European Commission

Quarterly Report on European Electricity Markets

Market Observatory for Energy

DG Energy

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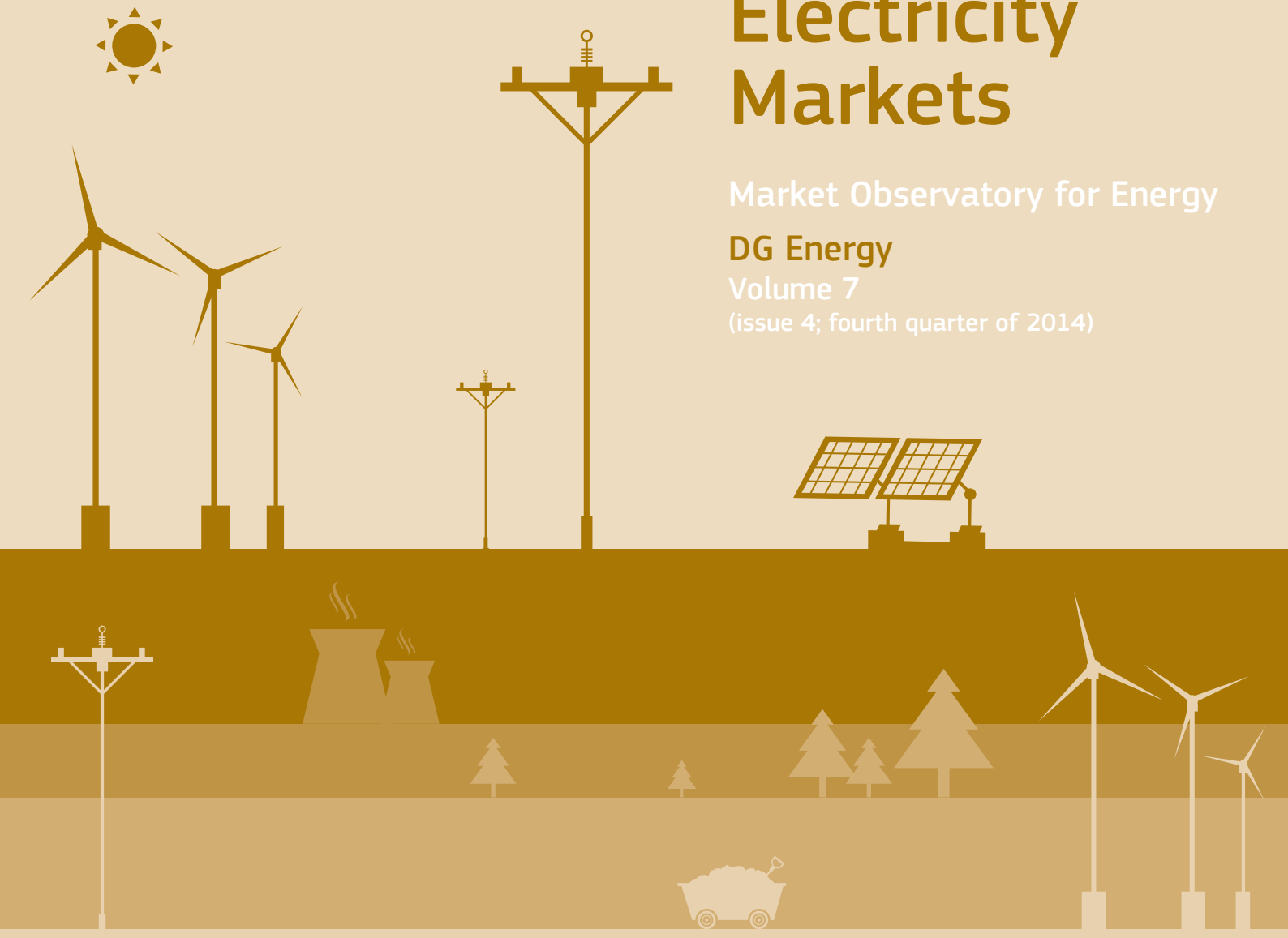

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Content

Highlights of the report

- As the ongoing economic recovery did not result in significant additional demand for electricity, and the relatively mild weather put a lid on residential demand, electricity consumption in the EU stagnated in the fourth quarter of 2014 on year-on year comparison.
- Wholesale electricity prices remained stable in the fourth quarter of 2014 in most of the EU markets, due to healthy power supply and limited demand. Coal prices were fairly stable, natural gas prices mostly increased, and the impact of the fall in crude oil prices did not appear in the gas markets yet.
- Coal fired generation remained profitable in Q4 2014, contrary to natural gas, being uncompetitive in most of the EU countries. Decreasing natural gas generation is replaced in many countries by renewables besides coal.
- Romania joined the electricity market coupling area of the Czech Republic, Slovakia and Hungary, and as a result Romanian wholesale prices started to converge to the other three markets. Now there are twenty-one coupled day-ahead electricity markets in the EU.
- In the last five years wholesale electricity prices in the US and Australia were normally cheaper than in the EU, while prices in Japan were significantly higher than their EU peers. Low electricity prices result in competitive production cost advantages in energy intensive manufacturing industries.
- In the case of industrial retail electricity prices a gradual convergence could be observed across the EU, while for households differences between national prices remained stable.

Executive summary

- **Electricity consumption in the EU remained stable** in September-November 2014 and decreased by 0.2% in the first eleven month of 2014 compared to the same periods of 2013. Parallel to this, the EU Gross Domestic Product (GDP) grew by 1.3% in the fourth quarter of 2014, on year-on-year comparison, similarly to the previous two quarters. As the gross value added increased only slightly in energy intensive sectors (e.g.: industry, construction), and the weather was generally mild across the EU in Q4 2014, demand for power both in the industrial and residential sectors remained moderate.

- **The PEP indicator**, expressing the average evolution of the wholesale power prices in the European markets, **stabilised in the fourth quarter of the year after a sharp increase at the end of the previous quarter.** Import coal prices in North-Western Europe were fairly stable throughout Q4 2014, import natural gas contracted prices showed a steady increase. The significant drop in crude oil prices, serving as price indication for the future evolution of oil-indexed natural gas contracts, did not appear yet in import gas prices in Q4 2014.

- Although the share of wind and solar generation slightly decreased in the fourth quarter of 2014 at EU level, **renewables could increasingly influence the competition between coal and gas,** even in those countries that can flexibly react to the changes in coal-gas price ratio in their power mixes (e.g.: the UK). Although coal generation remained profitable everywhere in the EU in Q4 2014, as opposed to natural gas, in many countries renewable sources tend to replace uncompetitive gas in the power mix instead of coal.

- Despite most of the European electricity markets are coupled with one or more of their neighbours, **there were still significant differences in wholesale electricity prices in the fourth quarter of 2014 in the EU, ranging from 31 €/MWh in Sweden to 59 €/MWh in Greece.** In the last two-three years convergence of wholesale electricity prices between European markets could be observed, however, local generation mixes and changes in the availability of generation and interconnection capacities can result in temporary divergence in market prices.

- **On 19 November 2014 the Romanian day-ahead wholesale electricity market was coupled with the Czech, Slovak and Hungarian markets.** As an immediate consequence, power flows against price differentials, occurring when electricity flows uneconomically from the higher-priced market to the lower-priced one, have completely disappeared since the coupling took place, and the number of hours, when prices in Hungary and Romania converged, have increased significantly; reducing welfare losses in cross-border electricity trading.

- Contrarily to 2012 and 2013, when at the end of December limited industrial demand for electricity combined with inflexible baseload power plants and simultaneously high amount of wind power generation led to negative prices in many European markets, **in December 2014 electricity prices did not fall significantly below the usual levels, as non-dispatchable power generation did not result in market oversupply** at the end of the month.

- **In international comparison the competitiveness of the European economy depends on electricity prices, especially in energy intensive sectors.** In the last five years wholesale electricity price levels in the US and Australia were of comparable magnitude and were significantly lower than prices in the EU during most of the time. In Japan however, wholesale electricity prices were higher by a factor of two to three compared to the EU.

- **During the last couple of years a gradual convergence could be observed between Member States in retail prices for electricity in the case of industrial consumers, while for households differences remained stable across the EU.** Industrial consumers face less often contracts with regulated retail prices and have better negotiating power to get competitive price offers from electricity utilities. For the first time in this report, data on monthly household retail electricity prices in the capital cities of almost all EU member states are presented which data complement well to the official data sources regularly used in the reports.

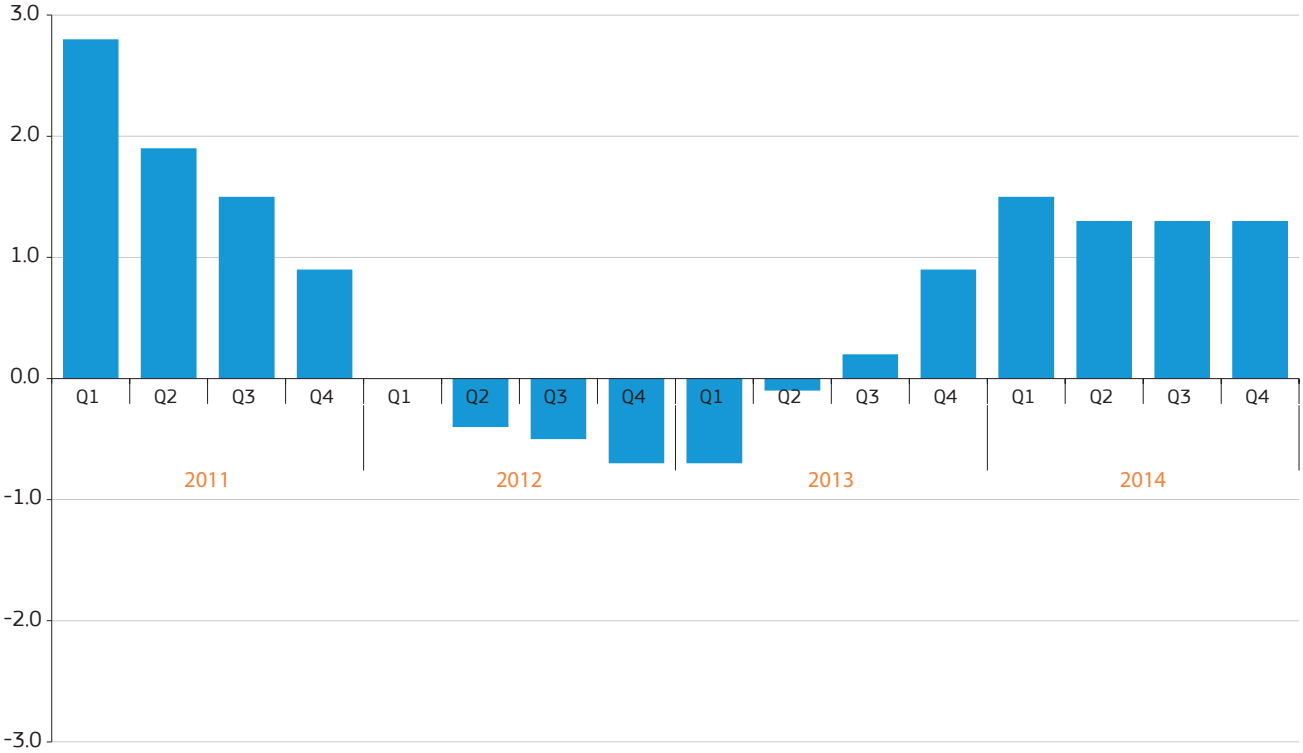
1. Electricity demand drivers

1.1 Drivers of EU electricity demand

- As Figure 1 shows, the economic recovery in the EU-28 continued in the fourth quarter of 2014, and GDP grew by 1.3%, in year-on-year comparison, similarly to the previous two quarters. In the third quarter of 2014 (which is the latest period with detailed data available) gross value added in economic sectors consuming significant amount of energy showed only moderate growth (e.g.: industry: 1%, construction: 0.1%), mitigating the energy demand for the economy as a whole.

- Electricity consumption in the EU-28 remained practically unchanged in September-November 2014 compared to the same period of the previous year, while in the first eleven months of 2014 it decreased by 0.2% compared to the same period of 2013. Decreasing electricity consumption, in parallel with improving economic performance may point on one hand to gains in energy efficiency. On the other hand, it must be noted that decentralised forms of electricity generation do not appear in statistics provided by electricity transmission system operators, serving as a basis for electricity consumption statistics, thus the actual electricity consumption might be underestimated.

FIGURE 1 – EU 28 GDP Q/Q-4 CHANGE (%)

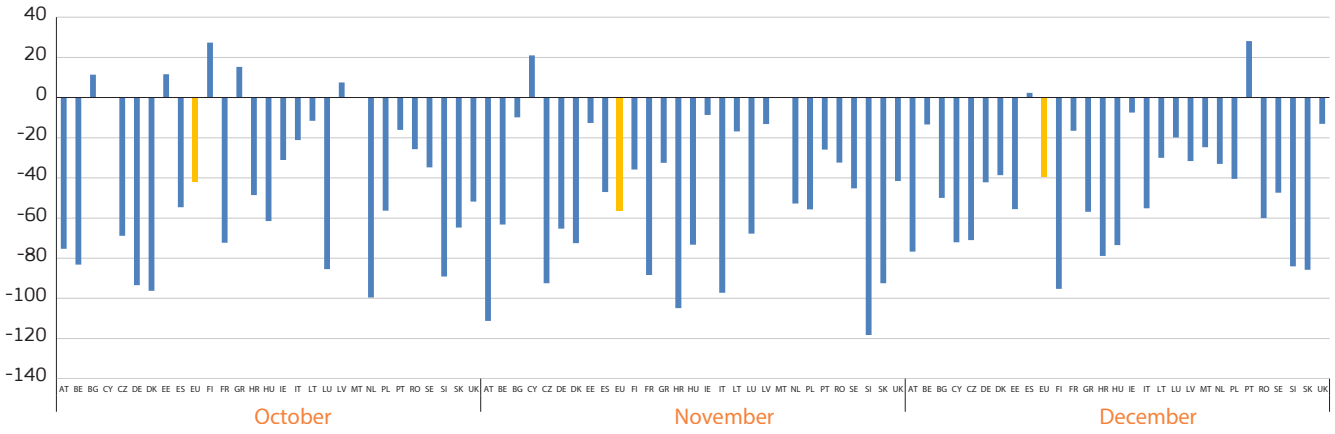


Source: Eurostat

- Figure 2 shows the monthly deviation of actual Heating Degree Days (HDDs) from the long term average in the twenty-eight member states of the EU in October, November and December 2014.

- In most of the member states actual HDDs were lower than the long term average during these three months, implying that temperatures were higher than the seasonal averages, resulting in relatively mild weather. At the beginning of the heating season this mild weather reduced heating related power demand, which might have also contributed to the stagnation in electricity consumption in year-on-year comparison in the fourth quarter of 2014.

FIGURE 2 – DEVIATION OF ACTUAL HEATING DEGREE DAYS (HDDs) FROM THE LONG TERM AVERAGE, OCTOBER – DECEMBER 2014



Source: Eurostat/JRC.
The colder is the weather, the higher is the number of HDDs

2. Evolution of commodity and power prices

2.1 Evolution of power prices, and the main factors affecting power generation costs

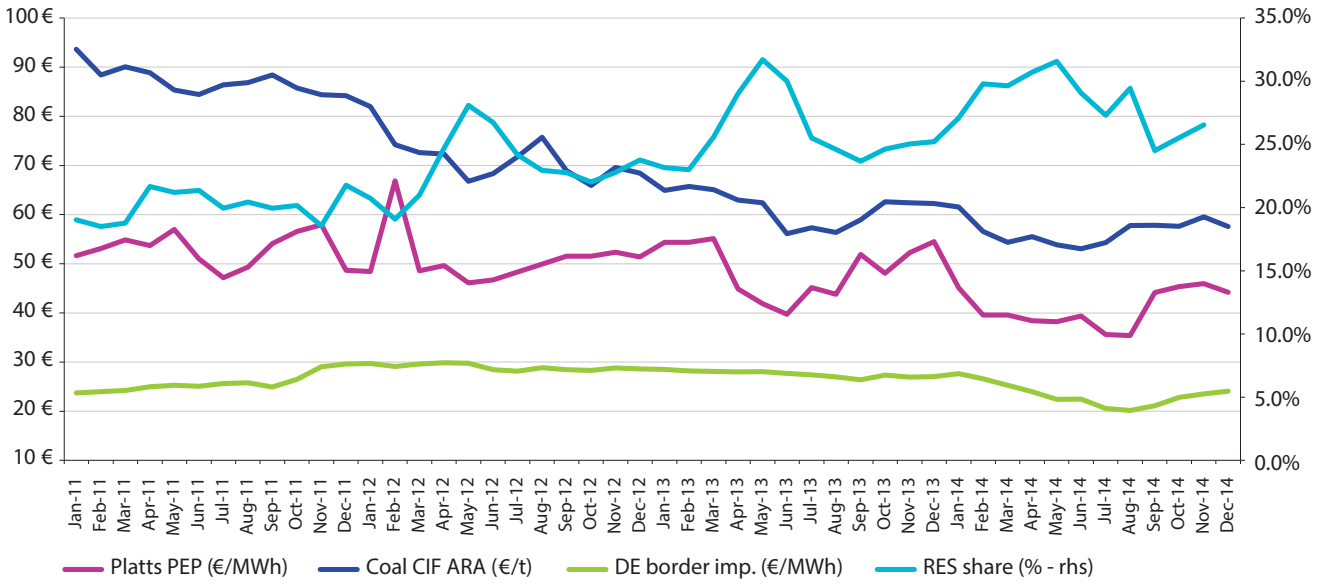
- Figure 3 shows the most important price drivers, affecting electricity generation costs in the EU between 2011 and 2014. Electricity generation mixes show great diversity across the EU member states, however, the increasing share of renewable sources in many countries exerts a downward pressure on wholesale electricity prices (shifting the so-called merit order curve, representing marginal supply costs of different generation technologies, to the right) and coal and gas-fired generetion are still setting the marginal electricity price in most of the European electricity markets.

- Coal prices (as represented by CIF ARA contracts, an import price benchmark widely used in North-Western Europe) decreased signficantly since the beginning of 2011, however, in 2014 they stabilsed in a range of 55-60 €/Mt, and at the end of the year they were close the 60 €/Mt.

- Natural gas prices (measured as import prices on the German border) decreased gradullay since the beginning of 2012, however, after reaching a trough in August 2014 a slight rebound occurred during autumn 2014. It is worth noting that the steep fall in crude oil prices during the last three months of 2014 did not occur yet in natural gas import prices, which normally follow the evolution of crude oil prices with a few months' time lag in long term natural gas supply contracts.

- The share of renewable generation sources (wind, solar, biomass, together with hydro) decreased by 5 percentage points between May and November 2014, and this also impacted the general electricity price level, as the red curve in Figure 3 shows, representing the Platts Pan-European Power Index (PEP) used as an electricity price benchmark in Europe. Since the beginning of 2012 the PEP index was following a decreasing trend, though in the consequence of the factors descbried in the points above it showed a slight increase during the last four months of 2014.

FIGURE 3 – EVOLUTION OF EUROPEAN AVERAGE WHOLESALE POWER PRICES COMPARED WITH COAL AND GAS PRICES AND THE SHARE OF RENEWABLES IN POWER GENERATION

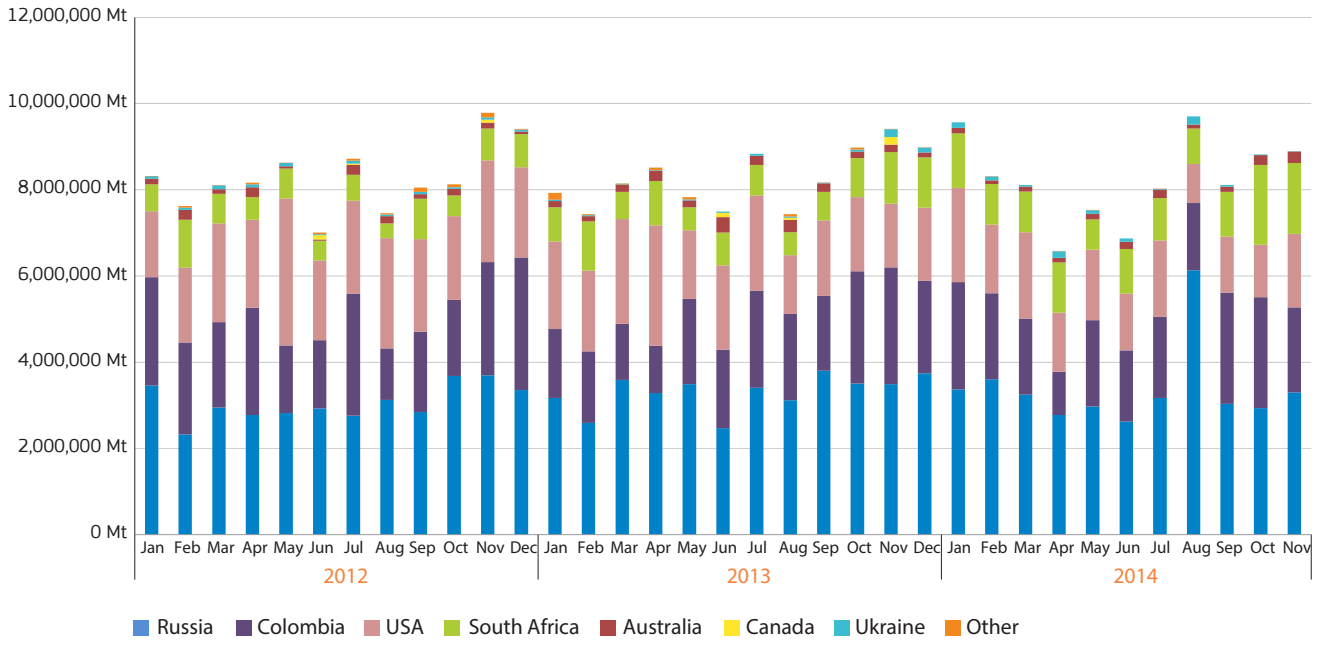


Source: Source: Platts, BAFA, ENSTO-E
Platts PEP: Pan European Power Index (in €/MWh)
Coal CIF ARA: Principal coal import price benchmark in North Western Europe (in €/Mt)
DE border imp. stands for long term contract based import natural gas price on the German border (in €/MWh)
RES (renewables) includes hydro, wind, solar and biomass; RES share in the total power generation estimation for the EU-28 as a whole (right hand scale)

- The EU imported the bulk if its steam coal needs, which is mainly used in power and heat generation, as Figure 4 shows, from Russia, Colombia, the USA and South Africa. Steam coal imports has a seasonal character, as during the winter period the monthly import is higher than in other parts of the year, relating to higher demand for electricity.

- In January-November2014 the amount of imported steam coal grew by 0.4% compared to the same period of the previous year. Imports from Russia, Colombia, and South Africa increased in this period (by 3.3%, 3.4% and 39%, respectively), while imports from the United States decreased by 20% compared to the same period of 2013.

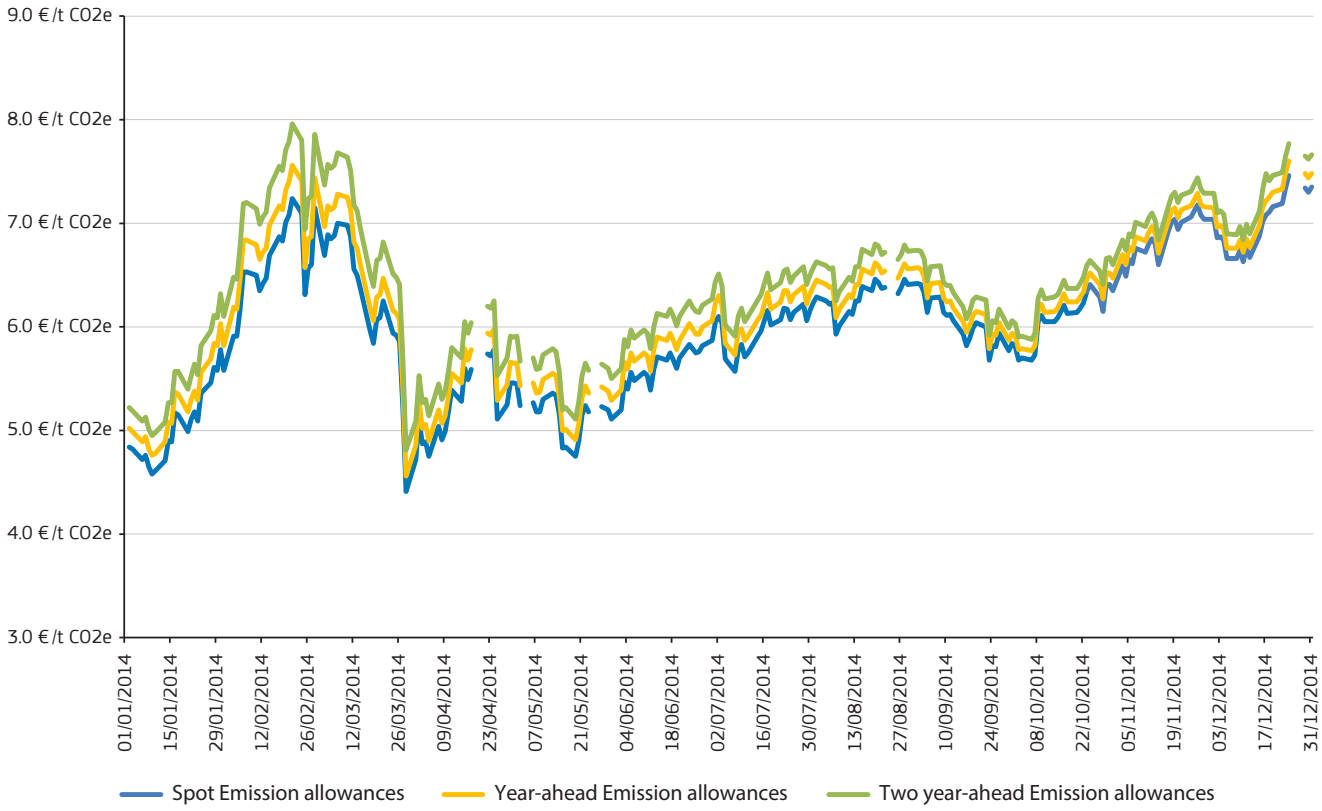
FIGURE 4 – EXTRA-EU STEAM COAL IMPORT SOURCES AND MONTHLY IMPORTED QUANTITIES IN THE EU-28



Source: Platts international coal trader

European emission allowance prices followed an upward trend since the beginning of the second quarter of 2014, when they were slightly below than 5 €/tCO2e, and finished the year between 7-8 €/tCO2e. The carbon market suffers from a constant oversupply, however, news about European policy measures aiming at tackling this oversupply by withdrawing a given amount of emission allowances from the market exerted influence on the price level.

FIGURE 5 – EVOLUTION OF ETS EMISSION ALLOWANCE PRICES IN 2014

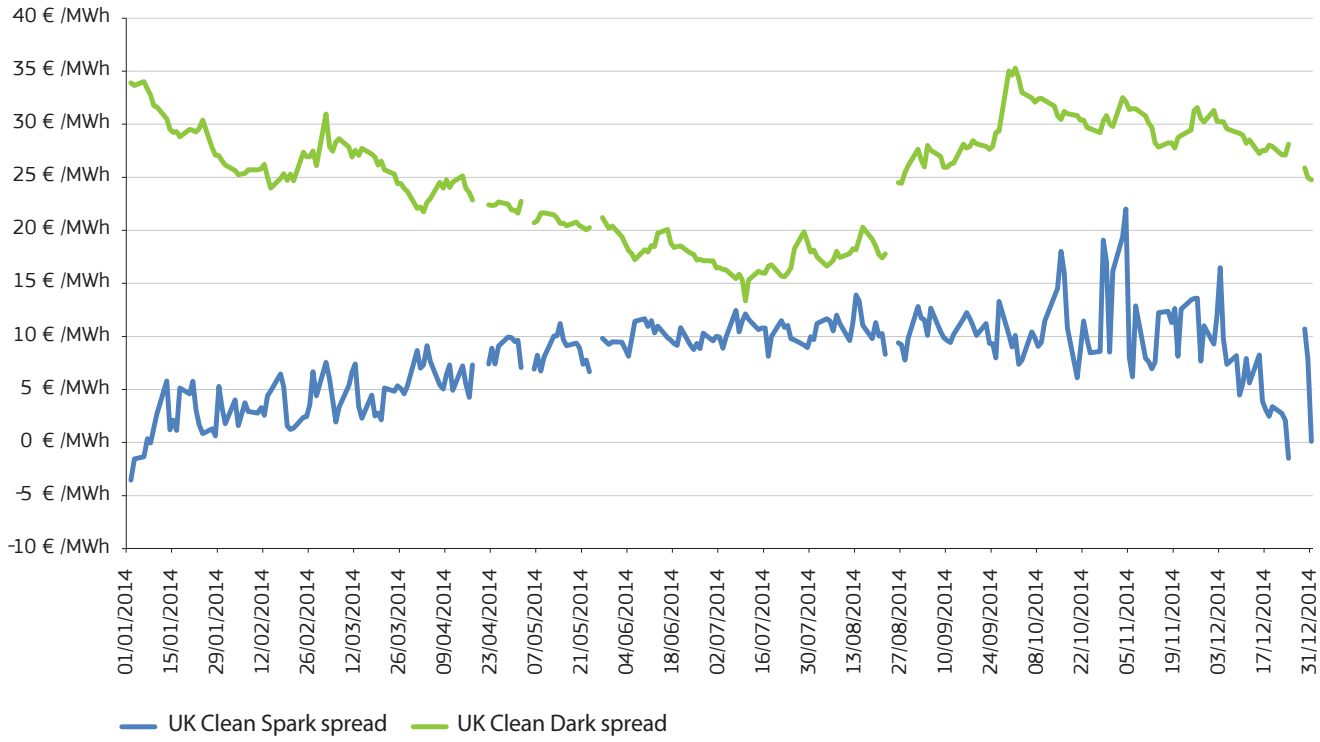


Source: Platts

- As Figure 6 and Figure 7 show, clean spark spreads, measuring the profitability of gas-fired power generation, remained positive in the United Kingdom in the fourth quarter of 2014, though at the end of the year, as prices in the wholesale electricity market fell steeper than the natural gas price, the profitablity decreased almost to zero. In Germany there could hardly be found any trading day in Q4 2014 when the clean spark spread was above zero, pointing to the highly unprofitable nature of gas-fired generation. Natural gas in Germany cannot compete with other generation sources (coal or renewables), and its share in the last two years remained around 5-10% in the country's power generation mix.

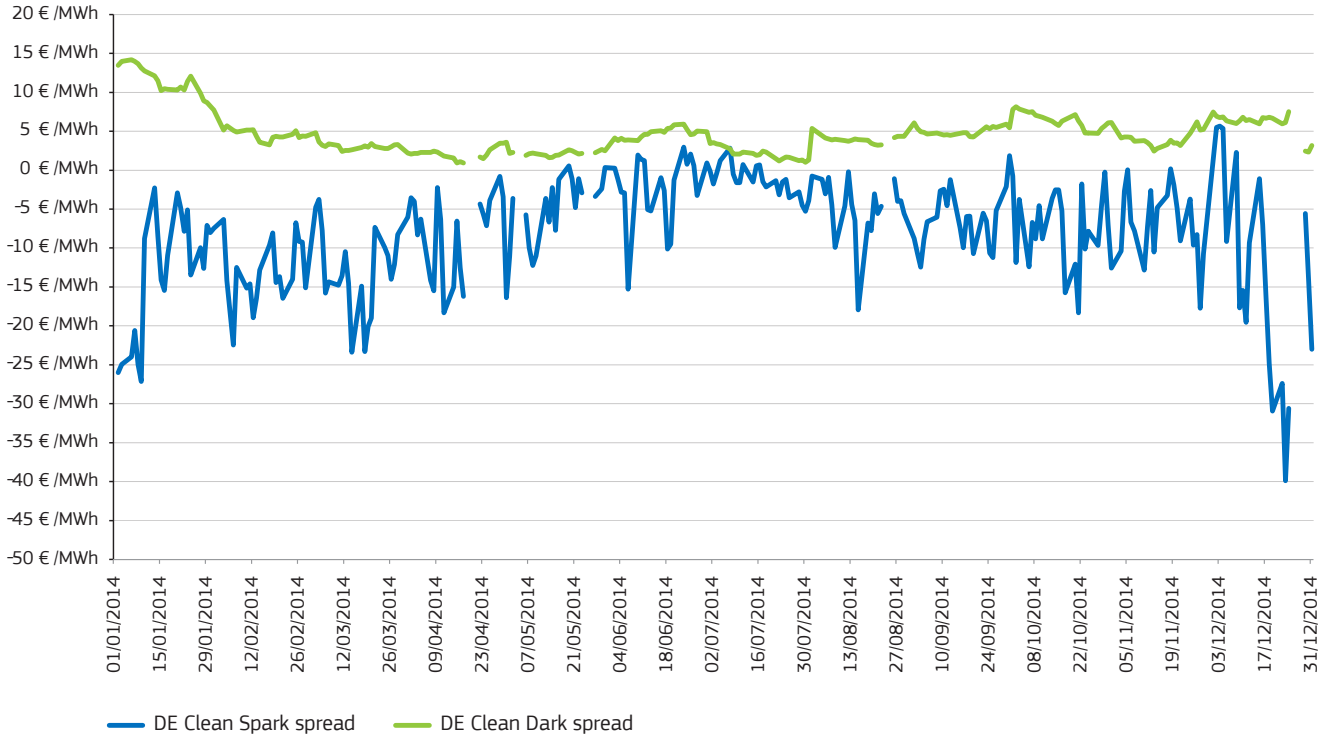
- Clean dark spreads, measuring the profitability of coal-fired generation, remained at high levels (25-30 €/MWh) in the UK in the fourth quarter of 2014, implying a significant proftability of coal-fired power generation. Meanwhile in Germany, due to lower electricity prices in the wholesale market, the profitability of coal-fired generation remained moderate (the average clean dark spread was around 5 €/MWh in Q4 2014).

FIGURE 6 – EVOLUTION OF CLEAN DARK AND CLEAN SPARK SPREADS IN THE UK



Source: Platts

FIGURE 7 – EVOLUTION OF CLEAN DARK AND CLEAN SPARK SPREADS IN GERMANY



Source: Platts

2.2 Comparisons of monthly electricity baseload prices on electricity markets

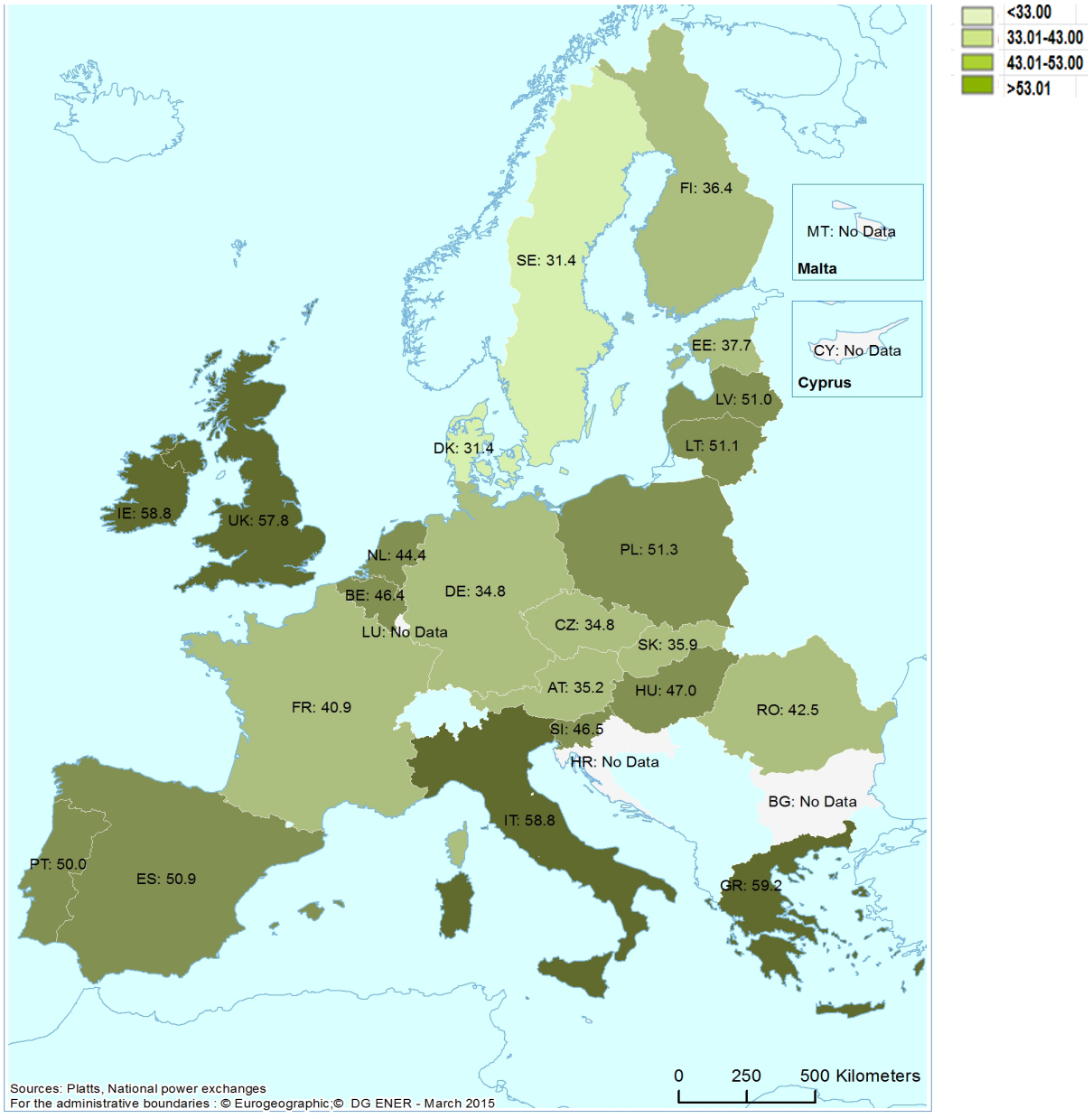
- As the map below (Figure 8) shows, there were significant price differences in wholesale electricity prices across the EU in the fourth quarter of 2014, ranging from 31 €/MWh in Sweden to 59 €/MWh in Greece.

- In three Nordic countries (Sweden, Denmark and Finland) and in some Central European countries (Germany, Czech Republic, Slovakia) the quarterly average wholesale electricity price was particularly low, due to good hydro and renewable generation availability in the power mixes and available interconnections with the neighbouring markets.

- Local market prices may significantly differ from each other even in a coupled region. For example, wholesale electricity prices in the Netherlands and Belgium (both countries were net power importers in Q4 2014) were higher than in France and Germany (being net power exporters). Ongoing outages of generation facilities or transmission infrastructure (e.g.: two nuclear reactors in Belgium, or coal-fired power plants in Poland) can also result in local price deviations from other markets in a coupled area.

- Besides domestic generation mixes and net electricity importer-exporter position of a given country, sufficient level of interconnection capacities also exert significant influence on the local price level. As Spain, Portugal, Italy, Ireland Greece, Latvia and Lithuania do not have sufficient interconnector capacities with other European markets or are connected only to one other European country, measurable premiums in wholesale electricity prices to other countries might exist, as it was the case in Q4 2014, when the quarterly average price level was above 50 €/MWh in all of these markets.

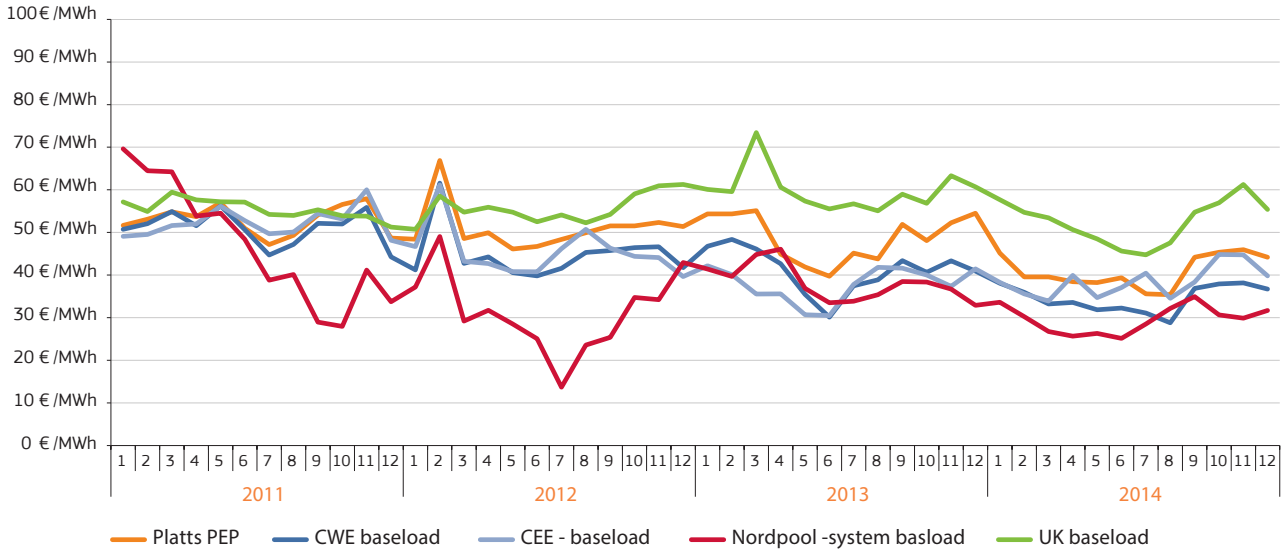
FIGURE 8 – COMPARISON OF AVERAGE WHOLESALE BASELOAD ELECTRICITY PRICES, FOURTH QUARTER OF 2014



- Figure 9 and Figure 10 show the evolution of the monthly average baseload wholesale electricity prices in the main power regions in the EU; in parallel with the Platts European Power Index (PEP). Most of the market indices on Figure 9 showed only minor changes in the fourth quarter of 2014, after shooting up in the third quarter of the year. In the UK monthly average electricity prices were higher than the PEP index, mainly affected by increasing gas prices, while in other markets, as Figure 9 shows, prices were below the PEP benchmark. Prices in the CWE and CEE regions are normally close to the PEP index, while Nordpool system prices are lower, given the region's abundant hydro generation capacities.

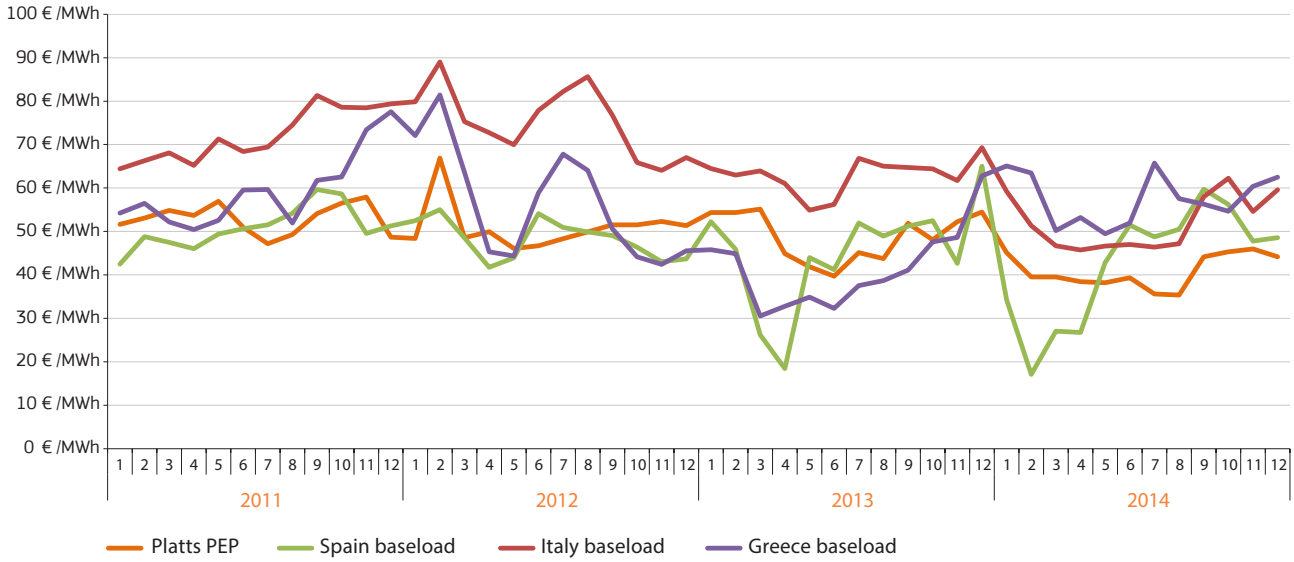
- Price premium of the Italian market to the PEP benchmark index was decreasing during the last few years, as costly fossil fuel generation has been partly replaced by renewables in the country's power mix. However, as the country heavily relies on power imports, the wholesale electricity price is among the highest in the EU. The Spanish market is substantially influenced by domestic hydro availability and the permanent bottlenecks in the interconnection with France, while in Greece the high share of fossil fuels and reliance on power imports make the domestic wholesale electricity price higher than the PEP.

FIGURE 9 – COMPARISONS OF THE PLATTS PEP AND MONTHLY ELECTRICITY BASELOAD PRICES IN REGIONAL ELECTRICITY MARKETS (CWE, CEE, NORDPOOL AND THE UK)



Source: Platts, European power exchanges

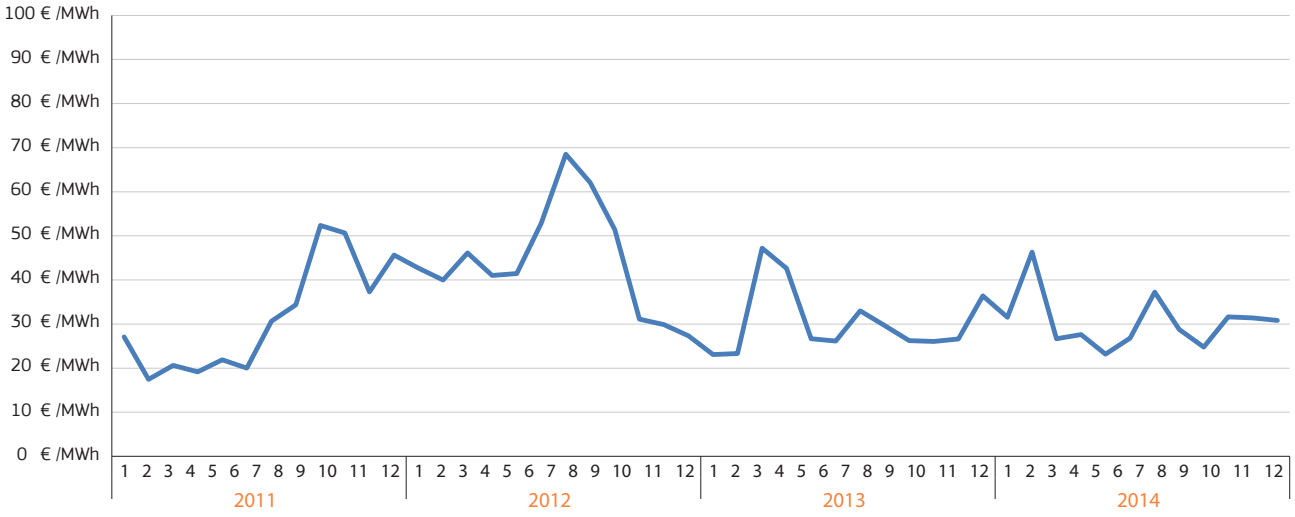
FIGURE 10 – COMPARISONS OF THE PLATTS PEP AND MONTHLY ELECTRICITY BASELOAD PRICES IN REGIONAL ELECTRICITY MARKETS (SPAIN, ITALY AND GREECE)



Source: Platts, European power exchanges

- As it can be followed on Figure 11, wholesale electricity prices showed signs of convergence since the beginning of 2012, as measured by the difference between the highest and the lowest priced market in the EU. However, temporary deviation from the converging trend may occur, as the result of factors described in the previous points above (local generation and infrastructure availability, different fuel mixes, availability and sufficiency of interconnections between neighbouring markets, etc.).

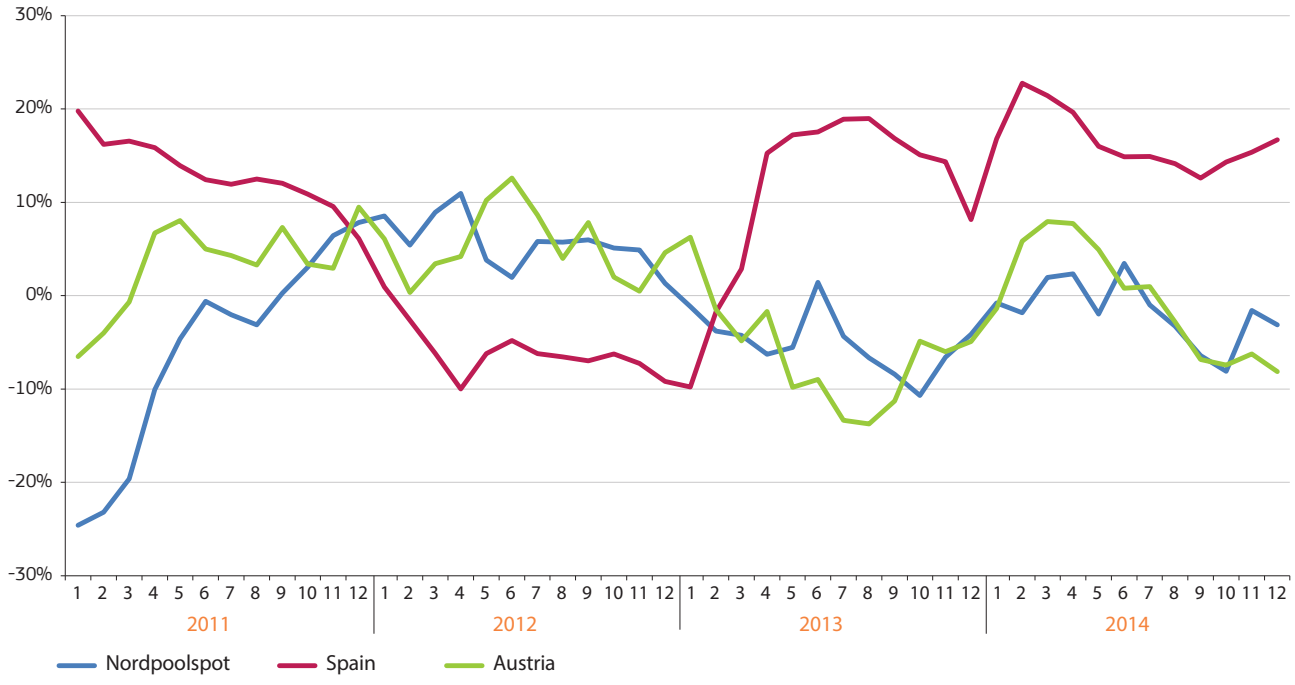
FIGURE 11 – DIFFERENCE BETWEEN THE HIGHEST AND THE LOWEST REGIONAL WHOLESALE ELECTRICITY PRICE



Source: Platts, European power exchanges

- As Figure 12 shows the deviation of actual hydro reservoir levels from the local long term seasonal averages. In Spain the level of hydro reserves was 10-20 percentage points higher than the long term seasonal average during the whole year in 2014. In contrast, Austrian hydro reserves were lower than the long term average since the second half of 2014, and in December the negative gap between the actual and long term level widened to almost 10%. In the Nordic market hydro reserves were decreasing until October 2014, and since then a slight rebound could be observed.

FIGURE 12 – DEVIATION OF HYDRO RESERVOIR LEVELS FROM THE LONG TERM LOCAL TREND IN THE NORDPOOL AREA, SPAIN AND AUSTRIA (IN PRECENTAGE POINTS)



Source: Nordpool, OMEL, E-Control

3. Regional wholesale electricity markets

3.1 Central Western Europe (Austria, Belgium, France, Germany, the Netherlands, Switzerland)

- As Figure 13 shows, the monthly average baseload day-ahead power price in the CWE region remained statble in the fourth quarter of 2014, around 37-38 €/MWh, after a significat jump measured in September 2014. Peakload monthly averages were around 44-45 €/MWh in Q4 2014.

- On the demand side of the wholesale electricity market increasing lighting needs in paralel with the onset of the winter season affected demand for power, however, generally mild weather in the region and moderate economic growth have put a lid on residentail and indsutrial power demand. On the supply side of the market generally high nuclear power generation and healthy overall electricity supply helped in assuring stable prices across the region.

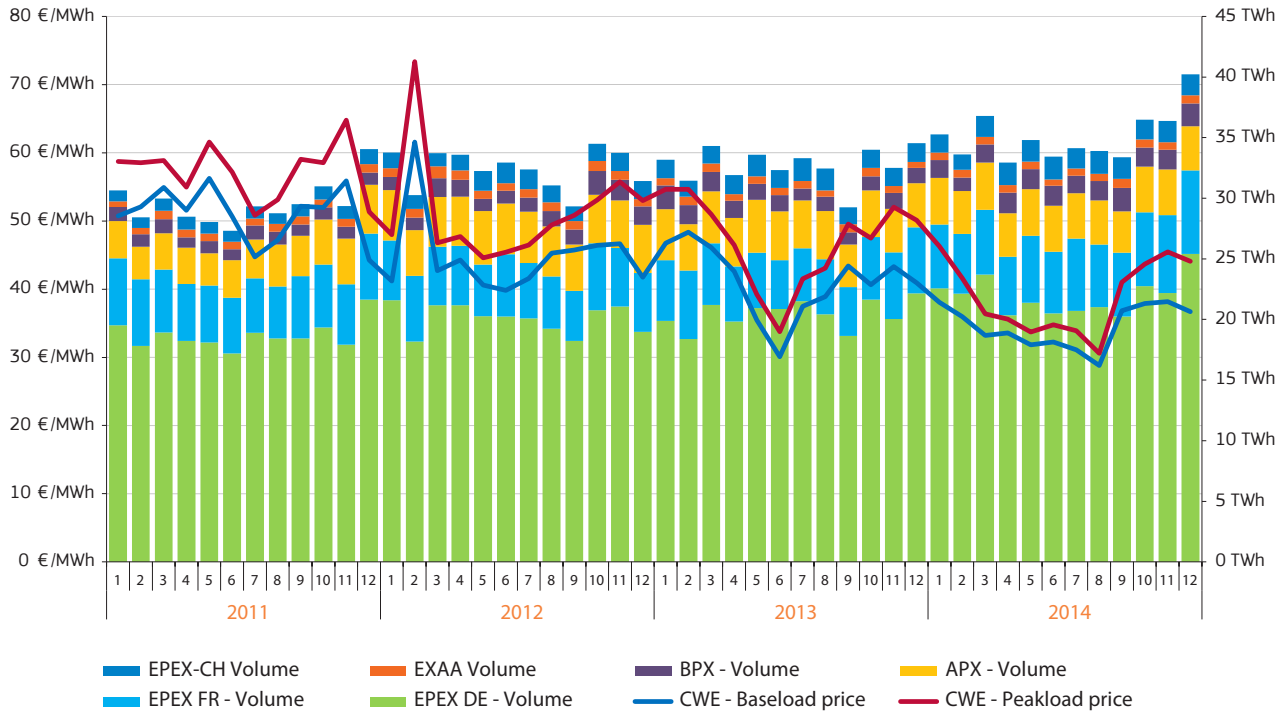
- In Germany the monthly baseload price was slightly up in October and November, due to receding wind power generation. In December wind power generation increased again, however, as it dropped significantly during Christmas holidays, negative hourly prices, which could be observed this time of the year in 2012 and 2013, did not occur at the end of 2014 in the German market. In France strong nuclear power generation assured more than 77% of domestic power production in Q4 2014, reducing the need for fossil fuels and hydro in the power mix, which has lead to eight-year high hydro levels in November 2014.

- Contrarily to Germany and France the Netherlands and Belgium were net power importers in the fourth quarter of 2014. In the Netherlands, importing its power need mainly from Germany and Norway, the December 2014 monthly average baseload price rose to 46 €/MWh, being the highest in twelve months, mainly in the consequence of lower German wind generation and higher natural gas prices, being a crucial cost setting factor in the Dutch domestic power generation.

- Belgium had to heavilty rely on power imports to satifsfy its domestic electricity consumption; almost 28% of its power need had to be imported in Q4 2014. However, on 19 December one of the tree nuclear reactors being permanently offline was reconnected to the grid (Doel-4), resulting in an increase of domestic generation capacities by 1 GW, which triggered an immediate 10% decrease in day-ahead power prices as Figure 14 shows.

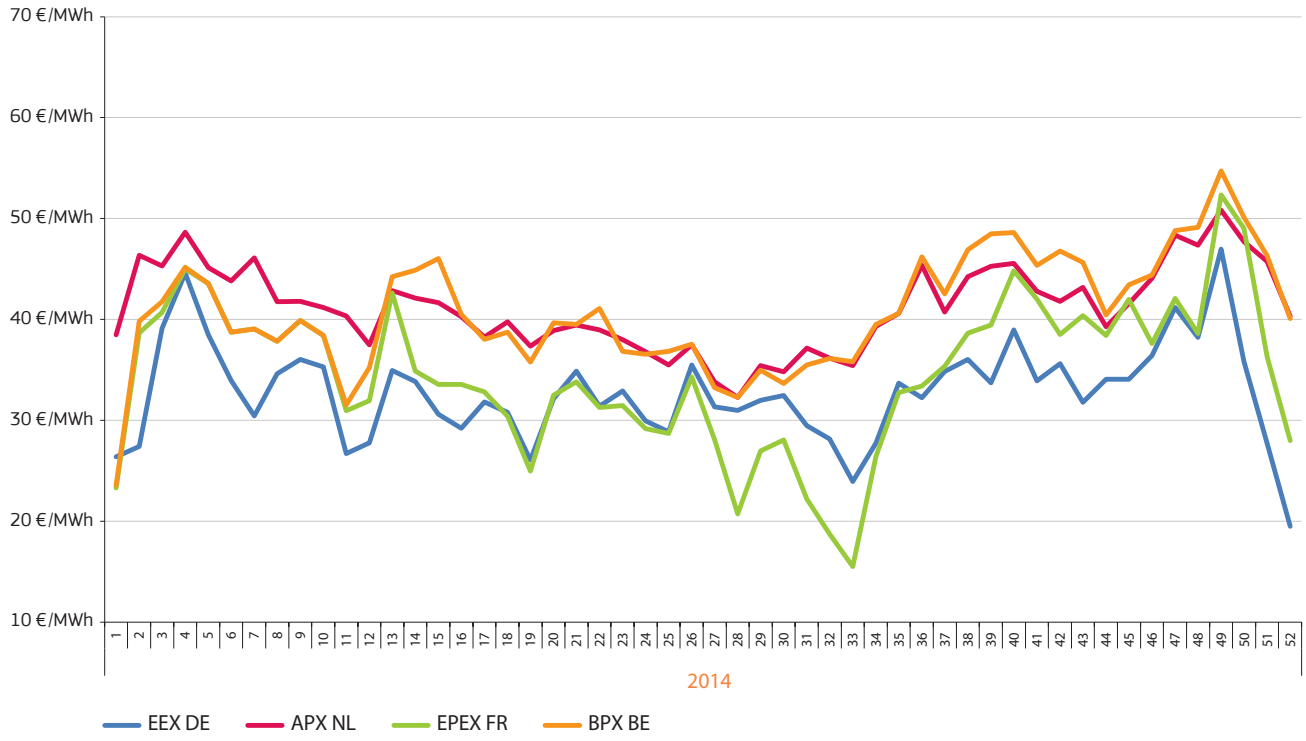
- In Austria and Switzerland the share of hydro power generation, following the usual seasonal pattern, receded in the fourth quarter of 2014 and in December assured around half of the electricity need in the both countries, down from 70% observed in August 2014. In Austria fossil fuels replaced decreasing hydro in the generation mix, while in Switzerland nuclear served as replacement, shifting the power mix in both countries towards costlier generation sources and thus increasing wholesale electricity prices.

FIGURE 13 – MONTHLY TRADED VOLUMES AND PRICES IN CENTRAL WESTERN EUROPE



Source: Platts, EPEX

FIGURE 14 – WEEKLY AVERAGE WHOLESALE POWER PRICES IN THE CWE REGION



Source: Platts

3.2 British Isles (UK, Ireland)

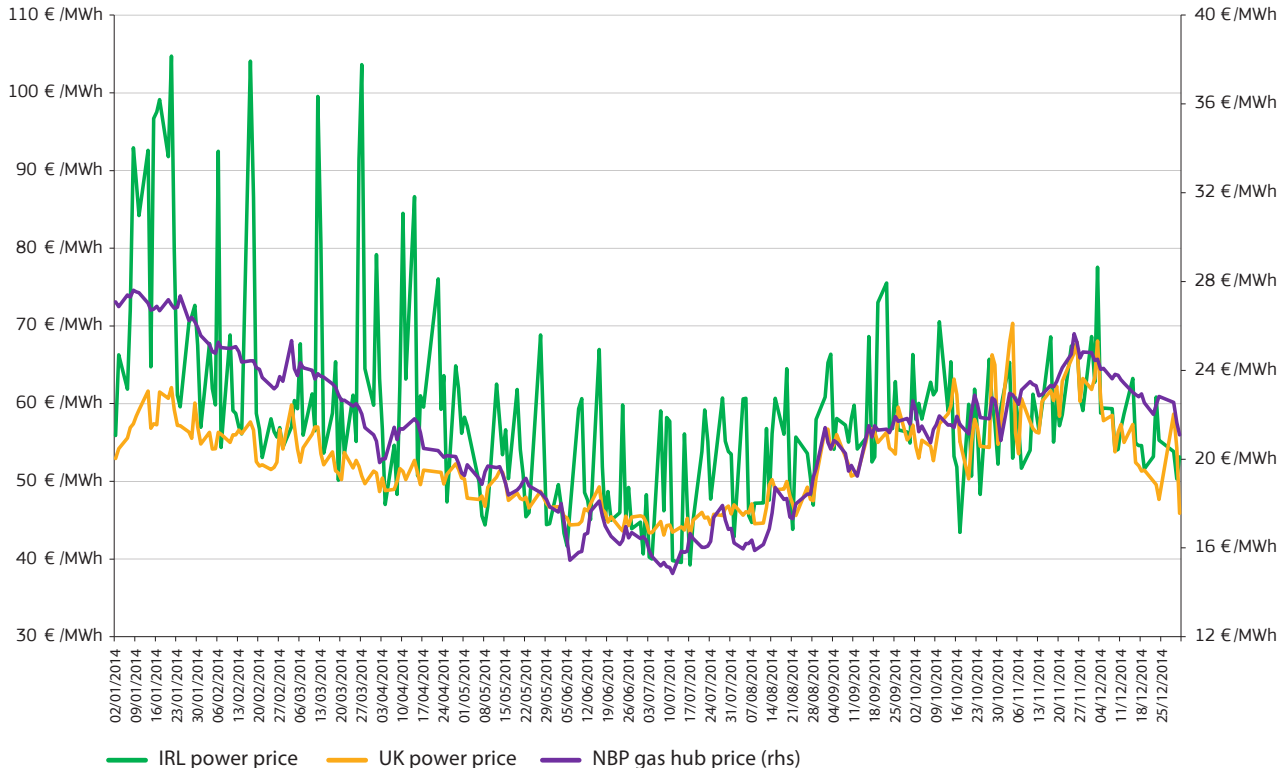
- As Figure 15 shows, baseload power prices in the UK and Ireland continued their upward trend in October and November 2014. The UK monthly average baseload contract stood at 57 €/MWh in October and at 61 €/MWh in November, which latter was the highest since November 2013. The Irish monthly average baseload price also increased in these two months, reaching 59 €/MWh in November. In December 2014 wholesale electricity prices fell back in both countries to a monthly average of 55-56 €/MWh.

- At the beginning of Q4 2014 the evolution of wholesale electricity prices in the UK was primary influenced by supply concerns, as four nuclear reactors were taken offline in October, and by increasing natural gas prices. In November, though the nuclear reactors were restarted, decreasing wind generation and further increasing gas prices exerted an upward pressure on the wholesale electricity market, resulting in price spikes (the daily average price rose above 70 €/MWh several times during the month). In December, due to the combined impact of decreasing natural gas prices, pick-up in wind generation, and decreasing demand for power at the end of the year, wholesale prices began to decrease.

- Coal-fired generation remained highly profitable during the whole Q4 2014 in the UK. Gas-fired generation was also profitable, however, as in December power prices declined steeper than gas prices, the profitability vanished by the end of the year. The UK power mix normally reacts quickly to gas-coal relative price changes, however, decreasing gas generation was only partially offset by coal; it was rather renewables that replaced gas. In December 2014 the share of fossil fuels in the UK power mix decreased to 53%, being the lowest in the last five years, which shows the increasing importance of renewables in the country's generation mix.

- Irish price premium to the UK wholesale electricity market has almost completely disappeared (being less than 1 €/MWh) in the fourth quarter of 2014 for the first time in the last five years. As a result of better interconnection capacities with the UK and a more diversified power generation mix in Ireland and as wind can increasingly substitute gas in the power mix besides coal, owing to increasing wind power generation, the day-ahead wholesale price became less volatile, and the premium to the UK shrunk significantly during the last few quarters.

FIGURE 15 – DAILY AVERAGE POWER PRICES IN THE UK AND IRELAND, IMPACTED BY GAS PRICES



Source: Platts, SEMO

3.3 Northern Europe (Denmark, Estonia, Finland, Latvia, Lithuania, Norway, Sweden)

- The monthly average wholesale system price in the Nordpoolspot market stood at 35 €/MWh in September 2014; by November it fell below 30 €/MWh and finished the year at 32 €/MWh, showing a high degree of stability during the fourth quarter of 2014, as Figure 16 shows. Following the seasonal pattern, the average monthly traded volume increased significantly between September and December 2014 (from 25 TWh to 35 TWh) in the Nordpoolspot market.

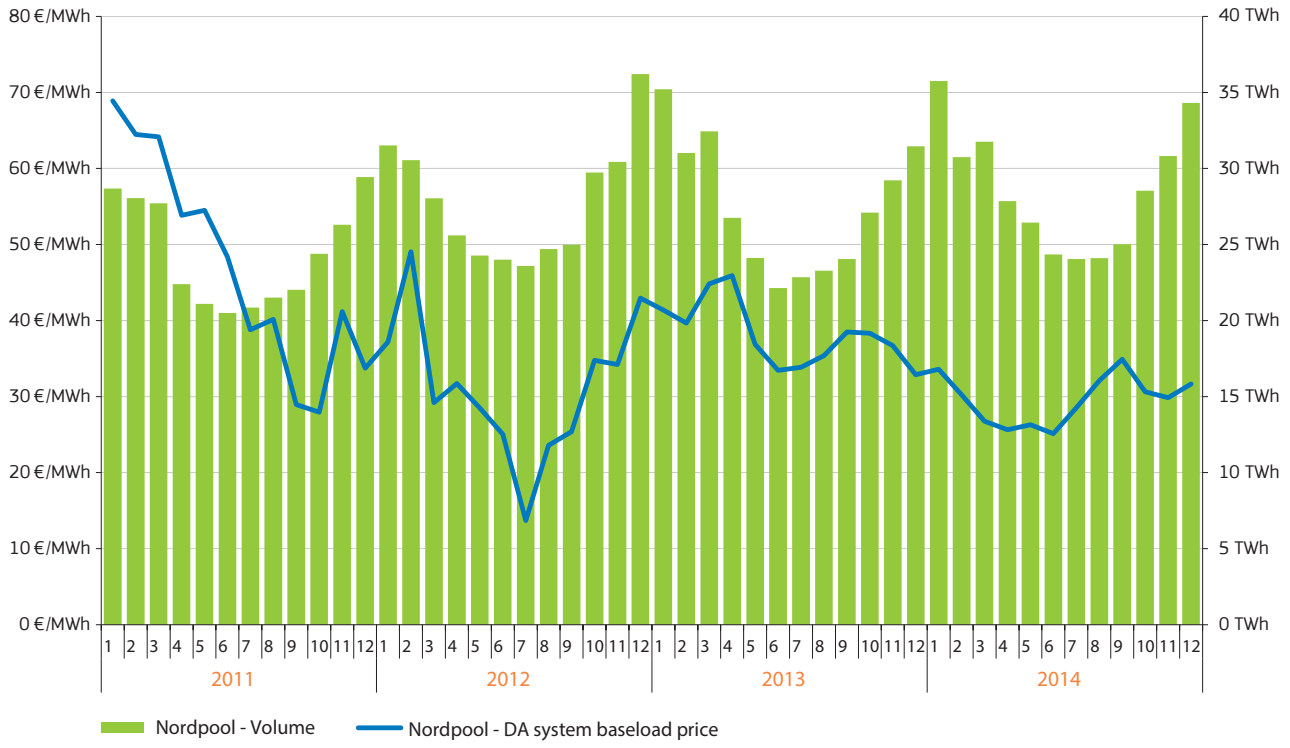
- Hydro levels in the Nordic region were 8% below than the long term seasonal average in September 2014, however, this difference decreased to 2% by the end of the year. Improving hydro availability had a downward impact on regional wholesale electricity prices.

- Besides hydro power generation in Norway, other sources also played a key role in the Nordic region. In Sweden and Finland nuclear power generation was the principal source of electricity in the fourth quarter of 2014, assuring respectively 44% and 35% of the domestic generation in the two countries. In Finland biomass assured around 17% of the electricity generation; implying that most of the Nordic region can massively produce baseload power that can be exported to other countries.

- Norway proved to be the cheapest market again in the Nordic region with an average price of 31 €/MWh in the fourth quarter of 2014, while in Latvia and Lithuania the quarterly average price reached 51 €/MWh. This latter country imported 80% of its total electricity imports (and half of its consumption) from Belarus and Russia, implying that the necessary connections with other areas of the Nordic market still need to be implemented.

- Wholesale electricity prices in the countries of the Nordic region showed 5-15 €/MWh discounts to Central Western and Central Eastern European markets in Q4 2014, resulting in good power export opportunities. Norway exported most of its power to Sweden and the Netherlands, while Sweden exported the bulk of its own electricity generation to Finland, Poland, Denmark and Germany.

FIGURE 16 – MONTHLY TRADED VOLUMES AND PRICES IN NORTHERN EUROPE

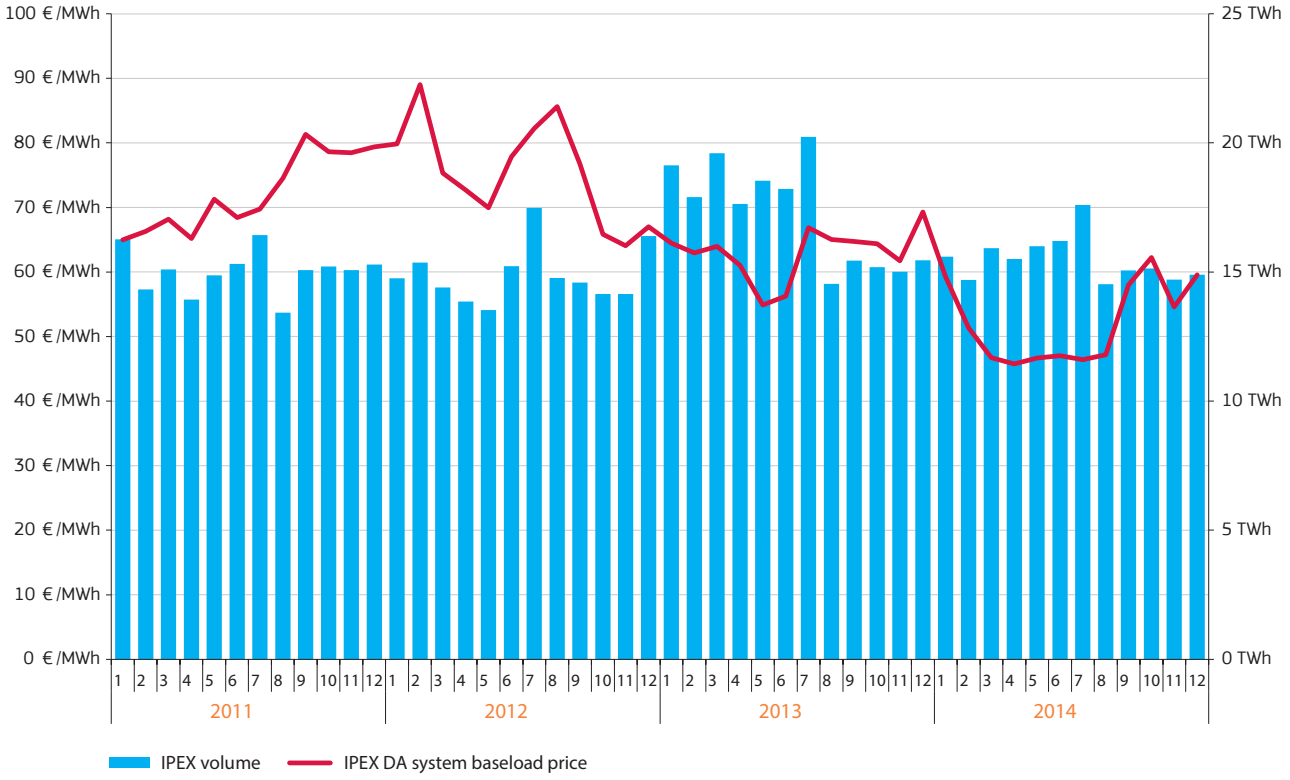


Source: Nordpool spot market

3.4 Apennine Peninsula (Italy)

- Between October and December 2014 the Italian monthly average baseload electricity price fluctuated in a range of 55-62 €/MWh, which was higher than in the third quarter of 2014 (46-58 €/MWh).
- In October 2014 the Italian monthly baseload average price rose by 7% compared to September, primarily owing to outages in some coal fired generation facilities in the country and to increasing natural gas prices on the PSV national hub on fears from the consequences of potential gas shortages from Russia, because of the ongoing crisis in Ukraine.
- In November however, as gas supply fears eased and due to heavy rainfalls hydro availability improved in Italy, wholesale electricity prices began to fall. In December, despite decreasing oil and gas prices, temperatures being higher than the seasonal average, and decreasing demand for power in the industrial sector at the end of the year, the monthly average baseload price rose back to close to 60 €/MWh.
- The share of conventional thermal generation (gas, coal and oil) in the Italian power mix was more than 65% in October-November 2014, definitely higher than in Q2 2014 (53%) and in Q3 2014 (57%), while at the same time share of hydro and renewables was comparatively lower, resulting in higher generation costs and wholesale electricity prices.

FIGURE 17 – MONTHLY TRADED VOLUMES AND PRICES IN ITALY



Source: GME (IPEX)

3.5 Iberian Peninsula (Spain and Portugal)

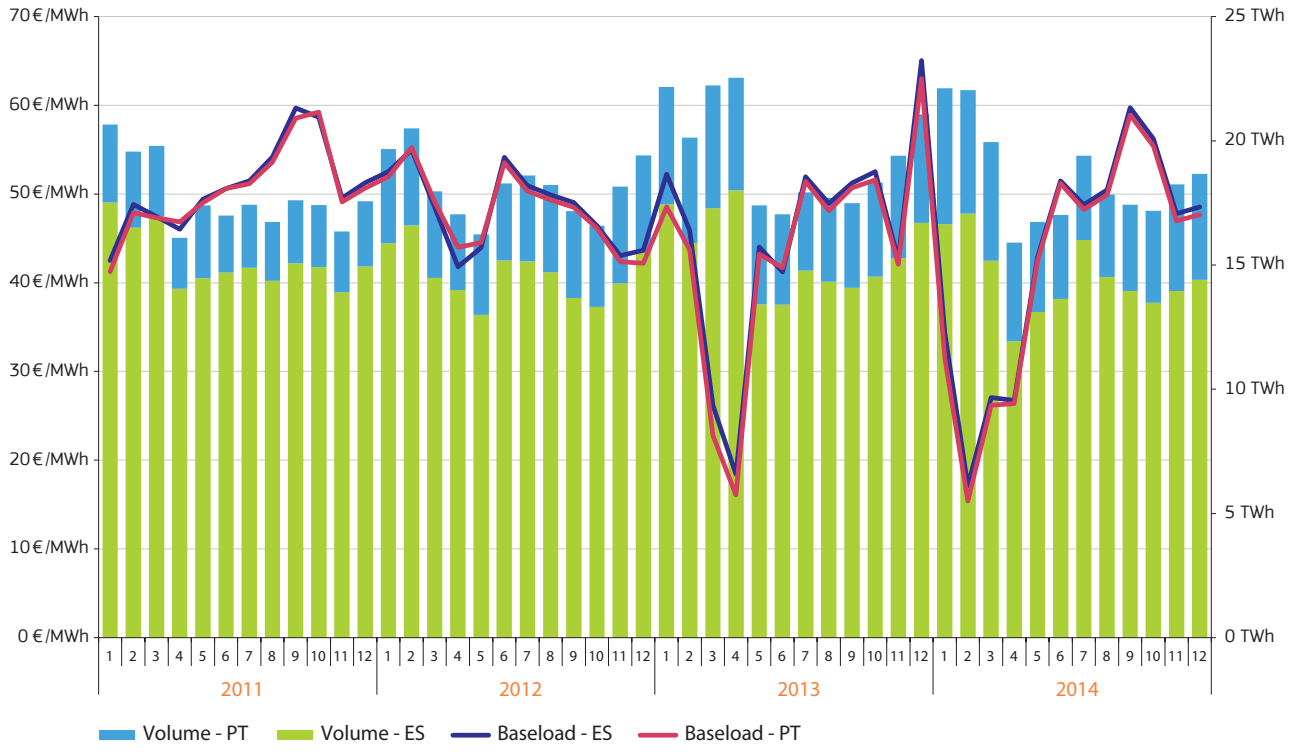
- Spanish and the Portuguese wholesale electricity markets could be characterised by a decreasing price trend in the fourth quarter of 2014. While in September 2014 the Spanish monthly average baseload price was 60 €/MWh (and the equivalent Portuguese contract stood at 59 €/MWh), in December it fell back to 49 €/MWh (and the Portuguese baseload average fell to 48 €/MWh).

- This decrease in wholesale electricity prices was mainly due to seasonal impacts, decreasing demand after the summer peak and seasonally mild weather resulting in the lack of additional demand for power. Although in November one of the seven nuclear reactors of Spain had to be taken offline, supply side constraints did not appear in the electricity market. In December 2014 prices remained practically at the same level as in November.

- The share of fossil fuels decreased in Q4 2014 in the power generation mix in both Spain and Portugal, and coal and gas was replaced by less costly generation sources, such as hydro and wind, resulting in decreasing wholesale prices in the market. As in Portugal the share of hydro and renewable sources was higher than in Spain (58% vs. 36% in October-November 2014), wholesale electricity prices were below their Spanish peers.

- As in Spain there was a 10 €/MWh price premium to the French market in Q4 2014 on average, it is reasonable to say that the market coupling between the two countries, implemented in May 2014, could still not have a full impact on wholesale price convergence between France and Spain, in the lack of sufficient level of interconnections, which need to be solved in order to fully integrate the Iberian markets into North-Western Europe coupled area.

FIGURE 18 – MONTHLY TRADED VOLUMES AND PRICES IN THE IBERIAN PENINSULA



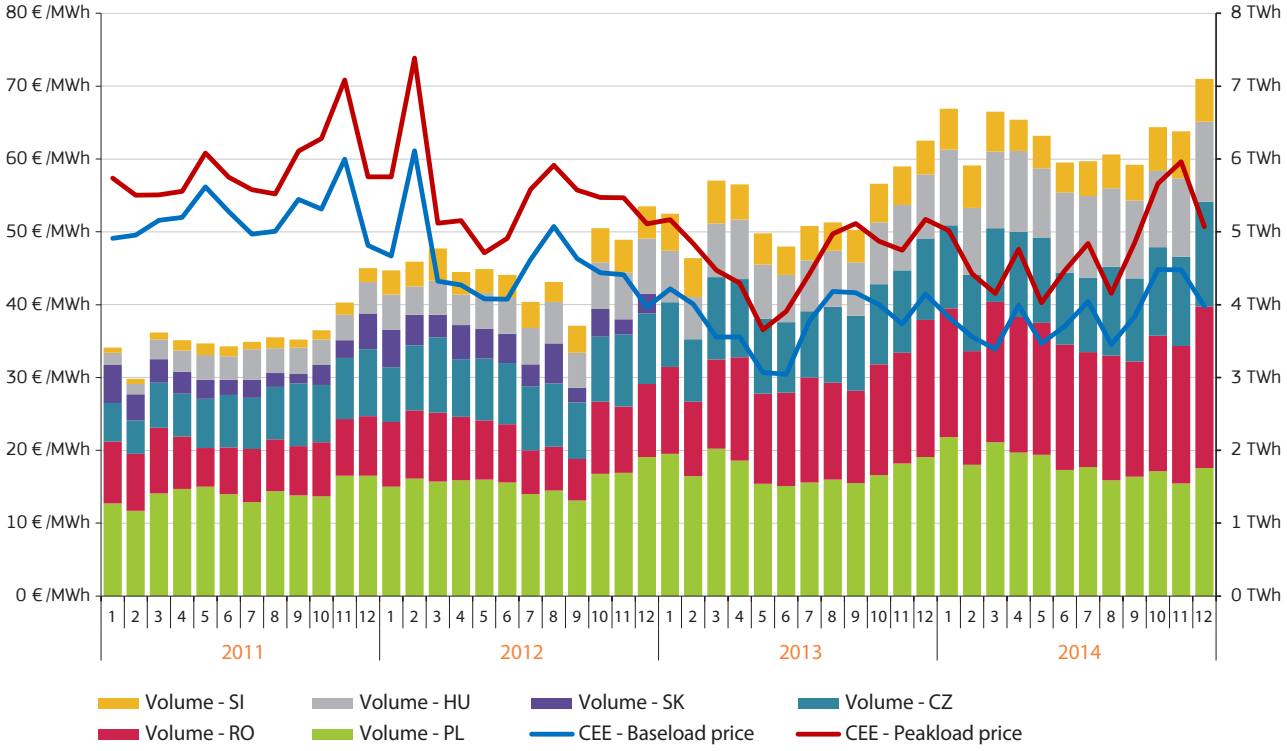
Source: Platts, OMEL

3.6 Central Eastern Europe (Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia)

- As Figure 19 shows, the combined traded volume of day-ahead baseload power contracts in the CEE region reached 19.9 TWh in the fourth quarter of 2014, which was up by 12% compared to the same quarter of the previous year; continuing the dynamic growth of the last few years.

- The monthly average regional baseload wholesale price rose from 39 €/MWh in September 2014 to 45 €/MWh in November, while the monthly peakload average rose from 49 €/MWh to 60 €/MWh during the same time; both reaching in November the highest monthly price since the third quarter of 2012. In December both monthly baseload and peakload averages fell back, respectively to 40 €/MWh and 51 €/MWh.

FIGURE 19 – MONTHLY TRADED VOLUMES AND PRICES IN CENTRAL EASTERN EUROPE



Source: Regional power exchanges, Central and Eastern Europe (CEE)

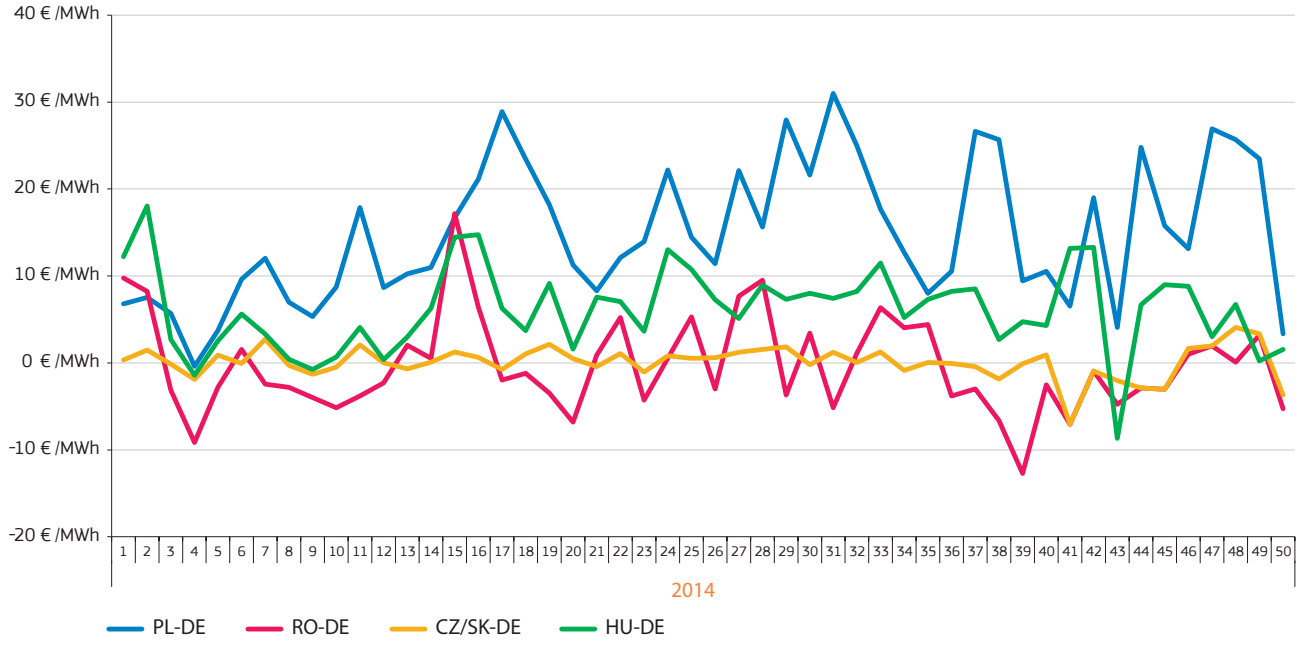
- Figure 20 shows, Polish wholesale electricity prices were the most expensive in the CEE region in the fourth quarter of 2014, by the end of November reaching a more than 25 €/MWh premium to the German market. The monthly average Polish baseload price was 51 €/MWh in November 2014, being the highest since autumn 2011. During Q4 2014 plant maintenance works, low capacity margins putting pressure on the balancing market and low wind generation in Central Europe assured an upward pressure from the supply side on the Polish electricity market. High prices in Poland assured good power export opportunities for Sweden and Germany, given the significant Polish price premium to these two countries.

- Czech and Slovak market prices were the most closely aligned with their German peers; at the beginning of the fourth quarter of 2014 they were even in discount, however, in November they were in slight premium to Germany, as the share of fossil fuel generation increased in the two countries' power mixes and cross border curtailments on the Slovak-Hungarian border were over.

- In Hungary the aforementioned interconnection curtailments, combined with plans on maintenance works of the country's nuclear plant resulted in higher prices in the first half of October 2014. Later on the return of cross border capacities and healthy level of hydro reserves in the Balkans, combined with mild weather conditions helped in reducing price premiums to Germany.

- Romanian power prices started Q4 2014 with a 10 €/MWh price discount to Germany, however, as later the share of hydro power, renewables and nuclear power generation decreased in the domestic generation mix, leaving higher part to fossil fuels, the wholesale price level started to increase and the price discount turned to a slight premium by the end of November 2014.

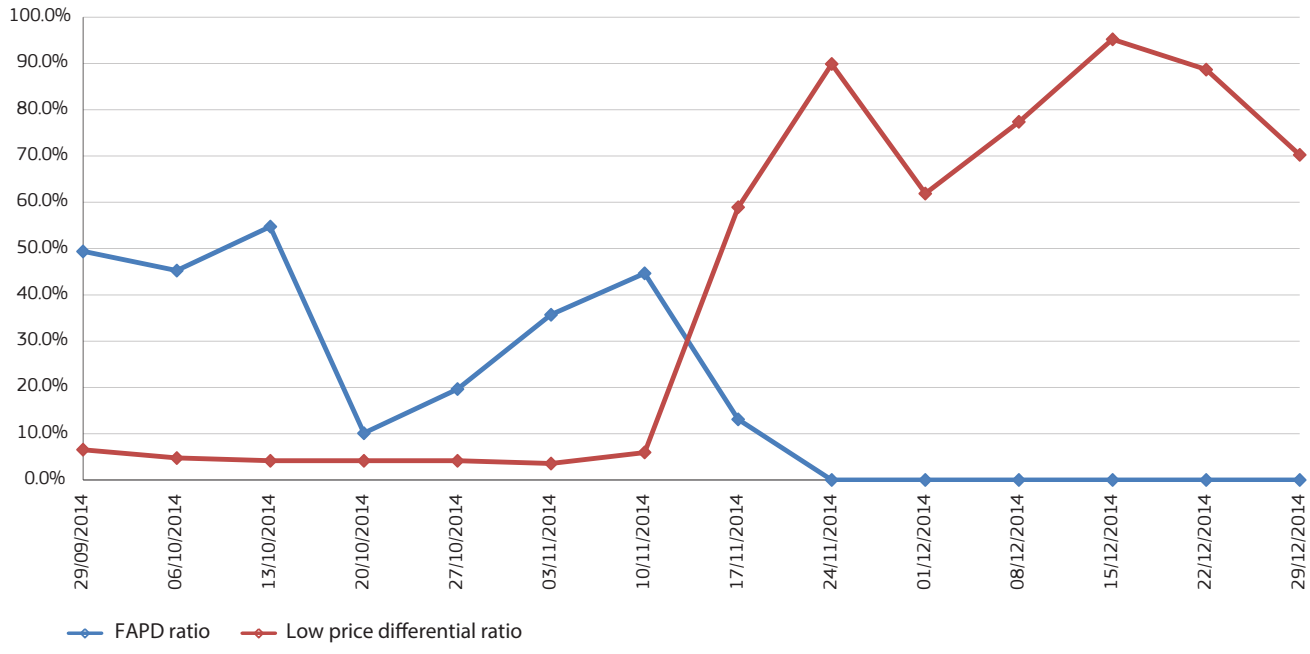
FIGURE 20 – REGIONAL WEEKLY BASELOAD PRICE PREMIUMS OR DISCOUNTS TO THE GERMAN MARKET



Source: Platts (EPEX), Regional power exchanges

- On 19 November 2014 the Romanian day-ahead wholesale electricity market was coupled with the Czech, Slovak and Hungarian trilateral coupling area. As the next chart (Figure 21) shows, flows against price differentials (FAPDs) practically disappeared after the coupling had taken place, and the ratio of trading hours, when the price differential between the Hungarian and the Romanian market was less than 1 €/MWh, rose significantly, providing evidence for better price convergence between the two countries.

FIGURE 21 – RATIO OF FAPDS AND RATIO OF WEEKLY TRADING HOURS WITH CONVERGING PRICES BETWEEN HUNGARY AND ROMANIA



Source: HUPX and OPCOM

3.7 South Eastern Europe (Greece)

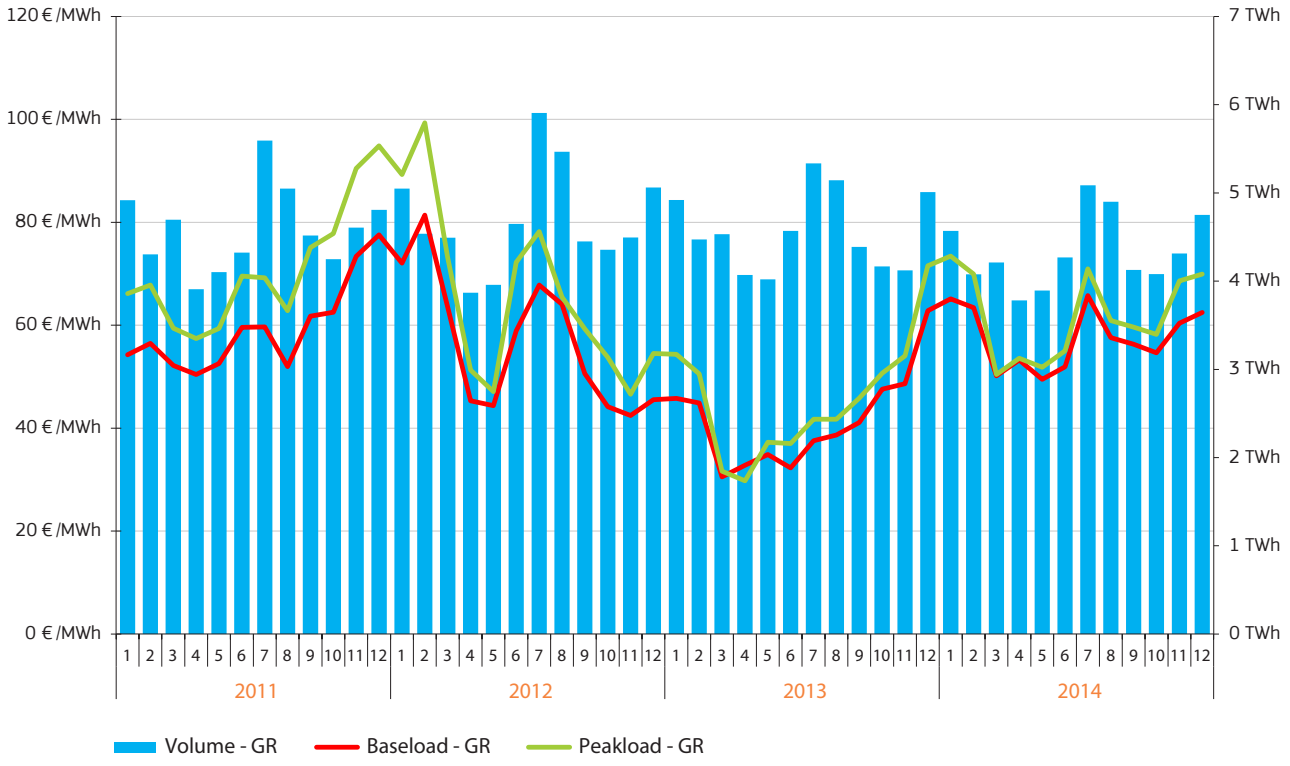
- Between September and December 2014 the Greek monthly average wholesale baseload power price rose from 56.3 €/MWh to 62.5 €/MWh, while during the same time the monthly average peakload contract went up from 59.6 €/MWh to 70 €/MWh.

- Between September and December the share of renewables in the Greek electricity generation mix decreased from 19% to 15%, and this decrease could not be fully compensated by increasing hydro generation. The share of gas fired generation increased, while hard coal and lignite remained practically the same. These changes resulted in a slight shift to costlier power generation sources, putting an upward price pressure on the wholesale electricity market in Greece.

- In the fourth quarter of 2014 Greece still had to heavily rely on imports in order to satisfy its domestic power needs. Similarly to the previous two quarters, Greece imported around 20% of its consumption, mainly from Bulgaria, the Former Yugoslav Republic of Macedonia, Italy and Turkey.

FIGURE 22 – MONTHLY TRADED VOLUMES AND PRICES IN GREECE

Source: DESMIE



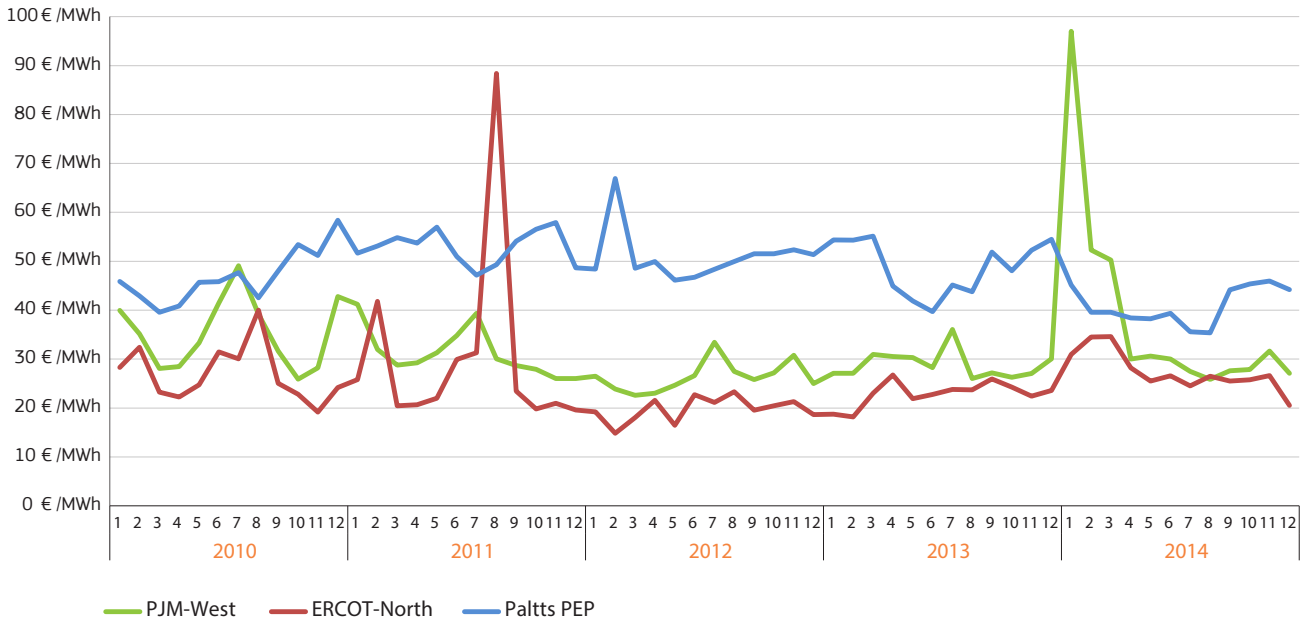
4. International outlook
comparing EU power prices with international peers

- As the next chart (Figure 23) shows, during the last few years available cheap domestic gas resources (mainly shale gas) made electricity generation in the US more reliant on natural gas. During most of the time in the last five years wholesale electricity prices on the major US hubs were lower, yet more volatile than the European power benchmark - the Platts European Power Index (PEP) index.

- Over 2011 and 2012, as US gas hub prices gradually decreased, US wholesale electricity prices stood at levels around half of the wholesale electricity prices in the EU. This gap started to decrease in 2013, and in 2014 EU wholesale electricity prices were around 40% above US wholesale electricity prices.

- Permanent wholesale electricity price differentials between the US and the EU result in a competitiveness advantage for energy intensive industries, manufacturing in the US. Energy intensive industries might react sensitively on this competitiveness advantage, especially in those sectors where trade intensity (the importance of exports and imports between the EU and the US compared to the EU domestic production) is outstandingly high.

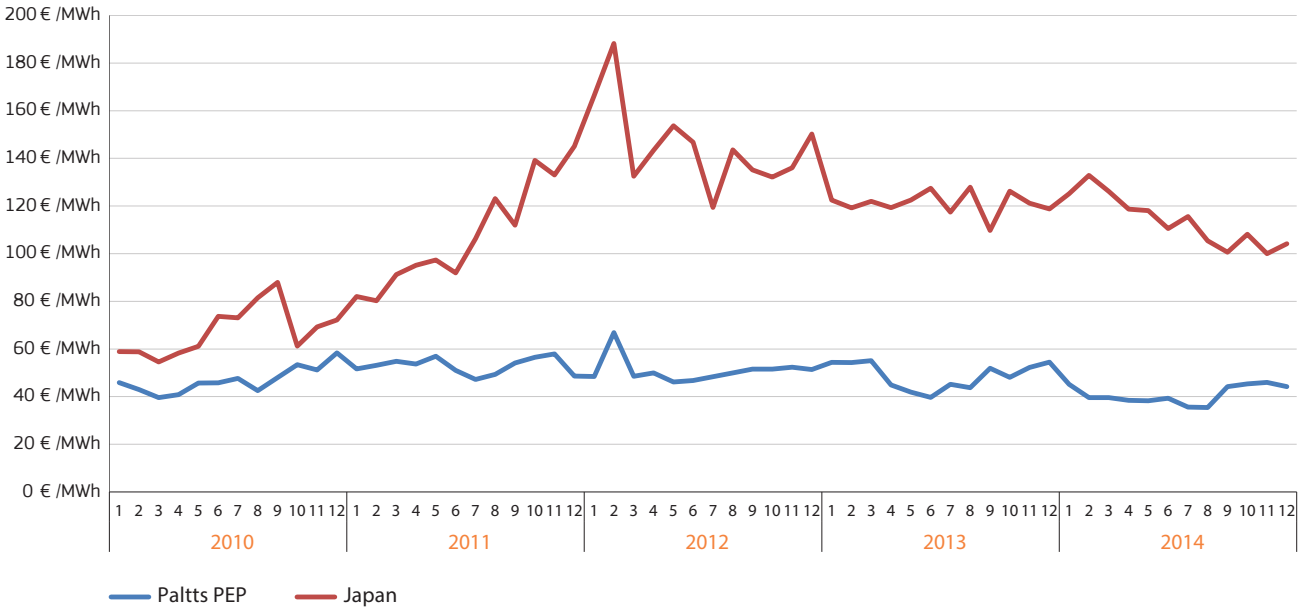
FIGURE 23 – COMPARISON OF THE MAJOR US WHOLESALE ELECTRICITY HUB PRICES WITH THE EUROPEAN AVERAGE (PEP)



Source: Platts, US electricity hubs
PJM West: Pennsylvania-Jersey-Massachusetts hub (Western part); ERCOT: Texas hub; Platts PEP: Pan-European Power index

- Looking at Japan, over the last few years, wholesale electricity prices have consistently been higher than in the EU. However, the Fukushima accident in March 2011, which prompted permanently taking off most of the country's nuclear generation facilities from the power grid, resulted in significant increase in wholesale electricity prices. Nuclear generation had to be substituted by costlier gas-fired generation, for which the feedstock needs to be imported in the form of LNG. While in 2010 the average Japanese wholesale electricity price level was 1.5 times higher than in the EU, by 2014 this ratio widened to 3.5. The difference is even more accentuated when the Japanese price level is compared to the US.

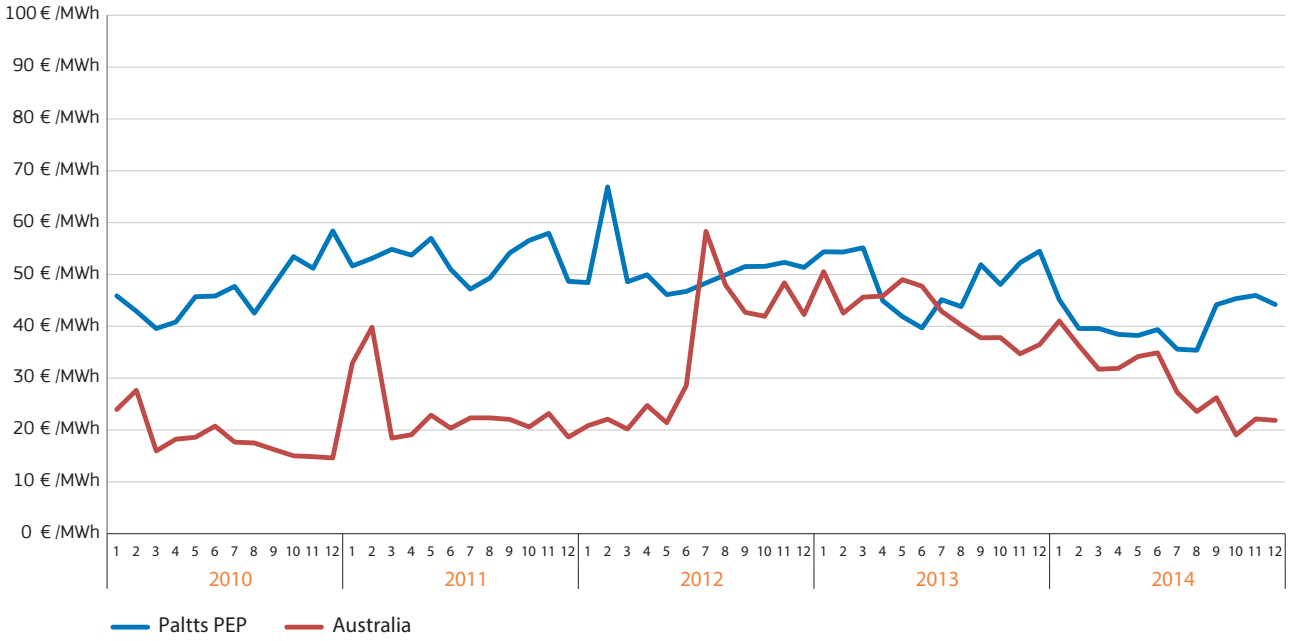
FIGURE 24 – COMPARISON OF THE JAPANESE WHOLESALE BASELOAD ELECTRICITY PRICE WITH THE EUROPEAN AVERAGE (PEP)



Source: Platts, JEPX

- In Australia the average wholesale electricity price level used to be lower by a magnitude of two-to-three compared to the EU average (as measured by the PEP index) between 2010 and the first half of 2012. The country's abundant domestic coal endowments assure cheap resources for power generation, resulting in one of the lowest wholesale price in the world. In July 2012 a carbon tax was introduced, aiming at supporting climate policy goals of the government, which resulted in a spike of wholesale electricity prices. At this time the Australian wholesale price level got closer to the EU PEP. As coal prices decreased further in each region of the world, Australian wholesale electricity prices have also resumed going down. In 2014 the carbon tax was scrapped and by the end of the year the wholesale electricity price level returned to the lows observed at the beginning of 2012.

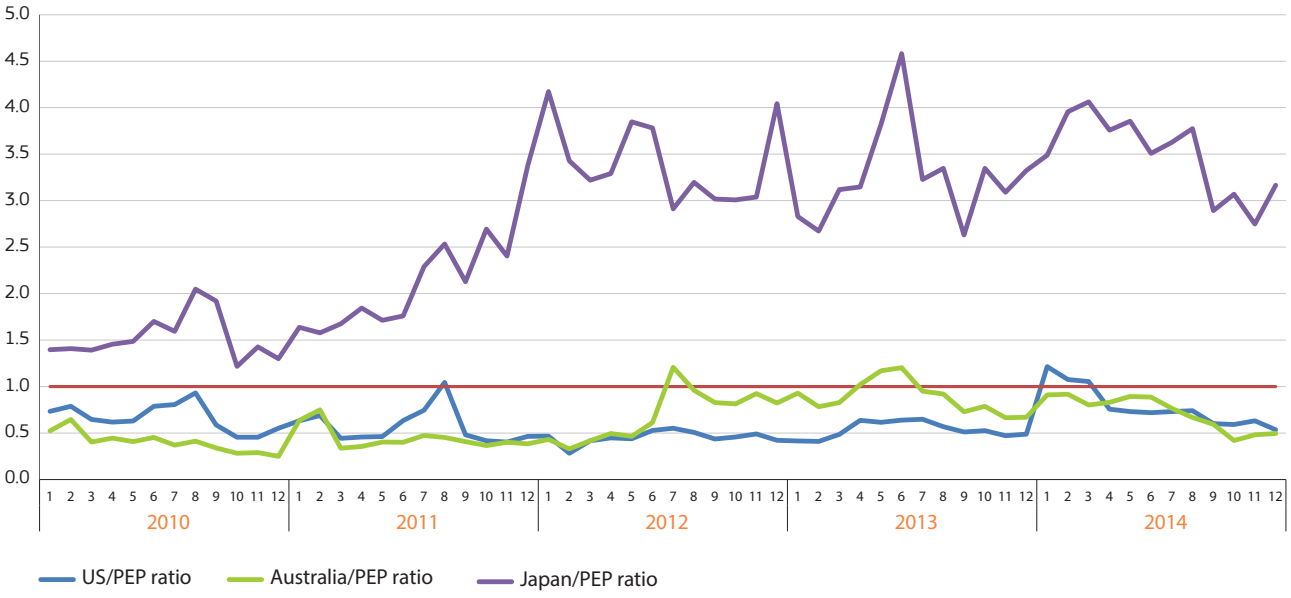
FIGURE 25 – COMPARISON OF THE AUSTRALIAN WHOLESALE BASELOAD ELECTRICITY PRICE WITH THE EUROPEAN AVERAGE (PEP)



Source: Platts, AEMO

- Putting all these together, Figure 26 shows that wholesale electricity prices in the US and Australia are of comparable magnitude, and during most of the time between 2010 and 2014 they were both well below the level of European wholesale electricity prices. In contrast, prices in Japan are extremely high compared to the other three regions (EU, US, Australia), which is especially true since the Fukushima accident, resulting in a permanent mothballing of significant nuclear electricity generation capacities in the country.

FIGURE 26 – THE RATIO OF THE US, JAPANESE AND AUSTRALIAN WHOLESALE ELECTRICITY PRICE CONTRACTS AND THE EUROPEAN AVERAGE (PEP)



Source: Platts

5. Building the internal market for electricity

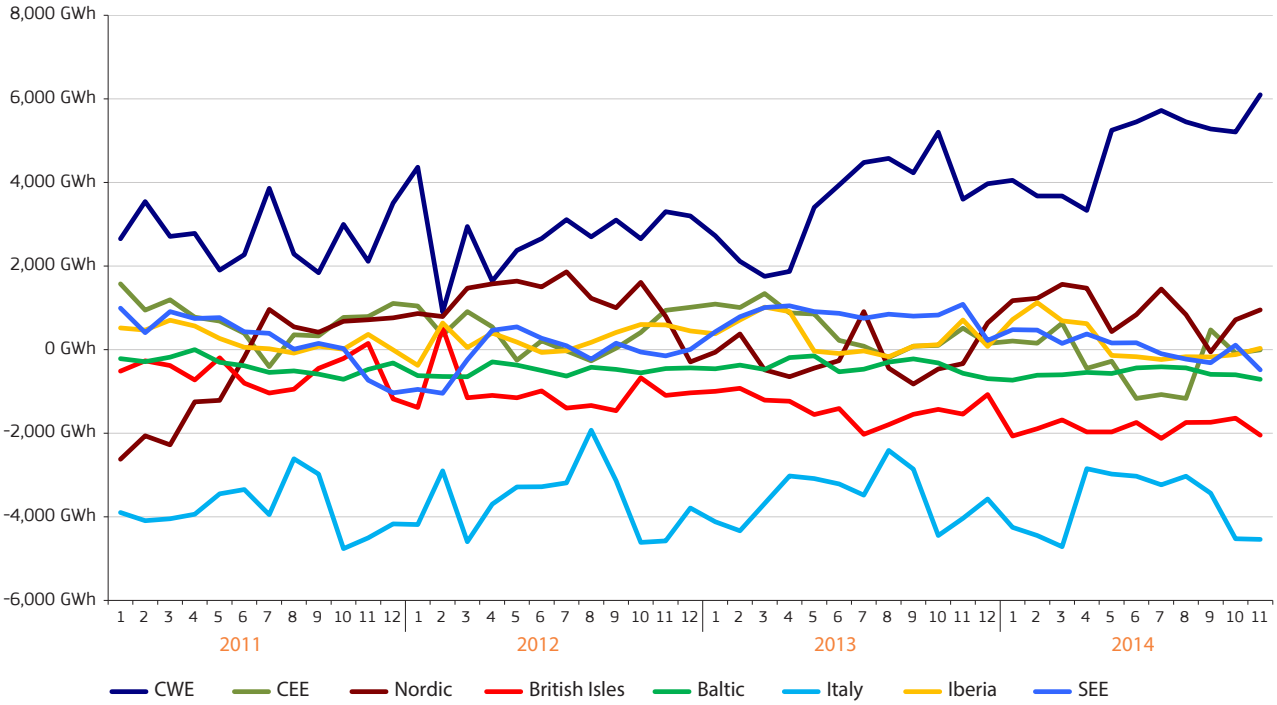
- As Figure 27 shows, the Central Western Europe (CWE) power region continued to strengthen its net electricity exporter position in the fourth quarter 2014, and in December 2014 it exported 6 TWh more electricity than its combined imports. Most of the countries in the region belong to the cheapest markets in the EU, and higher priced countries, like the UK, Poland, Italy and countries in Central and Eastern Europe could absorb the power coming from the CWE region.

- In earlier periods the CEE region used to be net power exporter, however, since there were permanently high prices in Poland, the region was a net electricity importer in the fourth quarter of 2014. In this region only the Czech Republic was significant net electricity exporter in Q4 2014.

- The British Isles and Italy were still in a strong net importer position, importing their electricity need from countries in the CWE region. The Nordic region was still net electricity exporter at the end of 2014, however as price premium of the CWE region to the Nordic markets decreased compared to earlier periods, the export surplus over the imports is not so big as it used to be. The Baltic region was still in a slight net importer position in Q4 2014, importing its power need from the Nordic markets and from Russia and Belarus.

- Figure 28 shows the map of commercial power flows between neighbouring markets in most of the countries of the European continent, providing information on cross-border power flows and the net electricity exporter or importer position of each country in September-November of 2014.

FIGURE 27 – EU CROSS BORDER MONTHLY PHYSICAL FLOWS BY REGION

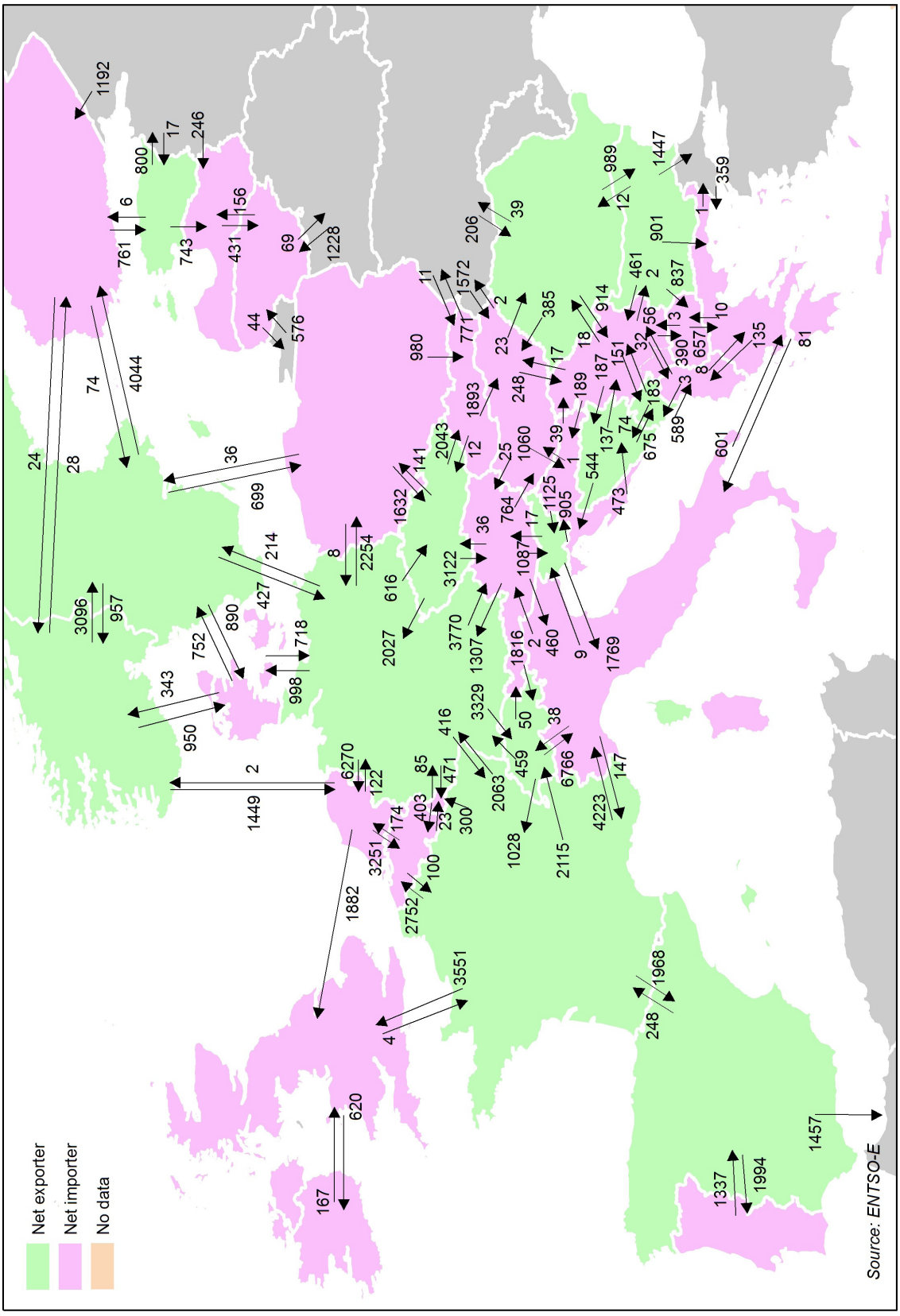


Source: ENTSO-E

European countries are grouped in the following regions:

Central Western Europe	*DE, NL, FR, LU, BE, AT, CH*	*Nordic*	*SE, FI, DK, NO*
Central Eastern Europe	*PL, CZ, HU, SK, HR, SI*	*British Isles*	*UK, IE*
Iberian-Peninsula	*ES, PT*	*Apennine Peninsula*	*IT*
South Eastern Europe	*RO, BG, GR, RS, BA, ME, FYROM, AL*	*Baltic*	*EE, LT, LV*

FIGURE 28 – COMMERCIAL ELECTRICITY FLOWS IN GWH IN SEPTEMBER – NOVEMBER 2014 (FINAL SCHEDULE)

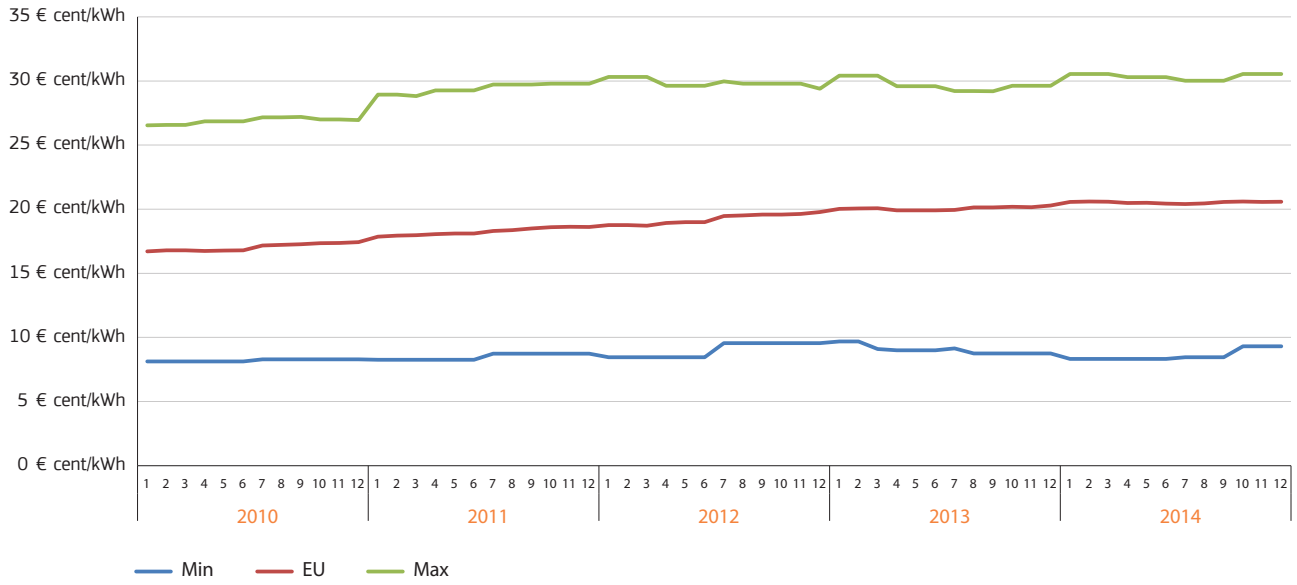


Data for some countries are not available (see the legend). Due to presentation constraints the Northern European countries and Cyprus cannot be included on the map completely. There is no data available on Kosovo under UNSCR 12/4499. Data on flows between Germany and Austria are estimates. For the majority of the reported borders, commercial flow data is netted on hourly frequency. In the case of the Czech-Slovak border, gross commercial values are given.

6. Retail electricity prices in the EU

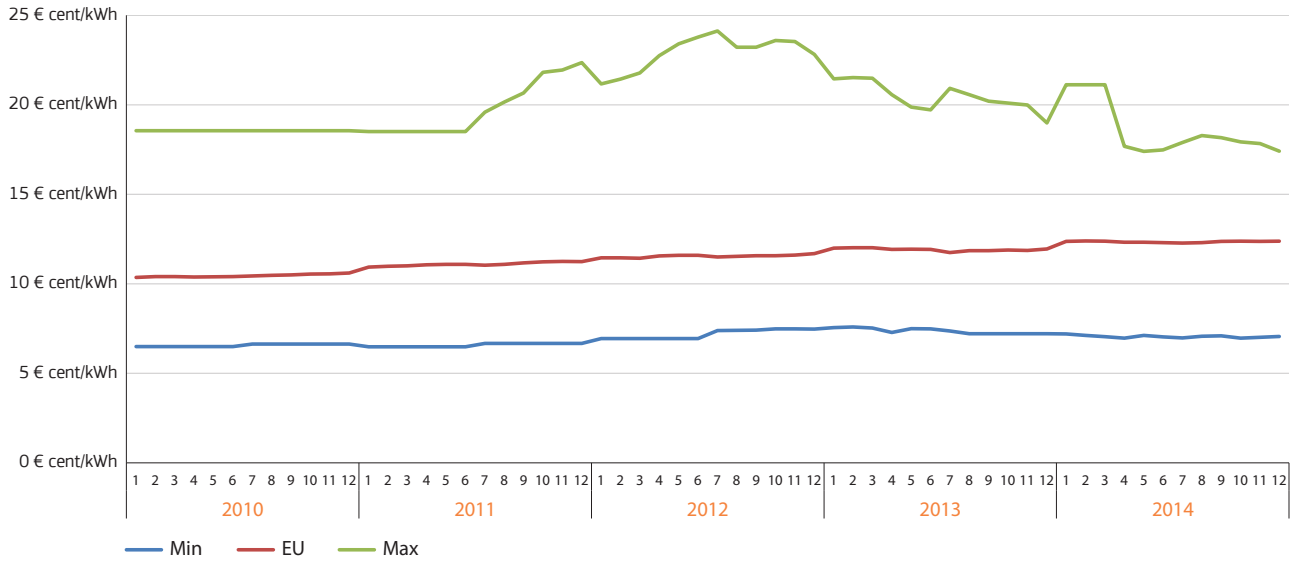
- Figure 29, Figure 30 and Figure 31 on the next pages show the retail electricity price ranges for household and industrial consumers in the last five years for different consumption bands.
- In the case of household consumers retail prices for medium level of annual electricity consumption (between 2,500 kWh and 5,000 kWh - Band Dc) are presented, while for industrial consumer both prices for medium level consumption (between 500 MWh and 2 000 MWh - Band Ic) and for large consumption (between 70 000 MWh and 150 000 MWh - Band IF) are shown. These annual consumption bands correspond to the retail price reporting system of Eurostat.
- Retail prices paid by households include all taxes, while retail prices paid by industrial customers are prices without VAT and recoverable taxes and levies. Monthly retail electricity prices are estimated by using half-yearly prices from Eurostat and Harmonised Consumer Price Indices (HICP) for the household prices and Producer Price Indices (PPI) for the industrial consumers.
- In December 2014 the lowest estimated household retail electricity prices could be observed in Bulgaria (9.3 Eurocent/kWh), while the highest prices could be observed in Denmark (30.6 Eurocent/kWh), resulting in a price differential ratio of 3.3 between the cheapest and the most expensive country in the EU.
- In the case of industrial consumers having medium level annual consumption the price ratio of the cheapest country (Sweden, with a price of 7.1 Eurocent/kWh) and the most expensive country (Italy, with a price of 17.4 Eurocent/kWh) was 2.5 in December 2014. At the same time the cheapest country was Sweden (4.9 Eurocent/kWh) and the most expensive one was Cyprus (14.5 Eurocent/kWh) in the case of large industrial consumers, giving a price differential ratio of 3 for the highest and the lowest priced country in the EU.
- Figure 32 shows the evolution of the monthly relative standard deviation of retail electricity prices between EU member states in the period 2010-2014, providing information on the degree of price convergence. It seems that in the case of household consumers there are permanently existing price differences between the EU countries and not too many sings of convergence could be observed.
- In contrast, in the last two-three years retail prices paid by industrial consumers started to gradually converge across the EU. This slow price convergence might be related to less retail price regulation compared to the household sector and better negotiating position of industrial consumers with electricity utilities, leading to more competitive price offers.
- Figure 33 shows the electricity component of the so-called Household Energy Price Index (HEPI), calculated with a methodology developed by Vaasaett on the basis of monthly electricity invoice collecting in given capital cities in the EU. According to these data households in Copenhagen had to pay the highest electricity prices in the EU (30.3 Eurocent/kWh), while households in Budapest paid the lowest prices (12.2 Eurocent/kWh) at the end of 2014. The greatest increase in household electricity prices between December 2013 and December 2014 could be observed in London (+11.4%), while in Prague the retail electricity price decreased by 12.8% in this period.
- The maps (Figure 34 and Figure 35) on the next two pages show the estimated retail electricity prices paid by households and industrial consumers having medium level of annual electricity consumption in the fourth quarter of 2014. In most of the EU countries national retail prices for household consumers with a medium level annual consumption, as provided by Eurostat, correspond well with data of Vaasaett for the capital cities in the same country.

FIGURE 29 – RANGES OF NOMINAL ELECTRICITY PRICES PAID BY HOUSEHOLD (ALL TAXES INCLUDED) CONSUMERS IN ANNUAL CONSUMPTION BAND DC (2 500 KWH < CONSUMPTION < 5 000 KWH) IN EU MEMBER STATES



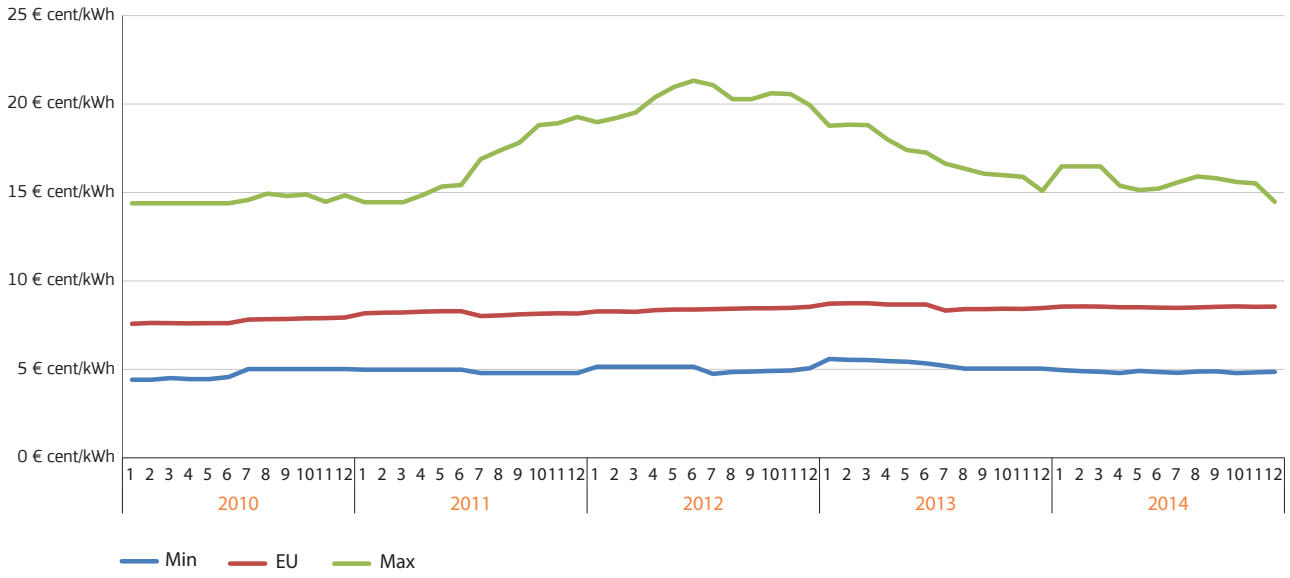
Source: Eurostat.

FIGURE 30 – RANGES OF NOMINAL ELECTRICITY PRICES PAID BY INDUSTRIAL (WITHOUT VAT) CONSUMERS IN CONSUMPTION BAND IC : 500 MWH < CONSUMPTION < 2 000 MWH IN EU MEMBER STATES



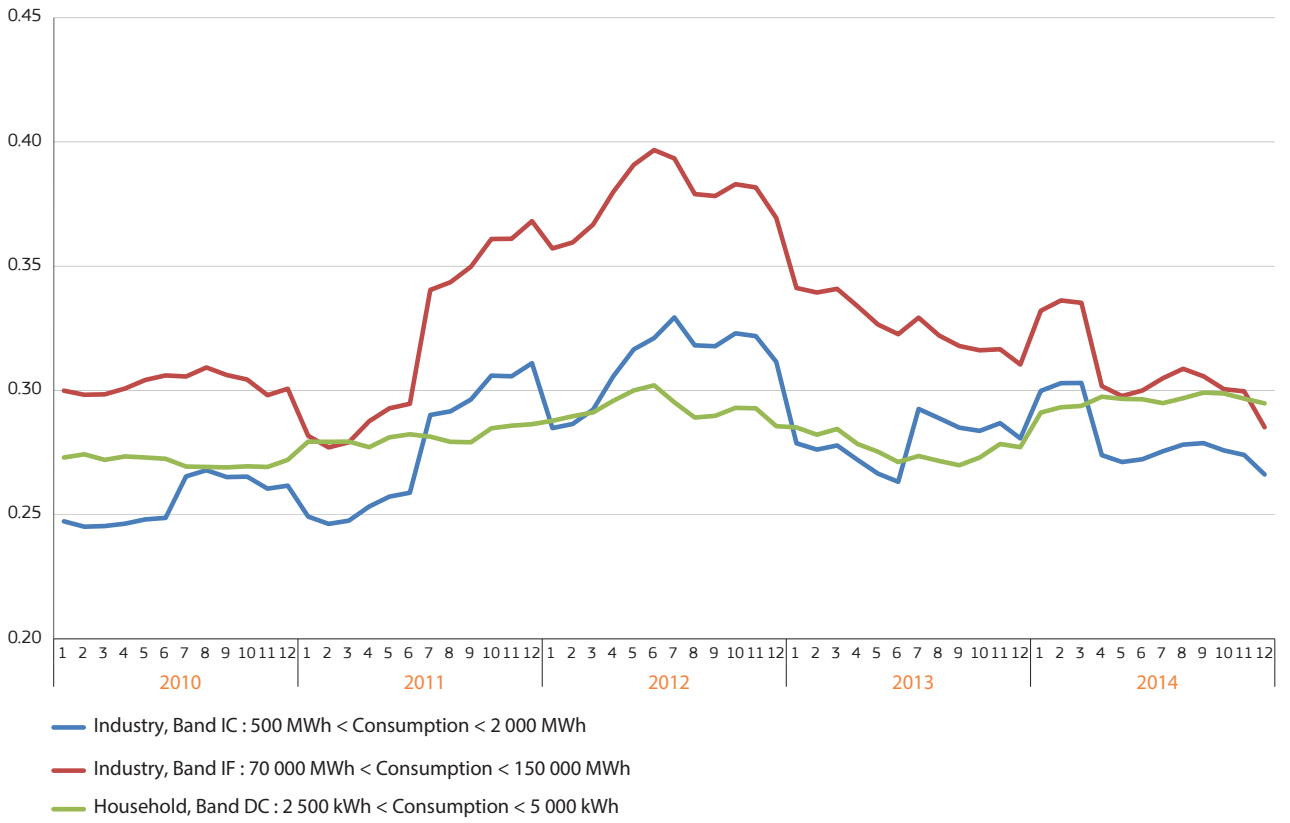
Source: Eurostat.

FIGURE 31 – RANGES OF NOMINAL ELECTRICITY PRICES PAID BY INDUSTRIAL (WITHOUT VAT) CONSUMERS IN CONSUMPTION BAND IF : 70 000 MWH < CONSUMPTION < 150 000 MWH IN EU MEMBER STATES



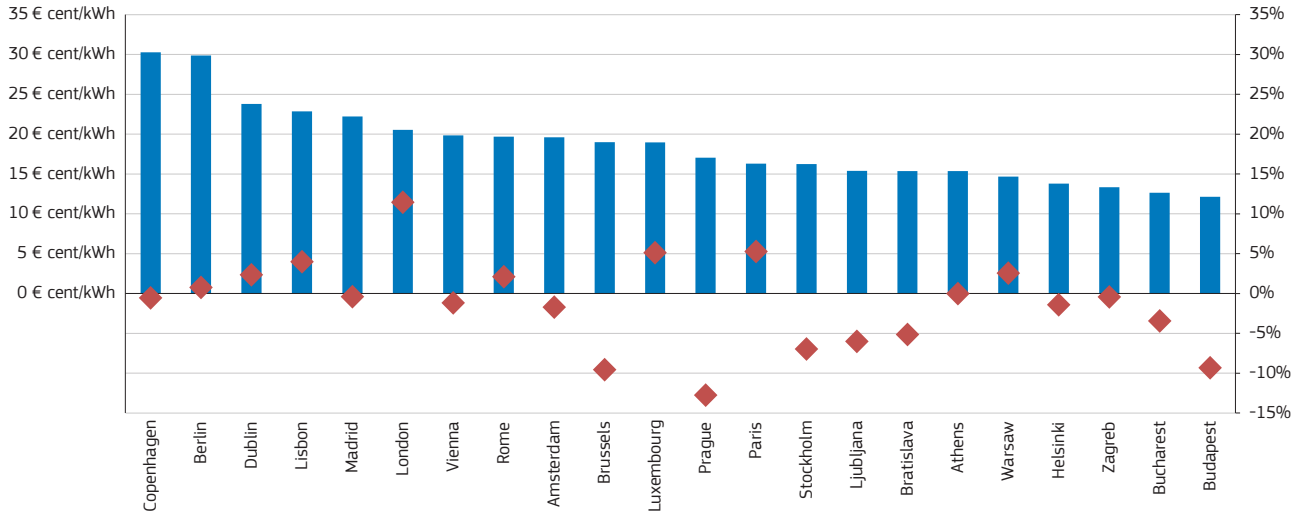
Source: Eurostat.

FIGURE 32 – RELATIVE STANDARD DEVIATION OF RETAIL ELECTRICITY PRICES



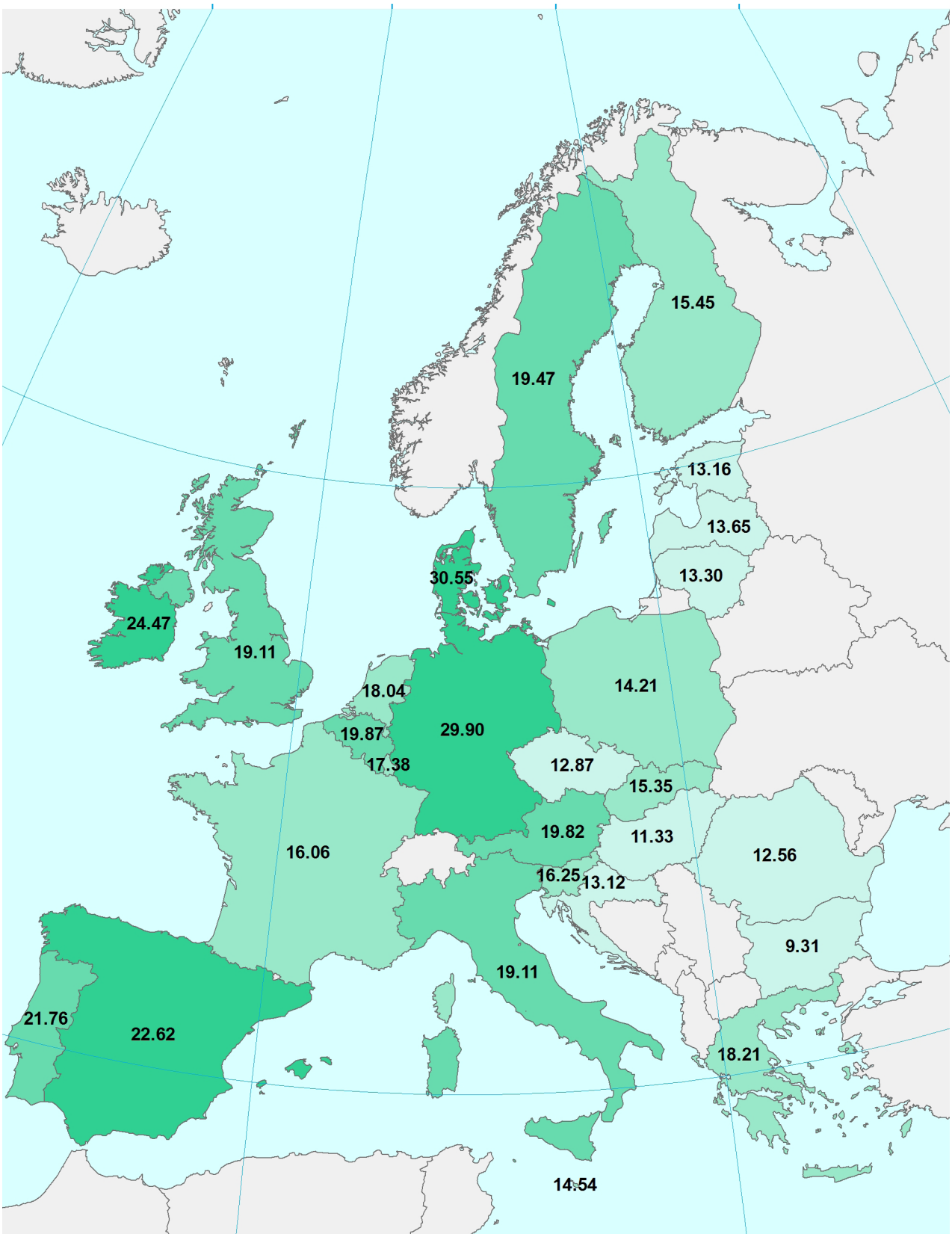
Source: Eurostat.

FIGURE 33 – THE HOUSEHOLD ENERGY PRICE INDEX (HEPI) IN EUROPEAN CAPITAL CITIES – ELECTRICITY PRICES IN DECEMBER 2014, AND CHANGES IN HOUSEHOLD ELECTRICITY PRICES COMPARED TO DECEMBER 2013



Source: Vaasaett. No data available for Tallin, Riga, Vilnius, Valetta, Sofia and Nicosia

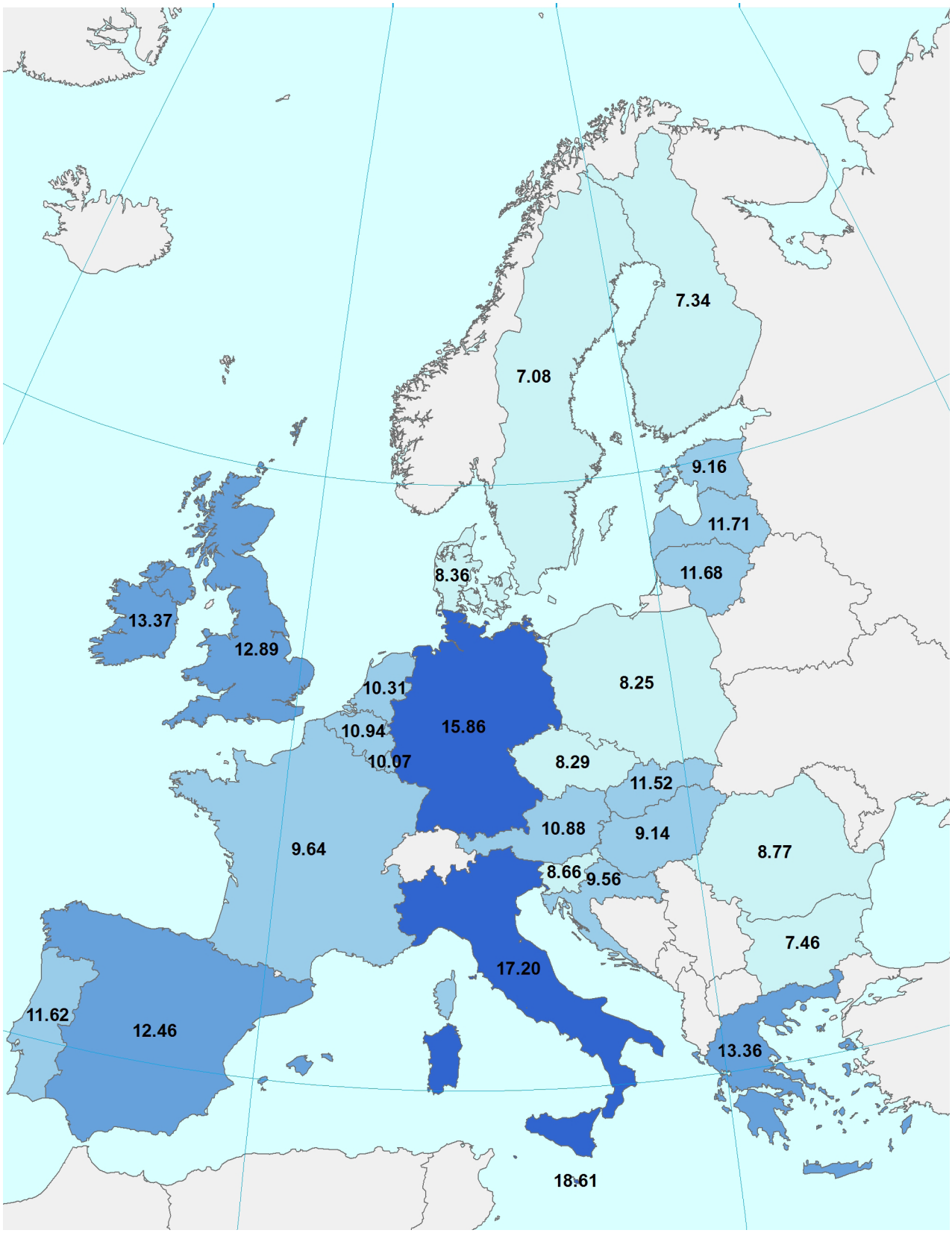
FIGURE 34 – ELECTRICITY PRICES (INCLUSIVE OF TAXES) – HOUSEHOLDS – ESTIMATED PRICES: 4TH QUARTER OF 2014



Band DC : 2 500 kWh < Consumption < 5 000 kWh
Prices per kWh (c€)

Source : data computed from Eurostat half-yearly retail electricity prices and consumper price indices

FIGURE 35 – ELECTRICITY PRICES (WITHOUT VAT AND NON-RECOVERABLE TAXES) – INDUSTRIAL CONSUMERS – ESTIMATED PRICES: 4TH QUARTER OF 2014



Band IC : 500 MWh < Consumption < 2 000 MWh
Prices per kWh (c€)

Source : data computed from Eurostat half-yearly retail electricity prices and consumper price indices

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. If the level of dark spreads is above 0, coal power plant operators are competitive in the observed period. *See dark spreads.*

Clean spark spreads are defined as the average difference between the cost of gas and emissions, and the equivalent price of electricity. If the level of spark spreads is above 0, gas power plant operators are competitive in the observed period. *See spark spreads.*

Contango: A situation of contango arises in the when the closer to maturity contract has a lower price than the contract which is longer to maturity on the forward curve.

Cooling degree days (CDDs) are defined in a similar manner as Heating Degree Days (HDDs); the higher the outdoor temperature is, the higher is the number of CDDs. On those days, when the daily average outdoor temperature is higher than 21°C, CDD values are in the range of positive numbers, otherwise CDD equals zero.

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 in this publication for UK and Germany, with the coal and power reference price as reported by *Platts*.

Flow against price differentials (FAPDs): By combining hourly price and flow data, 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 electrical systems.
With the closure of the day-ahead markets (D-1), the prices for each hourly slot of day D are known by market participants. Based on the information from the power exchanges of two neighbouring areas, market participants can establish hourly price differentials. Later in D-1, market participants also nominate commercial schedules for day D. An event named 'flow against price differentials' (FAPD) occurs when commercial nominations for cross border capacities are such that power is set to flow from a higher price area to a lower price area. The FAPD chart in this quarterly report provides detailed information on adverse flows, presenting the ratio of the number of hours with adverse flows to the number of total trading hours in a quarter.

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.

Spark spreads are reported as indicative prices giving the average difference between the cost of natural gas delivered ex-ship and the power price. As such, they do not include operation, maintenance or transport costs. Spreads are defined for a gas-fired plant with 50 % efficiency. Spark spreads are given for UK and Germany in this publication, with the gas and power reference price as reported by *Platts*.

Tariff deficit expresses the difference between the price (called a tariff) that a *regulated utility*, such as an electricity producer is allowed to charge and its generation cost per unit..