European Commission

Quarterly Report on European Electricity Markets

DG ENERGY

MARKET OBSERVATORY FOR ENERGY

VOLUME 5, ISSUE 2: April 2012 – June 2012

EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR ENERGY

Dear readers,

In the second quarter of 2012 electricity consumption in the EU fell to a three-year low, largely as a consequence of low industrial power demand. At the same time, EU 27 gross domestic product registered negative growth for the first time since the end of 2009. Mild weather conditions in most of the EU Member States also contributed to lower electricity demand.

Prices of energy commodities followed a downward trend during most of the second quarter of 2012. Crude oil prices fell significantly during this period from the peak registered in March 2012, after fears of possible global supply shortages eased. Abundant coal imports into the EU and increasing domestic stocks assured cheap coal prices throughout the whole quarter. In the case of natural gas the end of the winter period eliminated most of the heating-related demand. Emission allowance prices remained in low ranges during the second quarter of 2012.

Lower generation costs, generally good renewable source availability and weak industrial electricity demand all contributed to decreasing wholesale power prices in most of the European markets. In some countries the share of coal-fired generation increased due to the competitive power generation costs from coal and permanently low carbon prices. Abundant hydro-based generation in the Nordic market kept price levels low, while in the Iberian market a dry season kept the price level higher. Hydro generation in the Balkans also impacted power prices in the Central Eastern European region where cross border power flow restrictions between some countries also contributed to market volatility in the second quarter of 2012. In June 2012 higher than seasonal temperatures in the Southern European countries contributed to increasing electricity demand and prices.

The 'Focus On' topic in the current report is an analysis on the convergence of national wholesale power prices as we are getting closer to the realisation of a functioning internal electricity market in Europe.

Philip Lowe

HIGHLIGHTS

- In Q2 2012, energy-intensive sectors such as industry and construction experienced decreases in gross value added on a yearly basis, contributing to falling energy consumption in those sectors. As a result, EU-27 gross inland electricity consumption decreased by 1% compared to the second quarter of 2011 and fell to the lowest level since the second quarter of 2009.

- In most of the European markets, day-ahead prices followed a slightly decreasing trend during the second quarter of 2012. A healthy supply of wind and solar power and mild weather conditions reducing power demand for heating contributed to this trend. Power generation costs were kept under control by decreasing energy commodity prices and constantly low emission allowance prices. In contrast, in June 2012 power prices increased in some Southern European countries due to warm weather and increasing power demand for cooling.

- Crude oil prices fell significantly in Q2 2012 after reaching high levels in March 2012, primarily due to healthier oil supplies and expectations of a slowdown in major oil consumer economies. Spot gas prices also decreased after the end of the heating season, while coal prices were still on a downward trend due to high amounts of imports and increasing domestic stocks in Europe. Emission allowance prices were still low during the quarter, though news of the European Commission's intentions to tackle the problem of market oversupply gave a boost to carbon prices at the end of Q2 2012. Switching to coal from gas in power generation also gave support to emission allowance prices.

- In Spain, as wind based generation reached its daily maximum several times during peak hours in April 2012, there were six days in that month when the daily peakload average price was less than the daily average baseload price in the Iberian market.

- After the end of winter as electricity consumption decreased in Q2 2012, power plant and energy interconnector maintenance works got underway in many countries, substantially affecting domestic power supply. Besides maintenance works in some countries, regularly occurring restrictions in cross border power flows increased market volatility, as also occurred several times in the case of Hungary in Q2 2012.

- On the 18th of June 2012 wholesale power trading started in the Lithuanian market as a new Nordpool bidding area. Lithuania is the 22nd Member State of the EU for which we are reporting on wholesale market developments in this publication.

- In this quarter the 'Focus on' chapter of the report covers the convergence of national wholesale power prices in different markets as we are getting closer to a fully-fledged and functioning internal electricity market in Europe.

Volume 5, Issue 1 : April 2012 – June 2012 ; page 1/36

QUARTERLY REPORT ON EUROPEAN ELECTRICITY MARKETS

CONTENTS *Page*

A. Recent developments in the electricity markets across Europe

- In the second quarter of 2012 gross inland electricity consumption in the EU-27 was 716.2 TWh, being the lowest quarterly consumption since the second quarter of 2009. Compared to the previous quarter, electricity consumption was down by 17.6% as the heating season was coming to an end. Compared to the same period of 2011 gross inland electricity consumption decreased marginally by 1%.
- The EU economy showed signs of gradual slowdown during the last couple of quarters. While in Q1 2011 the year-on year GDP growth rate was above 2%, in the first quarter of 2012 only a close-to-zero growth could be observed that turned into the negative range in Q2 2012 (-0.3% for the EU-27) for the first time since Q4 2009. In some energy intensive economic sectors, such as industry and construction, significant decreases in the gross value added data could be observed in Q2 2012 (-1.5% and -3.9%, respectively). The sluggish economic situation in the EU must have contributed to the decrease in electricity consumption reaching three-year low in Q2 2012.

- Meteorological conditions in Q2 2012 remained within the normal range. Heating degree days (HDD)* did not show significant deviations from the long term average values. During the first two weeks of April 2012 the weather was colder than usual in many European power regions which prompted an additional power demand for heating needs. In contrast, May was milder than usual in most of the EU countries, reducing heating related power demand. In some countries high temperatures in June 2012 assured for additional power demand for cooling needs as cooling degree days (CDD) were higher than in the same month of the previous year.
- Spot crude oil prices began to decrease after reaching high levels in mid-March 2012 and this downward movement continued in most of Q2 2012. At the beginning of April 2012 the Brent crude daily spot price reached 94€/bbl, while on the 20th of June it was slightly above 70 €/MWh and finished the quarter at 75 €/MWh. This significant decrease in crude oil spot prices was partially cushioned by the depreciation of the euro (from the beginning till the end of Q2 2012 the EUR/USD exchange rate decreased from 1.33 to 1.26). The significant decrease in oil prices was primarily due to improving global oil supply and weakening economic perspectives keeping the demand for oil under control.
- Spot natural gas prices on the NBP hub fluctuated in a narrow range of 24-26 €/MWh in April 2012. From mid-May as the weather turned warmer putting an end to the heating season and as gas flows from a giant gas field in Norway to UK resumed after the end of maintenance works, prices became lower. During the whole month of June 2012 spot gas prices were around 23-24 €/MWh.
- Coal daily prices started the second quarter of 2012 slightly above 75 €/t, and continued their slide that also characterised the previous quarter. During May 2012 coal prices fell to 65 €/t several times but from this level they always bounced back. The reasons for the ongoing price slide were the massive thermal coal shipments from the US and Colombia and the increasing coal stocks in Europe as the economic perspectives put a lid on energy demand, further increasing the oversupply in the coal market. Global seaborne thermal coal oversupply was further aggravated by decreasing coal demand in some emerging markets (China, India). During Q2 2012 monthly average year-ahead coal prices were 10-15 €/t higher than the spot contracts showing that the market anticipated higher prices in the future compared to this extremely cheap period.
- Emission allowance prices were particularly low at the beginning of April 2012 (6.2 €/t CO2e) as freshly released data showed a bigger fall in greenhouse gas emissions than it had been anticipated and thus the oversupply in the emission allowance market seemed to prevail for a long period. In Q2 2012 emission prices were influenced by the events in energy commodity markets and news on the European Commission's (EC) intentions to alleviate oversupply in the emission allowances market. Coal prices were relatively cheap compared to gas prices which resulted in a fuel

* Definitions of terms marked by an asterisk (*) can be found in the Glossary

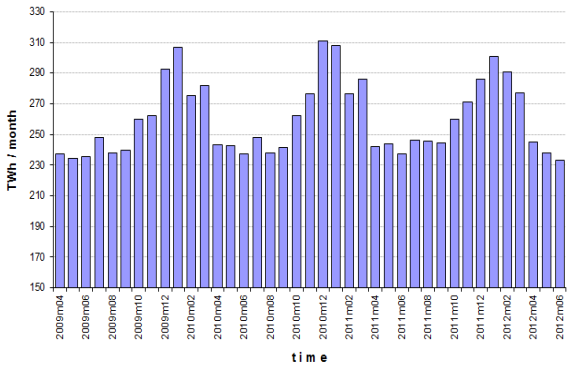
switch from gas-fired to coal-fired power generation, giving a support to carbon prices during Q2 2012. While in April-May emission allowance prices fluctuated in a narrow range of 6-7.5 €/tCO2e, in June 2012 they increased from 6.3 €/tCo2e to 8.3 €/tCo2e, reaching a four month high by the end of Q2 due to better performance of energy markets and news from EC's plans on delaying emission auctions in the period starting in 2013.

- In Q2 2012 the combined traded volume of day-ahead power contracts on European wholesale power trading platforms was 296 TWh, showing a decrease compared to the previous quarter (-8.6%), however, in a year-on-year comparison the total traded volume was up by 10.1%. The total traded volume of power managed to increase in spite of the decreasing electricity consumption, which could be interpreted as increasing liquidity in the European markets. In Q2 2012 the quarterly traded volume of day-ahead power contracts reached 45.6% of the combined gross inland electricity consumption in European countries having functioning wholesale markets; a ratio up from 40.3% measured in Q2 2011.
- The Platts' Pan-European Electricity Index (PEP) was slightly below 50 €/MWh in April 2012 and it fell to 46-47 €/MWh in May and June, which was the lowest since the end of summer 2010.

EU 27 Heating Degree Days in Q2
Values for 2010, 2011, 2012 and 1980 – 2004 average

	April	May	June
2010	248.26	153.20	58.24
2011	220.34	148.69	60.49
2012	308.29	156.56	86.78
LT avg.	289.25	154.04	66.55

Source : Eurostat /JRC

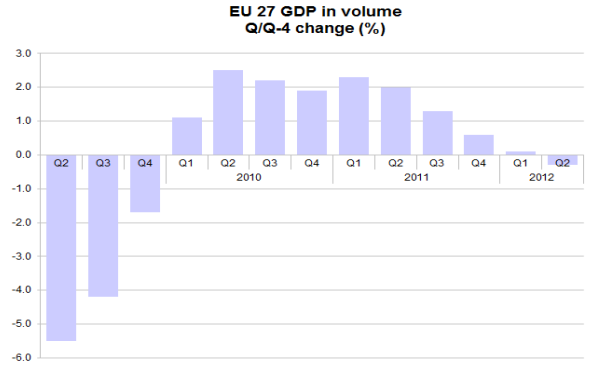


Source : Eurostat
Adapting to the changes in Eurostat's database, electricity supply is now presented instead of gross inland consumption.

Cooling degree day values in some EU countries having functioning wholesale power markets

	June 2011	June 2012
Greece	26.59	77.69
Spain	39.68	49.11
Italy	17.73	54.96
Hungary	7.69	30.58
Portugal	23.92	27.48
Romania	7.31	28.90
Slovenia	0.62	14.96
Slovakia	0.42	13.78

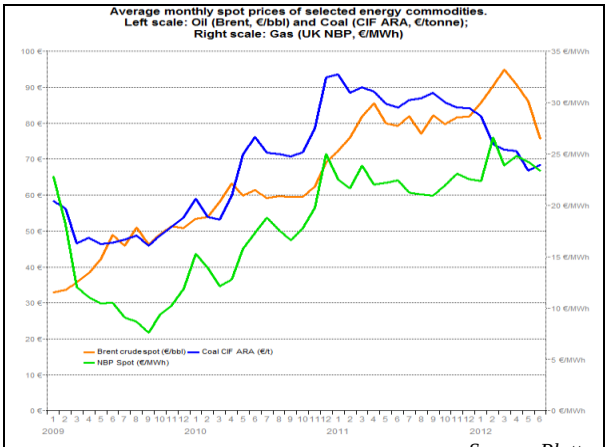
Source: Eurostat / JRC



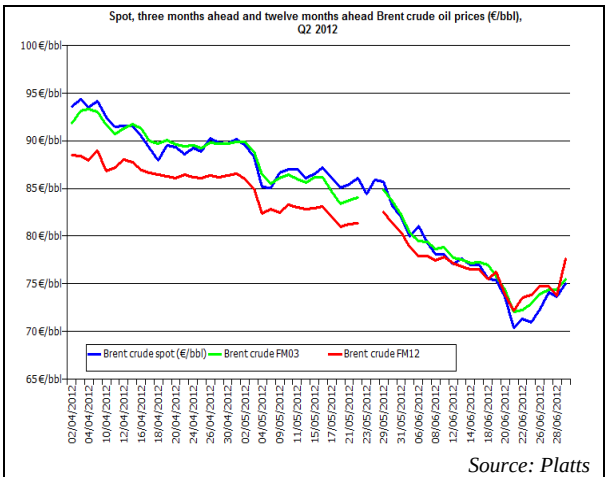
Source: Eurostat

Selected Principal European Economic Indicators

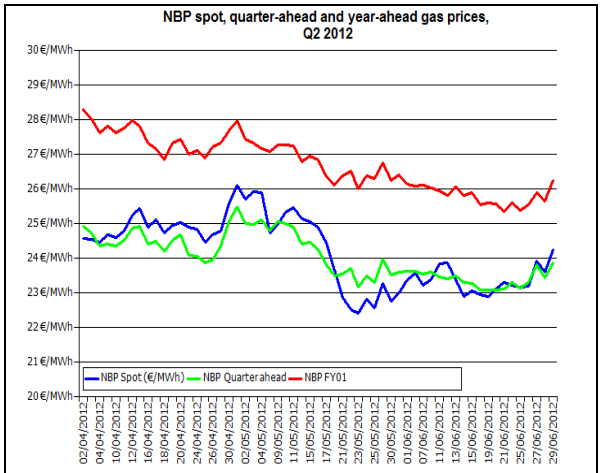
** Gross domestic product (GDP) at market prices is the final result of the production activity of resident producer units. It is defined as the value of all goods and services produced less the value of any goods or services used in their creation. Data are calculated as chain-linked volumes (i.e. data at previous year's prices, linked over the years via appropriate growth rates). Growth rates with respect to the same quarter of the previous year (Q/Q-4) are calculated from raw data.*



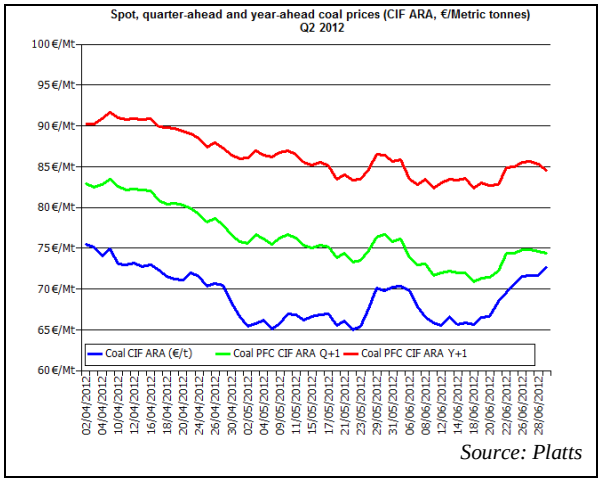
Source: Platts



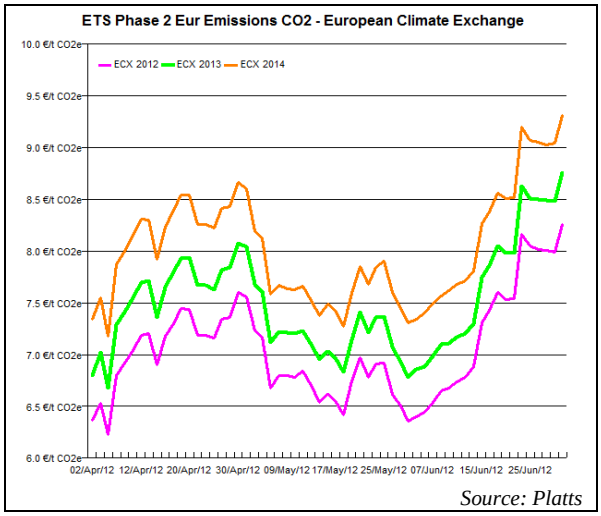
Source: Platts



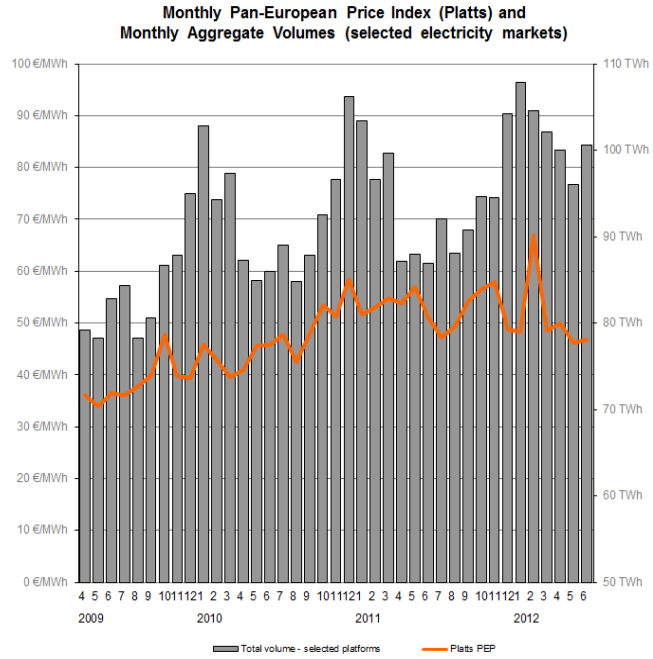
Source: Platts



Source: Platts



Source: Platts



Source: Platts (price index) and selected European electricity wholesale markets (volumes). The selected markets are :
Nordpool Spot A.S;
European Energy Exchange (EEX);
Amsterdam Power Exchange (APX Power NL);
Powernext Day-ahead S. A.;
Belpex Spot;
Energy Exchange Austria (EXAA);
Gestore del Mercato Elettrico (IPEX);
Mercado de Electricidad (OMEL);
Operator trhu s elektrinou (OTE);
Towarowa Gielda Energii S.A. (PolPX);
Hungarian Power Exchange (HUPX);
APX Power UK;
Operatul Pietei de Energie Electrica din Romania (OPCOM);
BSP Southpool;
Διαχειριστης ελληνικου συστηματος μεταφορας ηλεκτρικης ενεργειας (ΔΕΣΜΗΕ), Hellenic Transmission System Operator

A. 1 Wholesale markets

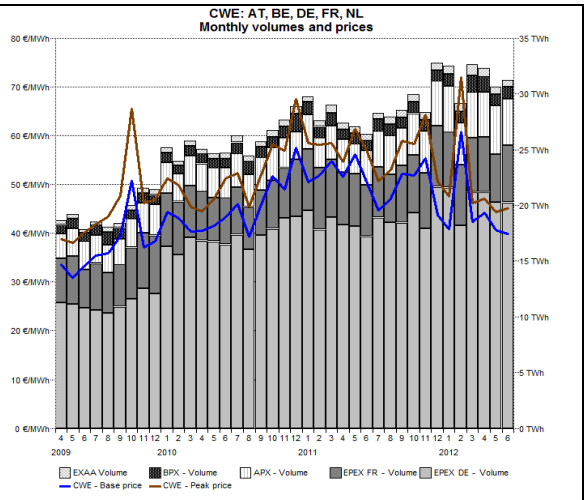
Central Western Europe (Austria, Belgium, Germany, France, the Netherlands)

- The first couple of days of Q2 2012 could be characterised by low wholesale baseload power prices in the CWE region, primarily owing to high wind power generation and mild temperatures. Although the weather turned colder during the following week, industrial power demand was reduced by the Easter Holidays. In mid-April daily baseload power prices reached their maxima in Q2 2012 due to the cold weather, receding renewable power generation and ongoing outages of some nuclear reactors in Germany and France (e.g.: Brokdorf with a generation capacity of 1.4 GW). From the second half of April as the weather turned milder, day-ahead power prices in the whole CWE region were put on a downward path.
- In May 2012 public holidays also played an important role in affecting the industrial power demand. Power prices showed a temporary drop on the 1st and the 8th of the month, however, the biggest daily decreases could be observed on the 17th (Ascension Day in some countries of the region) and on the 28th (Whit Monday). On these two days German daily baseload prices fell to a level of 27-28 €/MWh, which was also due to abundant wind and solar power generation. On the 28th of May solar power generation reached an hourly record of 22.1 GW that revealed the importance of solar power having a rapidly increasing share in the generation mix. In May

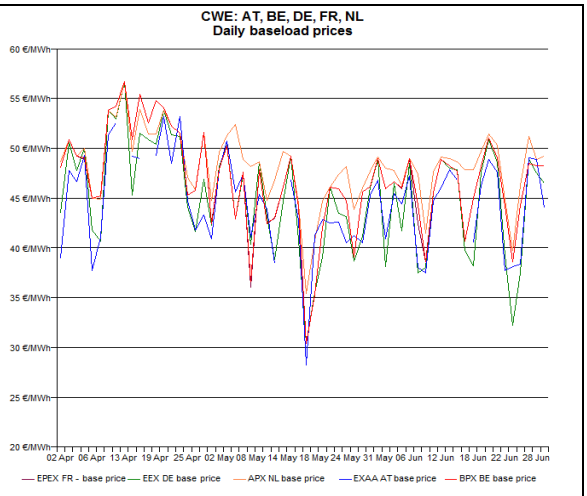
2012 the monthly average regional day-ahead baseload price** was 40.7 €/MWh, being 27% lower than in May 2011. Besides abundant renewable power generation and a particularly mild weather this significant annual decrease was due to the high base in May 2011, being impacted by the concerns of the future of nuclear generation in that time in Europe.

- By the end of May 2012 nuclear availability in France fell below 36 GW (compared to the total physical capacity of 63.1 GW) which was the lowest in the last three years. During the whole month of June 2012 it remained around 40 GW, in the consequence of a series of unplanned outages. Low nuclear availability in France and high renewable generation in Germany resulted in French price premiums many times during the last month of Q2 2012. Cooler weather, improving hydro availability and lower industrial demand resulting from the sluggish economic environment drove regional monthly baseload power prices down to a level (39.8 €/MWh) which was last seen in August 2010. The overall price volatility of day-ahead market, reaching high levels in May due to changes in the availability of renewables and consecutive public holidays, returned to its long-term value by the end of June 2012.
- From the beginning of Q2 2012 until mid-June German and French quarter-ahead and year-ahead power prices showed a permanent decrease. This was mainly due to a significant decrease in coal and crude oil prices and low emission allowance prices. Economic perspectives in the eurozone also contributed to lower industrial power demand expectations. In the last two weeks of Q2 2012, in parallel with the rebound in oil and carbon prices, forward power prices also started to increase.
- The decreasing trend of coal prices and low emission allowance prices during most of the second quarter of 2012 helped to keep German clean dark spreads* at a level assuring the profitability of coal-fired power generation. This could also be tracked in recent installations of new lignite power plants in the first half of 2012 in Germany. In contrast, biomass spreads were still in the deep negative range, mainly as a result of low power prices.
- In the second quarter of 2012 the combined volume of day-ahead power traded on the CWE markets was 94.1 TWh, showing a slight decrease (-0.1%) compared to Q1 2012. Compared to Q2 2011 the increase in traded volume of power was 16.4%, an impressive number compared to the decline in electricity consumption (-5.2%) over the same period in the CWE region. The combined traded volume of day-ahead contracts represented 31.8% of the gross inland electricity consumption in Q2 2012.
- No *FAPD events*[*], measuring the occurrence and magnitude of adverse flows, were observed in the second quarter of 2012 in the market coupling region of CWE.

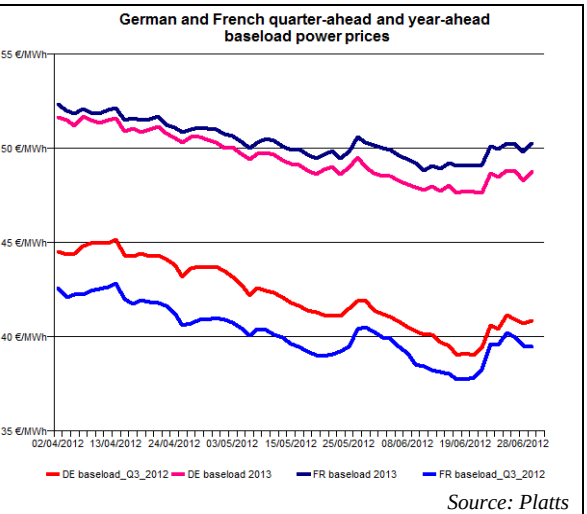
**Regional monthly baseload and peakload power prices in the Central West European (CWE) and in the Central East European (CEE) power regions are computed as the traded-volume-weighted averages of the participating countries' market prices.



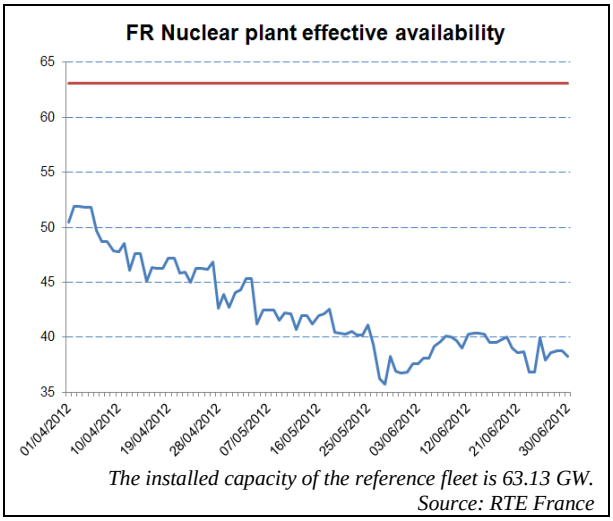
Source: Platts



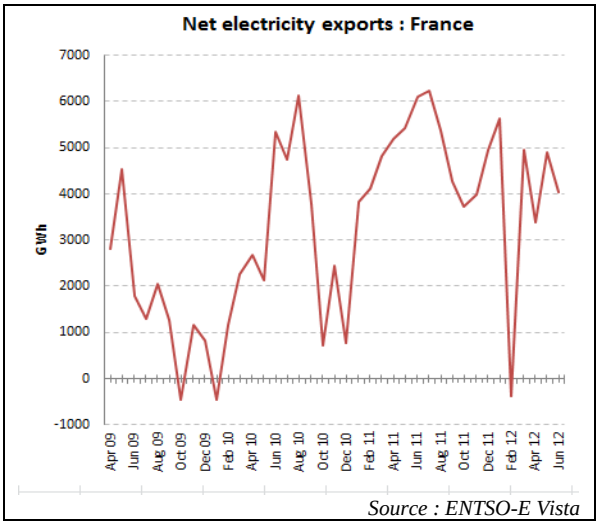
Source: Platts



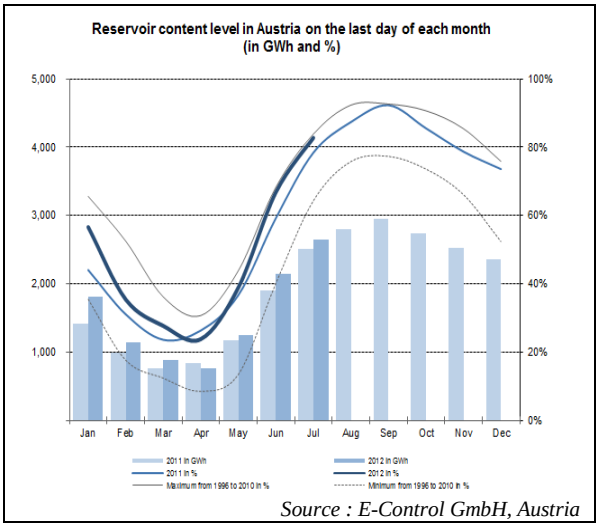
Source: Platts



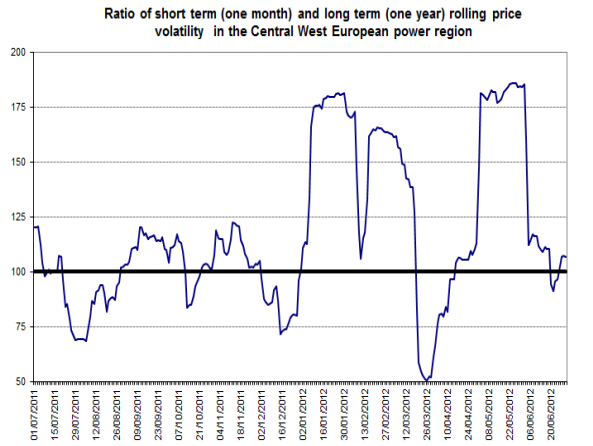
The installed capacity of the reference fleet is 63.13 GW.
Source: RTE France



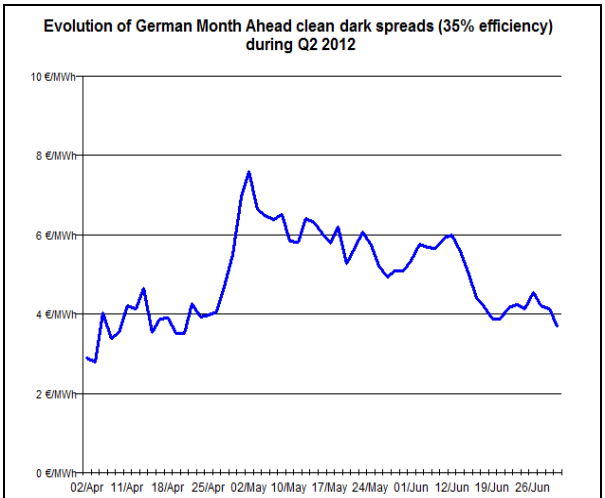
Source : ENTSO-E Vista



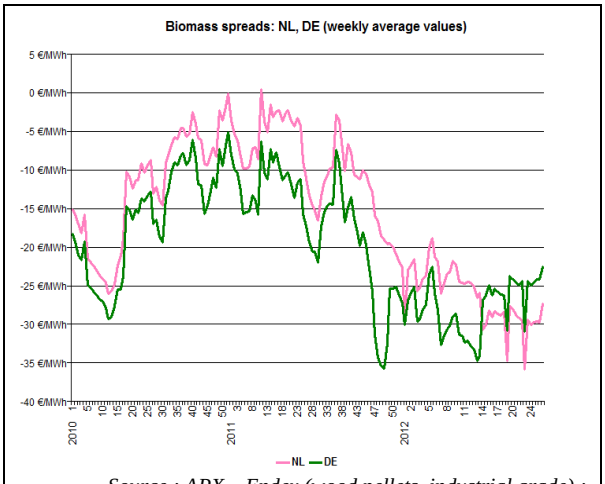
Source : E-Control GmbH, Austria



Source: Power price and volume data, own computations.



Source: Platts



Source : APX – Endex (wood pellets, industrial grade) ; Platts (electricity and emission prices; freight rates)

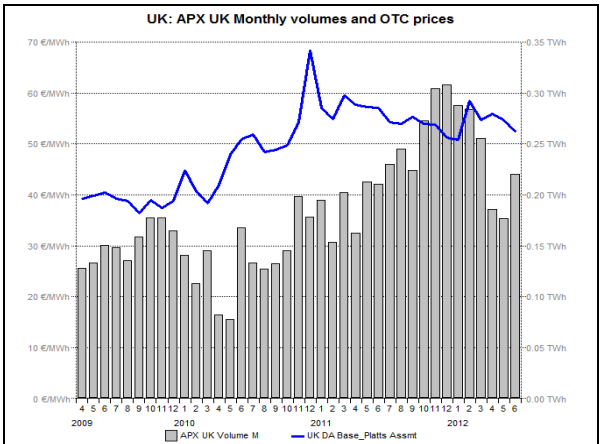
British Isles (UK, Ireland)

- Day-ahead baseload power price contracts started the second quarter of 2012 on a high level due to the colder-than-usual temperatures. Prices became lower before the Easter Holidays and as the weather turned milder. In mid-April as gas flows from the UK to the continent intensified, the reduction in domestic gas supply resulted in higher power generation costs and wholesale power prices in the UK went up. From the second half of April 2012, as wind power generation increased, nuclear availability was on a healthy level and natural gas prices became cheaper, power prices started to decrease.
- From early May 2012 this decreasing power price trend has been reversed, due to higher natural gas prices and to the tightness in the power system which was aggravated further by an unplanned nuclear plant outage erasing about a quarter of UK nuclear capacity in mid-May. Daily average baseload prices reached their peak (59.5 €/MWh) during Q2 2012 on the 14th of May. As domestic natural gas prices on the NBP hub began to fall and as the nuclear plants resumed operation power supply increased significantly and power generation costs decreased. These factors resulted in low baseload power prices, falling below 50 €/MWh on the 24th of May for the first time since January 2012.
- During the remaining period of Q2 2012 UK daily baseload power prices fluctuated in a range of 50-55 €/MWh. The main price moving factors were cooler than usual weather, demand decreasing impacts of the Jubilee Holidays at the beginning of June 2012 and natural gas prices being

affected by the scheduled maintenance of the Belgian-UK gas interconnector (increasing domestic gas supply and keeping gas prices low) and outages of some gas import source fields (decreasing domestic gas supply and pushing prices up). In the first half of June 2012 decreasing crude oil prices also had a lowering impact on UK power prices. During most of the time in Q2 2012 crude oil, coal and natural gas prices showed a decreasing trend that also put quarter-ahead and year-ahead power prices on a downward trajectory.

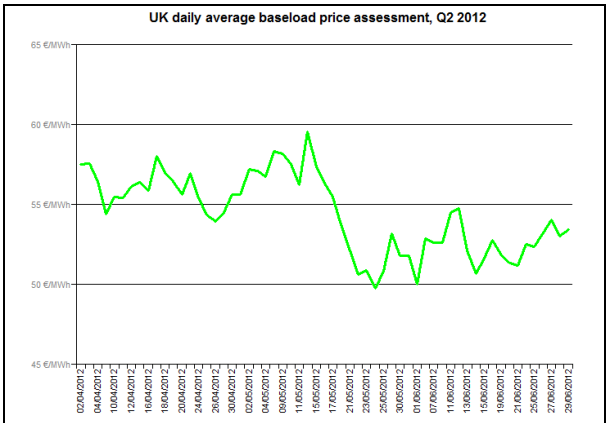
- During the second quarter of 2012 Irish daily baseload power prices proved to be more volatile again than their UK counterparts; varying between 54 €/MWh (15th of June) and 85.6 €/MWh (24th of April). Irish price premium over the UK market was 10.6 €/MWh in Q2 2012. In June 2012 the monthly average baseload power price in the Irish market was 57.3 €/MWh, the lowest since August 2010. This might have been related to the decreasing natural gas and coal prices which two fuels dominated the Irish power generation mix.

- Clean sparks spreads in the UK fluctuated around 4 €/MWh during the whole Q2 2012, mainly due to the slightly decreasing power and natural gas prices and to emission allowance prices remaining in low ranges. The near-end of the spark spread curve showed a decreasing trend during the last twelve months, pointing to the declining competitiveness of gas-fired power generation in the UK. Year-ahead spark spreads showed a jump as the seasonal contract change took place in April 2012. As there was a measurable premium in year-ahead power prices over short term forward power contracts, year-ahead spark spreads remained on higher levels during the second quarter of 2012.



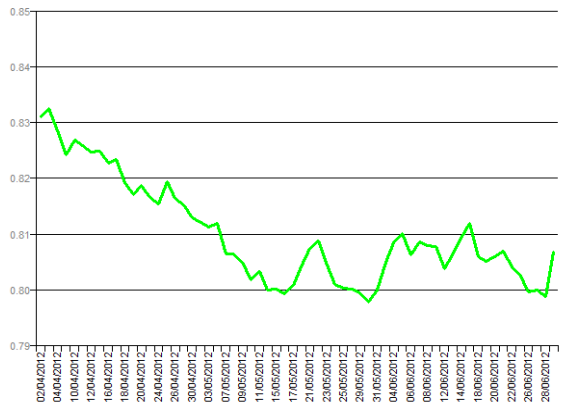
UK values are quoted in € using the €/£ daily exchange rate as reported by the European Central Bank.

Source: Platts

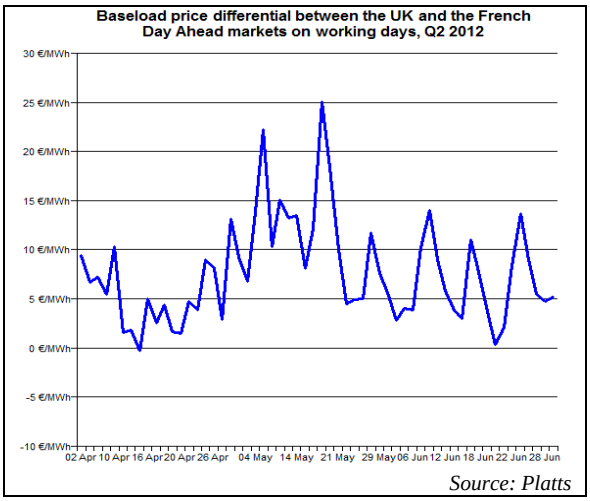


UK values are quoted in € using the €/£ daily exchange rate as reported by the European Central Bank.

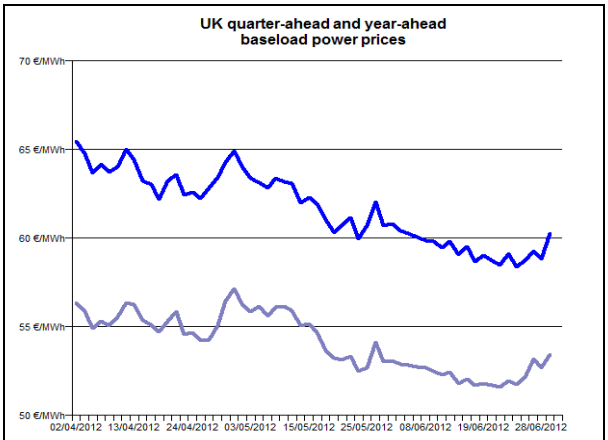
Source: Platts



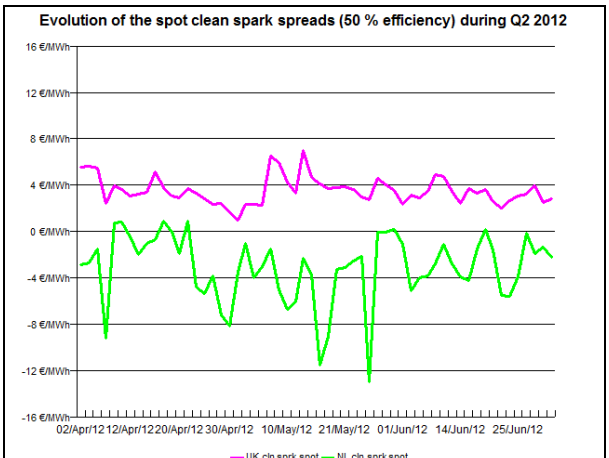
Source: European Central Bank



Source: Platts

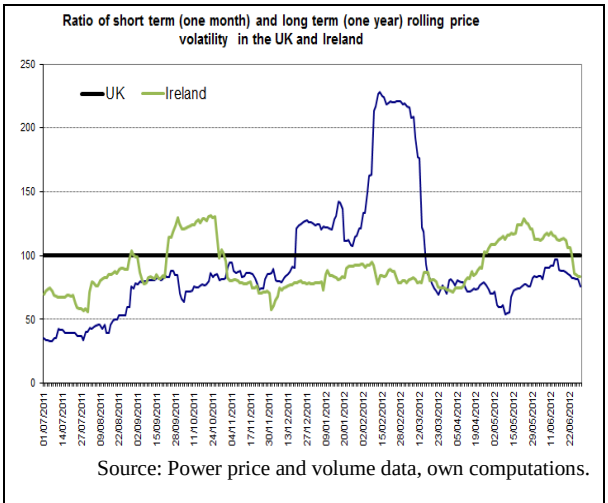


Source: Platts

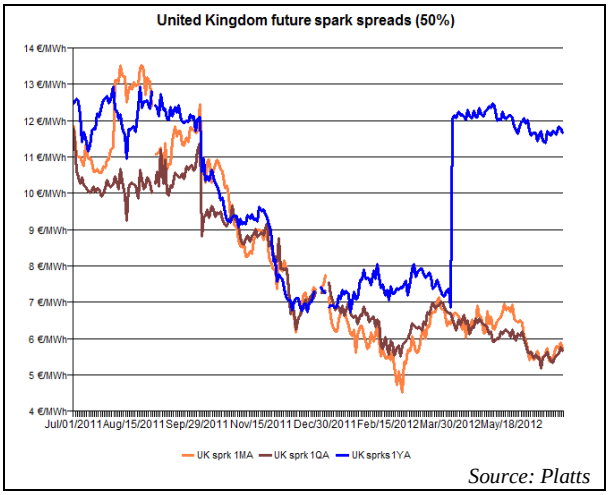


UK values are quoted in € using the €/£ daily exchange rate as reported by Platts

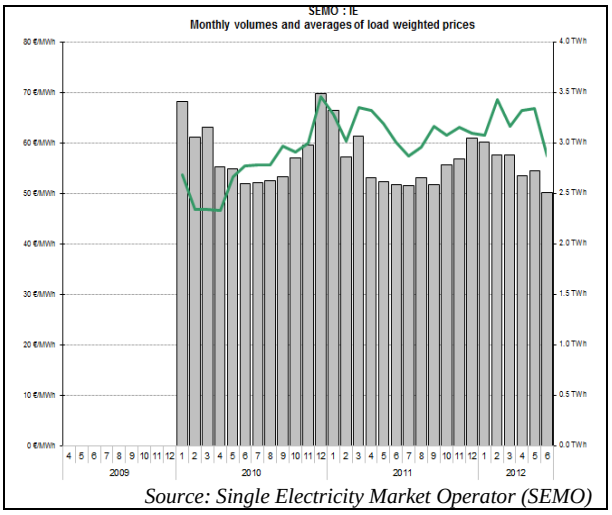
Source: Platts



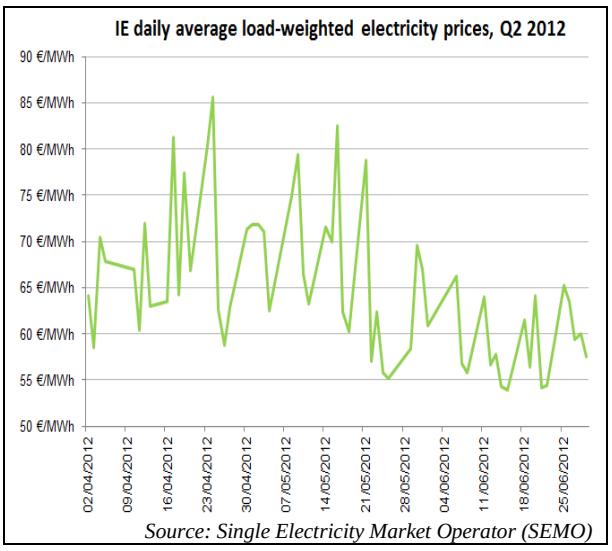
Source: Power price and volume data, own computations.



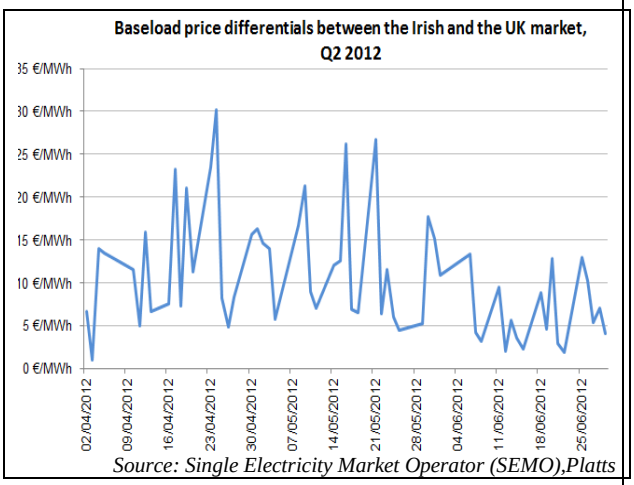
Source: Platts



Source: Single Electricity Market Operator (SEMO)



Source: Single Electricity Market Operator (SEMO)



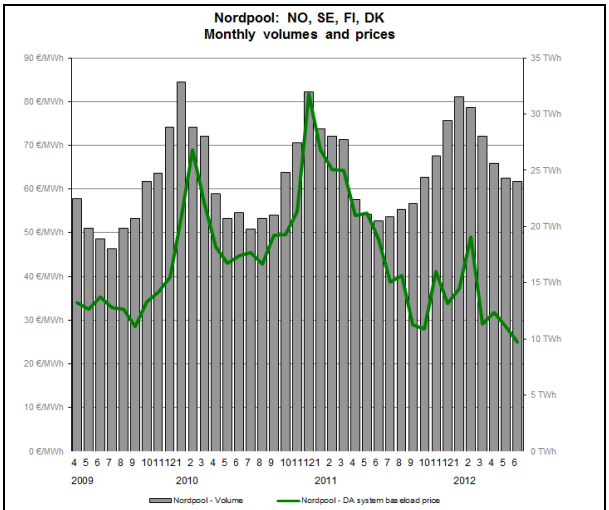
Source: Single Electricity Market Operator (SEMO),Platts

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

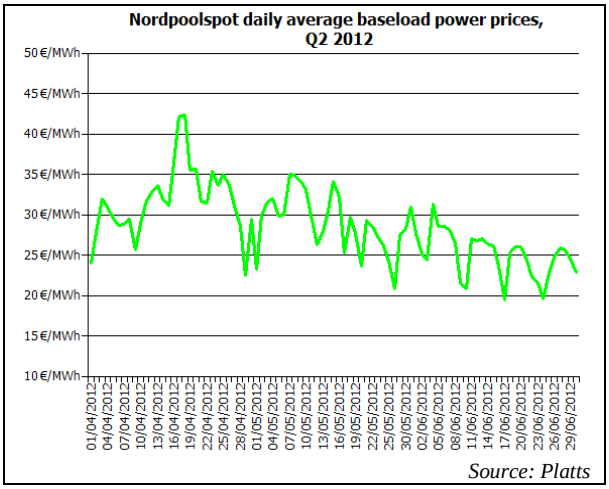
- After unusually low monthly averages measured in the first quarter of 2012, baseload power prices in the Nordic markets decreased in even lower ranges. In April 2012 the monthly average baseload power price was 31.7 €/MWh. Although the April average was slightly higher than in March, the downward trend gathered a new momentum in May (29.1 €/MWh) and in June 2012 the monthly average power price fell to the lowest since March 2007 (25 €/MWh).
- Daily average baseload power prices showed a transitory increase during the week after the Easter holidays, reaching the Q2 2012 quarterly peak on the 18th of April (42.3 €/MWh), primarily owing to an ongoing cold season in the Scandinavian countries and North-Western Europe. After the end of the cold weather prices followed a downward path until the end of Q2 2012; falling even below 20 €/MWh on some non-working days.
- The main reason for the competitive level of power prices in the Nordic power market was the abundant hydro-based power generation in the region. In Q2 2012 the level of hydro reserves were permanently higher than the ten-year median, though the ten per cent difference between actual and historical levels measured in April 2012 decreased to a range of 1-4 per cent in May and June 2012.
- As Nordpoolspot system price showed a significant discount to the German market (12.1 €/MWh on a quarterly average in Q2 2012), net power exports of the Nordic region rose to

the highest in the last five years (5.4 TWh).

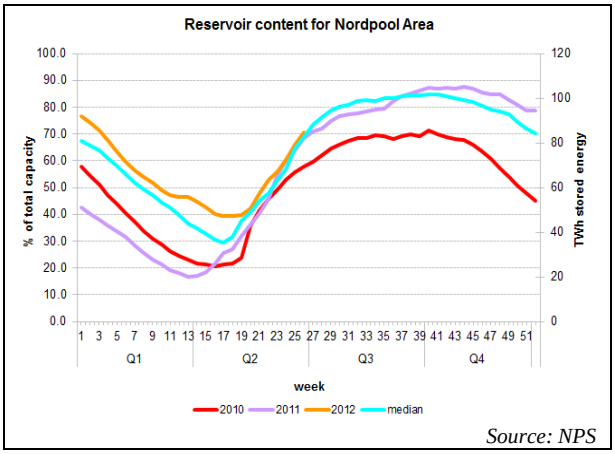
- The decreasing trend of day-ahead prices was accompanied by a low volatility during all of Q2 2012; the value of the short term backward-looking volatility was less than the one-year backward-looking long term number. Quarter-ahead and year-ahead Nordpool power prices also followed a decreasing trend during most of Q2 2012, though the decrease was not so steep as in the case of day-ahead contracts. Forward contract prices showed signs of recovery by the end of June 2012, implying that spot prices might also recover.
- On the 18th of June 2012 trading started in a new bidding area (Lithuania), adding a new country to the list of functioning power trading platforms in the EU. Although the market performance in Q2 2012 can only be assessed relying on data of thirteen days, indicating a limited basis for a thorough evaluation, Lithuanian daily average prices had a significant premium to Nordpool system price; on some days reaching 30-40 €/MWh. This might have been related to poor interconnections of Lithuania to other Nordpool price areas.
- In the second quarter of 2012 the total traded volume of day-ahead power contracts was 73.9 TWh, being 18% lower than in the previous quarter, pointing to the strong seasonal character of the market, but 15.4% higher than in the same quarter of the previous year. Nordpool was still the most liquid power region in the EU as a volume corresponding to 77.7% of the Nordic countries gross electricity consumption was traded on the spot market in Q2 2012.



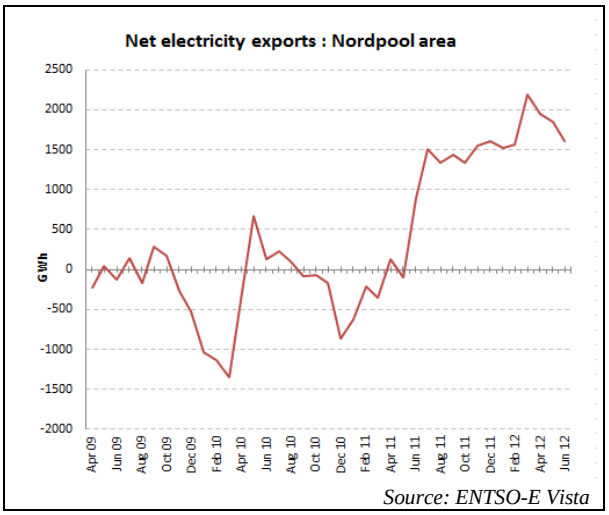
Source: Platts



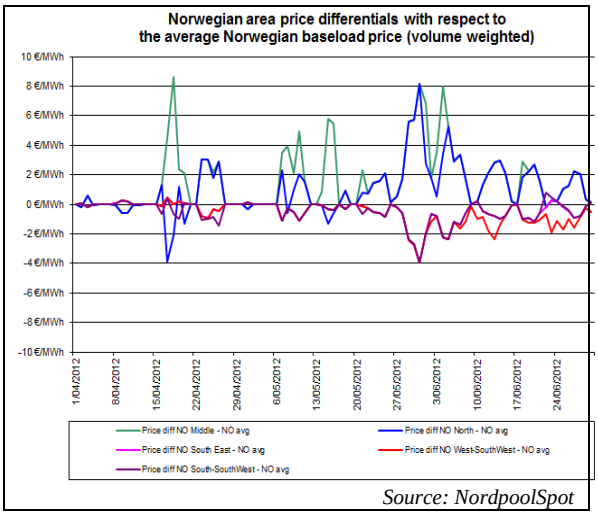
Source: Platts



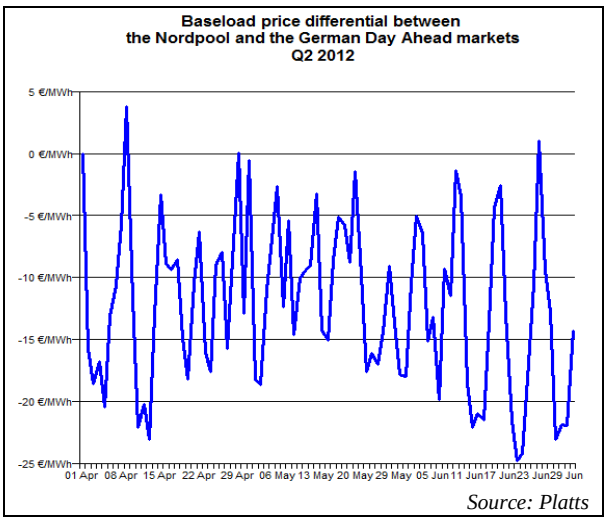
Source: NPS



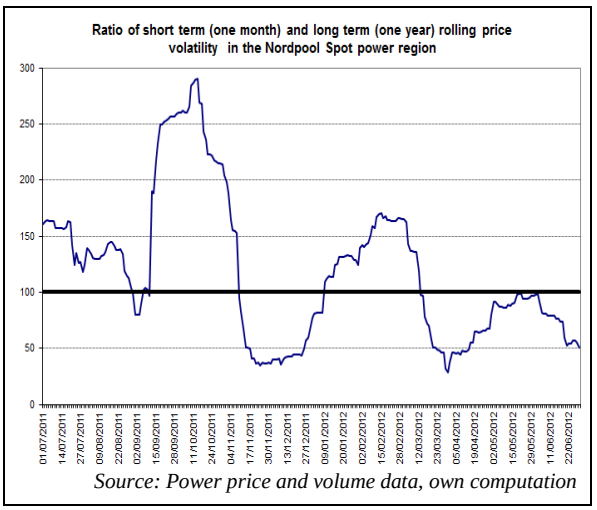
Source: ENTSO-E Vista



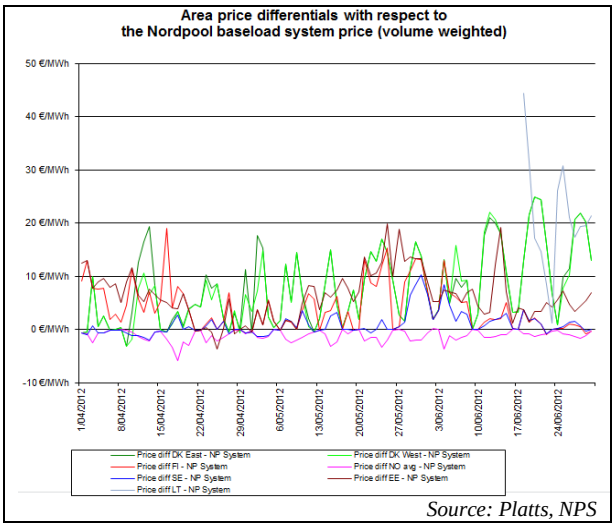
Source: NordpoolSpot



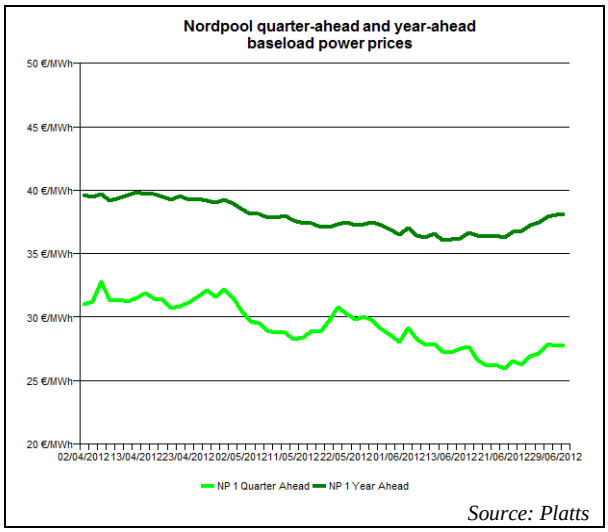
Source: Platts



Source: Power price and volume data, own computation



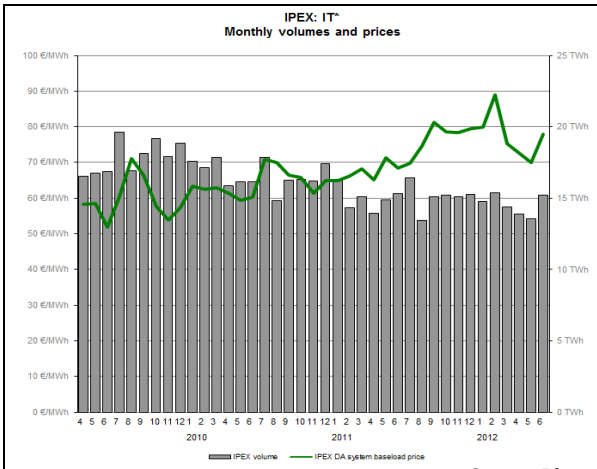
Source: Platts, NPS



Source: Platts

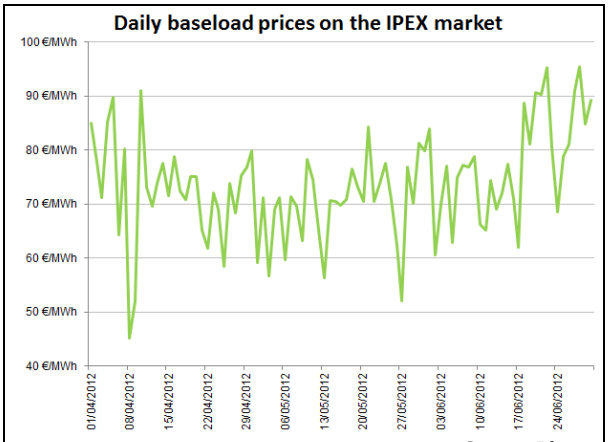
Apennine Peninsula (Italy)

- After very high power prices observed during the winter period in the Italian market, the monthly average baseload price managed to decrease to 72.7 €/MWh in April 2012 and to 70 €/MWh in May 2012 from 75.3 €/MWh observed in March. In June however, the monthly average price increased again (to 77.8 €/MWh).
- Looking at the evolution of power prices more closely, the daily baseload price started April 2012 at a high level, which might be related to high oil and natural gas prices. During the Easter holidays prices fell to the lowest level in Q2 2012 (45.3 €/MWh) and then rebounded within a couple of days' time and reached 91 €/MWh, primarily owing to the colder than usual weather.
- Later in that month as the weather turned milder and natural gas prices on the PSV hub gradually decreased, power prices also went down. In the first half of May 2012 baseload power prices fluctuated in a range of 60-70 €/MWh. From the second half of May power prices started to follow an increasing trend and by the end of June 2012 they reached 95 €/MWh. This increase in prices might have been related to extra power demand for cooling as June 2012 was warmer than the same month in the preceding year (in June 2012 the cooling degree days (CDD) value in Italy was 55 whereas a year before it was only 18).
- Due to rapid changes in weather circumstances short term backward looking volatility was greater than the long term number (one-year backward looking), reaching its peak in early May 2012.
- In some of the Italian regional bidding areas prices showed again a high degree of volatility and great deviations from the national system price in Q2 2012. Sicilian area daily baseload prices were the highest on the 15th of May (146 €/MWh), while hourly prices exceeded 200 €/MWh for several hours on that day. The Sardinian price area could be characterised by an even greater volatility, especially in June 2012 when power prices in Italy were on an upward path. In this month Sardinian area prices exceeded 240 €/MWh for a number of hours and on the 30th of June the daily average price was 273 €/MWh, with two hours having an hourly price of 450 €/MWh on this day. It seems that each time when summer heat entails an extra demand for power (for cooling needs) in this bidding area, which can be considered as an isolated power area, the probability of formation of very high prices in the market grows substantially.
- The ratio of power flows against price differentials (FAPDs) was only 4% in Q2 2012 between the Slovenian and Italian markets as an effective market coupling exists between these two neighbours. In the case of France and Austria the FAPD ratios with Italy were also low, though it was rather due to high price differentials (discounts) to the Italian market, prompting power flows from Italy to these markets in not too many occasions. Adverse power flows were more frequent between Italy and Greece, primarily owing to the volatile behaviour of the price differential between the two markets.



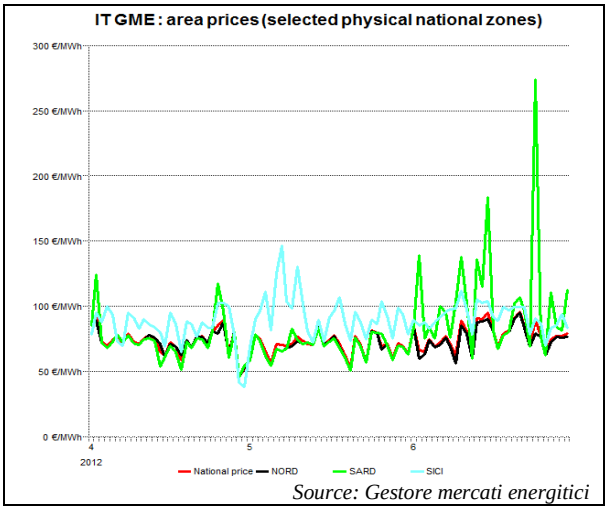
Source: Platts.

** Trade on Italian (IPEX), Greek (DESMIE) and Iberian (OMEL) electricity markets is incentivised by regulatory means.*

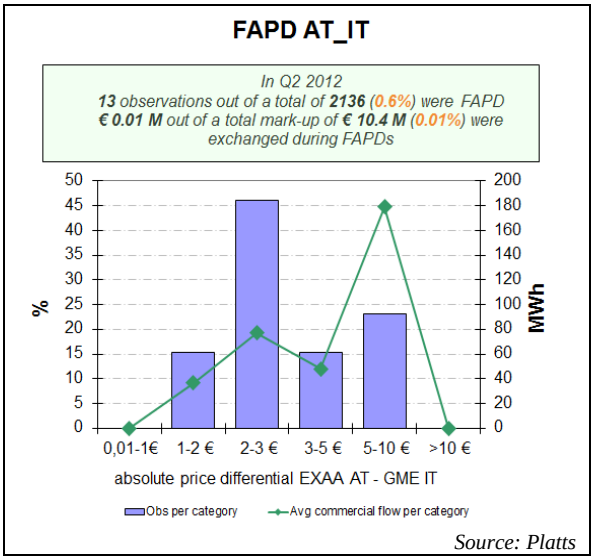


Source: Platts.

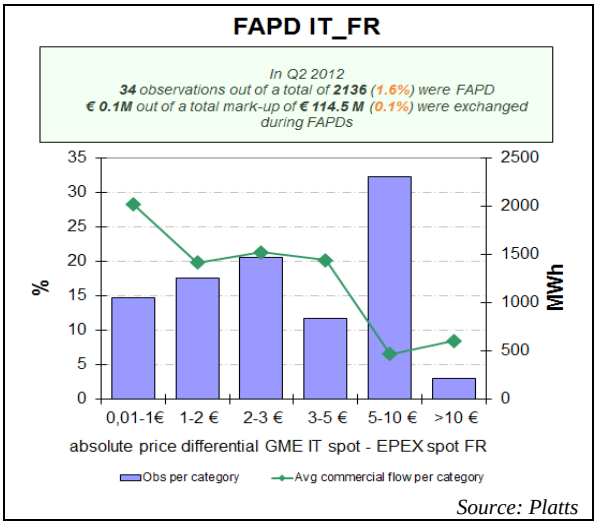
** Trade on Italian (IPEX), Greek (DESMIE) and Iberian (OMEL) electricity markets is incentivised by regulatory means.*



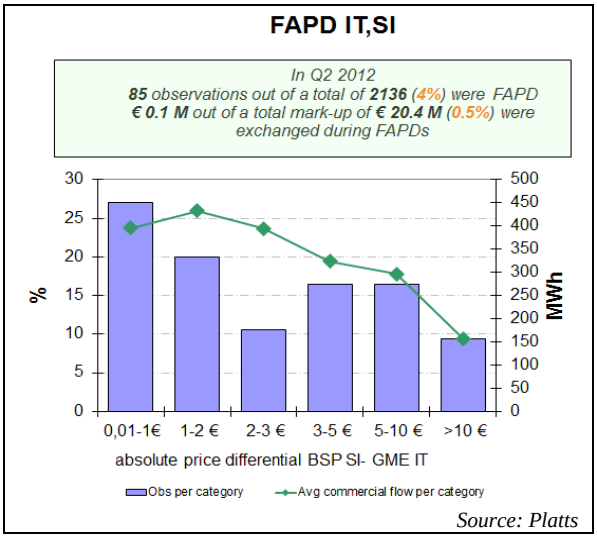
Source: Gestore mercati energitici



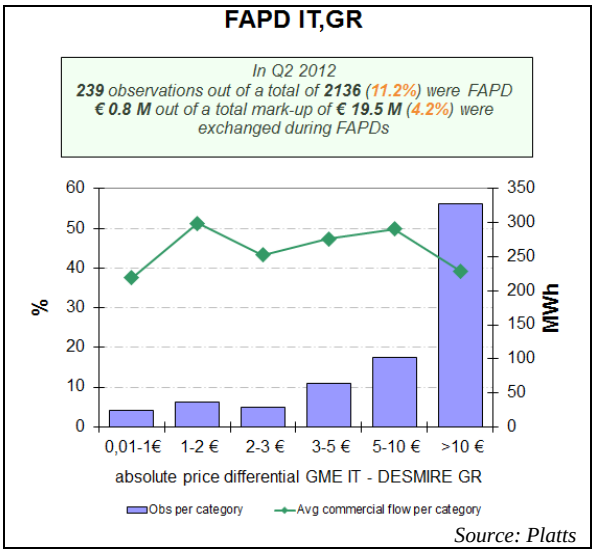
Source: Platts



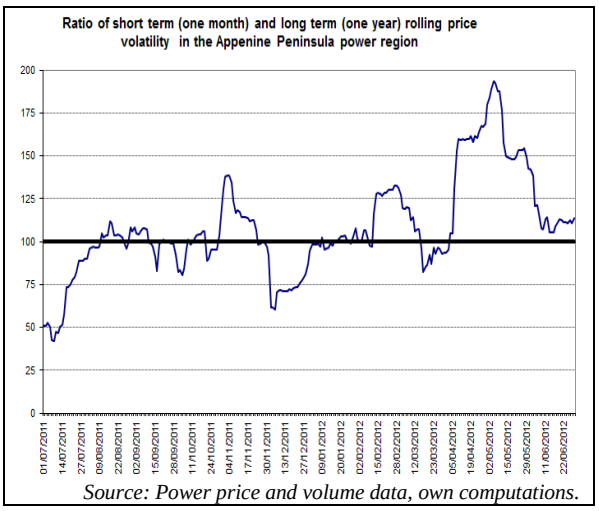
Source: Platts



Source: Platts



Source: Platts



Source: Power price and volume data, own computations.

Iberian Peninsula (Spain and Portugal)

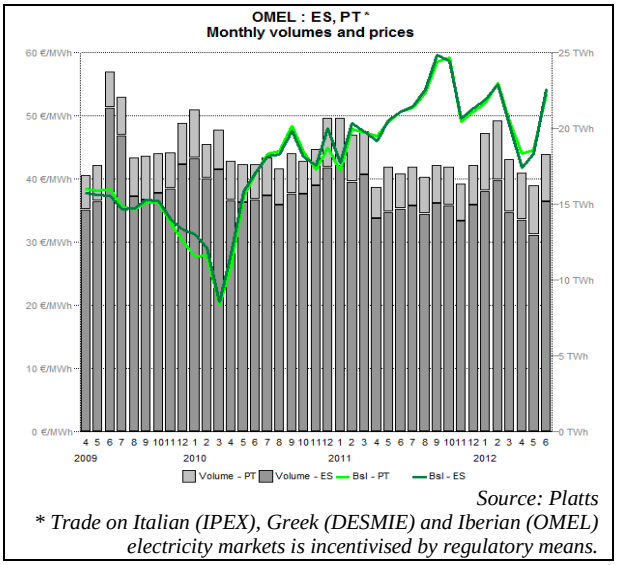
- In April 2012 Spanish day-ahead power prices were particularly volatile. Taking a look at the range they were fluctuating in during this month, there were three days (the 2nd, 12th and the 27th of April) when the daily average baseload price was above 55 €/MWh, while on the 19th and 25th they fell below 23 €/MWh. This high volatility was due to the coincidence of several factors. First, wind power generation played a dominant role in Spanish domestic power supply on some days in April 2012. For example, on the 17th of April more than 60% of the daily power generation was satisfied by wind energy. The high share of wind generation increased the fluctuation of prices as intermittent energy sources usually show a high degree of variance regarding their availability.
- The second reason for high price volatility was the colder than usual April weather, both in Spain and Portugal that entailed a higher than seasonally usual power demand. Cold weather combined with volatile wind power generation contributed to volatile power prices. An additional factor explaining the behaviour of Iberian power prices was the low level of hydro power generation. In April 2012 hydro reserves were by 10% lower on average than the long term seasonal level. Later in Q2 2012 this difference decreased, though this quarter can be considered as drier than usual. In mid-April short-lived unplanned outages occurred in some of the Spanish nuclear power plants that also contributed to the volatility of the power market.
- As wind power generation reached its daily maximum several times during peak hours in April 2012, there were six days in this month when the daily peakload average price was less than the daily average baseload price in the Iberian market. This development provided an interesting example for energy systems with increasing share of RES in the power generation mix.
- From the beginning of May the weather turned warmer and the month as a whole was warmer than usual. Daily average prices followed an increasing trend in May 2012. This was primarily due to the receding

share of wind in the power generation mix, as wind's share went down from 25% to 17% from April to May 2012. Another important reason was a series of planned maintenances of nuclear power plants. In May 2012 three reactors (Almaraz II, Trillo, Vandellos) were taken offline for a longer period, reducing the number of nuclear power plants in operation to five from eight.

- In June 2012 daily baseload power prices fluctuated mostly in a range of 50-60 €/MWh, and price volatility fell significantly compared to the levels measured in April and early May. Power prices in June 2012 were mainly influenced by the availability of nuclear generation, as in mid-June an unplanned outage reduced the number of plants in operation to four. This unplanned outage ended ten days later and at the same time two plants were reconnected to the grid after the end of the maintenance works started in May. Another important factor was the anticipation of summer heat periods entailing extra power demand for cooling needs.

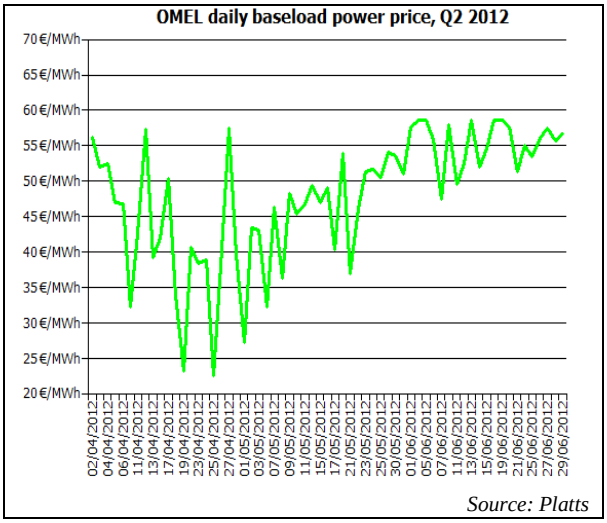
- Both quarter-ahead and year-ahead power prices gradually decreased from the beginning of April until mid-June 2012, similarly to other markets in Europe. From the second half of June as the sentiment improved on financial and commodity markets in Europe and emission allowance prices started to increase, Spanish forward contracts also turned up. High spot pool prices also put an upward pressure on forward contracts during the last two weeks of June 2012.

- The frequency of adverse flows between France and Spain was similar to that in the previous quarters (12% in Q2 2012). In Q1 2012 very high French power prices owing to the cold snap in February 2012 resulted in slightly higher FAPD ratios (16%). Only a couple of FAPDs could be observed between Spain and Portugal.

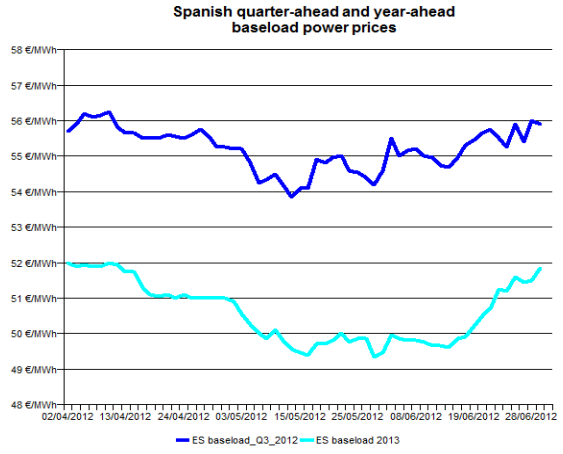


Source: Platts

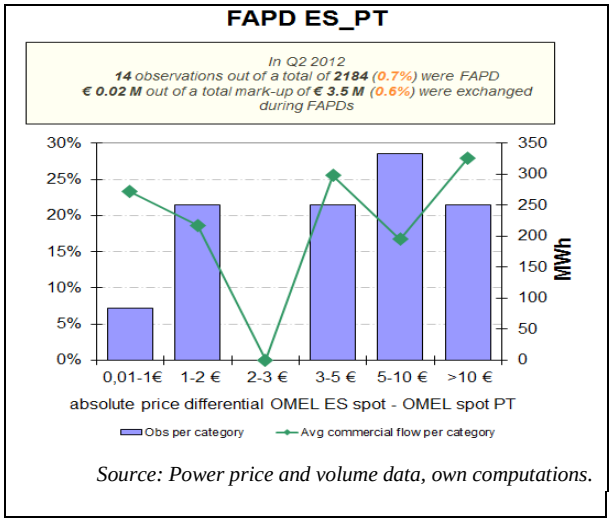
** Trade on Italian (IPEX), Greek (DESMIE) and Iberian (OMEL) electricity markets is incentivised by regulatory means.*



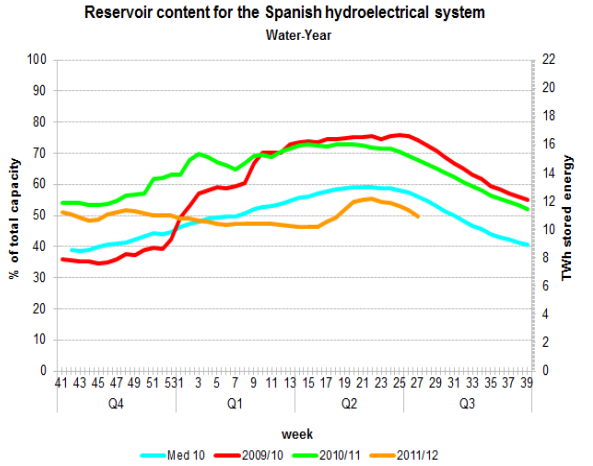
Source: Platts



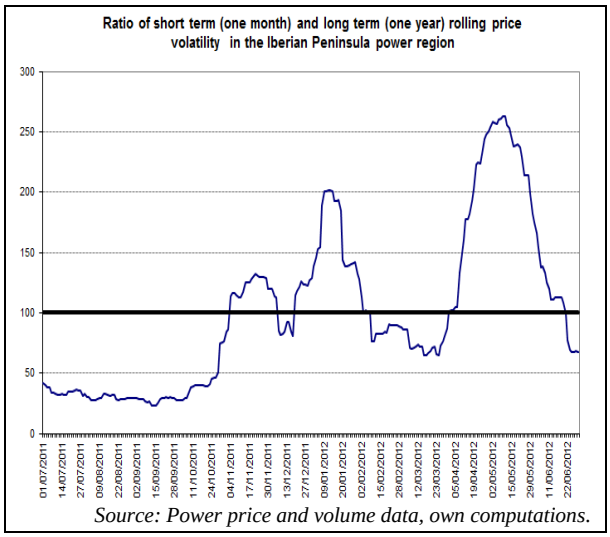
Source: Platts



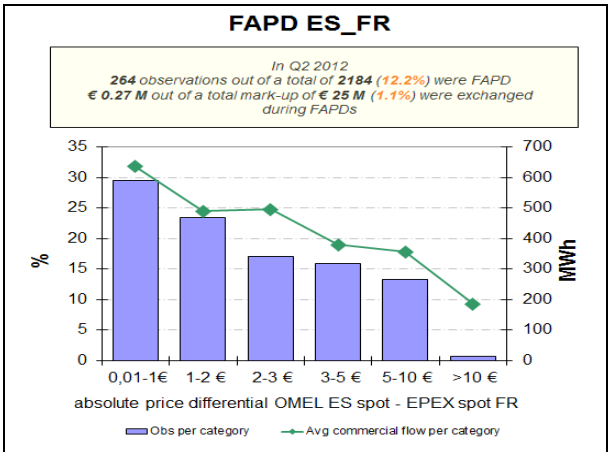
Source: Power price and volume data, own computations.



Source: Ministerio de Medio Ambiente, y Medio Rural y Marino, Gobierno de España



Source: Power price and volume data, own computations.



Source: Power price and volume data, own computations.

Source: Platts

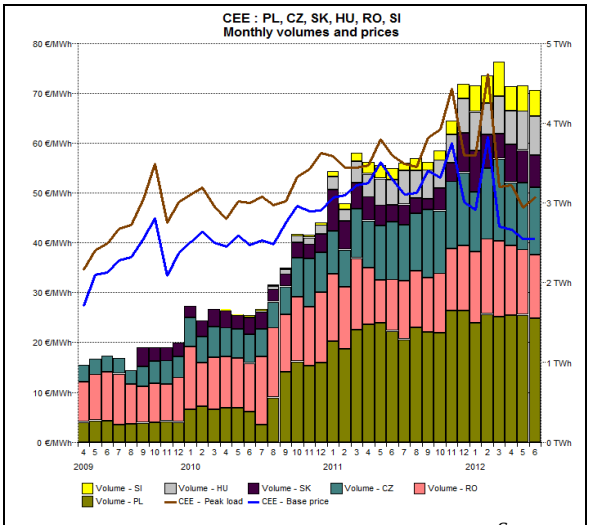
Central Eastern Europe (Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia)

- At the beginning of April 2012 baseload power prices in the Central East European region showed signs of divergence. While Polish, Czech and Slovak prices remained at moderate levels (around 40-50 €/MWh), Hungarian, Romanian and Slovenian power turned much more expensive. In the case of the former three countries good power supply contributed to low prices levels, in the case of Hungary, Romania and Slovenia low hydro generation in the Balkans provided opportunities to export power to this region and the resulting decrease in domestic supply kept prices on a higher level. Romanian and Slovenian day-ahead baseload prices were the highest on the 11th of April (72 €/MWh) during Q2 2012, while Hungarian daily prices were even higher (83 €/MWh) on the same day.
- In the case of Hungarian power prices costs related to power transports from Austria and Slovakia also played an important role in setting high prices. Cross border availability was significantly reduced several times in the first half of April 2012. Low cross border availability, dry weather in the Balkans resulting in low hydro generation, and reduced power imports from Ukraine all contributed to high and volatile power prices in Hungary during this period. Sometimes the Hungarian power market showed surprising reactions; for example on the 17th of April the Hungarian daily baseload power price rose to 99.4/MWh and on the following day it fell back to 52 €/MWh. A similarly high volatility could be observed in the Romanian market where prices fell below 27 €/MWh on the 16th of April, practically down 3 times from the level observed six days before.
- By the end of April 2012 as the weather turned milder, some power plants returned to the grid after maintenance works or unplanned outages and due to the increasing hydro availability in the Balkans power supply significantly improved in Hungary, Romania and Slovenia, and power prices re-converged with the other three CEE countries.
- In May 2012 power prices were generally lower in the CEE region than in April. The regional monthly average*** baseload price was 40.8 €/MWh in May while in April it stood at 42.7 €/MWh. Regional monthly peakload average decreased from 51.6 €/MWh to 47.1 €/MWh in the same period. Cheaper prices in May were mainly due to warm weather conditions, abundant renewable generation in the region and in Germany and good hydro availability in the Balkans. Maintenance works on the Italian-Greek power interconnector between 21th of May and the 10th of June also contributed to good power supply in the CEE region, helping to keep prices lower. In the Czech Republic and Hungary some nuclear reactor units were taken offline for planned maintenance works, though it had

*** In this part of the report Central East European power region comprises Poland, the Czech Republic, Slovakia, Hungary, Romania and Slovenia. Both regional monthly baseload and peakload power prices are computed as of traded-volume-weighted averages of the six countries' prices

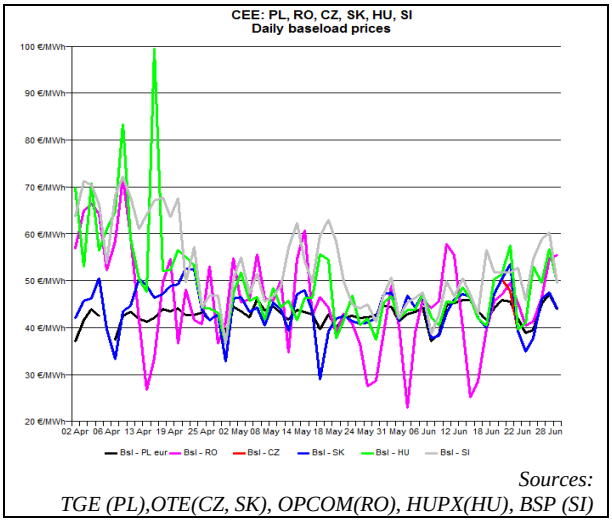
limited impact on power prices. The Slovak-Hungarian interconnector also underwent some maintenance that resulted in a temporary price spike in Hungarian power prices in mid-May. Czech daily baseload prices fell below 30 €/MWh on the 17th of May as power exports to Germany fell ahead of the Ascension Day (lower industrial demand on a public holiday).

- In June 2012 regional monthly baseload prices fell to a range of 38-43 €/MWh, which was the lowest since the summer of 2010 as a consequence of healthy power supply and only few plant outages in the region. Hydro levels in the Balkans were fairly high during this month that helped keeping prices lower. On the 4th and the 14th of June Romanian daily baseload prices, being the most volatile in Q2 2012 in the CEE region, fell below 30 €/MWh in the consequence of good hydro availability. At the end of the month as a heat wave touched the region hydro-power generation helped to keep price surges under control. In the last ten days of the month Hungarian, Romanian and Slovenian prices rose significantly due to the aforementioned heat wave, while Czech and Polish prices remained on a moderate level due to the availability of renewable generation in Germany.
- Similarly to their West European peers Czech and Polish forward prices were on a downward track during most of Q2 2012, year-ahead prices in both countries decreased to the lowest levels since autumn 2010. Forward prices in the region were influenced by decreasing fossil fuels and by the sluggish recovery perspectives of the European economy. Czech quarter-ahead power prices managed to rise at the end of June 2012 primarily owing to an anticipation of extra power demand stemming from cooling needs during the summer in the southern countries of the CEE region.
- Although in Q2 2012 traded volume of day-ahead power contracts (13.3 TWh) decreased by 3.5% compared to the previous quarter, in a year-on-year comparison it rose by 34%, which was an impressive growth rate and the highest one among the European power regions. The traded volume of power in the CEE region represented 14.9% of the participating countries' combined gross electricity consumption in Q2 2012.
- Cross border flow restrictions between Hungary and its two neighbours (Austria and Slovakia) could also be tracked in increasing FAPD ratios in Q2 2012.

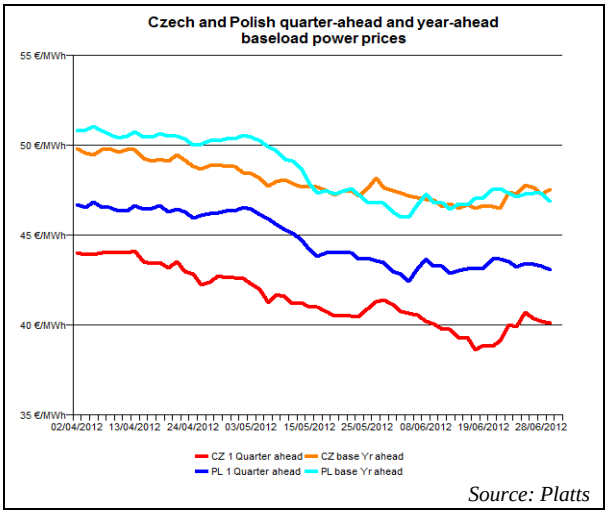


Sources:
TGE (PL),OTE(CZ, SK), OPCOM(RO), HUPX(HU), BSP (SI)

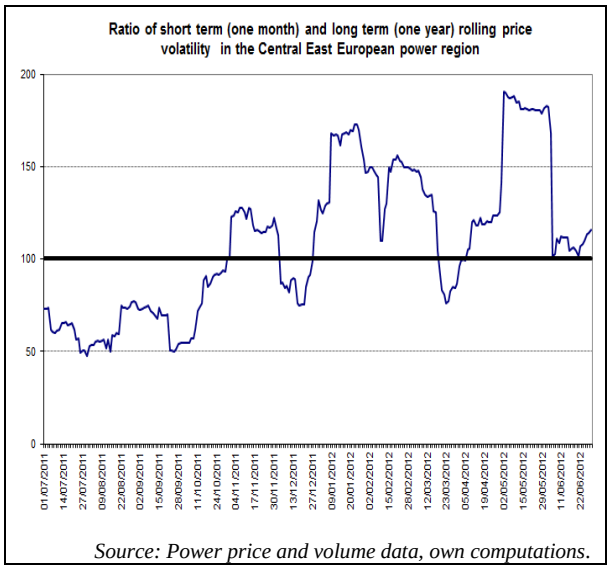
Monthly average baseload power prices (€/MWh)			
2012	April	May	June
Czech Republic	41.1	38.4	38.7
Slovakia	41.1	38.5	38.9
Poland	39.5	41.3	41.1
Romania	43.6	40.4	41.1
Hungary	51.4	41.9	42.8
Slovenia	51.7	46.5	43.3



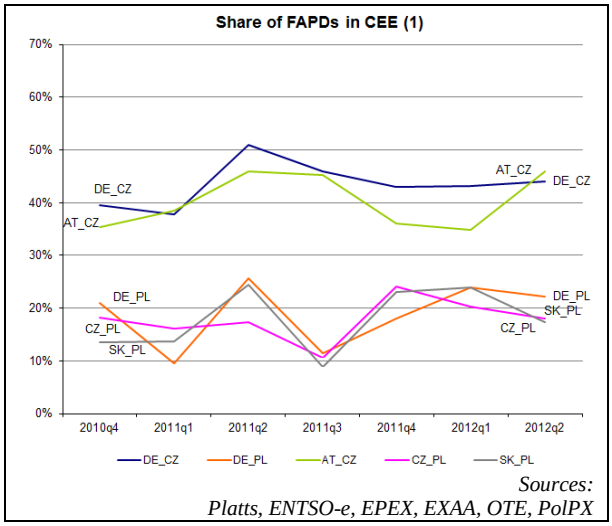
Sources:
TGE (PL),OTE(CZ, SK), OPCOM(RO), HUPX(HU), BSP (SI)



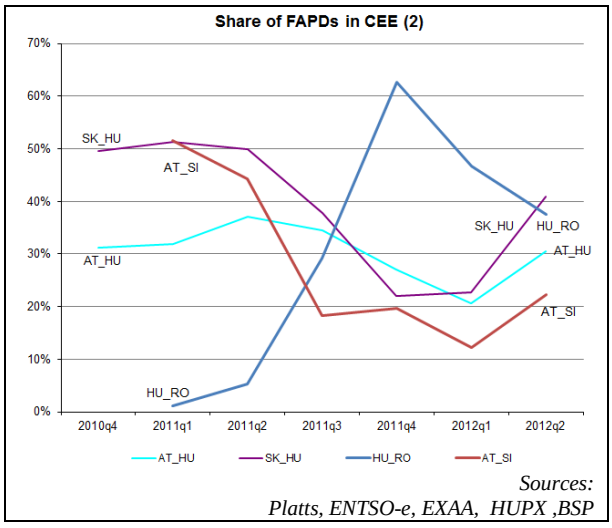
Source: Platts



Source: Power price and volume data, own computations.



Sources:
Platts, ENTSO-e, EPEX, EXAA, OTE, PolPX



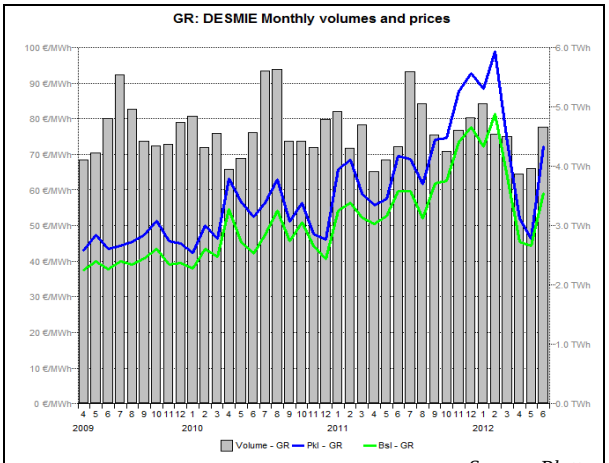
Sources:
Platts, ENTSO-e, EXAA, HUPX ,BSP

Distribution of FAPDs across the price differences

	0.01-1€	1-2€	2-3€	3-5€	5-10€	>10€
DE_CZ	20%	21%	17%	23%	16%	2%
DE_PL	19%	14%	13%	18%	20%	17%
AT_CZ	42%	29%	14%	11%	4%	0%
AT_SI	39%	21%	13%	19%	7%	0%
AT_HU	44%	26%	13%	11%	4%	1%
SK_HU	33%	27%	18%	11%	8%	3%
CZ_PL	28%	18%	10%	15%	15%	13%
SK_PL	6%	5%	8%	12%	25%	43%
HU_RO	6%	9%	7%	11%	25%	42%

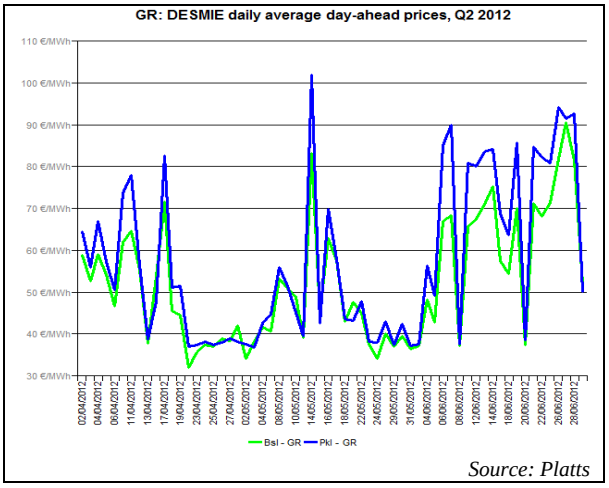
South Eastern Europe (Greece)

- The Greek monthly average day-ahead baseload power price decreased to 45.3 €/MWh in April 2012 from 63.6 €/MWh measured in the previous month, and in May 2012 the decrease in monthly price continued (44.4 €/MWh). Monthly average baseload and peakload power prices in April-May 2012 were the lowest since December 2010.
- Low daily power prices in April 2012 were mainly due to the milder-than-usual weather and holiday periods reducing the industrial demand for power (Greek Easter holiday in mid-April). In May 2012 mild weather continued to lower heating related demand and on most of the days prices were low. Increasing hydro-based power generation also contributed to low prices. Hydro resources are normally held back during the winter period in order to be able to satisfy higher power demand during spring and the summer period of the year.
- However, on the 14th of May the daily average baseload price rose to 83 €/MWh, while peakload surged to 102 €/MWh. This was due to an irregularity in bid calculation by the dominant power utility (PPC) as one of the gas-fired independent power plants was taken offline and this event reduced domestic power supply.
- In June 2012 as warm period arrived, power prices were up in Greece. Normally extra power demand is satisfied by putting on the grid power plants of gas-fired generation besides constantly running lignite based plants. As generation costs of gas-fired power generation were high during this period, given that natural gas is imported in the country mainly under oil-price-linked long term contracts, extra power demand due to the summer heat led to high power prices on some days (the daily baseload price peaked on the 27th of June above 90 €/MWh in Q2 2012).
- Greek baseload power prices showed a 7.8 €/MWh premium to the Romanian market in Q2 2012 on average. As both Romanian and Greek prices were volatile during the quarter, on some trading days significant differentials occurred between the two markets (40-50 €/MWh). Italian baseload power prices showed a significant (24 €/MWh) premium to Greece in Q2 2012 on average. The Greek power market's volatility was above the one-year backward looking average during most of Q2 2012, mainly in the consequence of the sudden price jump in mid-May and the impact of high temperatures on the power mix and to the power generation costs described above.

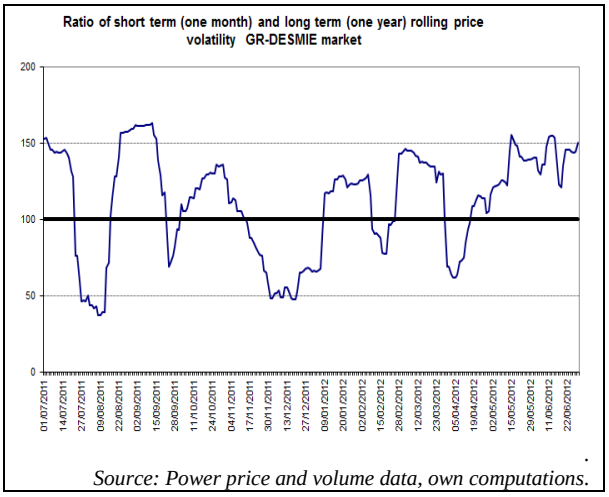


Source: Platts

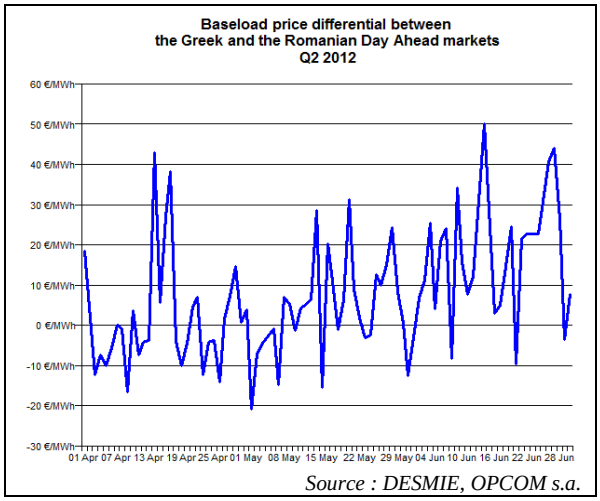
** Trade on Italian (IPEX), Greek (DESMIE) and Iberian (OMEL) electricity markets is incentivised by regulatory means.*



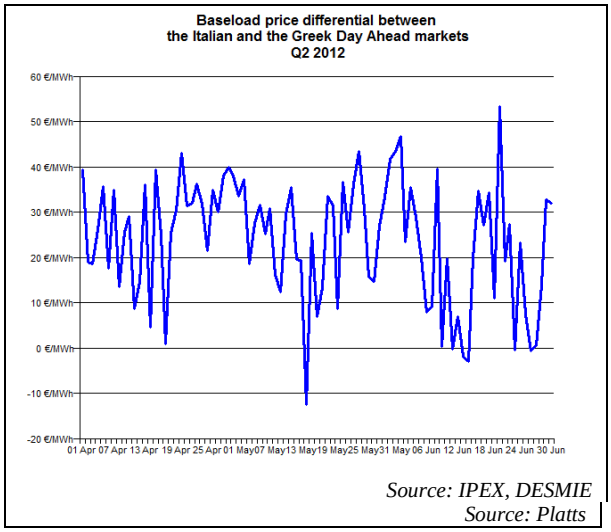
Source: Platts



Source: Power price and volume data, own computations.



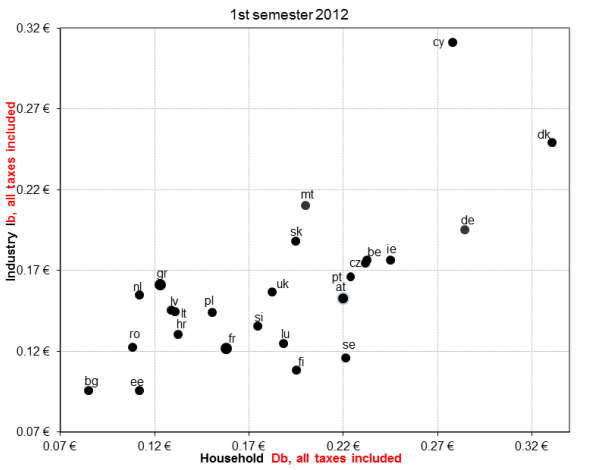
Source : DESMIE, OPCOM s.a.



Source: IPEX, DESMIE
Source: Platts

A. 2 Retail markets

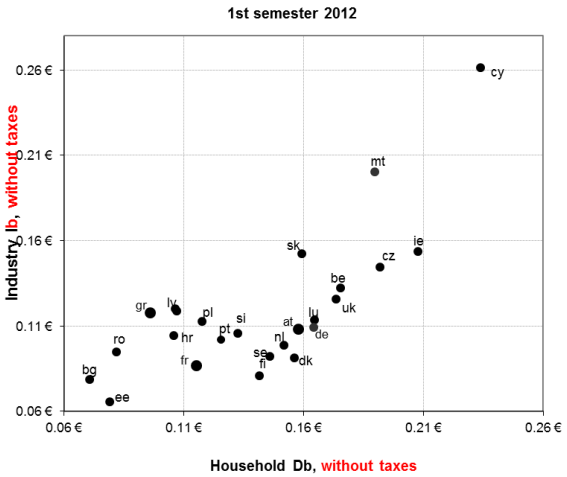
The next two charts show the electricity prices paid by household consumers in the Member States of the EU with annual consumption between 1000 kWh and 2500 kWh, and industrial consumers with annual consumption between 20 MWh and 500 MWh (consumption bands *Db* and *Ib* according to Eurostat's consumption categories). The first chart shows the household and industrial customer prices including all taxes (gross prices), while the second one shows prices without taxes (net prices) in the first half of 2012.



Source: Eurostat as of October 2012
Range for annual consumption:
Household band Db: 1.000kWh<consumption<2.500 kWh
Industry band Ib:20 MWh<consumption<500 MWh
Notes: No EU27 calculations due to missing data for IT, ES and HU. Provisional data for AT, CY and NL.

Between the second semester of 2011 and the first semester of 2012 the ratio between the lowest and highest gross price increased from 2.8 to 3.3 for industrial consumers and remained relatively stable at 3.9 for household consumers.

In absolute terms the range between the lowest and the highest pre-tax prices for households amounted to 16 cents/kWh (up by 2 cents/kWh with respect to the second semester of 2011) and to almost 20 cents/kWh for industrial consumers (an increase by almost 5 cents/kWh with respect to the second semester of 2011). The widening of the range between the highest and lowest prices was driven by increase in both household and industrial prices in Cyprus, where pre-tax prices are the highest in the EU.



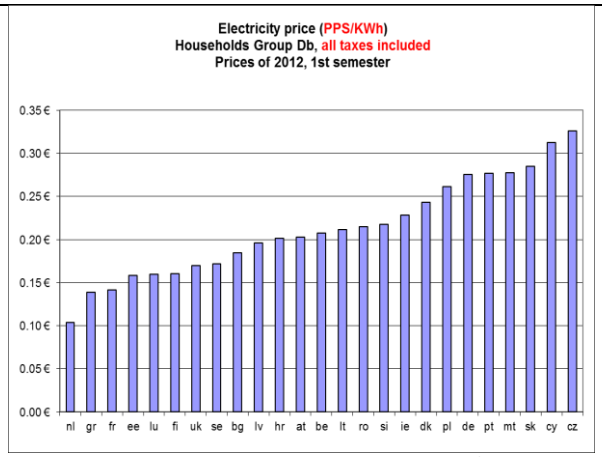
Source : Eurostat as of October 2012
Range for annual consumption:
Household band Db: 1.000kWh<consumption<2.500 kWh
Industry band Ib:20 MWh<consumption<500 MWh
Notes: No EU27 calculations due to missing data for IT, ES and HU. Provisional data for AT, CY and NL.

Denmark and Germany remained the EU Member States where household consumers paid the highest electricity prices, being 33.1 cents/kWh and 28.4 cents/kWh, respectively, in consumption band Db. The lowest price on the other hand was reported in Bulgaria, where households paid 8.5 cents/kWh in the same consumption band.

When correcting household consumer prices of electricity for purchasing power parity (PPS) the picture changes: the four most expensive Member States measured in PPS[3] are all new member states (the Czech Republic, Cyprus, Slovakia and

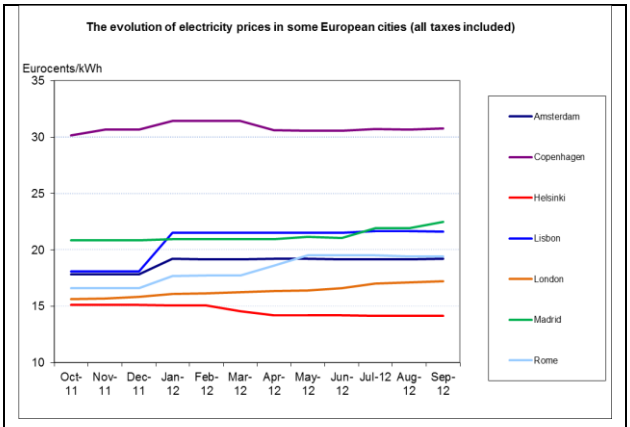
[3] Purchasing power standards

Malta). The same observation can be made at the lower end of the graph, with the seven of the eight countries with the lowest prices in PPS all being old member states (Netherlands, Greece, France, Luxembourg, Finland, the UK and Sweden), and only one new member state (Estonia).



Source : Eurostat as of October 2012
Range for annual consumption:
Household band Db: 1.000kWh<consumption<2.500 kWh
Notes: No EU27 calculations due to missing data for IT, ES and HU.
Provisional data for AT, CY and NL.

The next chart shows the evolution of all tax inclusive retail electricity prices paid by households in some European capitals between October 2011 and September 2012. Over this period prices rose the most in Lisbon (+19.5%), Rome (+17%) and London (+10.4%). The most significant price fall was observed in Helsinki (-6.3%).

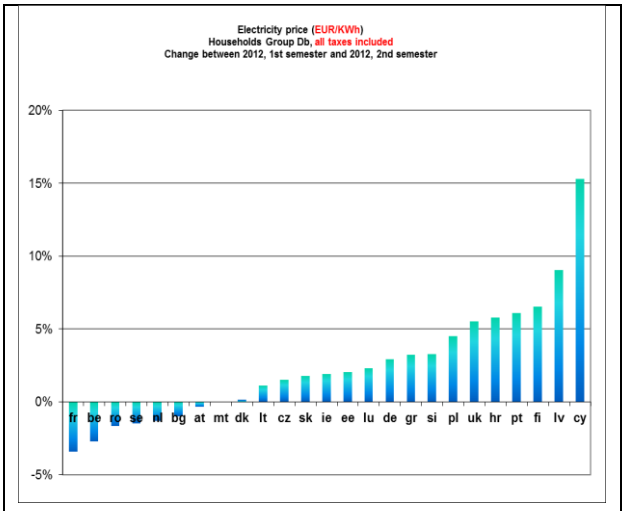


Source: HEPI
The HEPI electricity price index was developed by the Austrian energy market regulator E-control and VaasaEtt Global Energy Think Tank, providing monthly information about the evolution of the final electricity consumer prices in some selected capital cities of EU countries.

A.2.2 Price dynamics

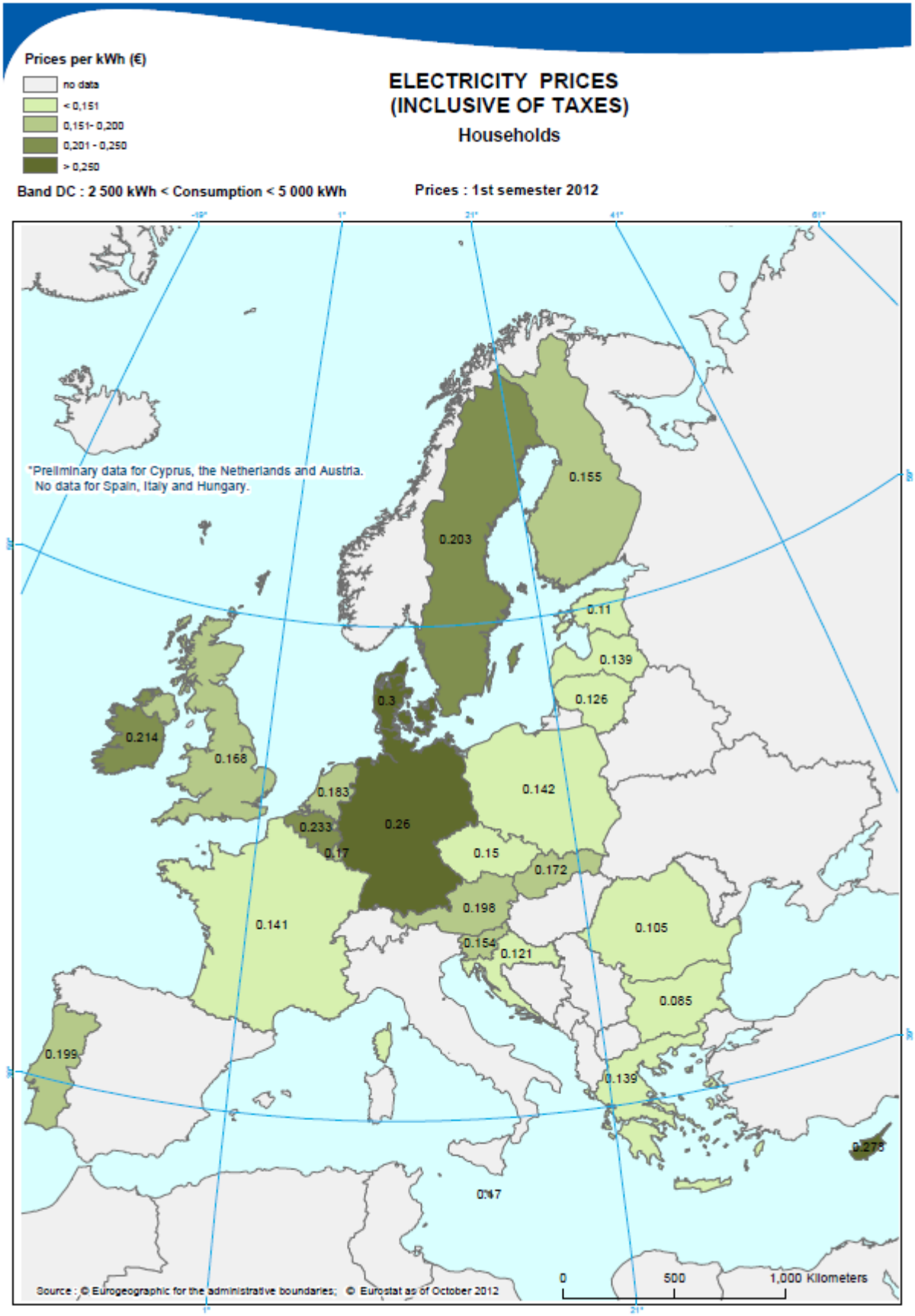
Electricity prices for household consumers with annual consumption between 1.000 kWh and 2.500 kWh (band Db) rose on average by a modest 2.5% in the first half of 2012, compared to the previous semester[4]. However, price developments in the individual Member States were quite diverse. Substantial price increases could be observed in Cyprus (+15.3%) and Latvia (+9%). In France, Belgium, Romania, Sweden, the Netherlands, Bulgaria and Austria prices were slightly lower than in the first half of 2011.

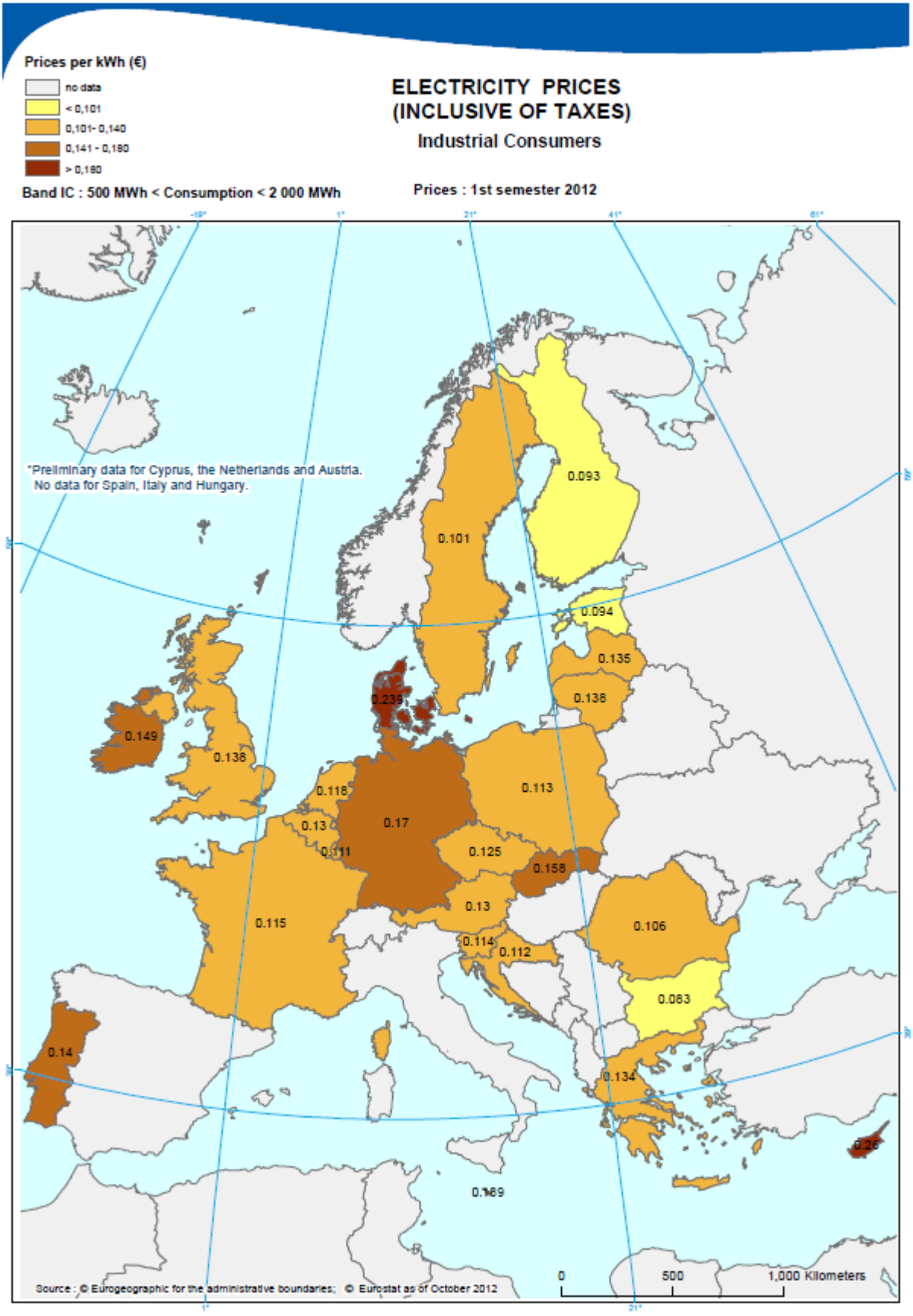
[4] In the remaining part of this chapter, unless otherwise stated, price changes are always compared to the previous semester (2nd semester of 2011).



Source : Eurostat as of October 2012
Range for annual consumption:
Household band Db: 1.000kWh<consumption<2.500 kWh
Notes: No EU27 calculations due to missing data for IT, ES and HU. Provisional data for AT, CY and NL.

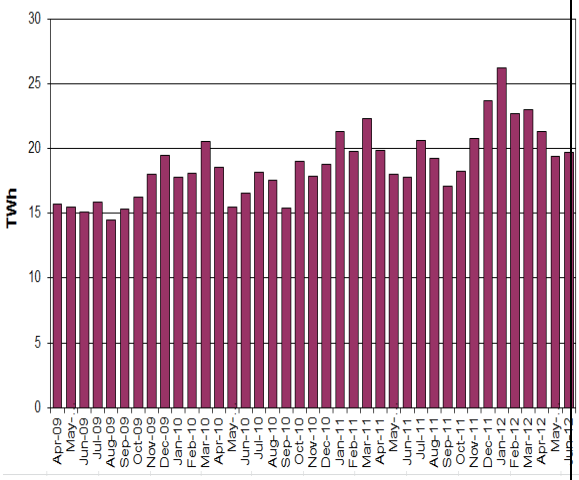
The next two maps show the electricity retail prices paid by households and industrial consumers in the first half of 2012. The maps show prices of band Dc in the case of households (meaning households with annual consumption between 2.500 kWh and 5.000 kWh, according to Eurostat's classification) and Band Ic industrial prices for consumers with annual consumption between 500 MWh and 2.000 MWh.


Prices per kWh (€)
no data
< 0,151
0,151- 0,200
0,201 - 0,250
> 0,250
ELECTRICITY PRICES
(INCLUSIVE OF TAXES)
Households
Band DC : 2 500 kWh < Consumption < 5 000 kWh
Prices : 1st semester 2012
*Preliminary data for Cyprus, the Netherlands and Austria.
No data for Spain, Italy and Hungary.
0.155
0.203
0.11
0.139
0.126
0.3
0.214
0.168
0.183
0.142
0.233
0.26
0.17
0.15
0.172
0.198
0.141
0.105
0.154
0.121
0.085
0.199
0.139
0.273
0.47
0
500
1,000 Kilometers
Source : © Eurogeographic for the administrative boundaries; © Eurostat as of October 2012


Prices per kWh (€)
no data
< 0,101
0,101- 0,140
0,141 - 0,180
> 0,180
ELECTRICITY PRICES
(INCLUSIVE OF TAXES)
Industrial Consumers
Band IC : 500 MWh < Consumption < 2 000 MWh
Prices : 1st semester 2012
*Preliminary data for Cyprus, the Netherlands and Austria.
No data for Spain, Italy and Hungary.
0.093
0.101
0.094
0.135
0.138
0.239
0.149
0.138
0.118
0.17
0.13
0.111
0.113
0.125
0.158
0.13
0.115
0.106
0.114
0.112
0.083
0.14
0.134
0.26
0.169
Source : © Eurogeographic for the administrative boundaries; © Eurostat as of October 2012
0
500
1,000 Kilometers

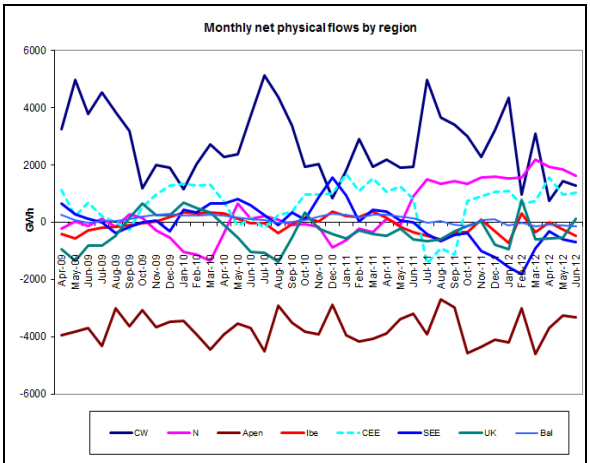
B. Building the internal market for electricity: cross border flows and trade

- In Q2 2012 the monthly amount of cross-border physical flows in the EU-27 reached 20.1 TWh on average which was 16% less than in the first quarter of 2012, following the usual seasonal decrease after the winter period similarly to the evolution of the gross inland electricity consumption.
- On year-on-year basis however, cross border power flows were up by 8.7% in Q2 2012, showing a magnitude of growth similar to that of the combined traded volume of power in the European wholesale markets (10.1%). Given that gross inland electricity consumption went down by 1% compared to Q2 2011, the increase in cross border flow volumes can be deemed to be impressive and shows the strengthening inter-linkages among the European power markets.
- As in Q2 2012 the year-on-year increase in power inflow to the Central West European region (CWE) was substantially greater than the growth in power outflow from CWE, the net power flow position of the region reached a several-year low. Power inflows to CWE were up from the CEE and Nordic markets, assuring cheap import sources for the CWE region. Meanwhile, Nordpool became the region having the strongest outflow position, primarily owing to permanently cheap power prices. As tightness of the domestic power supply eased in Q2 2012, the strong net importer positions of the Apennine and the South East European regions decreased compared to the previous quarter. Net power flow positions in the other power regions did not change significantly during Q2 2012.



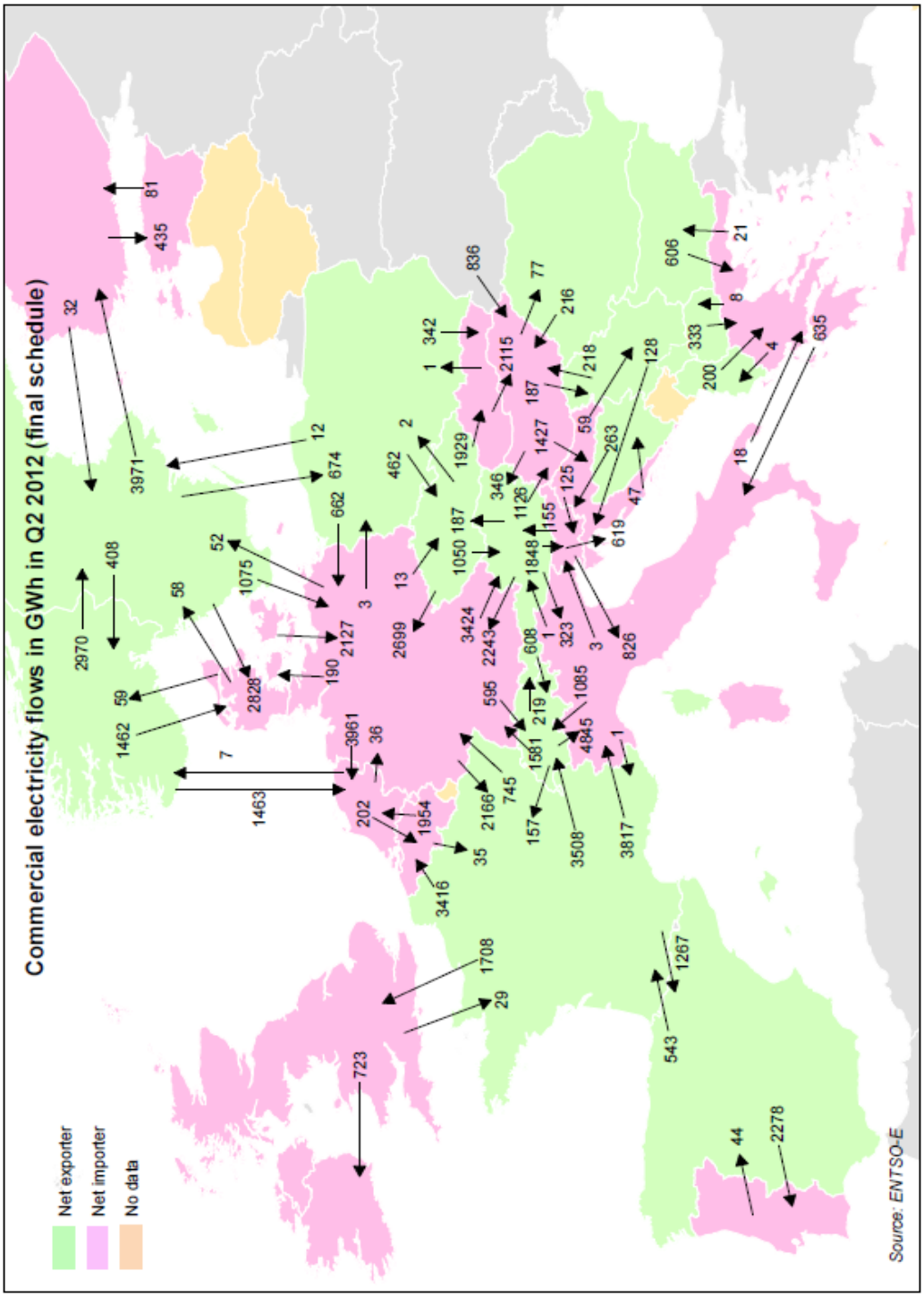
Source : ETSO

Note. Data for MT and CY are missing. Data for EE, LT and LV are available since September 2008, and for IE since July 2010. Data on physical flows from and to LU is incorporated in LU's neighbouring countries : DE, BE, FR. Data for a number of Member States is still partial, particularly for Member States in the South East European Region.



European countries are grouped in the following regions :

Central Western Europe	*DE, NL, FR, BE, AT, CH*
Nordic	*SE, FI, DK, NO*
Apennine Peninsula	*IT*
Iberian Peninsula	*ES, PT*
Central Eastern Europe	*PL, CZ, HU, SK*
South Eastern Europe	*SI, GR, BG, RO, HR, AL, FYROM, RS*
British Isles	*UK, IE (from July 2010 on)*
Baltic	*EE, LT, LV*



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. Data on the commercial flows concerning Romania, Bulgaria and Serbia are not complete. 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. For the case of the Czech-Slovak border, gross commercial values are given.

C. *Focus on Electricity Market Coupling in the EU*

A well-functioning and competitive market is needed to satisfy the needs and expectations of the European citizens. An efficient, interconnected and transparent European internal energy market will give consumers a choice between different companies supplying gas and electricity and will make the market accessible to all suppliers. Linking power markets brings benefits such as increased liquidity, stable prices and more efficient use of interconnector capacity.

Market coupling refers to the integration of two or more electricity markets from different areas through an implicit cross-border allocation mechanism. Instead of explicitly auctioning the cross-border transmission capacities among the market parties, the capacities are implicitly made available on the power exchanges of the various areas. As such, market coupling allows players to trade directly between markets by benefiting automatically from the cross-border capacities without having explicitly acquired the required transmission capacity across markets. The purpose of market coupling is to maximise the economic welfare of all players. The mechanism aims to enable the 'free' movement of electricity between the integrated markets. However, the movement of electricity is limited by the Available Transmission Capacity (ATC) between markets.

The Market Observatory for Energy has examined the extent of price convergence across the EU using detailed electricity price sets with high frequency. Price convergence is a good indicator for the efficiency of allocation of interconnections and adverse flows[5]. In coupled markets bid and offers across power exchanges are matched by taking account of the available cross-border transmission capacity. Demand is met by the cheapest supply regardless of where it is produced: where there is enough capacity, the price on all the exchanges should be the same. To measure the extend of price convergence, the Market Observatory for Energy has analysed the share of hours within which hourly day-ahead power exchange prices within a given zone show price divergence of not more than 1%[6].

[5] The Market Observatory for Energy regularly reports in the quarterly reports on electricity and gas on flows 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.

[6] The Market Observatory for Energy has conducted an additional test, whereby the share of hours within which hourly day-ahead power exchange prices within a given zone show price divergence of not more than 50 Eurocents/MWh.

In coupled markets price convergence is very high: for example, differences of not more than 1% over all hours in a year take place in Iberia and in the Czech Republic and Slovakia. Some markets with less interconnectors experience slightly lower price convergence. The coupling of power exchanges[7] means that the interconnection capacity is optimally used in the bidding process and only capacity restrictions can result in price divergence. Investments in new connection capacity and measures (e.g. phase shifters) increase interconnection capacity by allowing the more efficient use of existing connections.

The initial scoping of the analysis undertaken by the Market Observatory for Energy focussed on four regions[8]: Central-West Europe (Belgium, Germany, the Netherlands, France), Nordpool (the five regions of Norway[9], the two regions of Denmark, Sweden[10], Finland, Estonia), Centre-East (the Czech republic, Slovakia, Hungary, Romania and the three regions of Poland) and Iberia (Spain and Portugal). All other Member States were analysed separately.

COUPLED MARKETS IN THE EU

Central-West Europe (DE, FR, BE, NL, LUX, AT)

In 2011 the strongest price convergence in this region was observed between Belgium and France and the weakest between France and Germany. The market has been coupled only recently and higher convergence is expected for the future.

Over the period 2008 to 2011 the share of hours when price difference between France and Germany was below 1% more than doubled and between Germany and the Netherlands increased by a factor of three. After market coupling of Germany with France, the Netherlands, Belgium and Luxembourg in 2010 price convergence of the Netherlands increased with Germany and decreased with France and Belgium. As regards Austria, the interconnectors to Germany are well developed so that no congestion is being reported between Austria and Germany.

In 2011 the overall convergence of 64% in the Germany-Belgium-France-The Netherlands region was a remarkable achievement compared to what

[7] Market couplings exists in the following power regions and among the following power exchanges: Central Western Europe (German- EEX, France-PNX, Belgium-Belpex, the Netherlands-APX, Austria-EXAA), Nordpool (Norway, Sweden, Finland, Denmark, Estonia, Lithuania), Central Eastern Europe:(OTE-Czech Republic and Slovakia, Hungary-HUPX), South Western Europe (France-PNX, OMEL-Spain and Portugal). Italy (IPEX) is coupled with France (PNX) and Slovenia (BSP). Poland (PolPX) is coupled with Sweden (Nor pool).

[8] For the purposes of the analysis regions refer to geographical zones, which consist of submarkets coupled through power exchanges, or within which no declared congestions exists and, in both cases, hourly day-ahead power exchange prices within the show price divergence of not more than 1% in significant number of all hours in a year.

[9] The Norwegian power grid is divided into Elspot/Elbas areas in order to handle large and long-term congestions. From March 2010 Norway is divided into 5 Elspot/Elbas areas, largely as follows: south-eastern Norway (NO_1), south-western Norway (NO_2), middle Norway (NO_3), south-western Norway (NO_4) and western Norway (NO_5).

[10] At the time of the analysis Sweden was considered one region. As of 1 November 2011 it is divided into four zones.

could be observed before the market coupling took place in November 2010. In 2008 price convergence could be observed only in 5% of all trading hours, while in 2010 as a whole year the ratio of price converging hours was still only 14%.

Sweden, Finland, Norway, Denmark

In the Nordic market Norway is divided in five regions and since 1 November 2011 Sweden is divided in 4 regions. Southern areas in Norway and Sweden (densely populated and well connected) have very high correlation of prices (above 80% of all hours). In the regions in the middle of Norway, due to lack of interconnectors, prices converge in only ca. 40-50% of hours.

Denmark (divided in two regions) is a special case which requires to be treated on its own. This is because it is coupled with the Nordic and with Central-West markets. Its prices did not differ in 2011 more than 1% from prices of Sweden in 85% of hours (38% in the case of Denmark_1[11]) and from prices of Germany in 44% of hours (22% Denmark_2[12]). While the extend of the price convergence between Sweden and the west of Denmark decreased over the period 2008-2011, there has been no increase in the occurrence of flows against price differentials. Therefore the decrease is considered to be due to the very different power mix in the two countries and corresponding to the underlying market fundamentals. The connections to Norway are still weaker (ca. 40%).

Single interconnectors

Between some Member States single interconnectors exist where capacity is allocated by market coupling. The capacity of interconnectors is relatively small in comparison to domestic electricity consumption and therefore their influence on price convergence is limited. This is the case for example with the SwePol interconnector between Poland and Sweden, the NorNed between the Netherlands and Norway, and EstLink between Finland and Estonia, to name a few.

Non-coupled markets

In non-coupled markets the price convergence is significantly lower than in the coupled markets and is usually between 5% and 25%. For example the price convergence between Poland and Germany is about 6%, Germany-the Czech Republic 9%, Hungary-Romania 2%. The next table shows the evolution in the percentage of hours within which hourly day-ahead power exchange prices within a given zone show price divergence of not more than 1% over the period 2008-2011. The objective is not to have a 100% price convergence, but to avoid the occurrence of adverse flows and achieve efficient allocation of interconnection capacity.

[11] Denmark west
[12] Denmark east

	Percentage of hours with price convergence below 1%			
	2008	**2009**	**2010**	**2011**
Central West Europe (CWE)				
Germany-Belgium-France-The Netherlands	5%	5%	14%	64%
Belgium-France-The Netherlands	71%	59%	63%	68%
Germany-France	7%	7%	16%	16%
Germany-The Netherlands	7%	7%	21%	21%
Netherlands-France	71%	71%	63%	63%
Belgium-France	85%	85%	88%	88%
Belgium-The Netherlands	85%	85%	74%	74%
CWE - Nordpool				
Germany-Denmark_1	4%	4%	31%	44%
Germany-Denmark_2	4%	4%	22%	22%
Netherlands-Norway_1	0%	0%	6%	11%
Netherlands-Norway_2	0%	0%	7%	12%
Nordpool				
Sweden-Denmark_1	48%	48%	38%	38%
Sweden-Denmark_2	71%	71%	85%	85%
Sweden-Finland	98%	98%	94%	94%
Sweden-Norway_1	0%	0%	60%	60%
Sweden-Norway_3	67%	67%	82%	82%
Sweden_Norway_4	57%	57%	84%	84%
Apennine peninsula				
Italy continental	79%	78%	69%	69%
Italy area	28%	18%	19%	15%
Central East Europe				
Czech Republic - Germany	0%	0%	7%	9%
Hungary-Slovakia				15%
Hungary-Romania				2%

D. Glossary

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

Biomass spreads are indicative values giving the average difference between (1) the combined price of electricity and carbon emission on the corresponding day-ahead market and (2) the price of industrial wood pellets (delivered month-ahead ex-ship at Rotterdam).
Biomass spreads do not include operation and maintenance costs. However, the German spreads include transport costs of shipping the pellets along the Rhine (Rotterdam – Cologne area).
Specific calculation assumptions: conversion factor of 1 ton of standard wood pellet contains 4.86 MWh of energy; generation efficiency of coal and biomass fired power plants equals 35%; the price of carbon emission is defined as the difference of the German dark and clean dark spreads, calculated according to the methodology of *Platts*.

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

Clean spark spreads are defined as the average difference between the cost of gas and emissions, and the equivalent price of electricity. Spark spreads are indicative prices showing the average difference between the cost of gas delivered on the gas transmission system and the power price. As such, they do not include operation, maintenance or transport costs. The spark spreads are calculated for gas-fired plants with standard efficiencies of 50% and 60%. This report uses the 50% efficiency. Spreads are quoted for the UK, German and Benelux markets.

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

Cooling degree days (CDDs) are defined in a similar manner; 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^{o}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 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 provides detailed information on adverse flows. It has two panels.
The first panel estimates the ratio of the number of hours with adverse flows to the number of total trading hours in a quarter. It also estimates the monetary value of energy exchanged in adverse flow regime compared to the total value of energy exchanged across the border. The monetary value of energy exchanged in adverse flow regime is also referred to as "welfare loss". A colour code informs about the relative size of FAPD hours in the observed sample, going from green if less than 10% of traded hours in a given quarter are FAPDs to red if more than 50% of the hours are FAPDs.
The second panel gives the split of FAPDs by subcategory of pre-established intervals of price differentials. It represents the average exchanged energy and relative importance of each subcategory on two vertical axes.

Heating degree days (HDDs) express the severity of a meteorological condition for a given area and in a specific time period. HDDs are defined relative to the outdoor temperature and to what is considered as comfortable room temperature. The colder is the weather, the higher is the number of HDDs. These quantitative indices are designed to reflect the demand for energy needed to heat a building.

Relative volatility indicator (RVI) The RVI shows the relation between the one-month backward-looking price volatility and the one-year backward-looking price volatility. When the value of the RVI indicator is above 100, the market's short term volatility is higher than it was during the last one year, the market can be considered as being volatile. In the opposite case when the RVI is less than 100 the market is less volatile than usual, the short term volatility is less than that the one-year backward looking volatility would suggest.

Commission européenne, B-1049 Bruxelles / Europese Commissie, B-1049 Brussel - Belgium.
Office: DM 24 8/29. Telephone: direct line (32-2) 2961864. Fax: (32-2) 2921969.
E-mail: ENER-MARKET-OBSERVATORY-QUARTERLY-REPORTS@ec.europa.eu