural gas retail prices for households increased at the annual rate of 1.7%. Prices for median industrial consumers marginally decreased while prices for large industrial consumers decreased at the annual rate of 0.5%.

Natural gas prices, unlike their electricity counterparts, remain largely determined by international commodity prices as the energy component of natural gas bills ranges up to 84%. Falling wholesale prices counterweighted and in the case of large industrial consumers even reversed the impact of increasing taxes and levies. The impact of energy policy relevant charges remained limited as such charges accounted for less than 10% of the weighted EU average price in 2015.

Highly varying national taxes and levies have only a moderate impact on natural gas prices, therefore they are more convergent across Europe than their electricity counterparts. Prices became on average 25% less dispersed for all consumer types from 2008 to 2015, mirroring the progress towards a single EU energy market. Impacts of the internal market are also underlined by 36% and 58% less dispersed energy components for households and median industrial consumers respectively.

Natural gas retail prices decreased for all consumer types from 2014 to 2015<sup>3</sup>. Such price evolution might hamper energy efficiency investments by households in more efficient equipment and by industry in more efficient production processes.

Slightly increasing or even decreasing retail prices reflect natural gas market conditions which have considerably changed over the past few years. The fall in oil prices, which started in 2014 significantly impacted the mostly oil indexed gas prices. The decrease in gas prices in turn changed the favourable investment climate leading to lower gas production on the medium term. Such supply reduction combined with increasing demand would normally lead to increasing prices on the short term. Demand for natural gas is however hampered by slow economic growth in Europe and tough competition by US coal. The slow recovery of EU economies comes with stagnating electricity demand. Demand levels, which in 2015 have not reached pre- crisis levels, are not sufficient to create supply shortages which in turn could

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<sup>3</sup> Latest data of the evolution of gas prices for households in EU capitals (April 2016, source: VaasaETT Ltd) shows significant monthly drops in prices in various capitals which could be reflecting the recent decreases in the wholesale prices.

increase price levels. Gas fired power generation more than halved from 468 TWh in 2008 to 201 TWh in 2014 despite decreasing commodity prices.

The shale gas boom in the United States has not directly impacted European gas prices by increasing supply. However, it indirectly contributed to decreasing prices. On the domestic US markets coal was crowded out by shale gas. Relatively low transport costs of excess coal from the United States, made the commodity a feasible option in Europe. Coal imports from the United States to the EU have increased 12 fold from 2300 kilotons in 2008 to 31500 kilotons in 2014<sup>4</sup>. The increased use of US coal for power generation in Europe lowered the demand for natural gas and thus contributed to sustained lower prices.

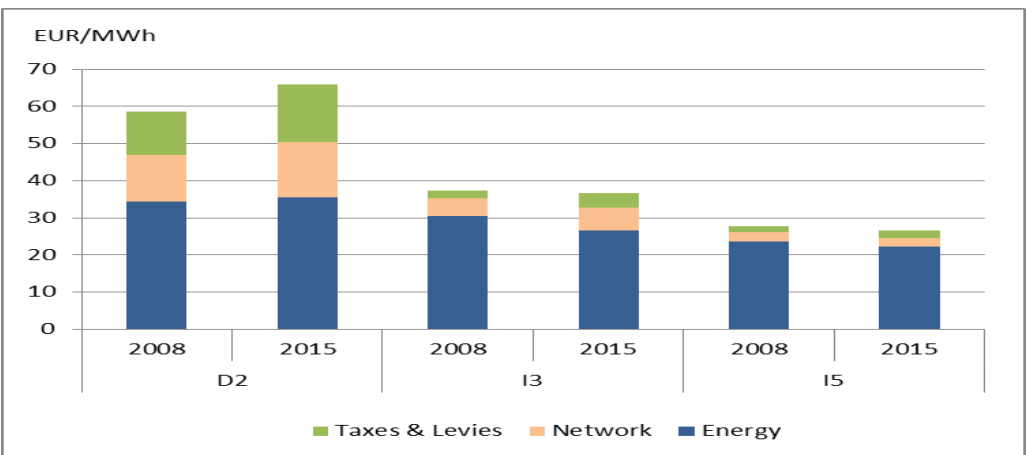
For large industrial consumers the weighted EU average of both the energy and network components decreased. This is a unique development across all analysed electricity and natural gas bands. The largest part of the bill - energy supply costs - decreased at the annual rate of 0.8% while network tariffs decreased by 1.9% annually. Taxes and levies increased at the annual rate of 4.4%.

For median industrial consumers decreasing energy costs (annual -1.9%) were counterweighted by increasing network tariffs (annual 6.2%) and growing taxes and levies (annual 11%). The combined impact of a moderate decrease in the largest component and faster increases in the smaller components led to almost net zero change in total prices from 2008 to 2015.

For households all three components increased over the observation period. The energy component accounted for the largest part of the household gas bill (53%). Its moderate annual increase of 0.3%, combined with respective annual increases of 2.5% and 4.2% of network tariffs and of taxes and levies led to a total annual price increase of 1.7%.

The composition of total prices remained almost constant for all households and large industrial consumers. The share of energy costs in the total price became slightly less prominent while the shares of the two other components slightly increased.

**Figure 9 – Natural gas components for different consumer types**



Source: European Commission, Member States

<sup>4</sup> Excludes coking coal, Eurostat nrg\_122a.

The following table summarizes the evolution of the three components as well as the evolution of their relative shares.

**Table 1. Evolution of price components by type of consumer**

Consumer Type	Household			Median industrial			Large industrial		
	Annual growth	Share 2015	Δ share	Annual growth	Share 2015	Δ share	Annual growth	Share 2015	Δ share
Energy	0.3%	53%	-5pp	-1.9%	73%	-9pp	-0.8%	84%	-1pp
Network	2.5%	23%	+1pp	3.6%	17%	+4pp	-1.9%	8%	-1pp
Taxes & Levies	4.2%	24%	+4pp	8.3%	10%	+5pp	4.4%	8%	+2pp
Total price	1.7%	-	-	-0.3%	-	-	-0.5%	-	-

Source: European Commission, Member States

Natural gas retail prices are less spread out across Europe than their electricity counterparts. This is largely due to the fact that they are less impacted by highly divergent national policies and fiscal measures. Various energy policy related levies, fees and charges imposed on natural gas bills are limited both in their value and variety. The following table displays natural gas price dispersion for various consumer types at the beginning and at the end of the observation period. Prices for all consumer types became more convergent over time.

**Table 2. Price dispersion by type of consumer**

Type of Consumer	Band	Year	Max/Min	Δ Total price dispersion 2008-2015	Δ Energy component dispersion 200-2015
Household	D2	2008	3.54	-14%	-36%
		2015	3.11		
Median industrial	I3	2008	1.8	-39%	-58%
		2015	0.63		
Large industrial	I5	2008	2.24	-26%	-30%
		2015	1.99		

Source: European Commission, Member States



### 2.2.1 Household Natural Gas Prices

The following chapter analyses natural gas retail prices paid by household consumers whose annual consumption falls in the range of 20 to 200 GJ. This consumption band is defined by Eurostat terminology as D2. It is the most representative consumption band in all but one reporting country. Disaggregated natural gas prices for this consumption band were reported by 23 EU member States and Turkey. Natural gas is not used on Cyprus and Malta and its household share in total primary energy supply is below 1% in Finland. Therefore, these three countries do not report prices.<sup>5</sup> Disaggregated prices could not be reported by Ireland, Latvia and Norway in the course of the current study.<sup>6</sup>

#### Summary

Natural gas prices for households grew at the annual rate of 1.7% from 2008 to 2015. While nominal price levels are largely determined by the energy component, price increases were driven by growth in taxes, levies and network tariffs.

With over 50% share in the weighted EU average price, the energy component remained the most dominant component. It was the largest of the three components in 20 reporting countries in 2015. In two of the three remaining, countries taxes and levies was the largest component (DK, SE) while Portugal was the only country reporting the highest share of network tariffs. These three countries, where the energy component was out weighted by another component, recorded the highest prices in 2015.

Progress towards a single energy market is mirrored by the increased convergence of household natural gas prices as such became 14% less dispersed from 2008 to 2015. This trend is underlined by the evolution of national energy components which became 37% less dispersed.

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<sup>5</sup> Finland reported industrial natural gas prices.

<sup>6</sup> Total prices for Ireland and Latvia are available in the Eurostat data base.



## COMPARING PRICE CHANGES: NATURAL GAS VS GENERAL PRICE LEVEL

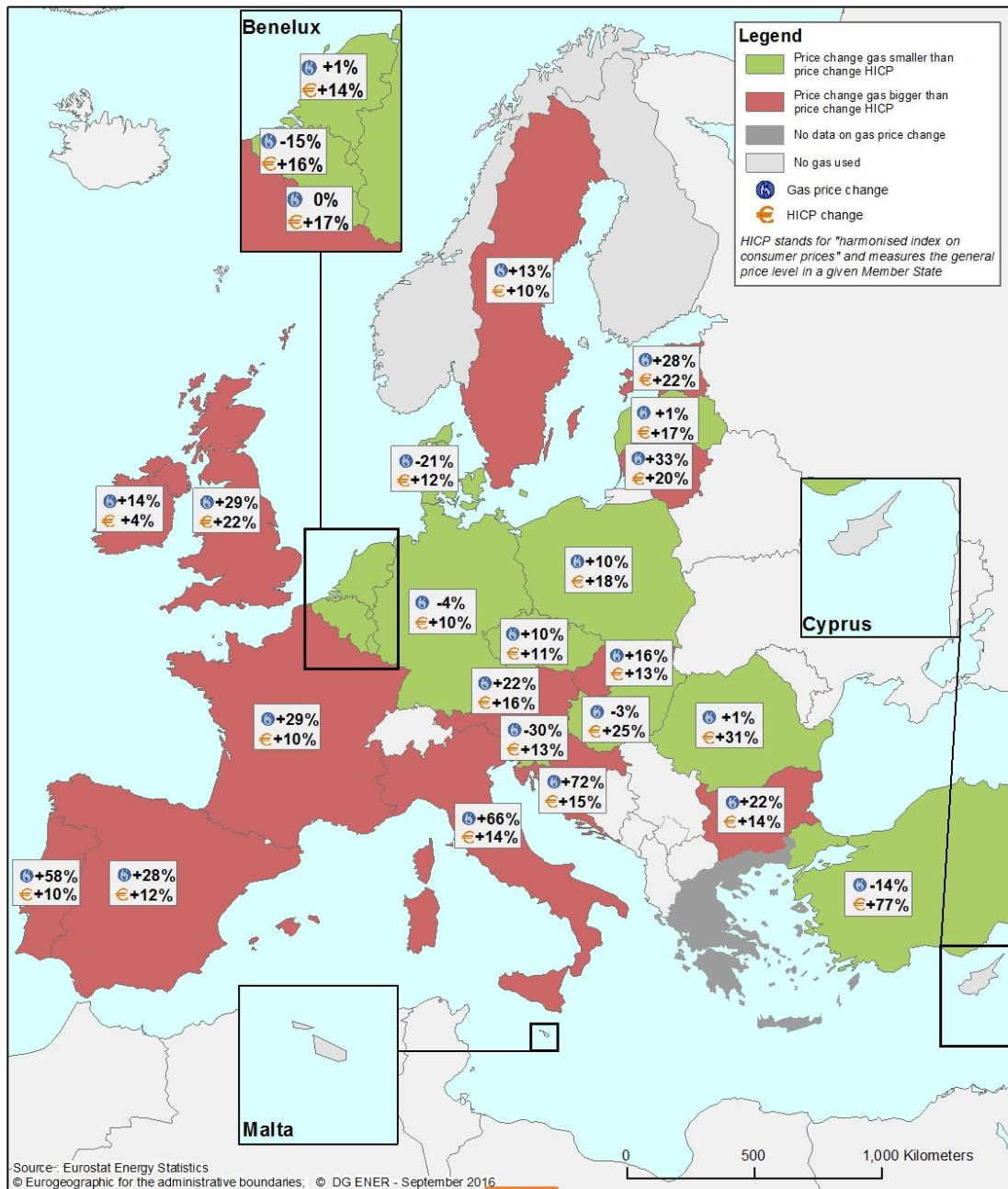
Gas prices for median household consumers (5.56 MWh < Consumption < 55.56 MWh)

all taxes included

2008 - 2015 % change

All prices in national currency

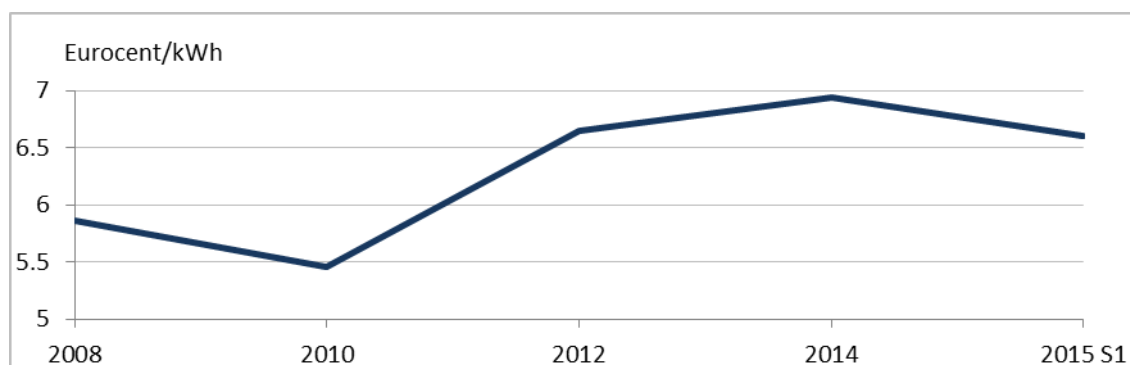
Indicators are displayed for countries that submitted data for DG Energy's ad-hoc data collection. Data submission was open to all countries reporting to Eurostat in the European Statistical System.



### 2.1.1.1 Price evolution – Total prices

The average<sup>7</sup> household natural gas price was 6.60 Eurocent/kWh in 2015. This average price increased at the annual rate of 1.7% from 5.86 €c/kWh in 2008. This growth closely resembles overall average inflation<sup>8</sup> of 1.5% during the same period. The average price decreased by almost 6% in the period 2008 - 2010 reflecting decreasing demand trends, partly due to the ongoing financial and economic crisis. From 2011 to 2014 prices increased at a faster pace of almost 15%. From 2014 to 2015 the average EU price, in line with the evolution of international commodity prices, decreased by 4%.

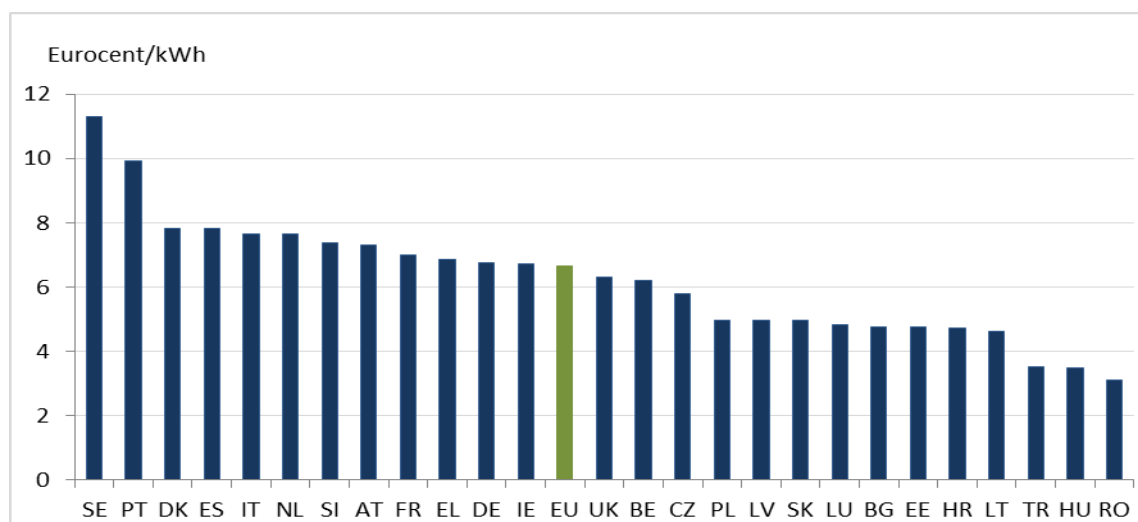
Figure 10 - Evolution of the weighted EU average natural gas price for households (D2)



Source: European Commission, Member States

The highest reported price was almost four- fold of the lowest in 2015 as household prices ranged from 3.11 Eurocent/kWh in Romania to 11.31 Eurocent/kWh in Sweden.

Figure 11 - Household (D2) natural gas prices by country in 2015



Source: European Commission, Member States

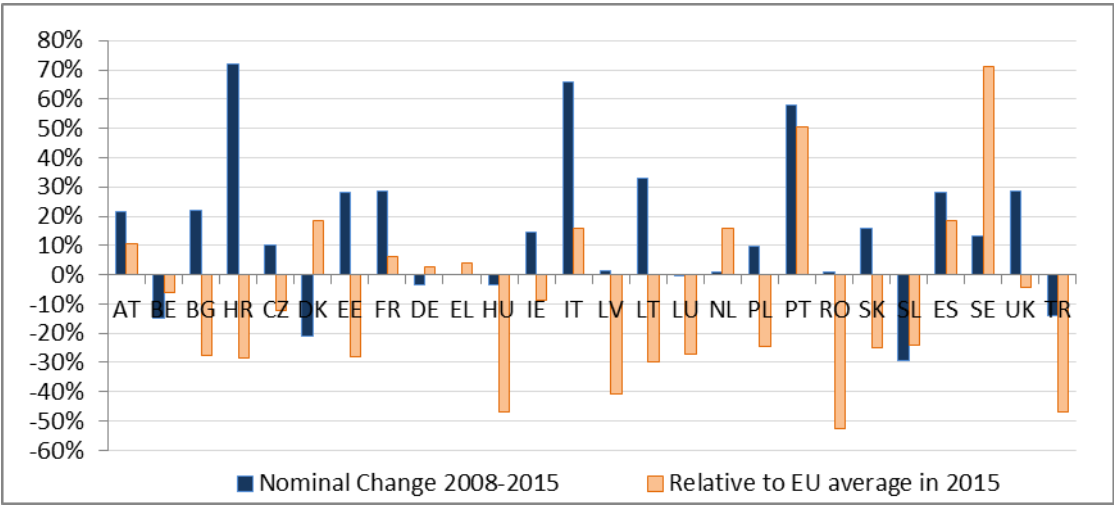
Significant differences in international price convergence are observed for different energy products. Electricity household prices are considerably more spread out than their natural gas counterparts. This is mostly due to the fact that household electricity prices are more impacted by various taxes and levies that highly differ from country to country.

<sup>7</sup> All average prices refer to weighted EU 25 average prices.

<sup>8</sup> Harmonized Consumer Price Index (HCPI), Eurostat prc\_hicp\_auid

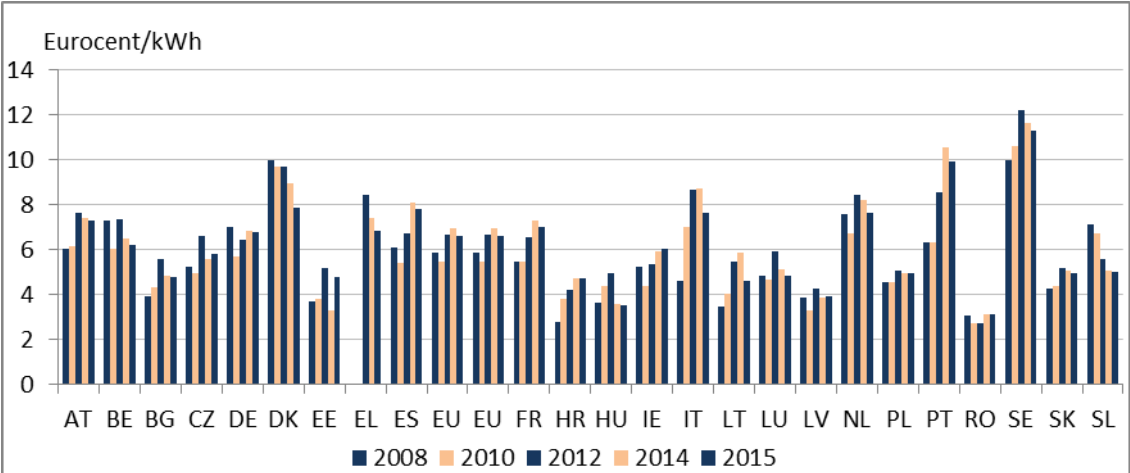
The following graph displays nominal price increases and decreases from 2008 to 2015 and national prices in 2015 relative to the 2015 average EU price<sup>9</sup>.

**Figure 12 - Price increases and national prices relative to EU average in 2015 for households (D2)**



Source: European Commission, Member States

**Figure 13 -Household (D2) natural gas prices by country and observation period**



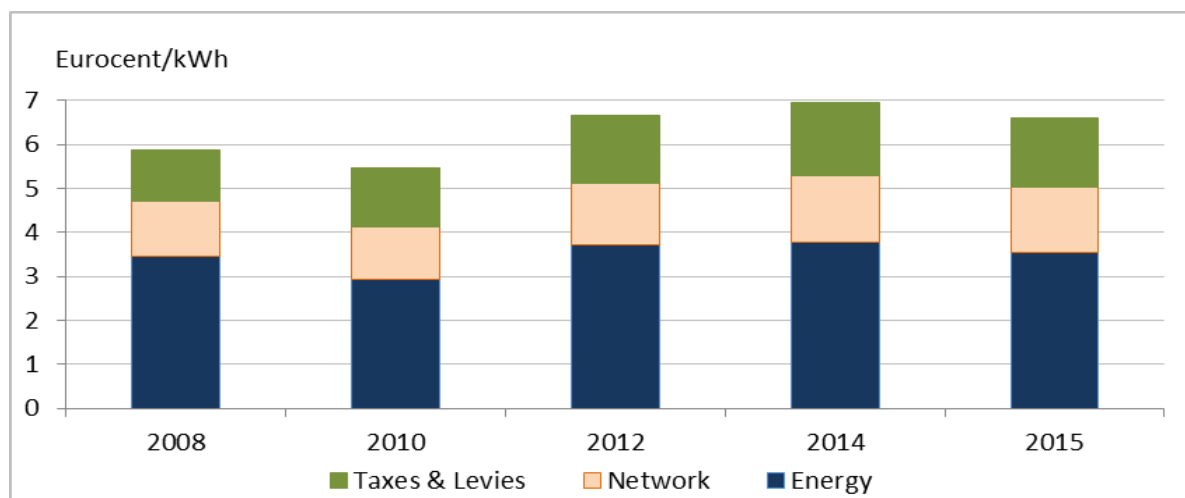
Source: European Commission, Member States

<sup>9</sup> 2010-2015 value for Austria

### 2.2.1.2 Price drivers – Main components

For a detailed description please consult the section on the main components.

Figure 14 - Weighted EU average price components for households (D2)



Source: European Commission, Member States

The average energy component increased marginally by at the annual rate of 0.3% from 2008 to 2015 and accounted for 3.54 Eurocent/kWh in 2015. The evolution of the energy component closely resembles the evolution of the total price. It was the largest of the three components in all but three (DK, SE, PT) reporting countries. These three countries recorded the highest prices in 2015. In Denmark and Sweden taxes and levies and in Portugal network costs out weighted the energy component.

#### Box - Pass through effect on gas

The main results of the analysis on the drivers of the energy component of gas retail prices are well aligned with theoretical expectations. *Wholesale gas prices are the main driver of the retail prices' energy component* and have a strong impact on the energy price component, particularly in the countries with more liberalised markets (*one Euro of wholesale gas prices affects the retail prices' energy and supply component by about €0.4 in general and by €0.7 in the energy component of households prices in NL, UK, BE*) Countries with regulated retail markets show a lower impact of wholesale prices (about €0.2) and markets with higher level of competition (CR3 equal or below 80%) show a slightly stronger impact of wholesale prices on the energy supply component. Finally, countries with liberalised markets seem to have lower prices, but limited data availability allows no further analysis.

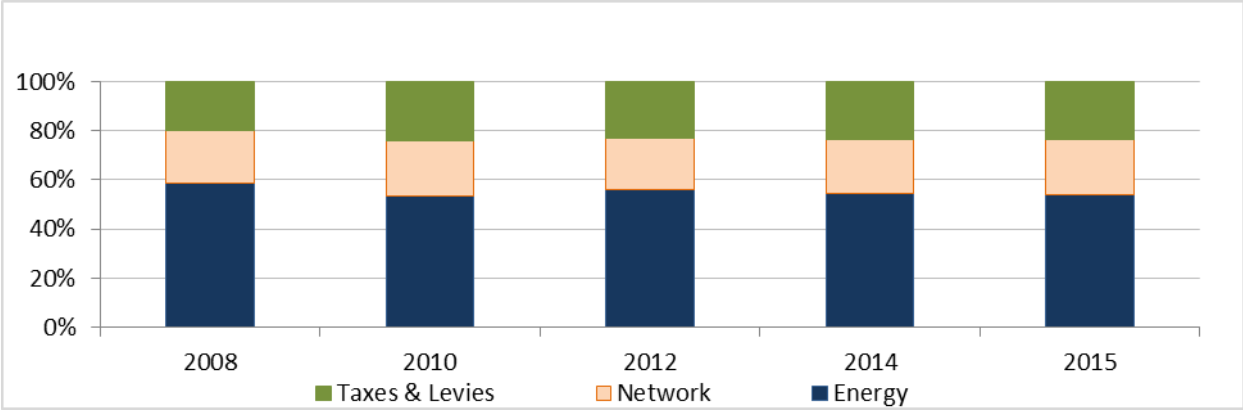
There are regional differences in prices, which could be explained by different market characteristics (e.g. retailer concentration, number of suppliers, number of households switching, etc.) but analysis on that could not be carried out because sufficient time series data for market characteristics were not identified.

Overall, wholesale prices affect retail prices, but how strongly and quickly wholesale prices are passed through to retail prices (supply component) also depend on retail market structures, of which no appropriate data have been available yet to fully explain price developments.

Source: Ecofys study sections 3.2.2.1 & 3.2.2.2 and related Annex 2

The average network component increased at the annual rate of 2.5% and cost the average EU household 1.49 Eurocent/kWh in 2015. The taxes & levies component increased at the annual rate of 4.2% from 2008 to 2015 and accounted for 1.56 Eurocent/kWh in 2015. The increase in taxes and levies is the most relevant contributor to overall natural gas price increases for households.

**Figure 15 - Share of price components in the weighted EU average price for households (D2)**

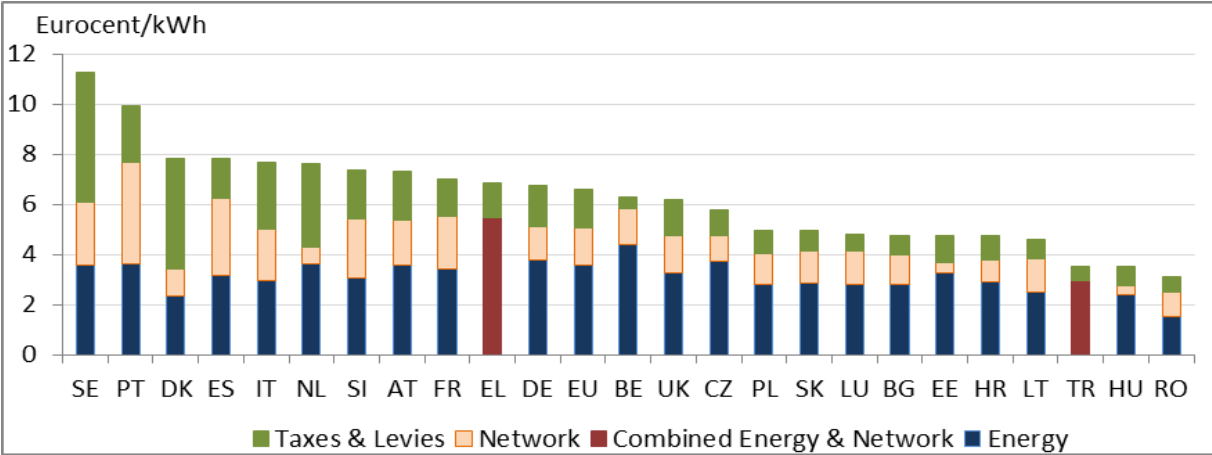


Source: European Commission, Member States

The share of the energy component in the total price decreased by 5 percentage points from 59% to 54%. The share of the Network component marginally increased from 21% to 22%.

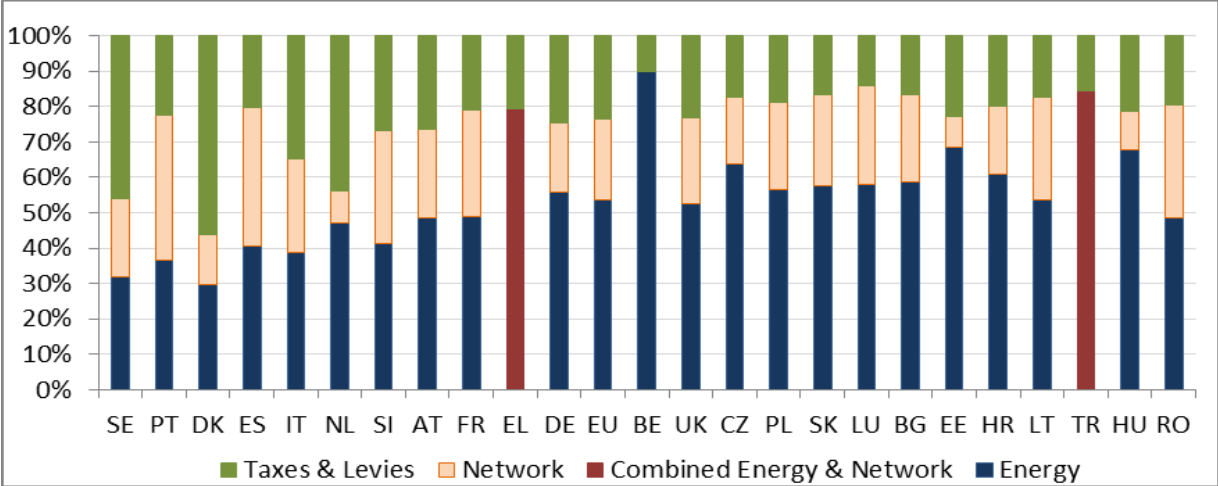
The share of the Taxes & Levies component in the total price increased by 4 percentage points from 20% to 24%.

**Figure 16 - Household (D2) natural gas price components by country in 2015**



Source: European Commission, Member States

Figure 17 - Share of price components in the household natural gas (D2) price in 2015



Source: European Commission, Member States

**Energy component**

Only one of the three price components, the energy component is determined by the market. Increasing competition contributes to decreasing energy components. The share of the energy component decreased by 5 percentage points and accounted for 53% of the average household price in 2015. The level of the network and taxes & levies components are set by divergent national laws and regulations. Their joint share in the average household price increased from 37% to 42%. As the part of the price which is set by market forces has been gradually decreasing, total prices are imperfect indicators for the measurement of price dispersion. The dispersion of the energy component however adequately reflects the progress towards an internal energy market. The energy component of the average median industrial price became 37% less dispersed since 2008.

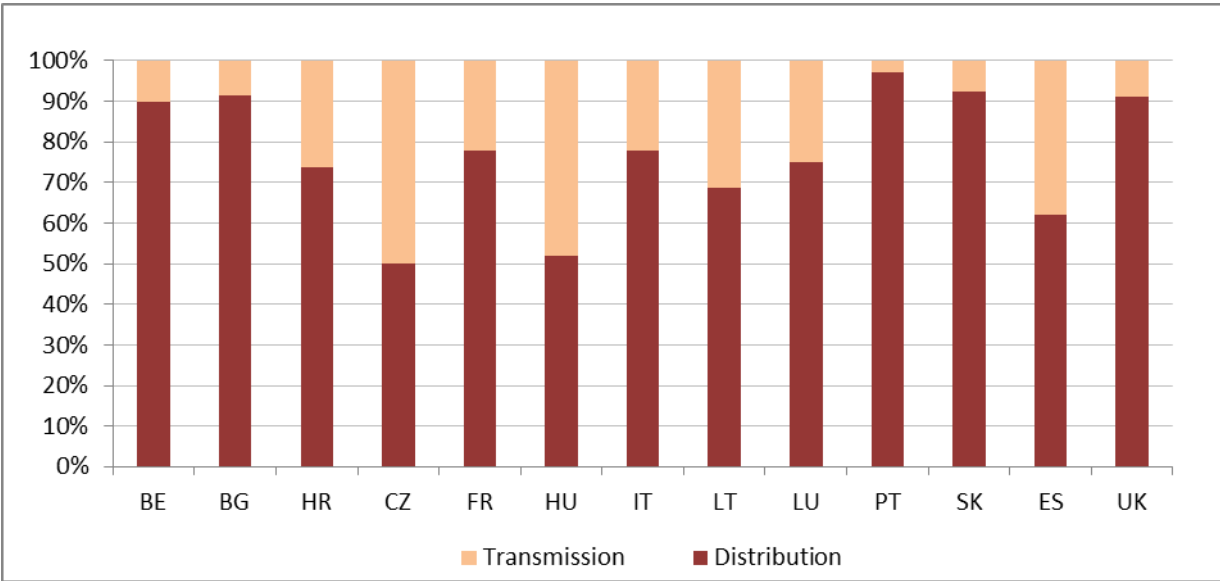
**Network component**

The Network component is broken down into two sub- components, namely transmission and distribution. Both transmission and distribution tariffs are regulated in all EU Member States as well as in Norway and Turkey. The allocation of cost elements (for example costs of infrastructure, losses, ancillary services) to the two sub- components might differ from country to country. Therefore, cross- country comparisons are to be undertaken with caution.

13 reporting countries provided the split between transmission and distribution tariffs<sup>10</sup>.

<sup>10</sup> 2014 data for Spain and the United Kingdom

**Figure 18 – Shares of transmission and distribution costs for households (D2) in 2015 by country**



Source: European Commission, Member States

**Taxes & Levies component**

It is to be noted, that only explicitly reported cost elements could be allocated to specific policies and consequently taken into account for the analysis. For example, RES or nuclear decommissioning costs exist in several countries which could not report such costs explicitly.

VAT is paid by household consumers in all reporting countries. Natural gas VAT rates ranged from 5% in the United Kingdom to 27% in Hungary in 2016.<sup>11</sup> The share of taxes and levies in the EU average price is less than a quarter. Not- earmarked taxes (VAT, excise tax and other taxes) accounted for 93% of the total taxes and levies component. Energy policy relevant levies were rather insignificant and accounted for only 7% of the total taxes & levies component.<sup>12</sup>

During the whole reporting period, 12 countries have not imposed any energy policy relevant levies, fees or charges on household natural gas prices. 11 countries imposed levies in at least one year (not necessarily in all years). While 24 EU Member States impose explicit renewable energy support levies<sup>13</sup> on household electricity consumption, only two (Italy and Slovenia) do so on natural gas bills.

<sup>11</sup> Source: DG TAXUD: Excise Duty Tables, Part II- Energy products and Electricity at: [http://ec.europa.eu/taxation\\_customs/taxation/excise\\_duties/energy\\_products/rates/index\\_en.htm](http://ec.europa.eu/taxation_customs/taxation/excise_duties/energy_products/rates/index_en.htm)

<sup>12</sup> includes tax data from Greece and Ireland

<sup>13</sup> RES support costs occur in all 28 Member States regardless if they are levied explicitly or not



**Table 3. Overview of taxes and levies sub- components for household natural gas consumers**

Sub- Component	Number of Countries	List of Countries
RES & CHP	2	IT, SI
Nuclear	0	
Social	3	BE, FR, UK
Security of Supply	2	GR, HU
Concession fees	3	AT, BE ,DE, PT
Market operation	2	BE, CZ
Energy Efficiency	3	BE, SI, UK

Concession fees for the occupation of public land, imposed by 4 Member States represented the most commonly applied levy on natural gas bills.

## 2.2.2 Industrial Natural Gas Prices

The following chapter analyses natural gas retail prices paid by industrial consumers whose annual consumption falls in the range of 10 000 to 100 000 GJ. This consumption band is defined by Eurostat terminology as I3 and is the most representative consumption band in the majority of the reporting countries. Disaggregated natural gas prices were reported by 24 EU member States and Turkey. Natural gas is not used on Cyprus and Malta, therefore these countries do not report such prices.<sup>14</sup> Disaggregated prices could not be reported by Ireland, Latvia and Norway in the course of the current study.<sup>15</sup>

### Summary

Nominal natural gas prices for median industrial consumers remained stable from 2008 to 2015 when the average price accounted for 36.5 EUR/MWh.

The energy component, with its almost three- quarter share in the total price, remained the most dominant component. Its moderate decrease counterweighted higher increases in the two smaller components. The impact of taxes and levies on the total price remained limited, therefore the evolution of the total price is mostly correlated to the evolution of the energy component. Natural gas prices are determined by international commodity prices rather, than divergent national taxes and levies, therefore they are more convergent across Europe than their electricity counterparts.

VAT is recoverable for most industrial<sup>16</sup> consumers in all reporting countries. Therefore the current study analyses industrial prices excluding VAT and other recoverable taxes.

Progress towards a single energy market is mirrored by the increased convergence of industrial natural gas prices as such became 39% less dispersed from 2008 to 2015. This trend is underlined by the evolution of national energy components which became 58% less spread out.

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<sup>14</sup> Finland reported industrial natural gas prices and Ireland reported VAT and excise tax for all bands.

<sup>15</sup> Total prices of Ireland and Latvia are available in the Eurostat data base.

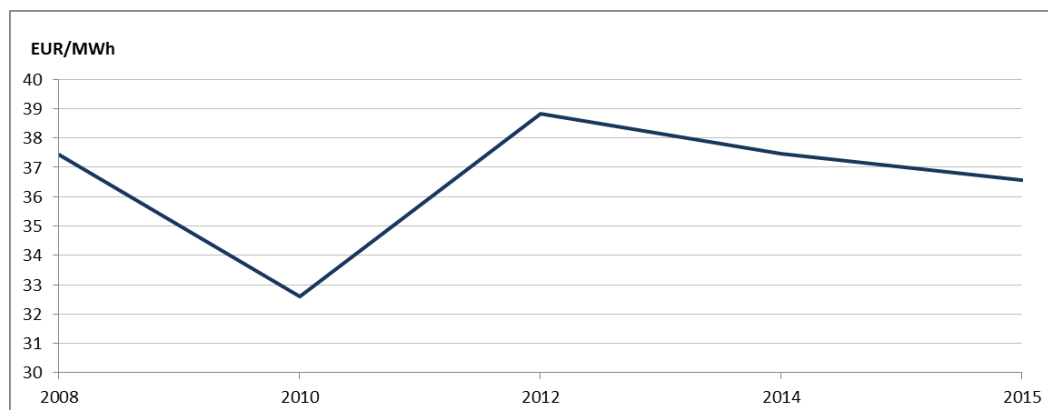
<sup>16</sup> According to Directive 2008/92/EC of the European Parliament and of the Council : Industrial end-user may include other non-residential user.



### 2.2.2.1 Price evolution – Total prices

The average<sup>17</sup> median industrial natural gas consumer paid 36.5 €/MWh in 2015. The average price has decreased at the annual rate of 0.3% from 2008 to 2010. The annual average inflation rate accounted for 0.5% during the same period.<sup>18</sup>

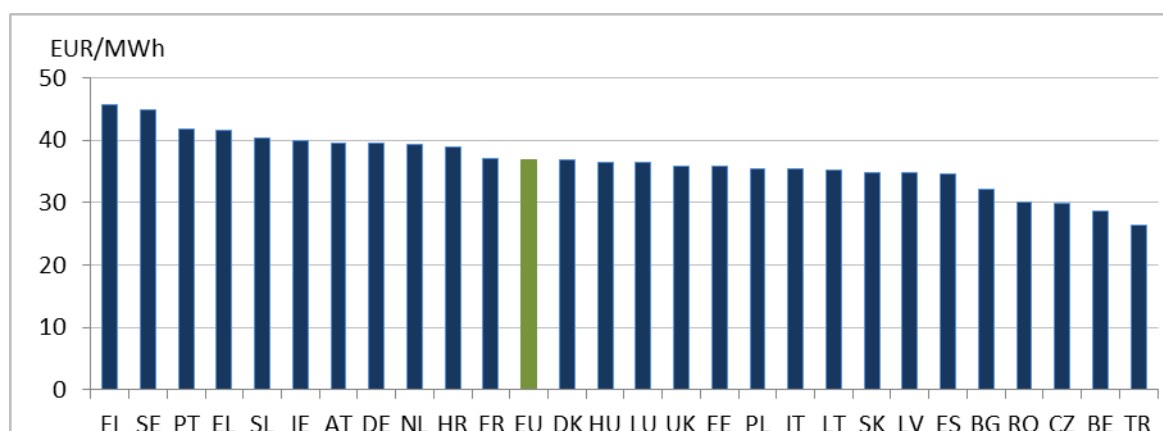
Figure 19 - Evolution of the average EU natural gas price for industrial consumers (I3)



Source: European Commission, Member States

The highest observed price was less than two fold of the lowest observed price in the EU. Prices for median industrial consumers ranged from 28.72 €/MWh in Lithuania and 26.40 €/MWh in Turkey to 45.72 €/MWh in Finland in 2015.

Figure 20 - Natural gas prices for industrial (I3) consumers in 2015 by country



Source: European Commission, Member States

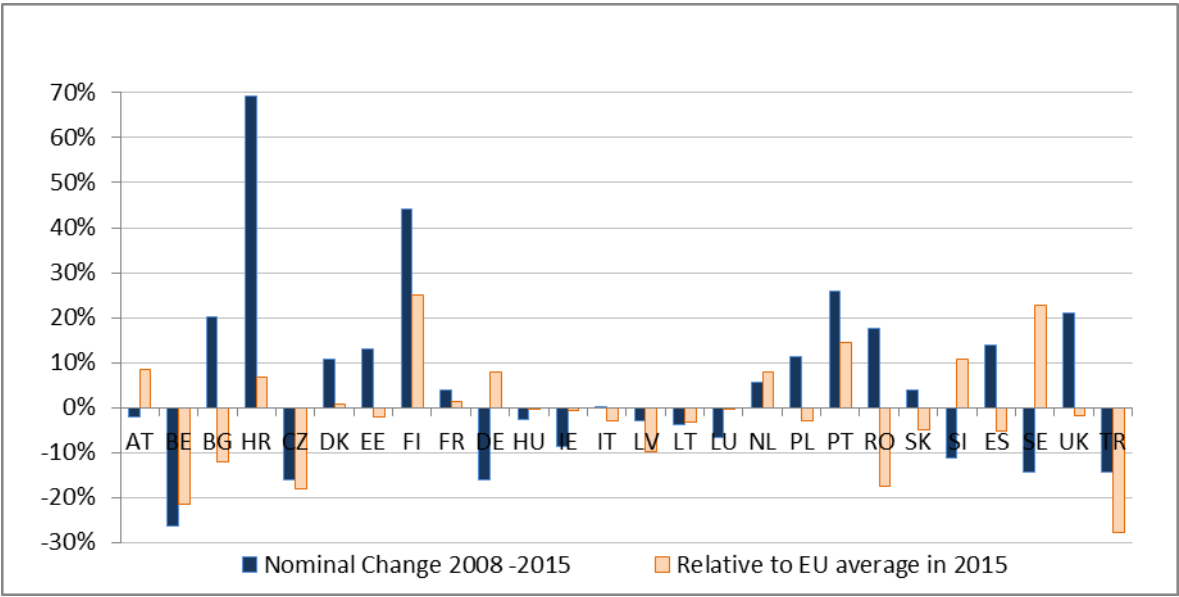
The following graph displays nominal price increases or decreases from 2008 to 2015 and national prices in 2015 relative to the 2015 average EU price<sup>19</sup>.

<sup>17</sup> All average prices refer to weighted EU average prices.

<sup>18</sup> Producer Price Index, Eurostat sts\_inpp\_a

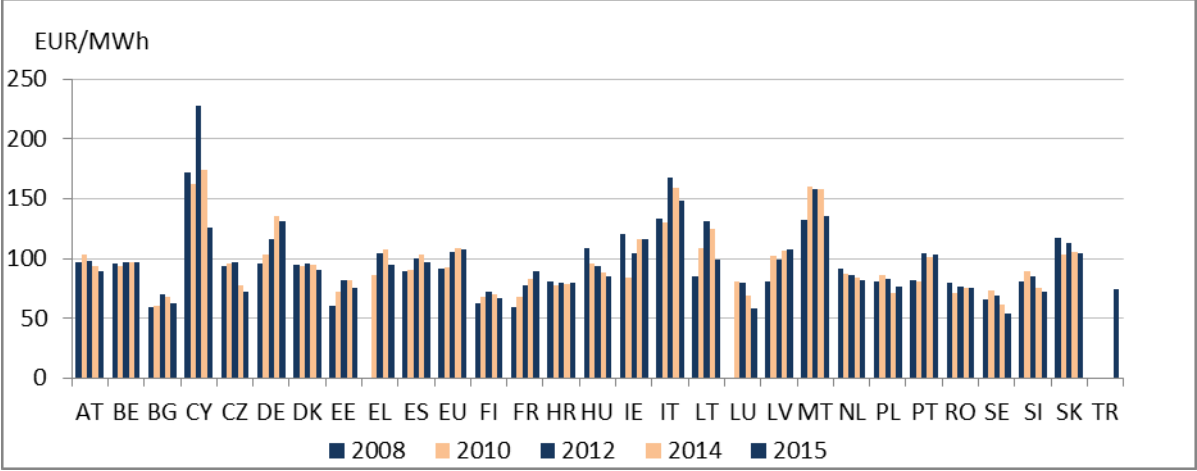
<sup>19</sup> 2010-2015 value for Austria

**Figure 21 - Gas price increases for industry (I3) and national prices relative to EU price in 2015**



**Source: European Commission, Member States**

**Figure 22 - Gas price for industry (I3) by observation period and country**

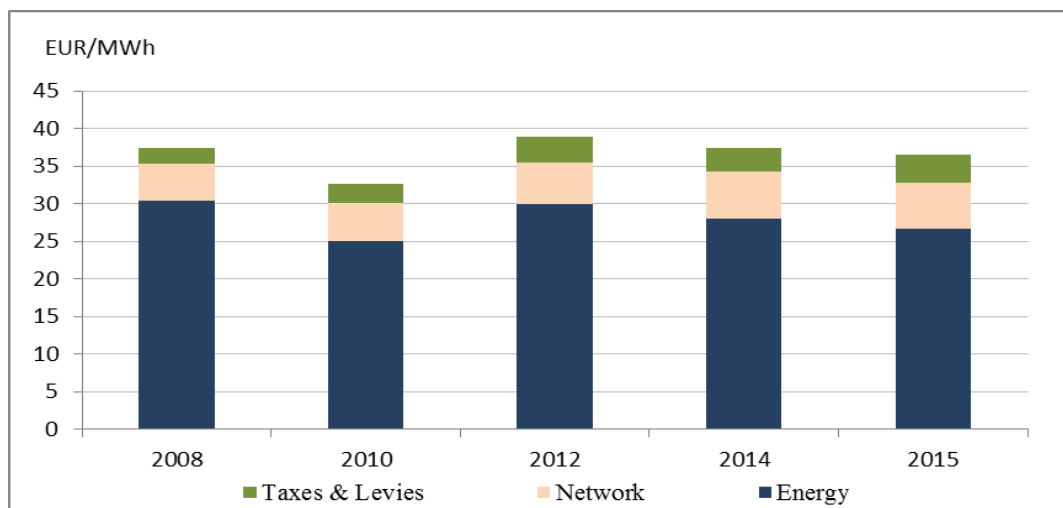


**Source: European Commission, Member States**

### 2.2.2.2 Price drivers – Main components

For a detailed description, please consult the section on the main components.

Figure 23 - Gas price components (EU weighted av.) by observation period for industry (I3)

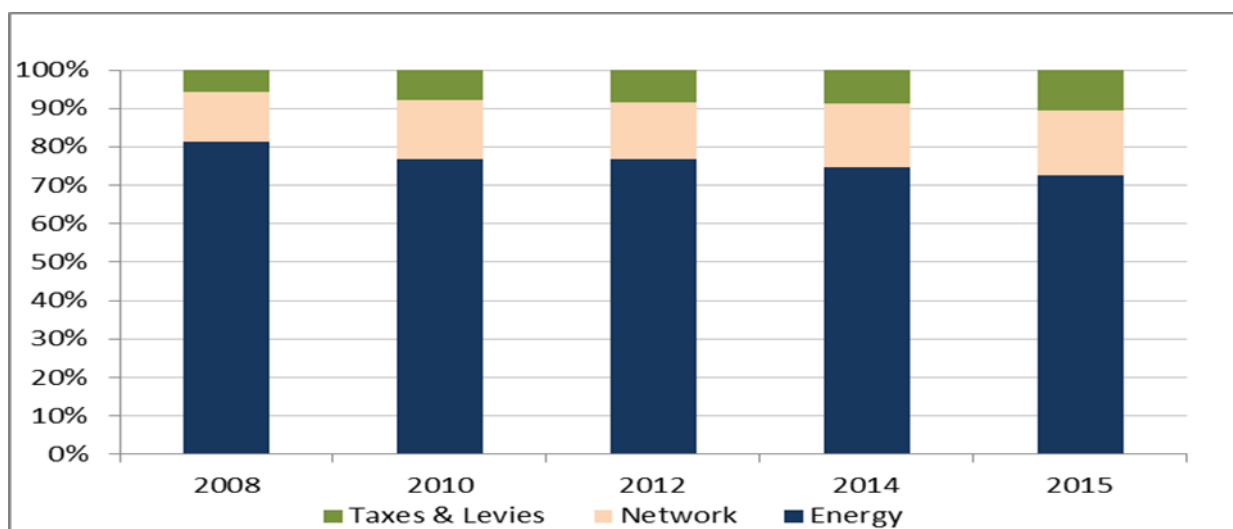


Source: European Commission, Member States

The average energy component decreased at the annual rate of 0.5% since 2008 and accounted for 26.5 €/MWh in 2015. For median industrial consumers the energy component was the largest of the three components in all reporting countries. The average network component increased at the annual rate of 3% and cost the average median industrial consumer 6.1 €/MWh in 2015.

The taxes & levies component experienced a faster increase of annual 11% but still remained the smallest component accounting only for 3.8 €/MWh in 2015.

Figure 24 – Shares of gas price components for industry (I3)



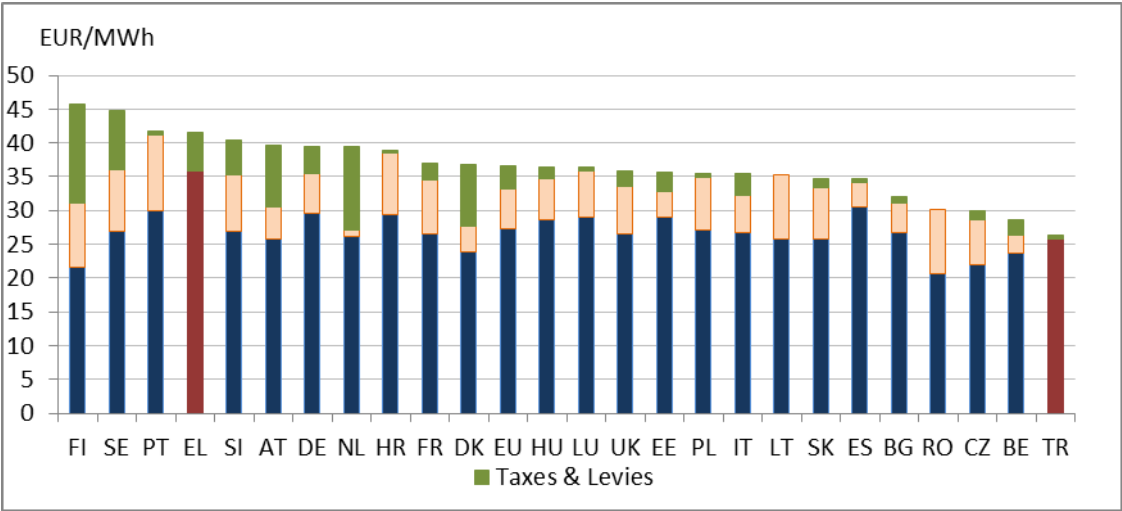
Source: European Commission, Member States

The share of the energy component in the total price decreased by 9 percentage points but it remained to make up two thirds of the total price in 2015.

The share of the network component slightly increased from 12% to 16%.

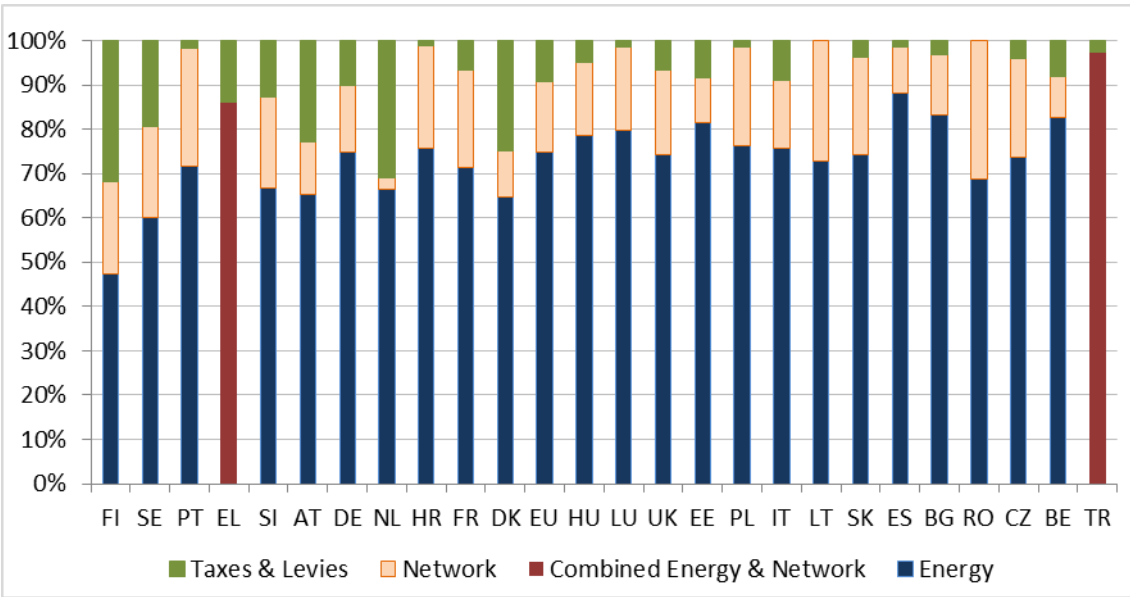
The share of the taxes & levies component in the total price increased by 5 percentage points from 5% to 10%.

**Figure 25 - Price components for industrial (I3) gas consumers in 2015 by country**



Source: European Commission, Member States

**Figure 26 - Price components for industrial (I3) natural gas consumers in 2015**



Source: European Commission, Member States

**Developments within components for industrial gas consumers**

The current edition of the Energy Prices and Costs study introduces sub- components within the network and taxes & levies components.

**Energy component**

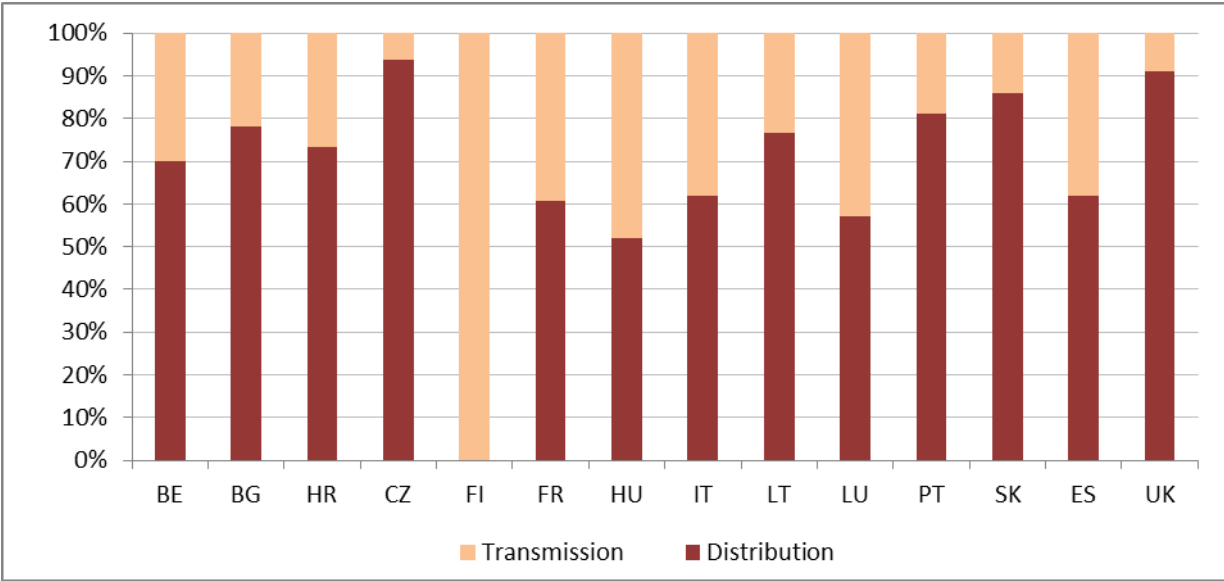
Only one of the three price components, the energy component is determined by the market. Increasing competition contributes to decreasing energy components. The share of the energy component decreased by 8 percentage points and accounted for 73% of the average median industrial price in 2015. The levels of the network and taxes & levies components are set by divergent national laws and regulations. Their joint share in the average median household price increased from 19% to 27%. As the part of the price which is set by market forces has been gradually decreasing, total prices are imperfect indicators for the measurement of price dispersion. The dispersion of the energy component however adequately reflects the progress towards an internal energy market. The energy component of the average median industrial price became 58% less dispersed since 2008.

**Network component**

The Network component is broken down into two sub- components, namely transmission and distribution. Both transmission and distribution tariffs are regulated in all EU Member States as well as in Norway and Turkey. The allocation of cost elements (for example costs of infrastructure, losses, ancillary services) to the two sub- components might differ from country to country. Therefore, cross- country comparisons are to be undertaken with caution.

14 reporting countries provided the split between transmission and distribution tariffs<sup>20</sup>.

**Figure 27 – Shares of transmission & distribution charges in 2015 for industrial gas (I3) consumers<sup>21</sup>**



Source: European Commission, Member States

<sup>20</sup> 2014 data for Portugal, Spain and the United Kingdom

<sup>21</sup> Data from 17 Member States were available. The graph displays 2014 shares for Estonia and the United Kingdom. There is no transmission grid on Malta, therefore all costs are attributed to the distribution system.



## Taxes & Levies component

It is to be noted, that only explicitly reported cost elements could be allocated to specific policies and consequently taken into account for the analysis. For example, RES support costs exist in several countries which could not report such costs explicitly.

VAT is recoverable for most industrial consumers in all reporting countries, therefore the current study analyses prices excluding VAT and other recoverable taxes.

Non-recoverable, not-earmarked taxes (for instance excise tax) accounted for 75% of the total average taxes and levies component.<sup>22</sup>

In Lithuania and Romania median industrial natural gas consumers do not pay any taxes or levies.

In the period 2008-2015 altogether 14 reporting countries have not imposed any energy policy relevant levies, fees or charges on median industrial natural gas prices. 10 countries imposed levies in at least one year (not necessarily in all years). While 25 EU Member States impose explicit renewable energy support levies<sup>23</sup> on industrial electricity consumption, only Italy does so, on natural gas bills.

Figure 28 - Overview of sub-components on natural gas bills for median industrial consumers

Sub-Component	Number of Countries	List of Countries
RES & CHP	1	IT
Nuclear	0	
Social	3	BE, FR, IT
Security of Supply	3	FI, GR, HU
Concession fees	3	AT, BE, PT
Market operation	2	BE, CZ
Energy Efficiency	1	SI

Source: European Commission, Member States

Concession fees for the occupation of public land, imposed by 3 Member States represented the most commonly applied levy on natural gas bills. Also 3 countries applied levies related to security of supply and social policies.

<sup>22</sup> includes tax data from Greece and Ireland

<sup>23</sup> RES support costs occur in all 28 Member States regardless if they are levied explicitly or not

## 2.2.3 Large Industrial Natural Gas Prices

The following chapter analyses natural gas retail prices paid by industrial consumers whose annual consumption falls in the range of 1 million to 4 million GJ. This consumption band is defined by Eurostat terminology as I5. The chapter does not only reflect on developments of large industrial prices but analyses them in comparison to median industrial prices. Disaggregated natural gas prices were reported by 20 EU Member States. Natural gas is not used on Cyprus and Malta, therefore these countries do not report such prices.<sup>24</sup> In Croatia, Greece, Ireland, Luxembourg, Latvia and Slovenia there is either no consumer in this consumption band or data is confidential.

### Summary

The average natural gas price of 26.6 EUR/MWh for large industrial consumers in 2015 was below that of 2008. The energy component with its share of 84% in the total price remained by far the largest component and thus the most prominent driver of the price evolution. The impact of taxes and levies on the total price is limited, as such made up only 8% of the bill.

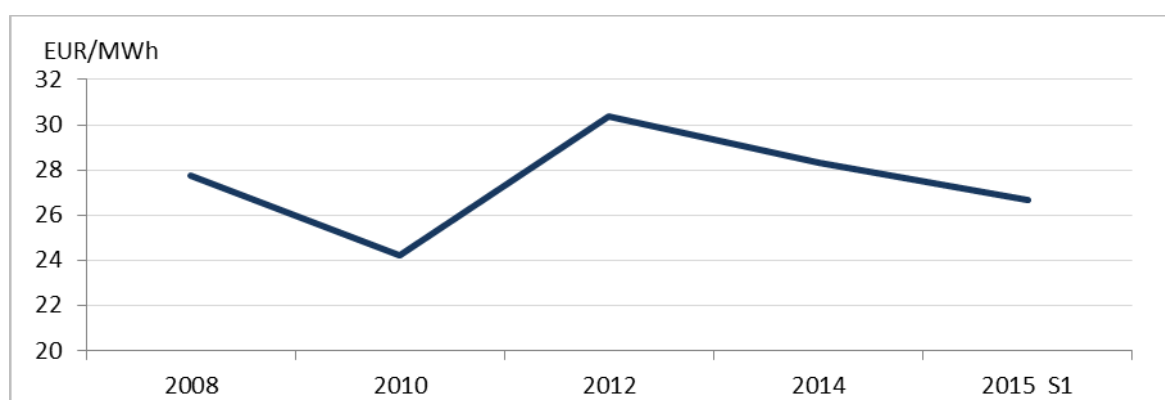
Industrial gas prices are determined by international commodity prices rather than highly divergent national taxes and levies, therefore prices for large industrial consumers show relatively small variation across Europe. The composition of large industrial prices remained remarkably stable over time.

Progress towards a single energy market is mirrored by the increased convergence of large industrial natural gas prices as such became 26% less dispersed since 2008. This trend is underlined by the evolution of national energy components which became 30% less spread out across the EU.

#### 2.2.3.1 Price evolution – Total prices

The average natural gas price for large industrial consumers was 26.6 EUR/MWh in 2015. This average price decreased since 2008 at the annual rate of half a percent. The average annual inflation rate accounted for the same figure, 0.5% during the period.<sup>25</sup>

Figure 29 - Weighted EU average natural gas price for large industrial consumers (I5)



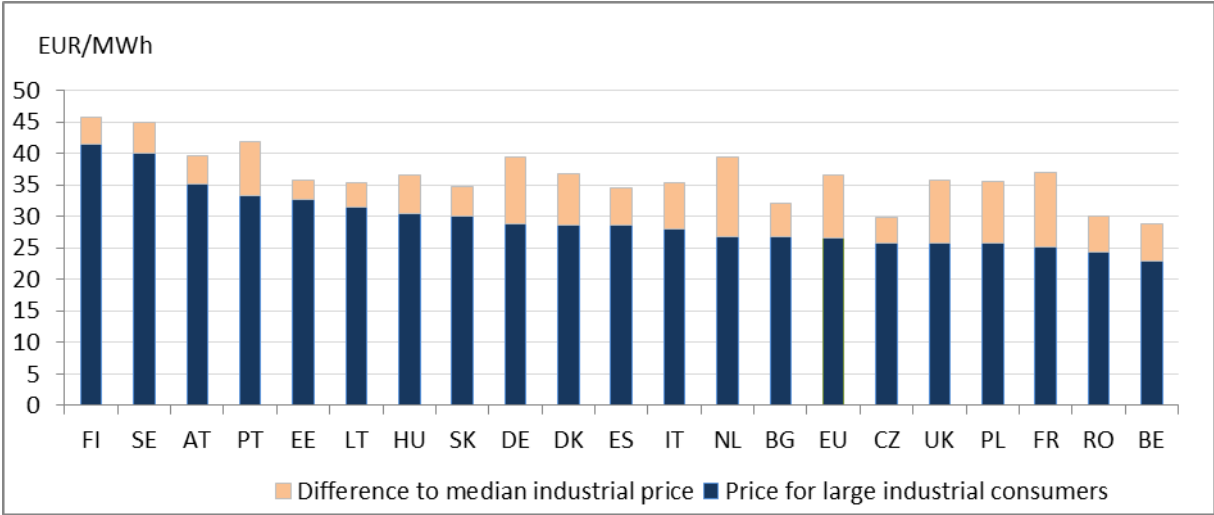
Source: European Commission, Member States

<sup>24</sup> Finland reported industrial natural gas prices and Ireland reported VAT and excise tax for all bands.

<sup>25</sup> Producer Price Index, Eurostat sts\_inpp\_a

Prices for large industrial consumers ranged from 22.91 €/MWh in Belgium to 41.40 €/MWh in Finland<sup>26</sup> in 2015.

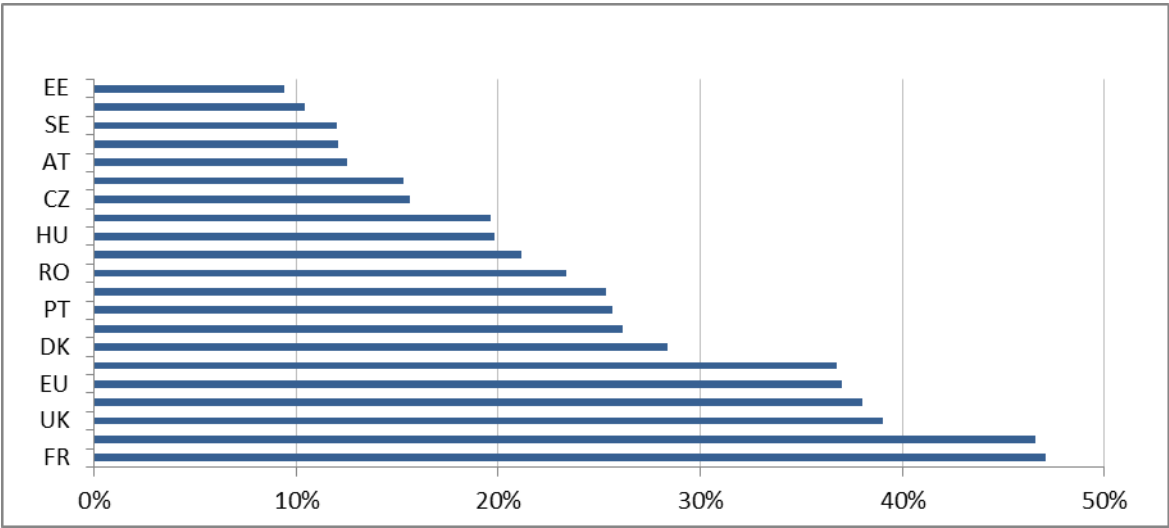
Figure 30 - Natural gas prices for industry in 2015 - large (I5) vs median (I3) consumers



Source: European Commission, Member States

In some countries large industrial consumers pay considerably less than median<sup>27</sup> industrial consumers, in other countries price differences are smaller. This highlights the fact that despite efforts towards the creation of a single EU energy market, retail price conditions remain persistently different across Member States. Such differences are in sharp contrast with developments on wholesale markets where major benchmarks are broadly aligned.

Figure 31 - Difference of median and large industrial price as % of large industrial price



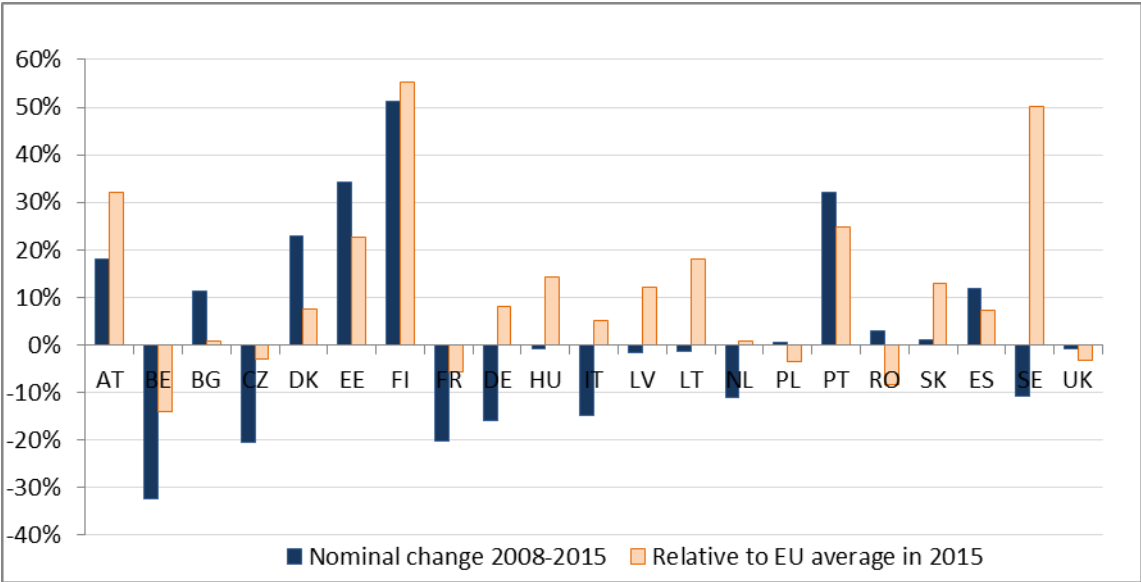
Source: European Commission, Member States

<sup>26</sup> It is to be noted that according to total prices formed as the aggregation of price elements reported for the ad-hoc data collection, Finland has the highest industrial natural gas price of 0.0457 €/MWh followed by the Swedish price of 0.0448 €/MWh.

<sup>27</sup> Eurostat consumption band I3

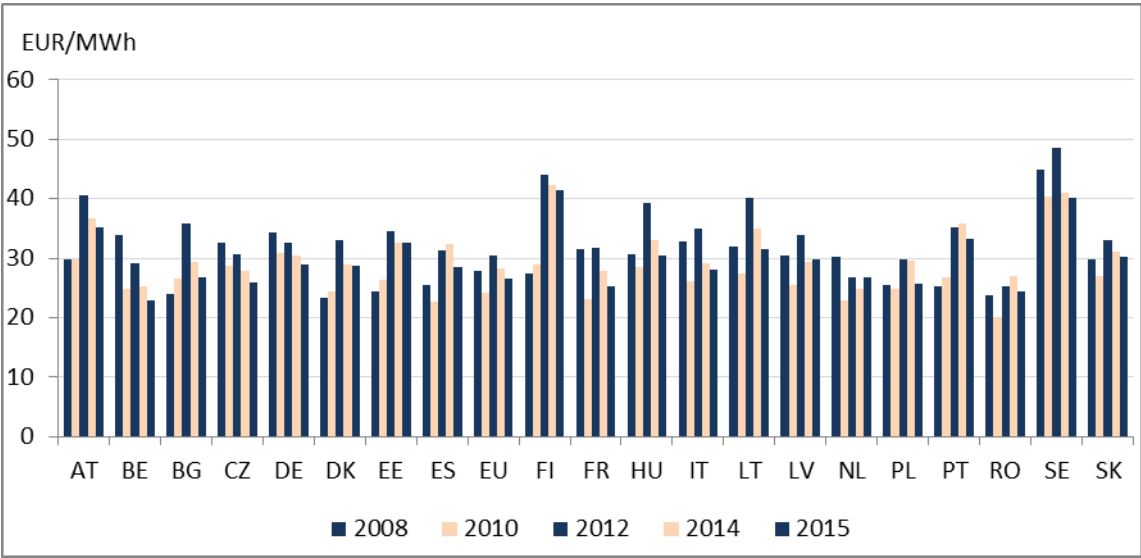
In absolute terms the Netherlands recorded the biggest difference of 12 EUR/MW between the median and the large industrial price, followed by France, the United Kingdom and Germany (differences above 10 EUR/MWh). In relative terms France and the United Kingdom reported the highest price differences of 47% while in Estonia the difference was only 9%.

Figure 32 - Price changes and national price relative to (weighted av.) EU price in 2015 for large industrial consumers (I5)<sup>28</sup>



Source: European Commission, Member States

Figure 33 - Natural gas prices for large industrial consumers (I5) by country



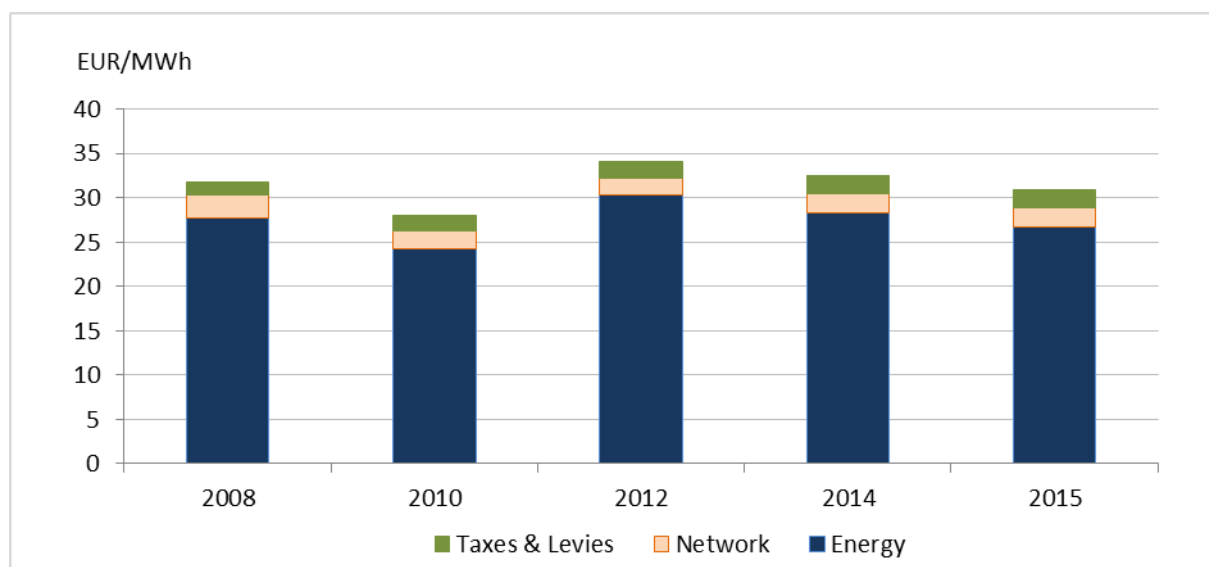
Source: European Commission, Member States

<sup>28</sup> 2010-2015 value for Austria

### 2.2.3.2 Price drivers – Main components

For a detailed description, please consult the section on the main components.

Figure 34 - EU average price components for large industrial natural gas consumers (15)



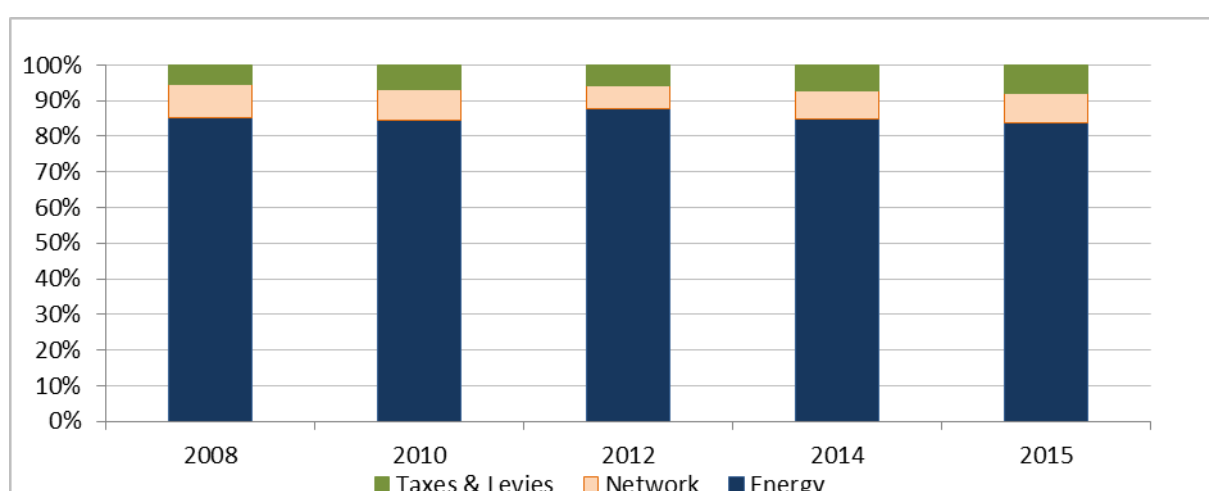
Source: European Commission, Member States

The average Energy component decreased at the annual rate of 0.8% since 2008 and accounted for 22.37 €/MWh in 2015.

The average Network component decreased at the annual rate of 1.9% and accounted for 2.21 €/MWh in 2015.

The Taxes & Levies component increased at the annual rate of 4.4% and accounted for 2.08 €/MWh in 2015.

Figure 35 - Share of price components in the EU average price for large industrial gas consumers(15)



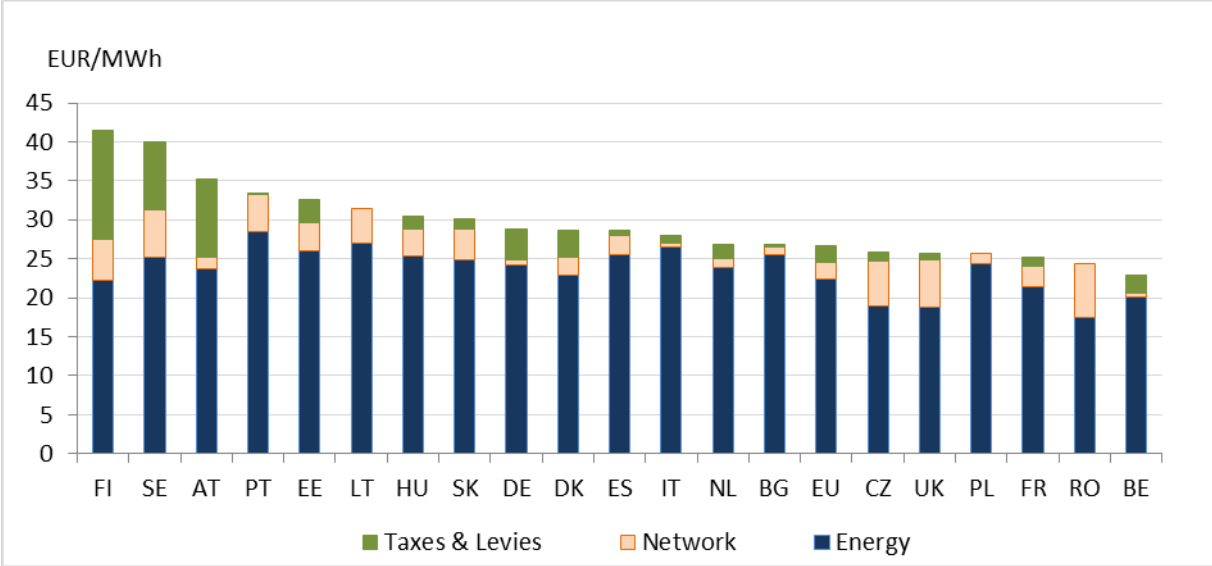
Source: European Commission, Member States

The share of the Energy component in the total price decreased by 1 percentage point and accounted for 84% of the total price in 2015. The energy component remained the largest of the three components in all reporting countries.

The share of the Network component remained constant at 8%.

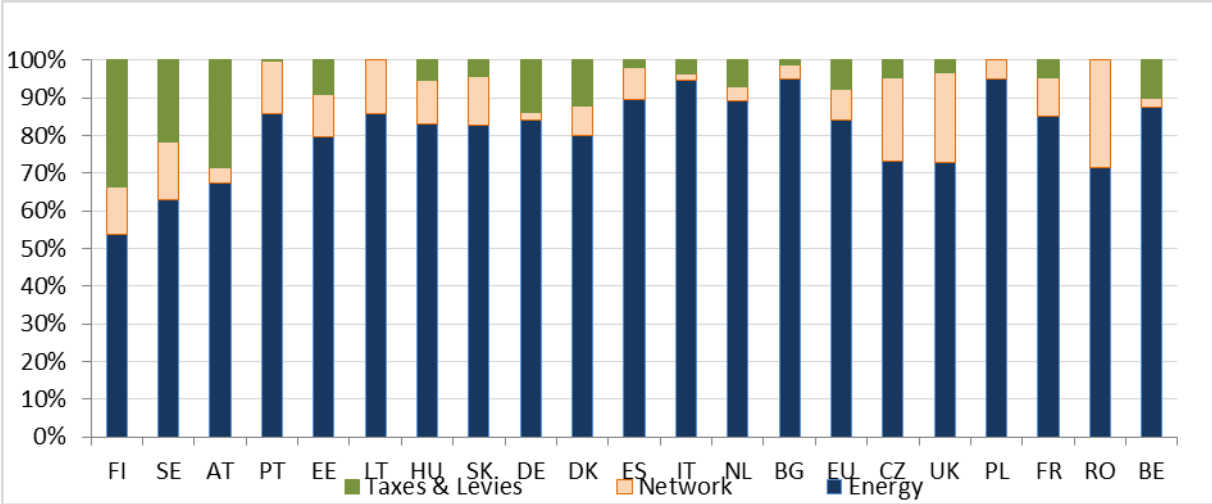
The share of the Taxes& Levies component in the total price increased by 3 percentage points from 5% to 8%.

**Figure 36 - Price components by country in 2015 for large industrial gas consumers (I5)**  
<sup>29</sup>



Source: European Commission, Member States

**Figure 37 - Share of price components in 2015 by country for large industrial gas consumers (I5)**



Source: European Commission, Member States

<sup>29</sup> It is to be noted that according to Eurostat (nrg\_pc\_203) data Sweden has higher industrial prices than Finland.

**Developments within components for large industrial consumers**

It is to be noted, that only explicitly reported cost elements could be allocated to specific policies and consequently taken into account for the analysis. For example, RES or nuclear decommissioning costs exist in several countries which could not report such costs explicitly.

**Energy component**

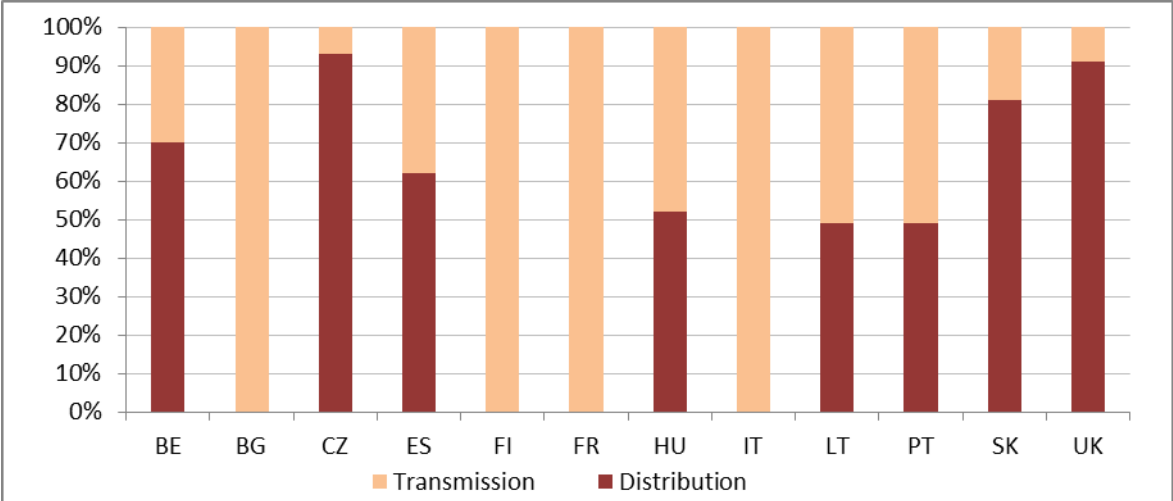
Only one of the three price components, the energy component is determined by the market. Increasing competition contributes to decreasing energy components. The share of the energy component decreased by 1 percentage points and accounted for 84% of the average large industrial price in 2015. The level of the network and taxes & levies components are set by divergent national laws and regulations. Their joint share in the average large industrial price increased from 5% to 6%. As the part of the price which is set by market forces has been moderately decreasing, total prices are imperfect indicators for the measurement of price dispersion. The dispersion of the energy component however adequately reflects the progress towards an internal energy market. The energy component of the average industrial price became 17% less dispersed since 2008.

**Network component**

The Network component is broken down into two sub- components, namely Transmission and Distribution. Both transmission and distribution tariffs are regulated in all EU Member States as well as in Norway and Turkey. The allocation of cost elements (for example costs of infrastructure, losses, ancillary services) to the two sub- components might differ from country to country. Therefore, cross- country comparisons are to be undertaken with caution.

12 reporting countries provided the split between transmission and distribution tariffs<sup>30</sup>.

**Figure 38 - Transmission & distribution shares in 2015 for large industrial consumers (15)**<sup>31</sup>



Source: European Commission, Member States

<sup>30</sup> 2014 data for Spain, Portugal and the United Kingdom.  
<sup>31</sup> Data from 17 Member States were available. The graph displays 2014 shares for Estonia and the United Kingdom. There is no transmission grid on Malta, therefore all costs are attributed to the distribution system.

Transmission shares ranged from 6% in the Czech Republic to 100% in Bulgaria, Finland and Italy, highlighting the lack of harmonization of the definitions for transmission and distribution.

### **Taxes & Levies component**

VAT is recoverable for industrial consumers, therefore the current study analyses prices excluding VAT and other recoverable taxes.

The share of taxes and levies in the EU average price is 8%. The impact of energy policy relevant levies is the least significant for this type of consumer. In Lithuania and Romania industrial natural gas consumers do not pay any taxes or levies.

**Table 4. Overview of sub- components on natural gas prices for large industrial consumers**

Sub- Component	Number of Countries	List of Countries
RES & CHP	1	IT
Nuclear	0	
Social	3	BE, FR, IT
Security of Supply	2	FI, HU
Concession fees	3	AT, BE ,PT
Market operation	2	BE, CZ
Energy Efficiency	0	

Concession fees for the occupation of public land, imposed by 3 Member States represented the most commonly applied levy on natural gas bills.