European Commission

Quarterly Report on European Electricity Markets

DG ENERGY

MARKET OBSERVATORY FOR ENERGY

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DIRECTORATE-GENERAL FOR ENERGY
Directorate A Energy Policy
Unit A Energy Policy & Monitoring of electricity, gas, coal and oil markets
Market Observatory for Energy

Dear readers,

The growth rate of the EU economy in the first quarter of 2012 was the lowest in two years. In the Eurozone, a minor contraction was observed compared to the same quarter in 2011. Gross value added in the major energy intensive economic sectors, such as industry and construction, decreased compared to the first quarter of 2011. This impacted gross inland consumption of electricity in the EU, which slightly decreased.

At the beginning of 2012, mild weather in some western European countries combined with abundant wind power generation resulted in a repeated occurrence of negative wholesale power prices for periods of several hours in France, Belgium, the Netherlands, Germany and Denmark. The combination of increasing share of intermittent renewable generation with priority dispatch and a rather inflexible load curve in the majority of Member States is set to challenge the functioning of intra-day markets. This is already witnessed by increasing price volatility.

In the first two weeks of February 2012, a severe cold spell had impacts across almost the entire European continent. Wholesale electricity prices in most of the European markets rose to several year highs and market fears of a possible natural gas supply disruption resulted in gas prices almost doubling over a couple of days. Short term wholesale markets sent strong and timely price signals which contributed to the secure operation of electricity systems. As a result, not a single major disturbance in the functioning of the European electricity system was observed during these days.

In March 2012, crude oil prices reached almost 100 €/bbl, a new high for the Brent as measured in Euro, driven by exchange rate depreciation and market tensions related to the situation in the Middle East and to the embargo on oil imports from Iran. European coal prices decreased almost continuously as markets were well supplied by increasing imports from the USA. Carbon emissions were traded at relatively low prices throughout the first quarter of 2012. Cheap coal and emission allowance prices assured the competitiveness of coal-fired power generation, which alongside the increasing share of renewable sources served as a replacement in some countries for nuclear capacities taken offline following the Fukushima accident a year earlier.

For the editing team:
Dinko Raytchev

HIGHLIGHTS

- In the first couple of weeks of 2012, the frequency of negative hourly prices in the Central West European power markets, mainly in Germany, multiplied compared to previous quarters. The main reason for the more frequent occurrence of negative prices was the increasing share of wind generation in the power mix coupled with inflexible load and relatively mild weather in January.

- In the first two weeks of February 2012, temperatures fell well below the seasonal average in most of Europe, drastically increasing demand for power. This resulted in increasing wholesale power price levels reaching several year highs in many European markets. Prices rose to extreme high levels especially in France where, because of the high share of electricity in domestic heating, the power grid is highly sensitive to fluctuations in outdoor temperatures during the winter period.

- Market fears about potential natural gas supply disruptions caused a sharp increase in gas prices, reaching levels twice as high as normal in many European hubs on some days.

- Despite harsh winter conditions, there was not a single serious disturbance in the European electricity system. This underlines the strength of the European internal electricity market and the effectiveness of related European policies.

- On 23 January 2012, the European Council adopted a decision on additional restrictive measures against Iran, including a ban of crude oil and petroleum products imports. This measure, coming in a context of depreciating exchange rate, may have contributed to the rise in crude oil prices in Europe as the geopolitical tensions around Iran and fears on how to find replacement oil sources both increased market uncertainties. In mid-March 2012, the crude oil price, measured in Euros, reached an all-time high, implying significant burdens on European consumers. Price developments in the oil market had an impact on rising spot and especially forward power prices in many European markets in Q1 2012.

- Coal import prices were on a downward trajectory during most of the first quarter of 2012 as increasing coal imports from the US and high stocks in Europe assured abundant coal supply. Emission allowance prices moved in a 6-9 €/t_{CO2e} range during most of Q1 2012, though hopes on setting aside or backloading allowances from the market supported prices in January and February. Low coal and emission allowance prices assured the competitiveness of coal-fired power generation.

- It seems that, a year after the Fukushima accident and the immediate reactions in some EU countries, the missing nuclear capacities have been partially replaced by renewable energy sources and solid fuel-based power generation. The opposing impacts of these energy sources on overall emission levels from the EU power industry are yet to be evaluated.

- In this Quarterly Report, the “Focus on...” part provides an analysis of network charges in electricity prices, examining the contribution of different costs to electricity prices paid by final customers in the Member States of the EU.

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QUARTERLY REPORT ON EUROPEAN ELECTRICITY MARKETS

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A. Recent developments in the electricity markets across Europe

- In the first quarter of 2012 the gross inland electricity consumption in the EU-27 was 868.7 TWh, 6.8% higher than in the fourth quarter of 2011. This growth followed the usual seasonality pattern as demand for power normally peaks in the first quarter of each year. Compared to the same quarter of 2011 electricity consumption slightly decreased (-0.2%).
- In January 2012 temperatures in Europe were close to the long term seasonal average[3]. The first two weeks of February brought an extreme cold weather in most of the EU countries that could also be tracked in the monthly evolution of *heating degree days*[*] (HDD). This two-week cold spell had an perceivable impact on power demand, as in February 2012 electricity consumption in the EU-27 was up by 5.1% compared to February 2011, though in Q1 2012 the electricity consumption decreased compared to Q1 2011. In March 2012 the weather turned to milder than usual and consequently the first

[3] The long term average is based on data covering the period between 1980 and 2011.

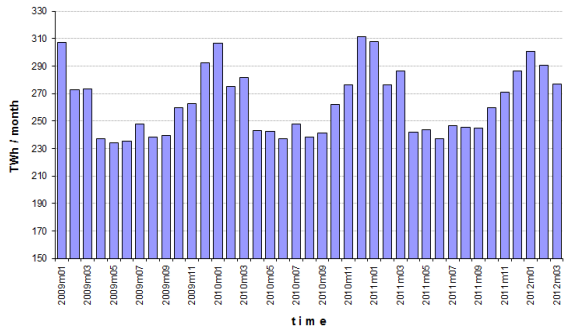
[*]The glossary in part D of this report contains definitions of words and expressions written in *italic* and marked by an asterisk (*).

quarter of 2012 was only slightly colder than the long term seasonal average and similar to Q1 2011.

- Industrial demand for power in Q1 2012 was also limited by the economic situation in the EU as the EU-27 GDP showed the slowest growth since the first quarter of 2010 (0.1% compared to Q1 2011). In the countries of the eurozone even a slight contraction could be observed (GDP was down by 0.1%) and the gross value-added in some energy-intensive economic braches such as industry or construction also decreased (by 0.6% and 2.8%, respectively).
- On the 23rd of January 2012 the EU Council adopted a decision (2012/35/CFSP) on restrictive measures against Iran, completely banning the imports of crude oil and oil products from this country to the EU with the effect of the 1st July 2012. The tensions around Iran and fears concerning the oil supply in Europe gave a boost to the Brent crude oil price quotations, which got close to 128 USD/bbl in March 2012 and measured in euros they reached 97.7 EUR/bbl on the 13th of March, being an all-time high price in Europe. Crude oil price finished Q1 2012 at 92.4 €/bbl, which was significantly higher than that on the first trading day of 2012 (85.4 €/bbl).
- In January 2012 daily average natural gas prices were stable, moving in narrow range of 22-24 €/MWh. Then, in the early days of February gas prices rose strongly, mirroring an increase of heating demand resulting from a cold spell touching most of the continent and renewed fears on supply disruptions. On the 7th of February the daily gas price average on the NBP hub reached 40.7 €/MWh, which was the highest daily price since March 2006. As the cold spell ended and temperatures became milder prices decreased into a range of 23-25 €/MWh and remained in this range until the end of Q1 2012.
- Coal import prices showed a steady decrease during most of Q1 2012; starting the year at 84.5 €/t and on the 20th of March reaching a bottom level of 70.9 €/t. This continuous slide in prices was mainly due to the increasing coal imports from the US and to the stock levels which remained high due to lower demand stemming from the slow economic growth in the EU. In the US natural gas is becoming more and more important in the domestic power generation and the excess supply of coal, being substituted by gas, was exported to Europe.
- Emission allowance contracts started to rise from the beginning of 2012 and reached a peak at the end of February just above 9 €/t_{CO2e}. In the first two months of 2012 the carbon price rise was fuelled by increasing oil and gas prices and expectations on policy makers' intentions to eliminate a measurable quantity of allowances from the ETS system in order to reduce the permanent oversupply in the market. In March 2012 prices began to decrease again when it appeared that no concrete reduction plans were discussed yet. By the end of the month they fell below 7 €/t_{CO2e}, a level which was similar to the one observed at the beginning of 2012.
- Decreasing coal prices and steady and low carbon prices boosted the competitiveness of coal-fired power generation in the EU, as witnessed by

the evolution of *clean dark spreads**. Decisions made by several European governments on reducing their countries' exposure to nuclear-based power generation have also offered a short term support to coal power generation.

- In Q1 2012, for the first time since the beginning of observations the combined monthly traded volume of all available European markets exceeded 100 TWh in each month of the quarter. The monthly average volume was 104.8 TWh. In spite of the slightly decreasing electricity consumption the traded volume of power in the observed markets grew by 4.9% compared to Q1 2011, pointing to a further increasing liquidity of the European trading platforms. The traded volume on the day-ahead power market represented 35.5 % of the gross inland electricity consumption in Q1 2012.
- The harsh cold snap in February 2012 the Platt's *Pan-European Power Price Index* (PEP). The PEP monthly average value reached its highest level since November 2008 (66.9 €/MWh). In January and March 2012 the monthly average price was around 48-49 €/MWh.

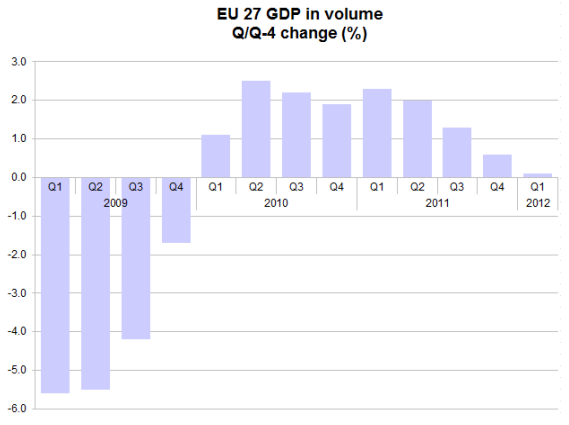


Source : Eurostat
Adapting to the changes in Eurostat's database, electricity supply is now presented instead of gross inland consumption.

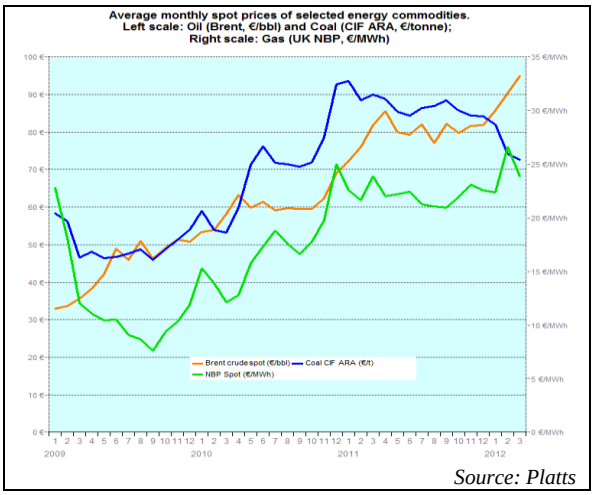
EU 27 Heating Degree Days in Q1
Values for 2010, 2011, 2012 and 1980 – 2004 average

	January	February	March
2010	624.23	499.45	421.50
2011	551.74	509.88	423.14
2012	537.48	584.40	367.47
LT avg.	545.97	471.03	412.40

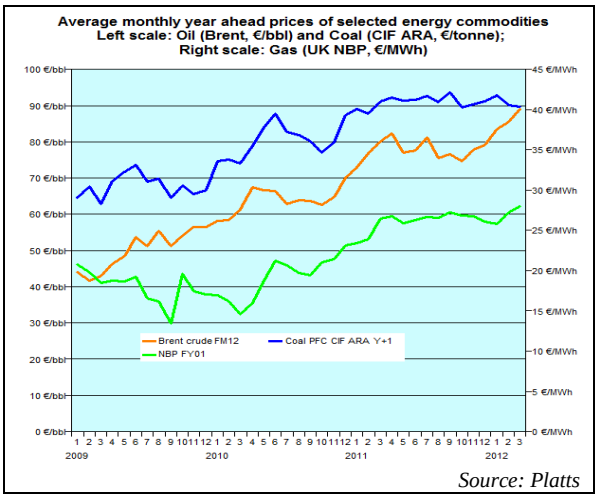
Source : Eurostat /JRC



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



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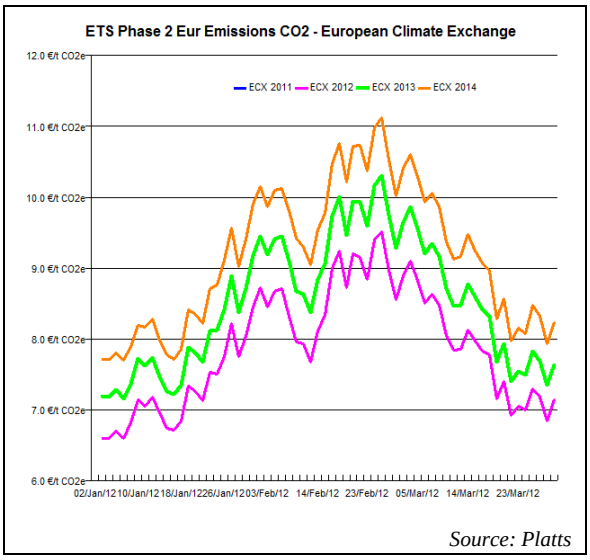
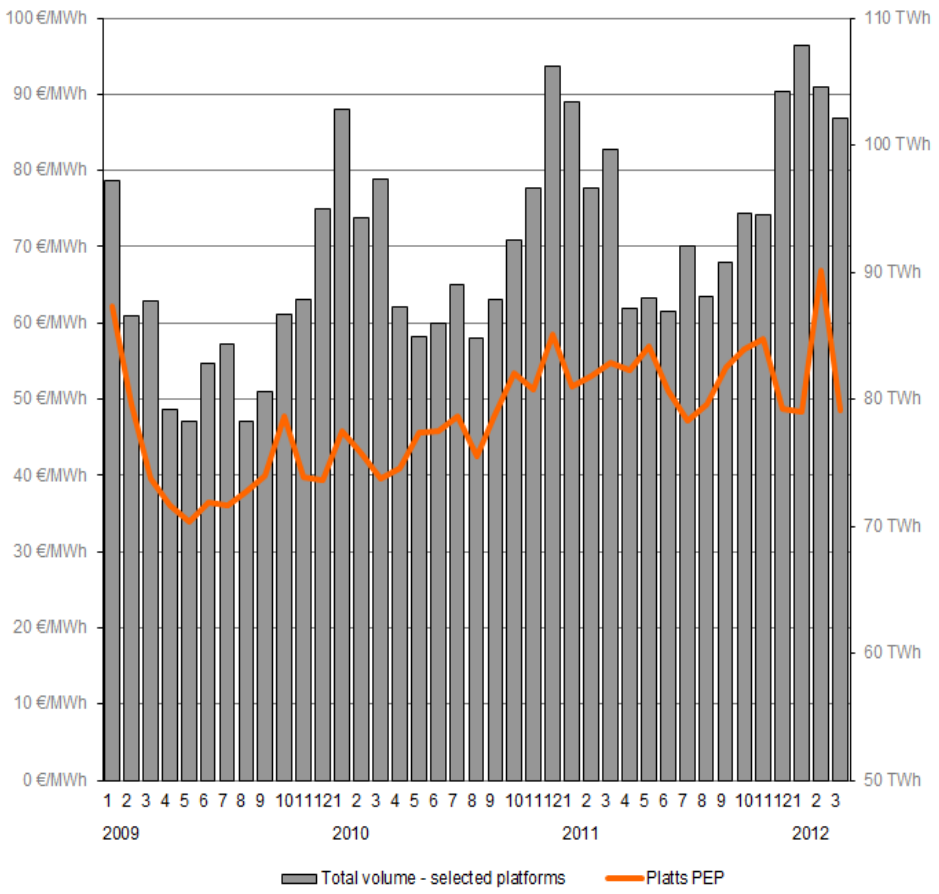


Source: Platts



Source: Platts (price index) and selected European electricity wholesale markets (volumes). The selected markets are :

Nordpool Spot A.S;
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)

- In January 2012 both monthly average regional day-ahead baseload and peakload prices[**] decreased to the lowest levels since August 2010 (39.3 €/MWh and 45.6 €/MWh, respectively). These price levels, being unusually low in the first month of the year were due to the coincidence of several different factors. Mild weather in January 2012 limited the demand for heating and the sluggish economic growth also limited power demand from various sectors of the economy. A higher-than-usual level of hydro generation also assured cheap sources of power in the CWE region. On the renewables side abundant wind generation throughout the whole month and on some occasions even solar generation significantly increased the domestic power supply in Germany, while permanently high level nuclear generation assured abundant power supply in France.
- The increasing importance of wind power generation resulted in a higher number of occasions when negative hourly prices could be observed in the German power system. In January 2012 there were five days with negative prices for several hours. On the 22nd of January 2012 between 06:00 and 07:00 in the morning the hourly German power price was -100.1 €/MWh, implying that power producers *had to pay* twice as much as the usual price magnitude *in order to sell* the produced electricity in the market. The main reason for the more frequent occurrence of negative prices was the increasing share of wind generation in the power mix coupled with inflexible load and relatively mild weather in January. In some markets in Central Western Europe negative prices could only be observed on New Year's Day and on the following day.
- The first two weeks of February 2012 could be characterised as the coldest period of the winter in the CWE region, as shown by the weather map on page 8. Low temperatures triggered sudden price increases in the regional power markets, which was amplified by receding wind power generation in the region. Daily average baseload power prices reached their peak between the 8th and the 10th of February 2012, in a range of 85-100 €/MWh with the exception of France where prices peaked at 367 €/MWh, reaching the highest level since July 2006. French power load reached a new record on the 8th of February (101.6 GW). Hourly prices were also extremely high in France (with a peak of 1938 €/MWh), while in the other CWE countries the hourly peak remained between 180 and 250 €/MWh. This sharp rise in French prices reflects the temperature-sensitivity of power demand in the country, revealing the high share of electricity in domestic heating. In February 2012 France became a net power importer for the first time since January 2010.
- The second half of Q1 2012 offered milder-than-normal temperatures in the CWE region, prompting less heating related demand for power.

[**] 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.

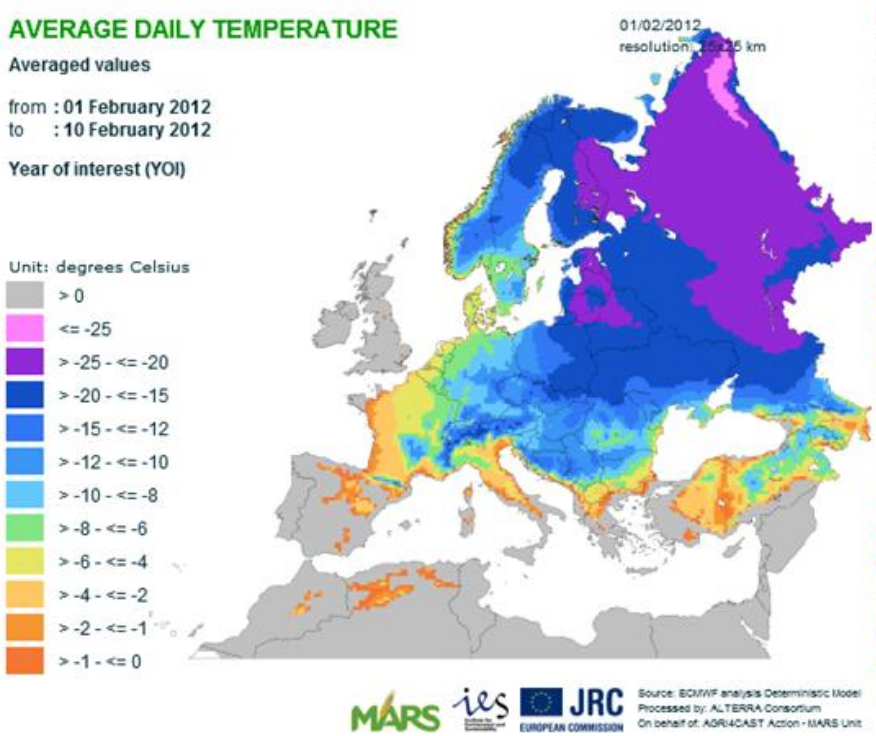
Regional market prices followed a slightly decreasing trajectory; baseload prices in Germany were close to a two-year low level by the end of March 2012, primary owing to strong solar and wind generation complemented by healthy hydro levels. Price volatility peaked twice during Q1 2012 in the CWE power markets, once in January as the consequence of negative prices, and for the second time in mid-February as the result of sudden price spikes. As a result of a steady downward direction in power prices volatility fell to the lowest level during the last twelve months by the end of March 2012.

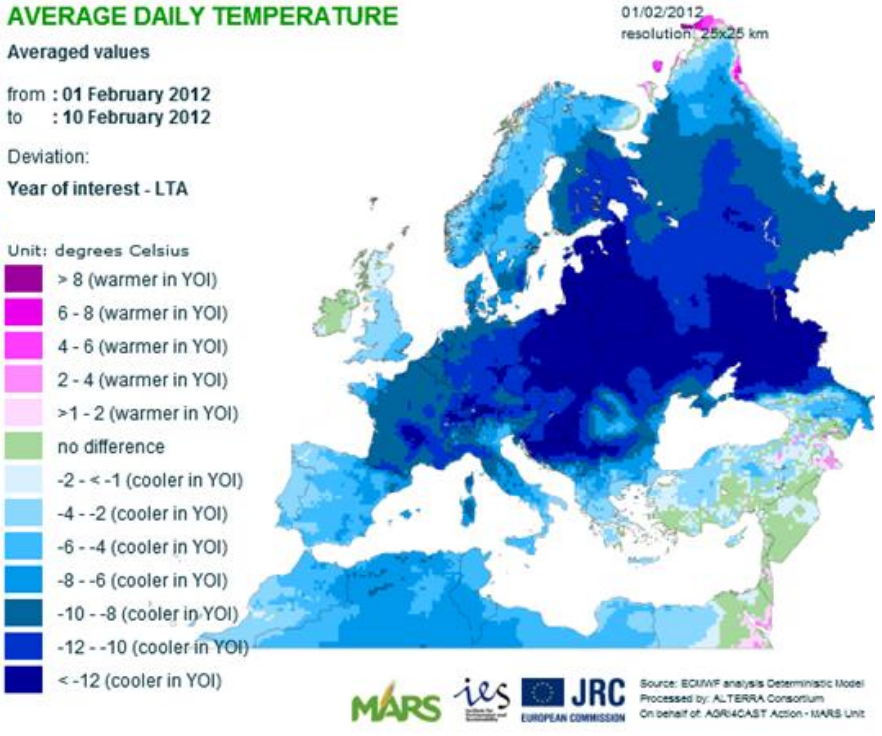
- A year after the Fukushima accident, resulting in political decisions that reduced the share of nuclear power in the German energy mix, new installed capacities managed to partially offset the missing nuclear reactors. During a twelve-month period ending in March 2012 7.5 GW solar generation capacity has been installed in Germany and new lignite capacities amounting to 2.7 GW came online.
- With the exception of the last ten days in March 2012 German quarter-ahead baseload power prices showed a measurable premium to their French counterparts during Q1 2012. This might be explained by rising gas and oil forward prices during Q1 2012 and by market expectations on a receding share of renewables generation from the first quarter's high levels during the next quarter in Germany. The French nuclear capacities contribute to a steadier generation profile.
- In parallel with high daily power prices, the German *clean dark spread** reached its maximum in the early days of February 2012. In the remaining part of the quarter it began to decrease as wholesale electricity prices were on a decreasing trajectory. Coal prices kept on decreasing during Q1 2012 and emission allowances also went back to the levels by the end of March they started the year. *Biomass spreads***** in Germany and the Netherlands remained fairly in the negative range during Q1 2012, pointing to the necessity of maintaining the current feed-in tariffs if biomass-based power generation is to be promoted.
- The volume of day-ahead power traded in the CWE markets amounted to 94.3 TWh, which was 3.6% higher compared to Q4 2011 and rose by 9.3% compared to the first quarter of 2011. The total amount of traded power in the CWE markets represented 25.3% of the combined gross inland consumption of these countries.
- No *FAPD events*, measuring the occurrence and magnitude of adverse flows, were observed in the market coupling region of CWE.

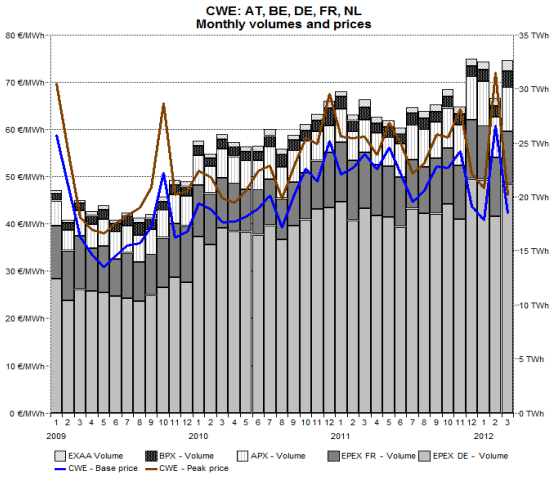
Average daily temperature **01.02.2012 – 10.02.2012 [done 01.02.2012]**

Left map : in absolute values

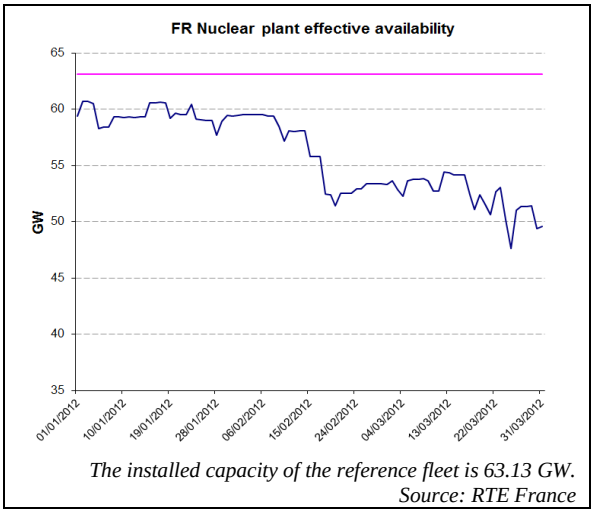
Right map : with respect to the long term average



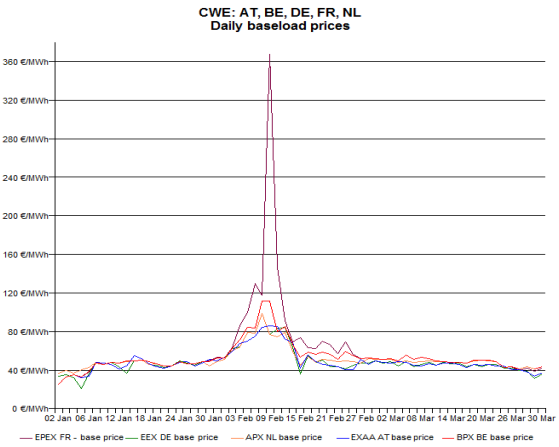




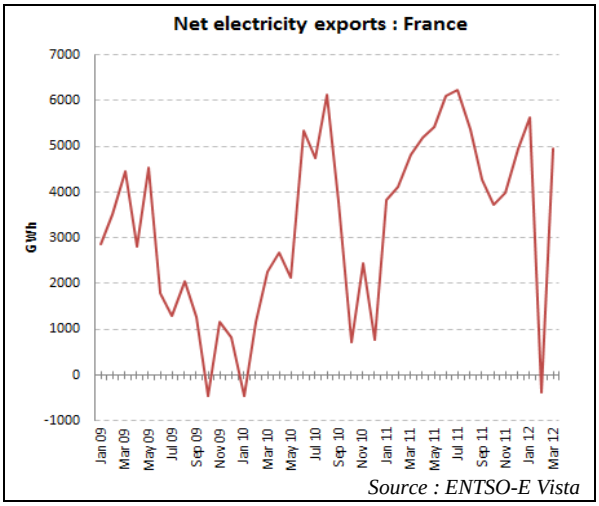
Source: Platts



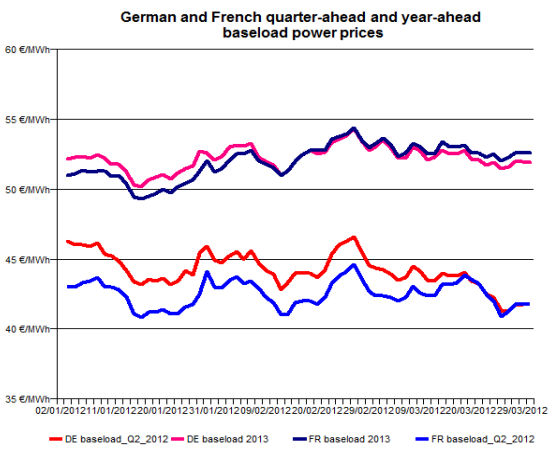
The installed capacity of the reference fleet is 63.13 GW.
Source: RTE France



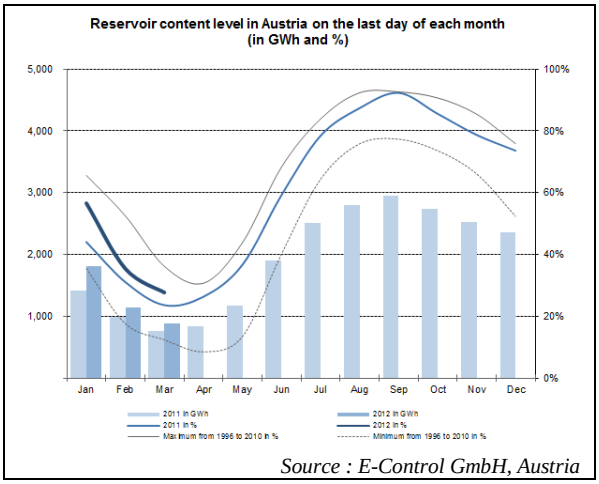
Source: Platts



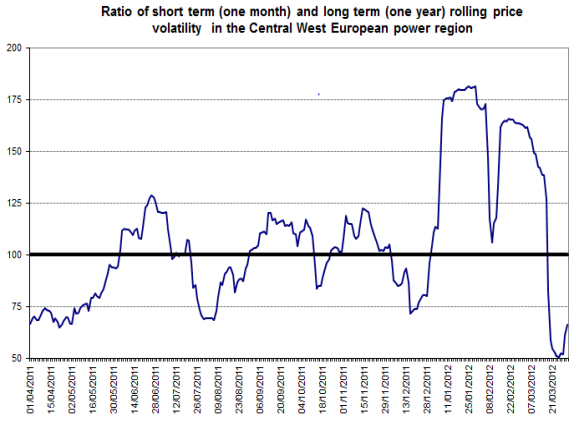
Source : ENTSO-E Vista



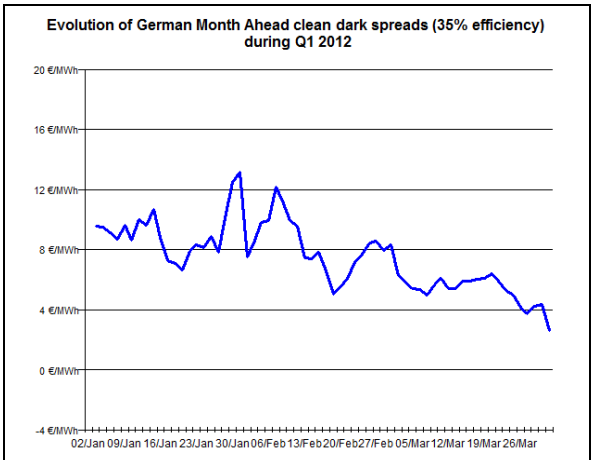
Source: Platts



Source : E-Control GmbH, Austria



Source: Power price and volume data, own computations.



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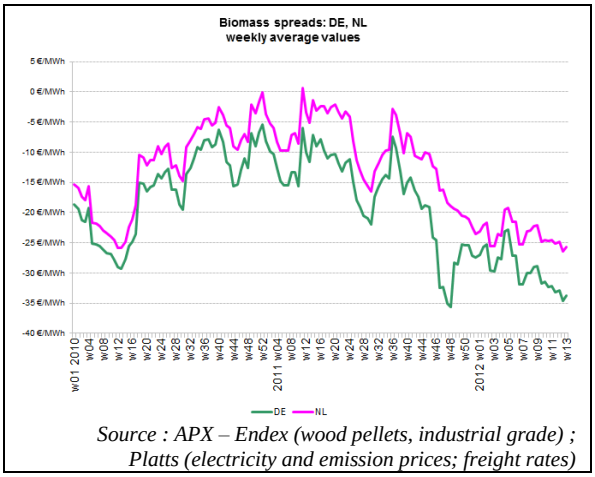
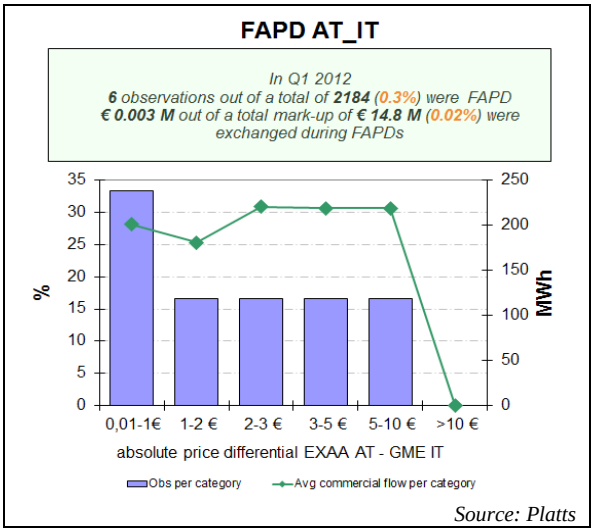


Source : APX – Endex (wood pellets, industrial grade) ; Platts (electricity and emission prices; freight rates)

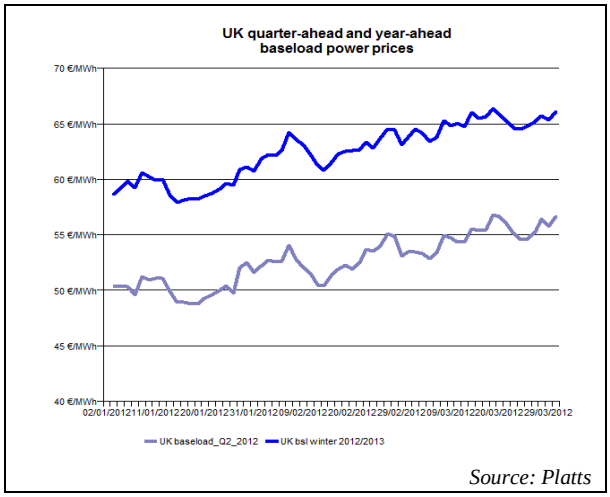


Source: Platts

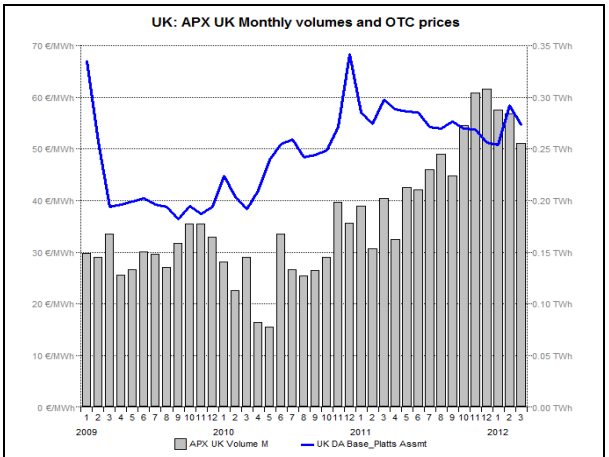
British Isles (UK, Ireland)

- In the UK the monthly average day-ahead baseload price was 50.8 €/MWh in January 2012, which was the lowest since October 2010. Daily average baseload power prices did not show too much volatility in January; with the exception of a short cold wave in the middle of the month resulting in a hike of the daily average price to 55 €/MWh. Most of the month could be characterised by a daily average price close to 50 €/MWh.
- From end of January 2012, in parallel with the increasing natural gas prices and the cold weather, daily average power prices also took a sharp upturn and reached their peak on 7-8th of February (close to 78 €/MWh). After gas prices began to retreat from their peak above 40 €/MWh and the weather turned milder again power prices began to fell and by the end of February 2012 they returned to a range of 50-55 €/MWh. As mid-February price peaks remained below continental power prices the UK managed to export some of its electricity to France where prices were extremely high during this period.
- It is also noteworthy that in February 2012, despite harsh winter conditions, power prices remained below the levels measured in December 2010. To a large extent, this was due to the availability of cheap coal sources and less tight grid margins.
- From the end of February till the end of the first quarter of 2012 UK daily baseload power prices were close to 55 €/MWh, mainly influenced by the mild weather, slightly increasing gas prices and some unplanned nuclear outages at the beginning and at the end of March 2012. The short term price volatility in the UK market was close to the long term average in the first month of 2012, then in February the alternation of sharp rises and steep falls in power prices assured a higher volatility. By the end of Q1 2012 however, as prices stabilised the volatility decreased significantly.
- Quarter-ahead baseload power prices and year-ahead (winter 2012/13) contracts gained around 5 €/MWh during the first quarter of 2012. This was mainly due to the price increase in oil and gas forward contracts.
- *Clean spark spreads** in the UK were close to 4 €/MWh in January 2012. In the first week of February, as gas prices took a sharp upturn they fell below zero (-4 €/MWh), implying that gas-fired power plants were facing strong competition from other generation sources. It seems that although power prices rose significantly, the impact of gas price increase was stronger. By the end of February, as emission allowance prices peaked in Q1 2012 clean spark spreads entered into positive territory again. Month-ahead and quarter-ahead future spark spread curves formed a V shape during Q1 2012 as gas prices showed a faster increase than the power prices during the first half of the quarter. At the end of the quarter both month-ahead and quarter-ahead spark spreads decreased to a level close to 7 €/MWh. Year-ahead spark spreads remained practically stable during the first quarter of 2012.
- Unlike the monthly average power price in the UK, which remained in February 2012 significantly below the level measured during the last long-lasting cold spell in December 2010,

monthly power prices in Ireland rose to 70 €/MWh in February 2012, being close to the record set in December 2010. The daily prices reached their maximum on the 8th of February during Q1 2012 (92 €/MWh), being significantly higher than the respective value in the UK. A significant price premium to the UK market could be observed during most of the quarter, pointing to the geographically isolated nature of the Irish power market. During most of Q1 2012 Irish daily power prices fluctuated in a range of 55-70 €/MWh, showing a volatility higher than in the UK market.

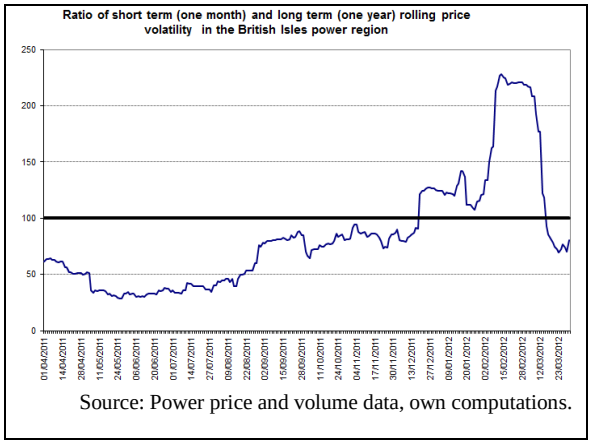


Source: Platts

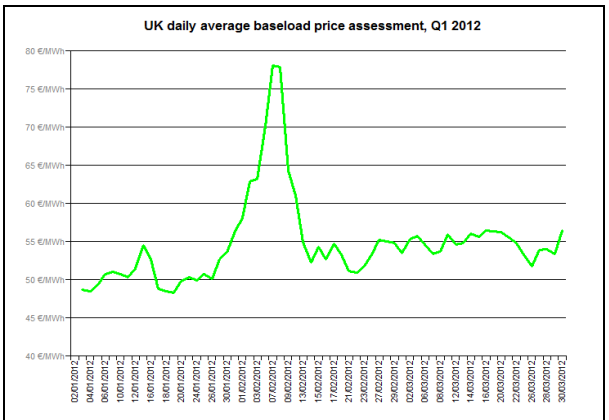


UK values are quoted in € using the €/£ daily exchange rate as reported by the European Central Bank.

Source: Platts

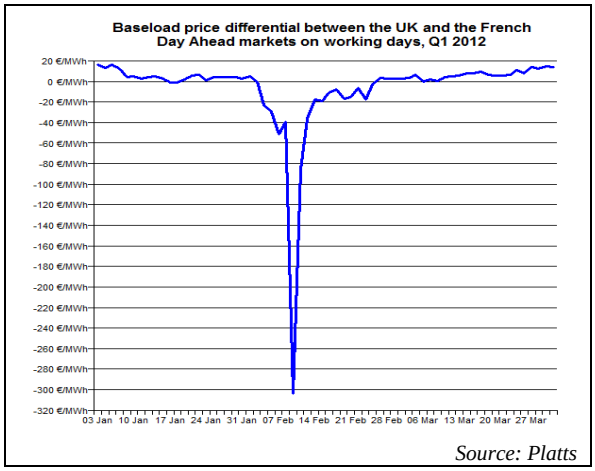


Source: Power price and volume data, own computations.



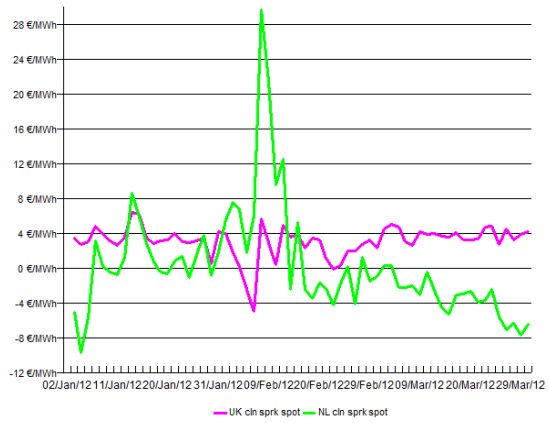
UK values are quoted in € using the €/£ daily exchange rate as reported by the European Central Bank.

Source: Platts



Source: Platts

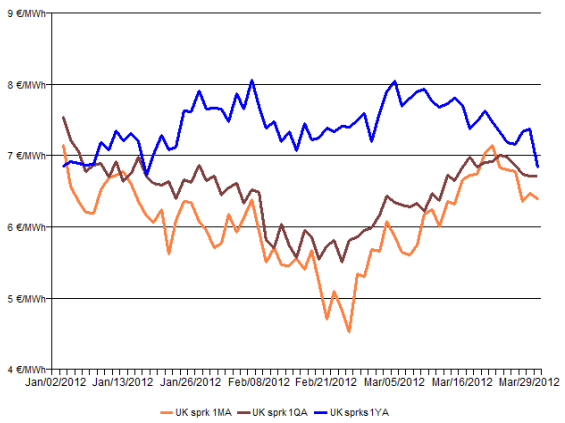
Evolution of the spot clean spark spreads (50 % efficiency) during Q1 2012



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

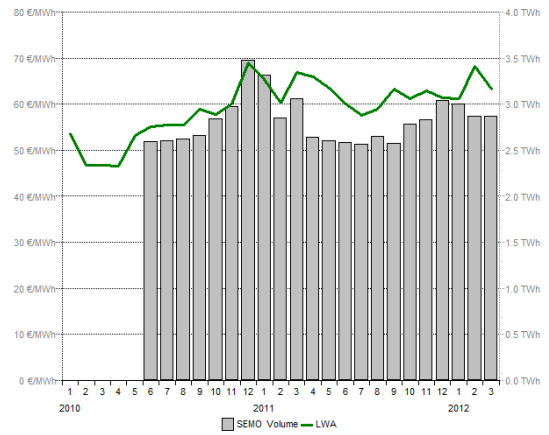
Source: Platts

United Kingdom future spark spreads (50%)



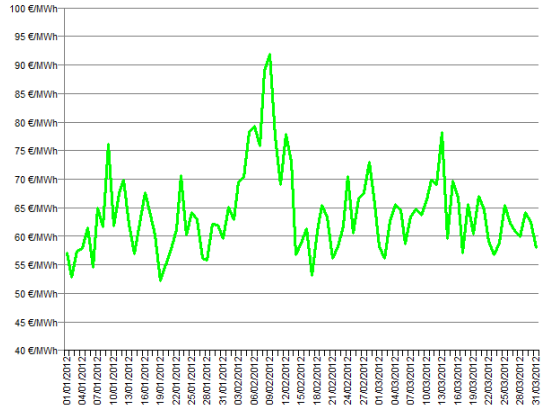
Source: Platts

SEMO: IE
Monthly volumes and averages of load weighted prices



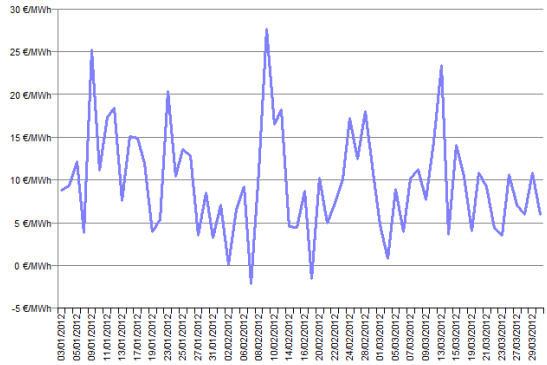
Source: Single Electricity Market Operator (SEMO)

SEMO: IE daily average load-weighted electricity prices, Q1 2012



Source: Single Electricity Market Operator (SEMO)

Baseload price differential between the Irish and the UK market Q1 2012



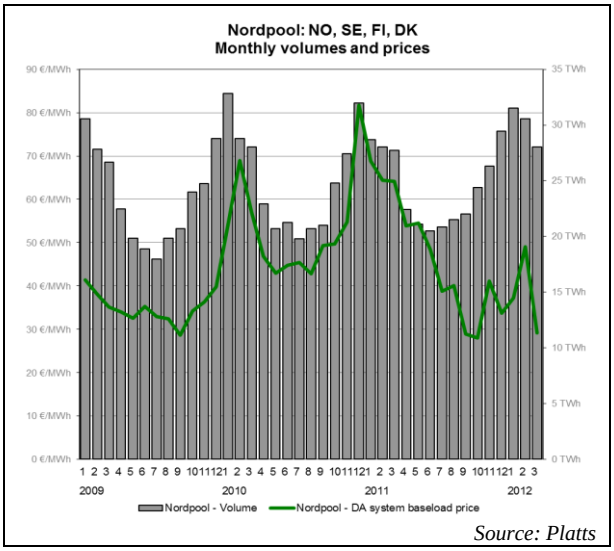
Source: Single Electricity Market Operator (SEMO),Platts

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

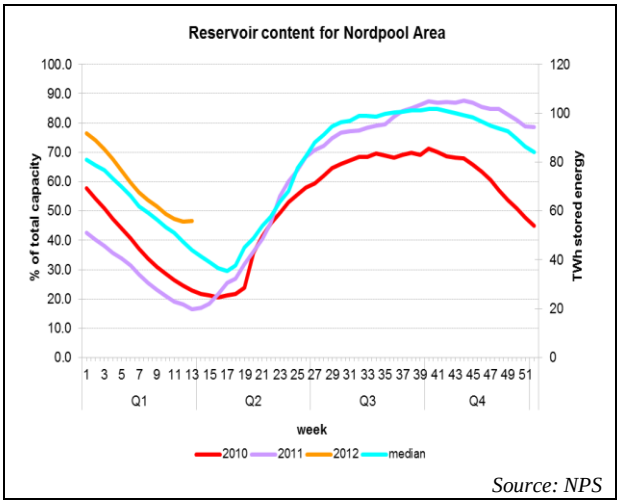
- In January 2012 the monthly average day-ahead system price in Nordpool, the Nordic market, was 37.2 €/MWh, being the lowest January monthly price in the last five years. In the first three weeks of the month daily average baseload power prices were mainly below 40 €/MWh, primarily owing to a mild weather. Hydro reserves were above the long term seasonal value and sufficient renewable energy availability also helped in keeping wholesale power prices low.
- In the last week of January 2012 daily power prices began to increase as the weather turned colder. On the 2nd of February unplanned nuclear outages in Sweden that concerned some reactors (Ringhals B2, Forsmark 3) resulted in a serious drop in nuclear generation capacity (from above 80% to 57% of the total nuclear capacity), which coupled with lower wind generation in Denmark and cold weather resulted in a price spike in the system. The Nordpool system price rose to 86 €/MWh on a daily average. In four price areas (Finland, Denmark East, Sweden SE 3&4) daily averages were above 100 €/MWh and in some areas hourly prices exceeded even 200 €/MWh. In Finland the daily electricity consumption rose close to its all-time high (15 GWh / day).
- On this day the Nordic electricity prices showed strong signs of decoupling. Southwest Norwegian regions could still benefit from their hydro resources keeping these area prices lower, while in northern Norwegian regions prices rose rapidly in the lack of sufficient interconnection capacities to transport power in these remote regions. Estonian prices also remained lower as alternative power import sources were available.
- After the operation resumed in the Swedish nuclear reactors the system price fell back to 43 €/MWh on the 5th of February. In the forthcoming days the cold snap reached its peak in Europe and the tightness of the European grids resulted in increasing power prices. The Nordpool system peak in Q1 2012 was reached on the 8th of February (96.2 €/MWh). This was in line with the prices in Central Western and Central Eastern Europe, though it is worth to note that prices went back to normal levels more quickly than anywhere else in Europe as sufficient level of hydro sources offered ample generation capacity. The average monthly price level was 49.1 €/MWh, being the lowest February monthly average price since 2009.
- From the end of February 2012 as temperatures started to rise and abundant hydro reserves still assured cheap power generation daily average prices went below 40 €/MWh, and from mid-March they reached a low range of 20-30 €/MWh; finishing Q1 2012 at 23 €/MWh. The average monthly discount of the Nordic system price to the German benchmark rose to more than 10 €/MWh in March 2012.
- The volatility of spot prices that rose significantly during the double-peak of daily prices in the first two weeks of February fell back to low levels by the end of March 2012.
- Quarter-ahead Nordpool baseload prices began to decrease from mid-February 2012 in parallel with the spot

prices and the decreasing power demand ahead of the spring period. Year-ahead prices remained fairly stable throughout the first quarter of 2012.

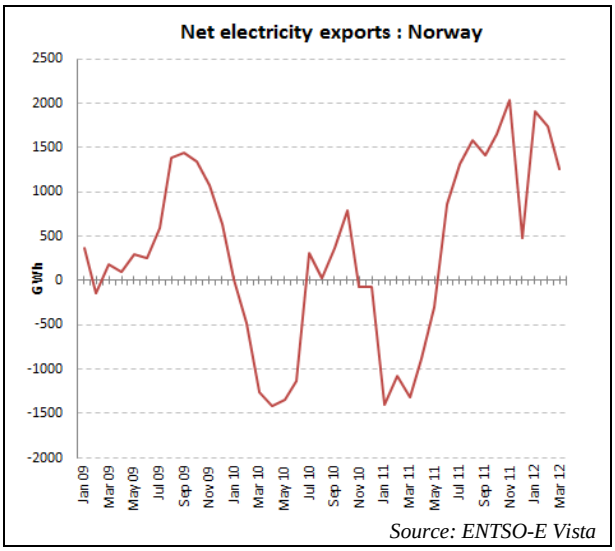
- The quarterly traded volume on the Nordic day-ahead market amounted to 90.1 TWh in Q1 2012, being 12.5% higher than in Q4 2011 and by 6.7% higher than in Q1 2011. The high increase in traded volume of power compared to the last quarter of 2011 also reflects the consumption peak in the first quarter of the year.
- Nordpool remained among the most liquid European electricity markets; the total amount of traded power represented 76.9% of the five countries' combined gross inland electricity consumption in Q1 2012.



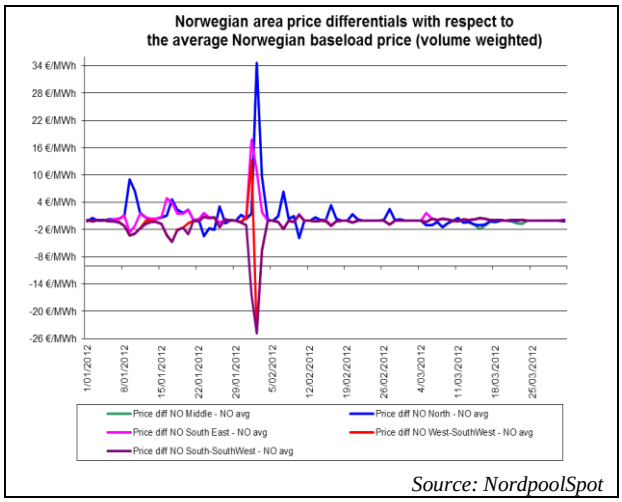
Source: Platts



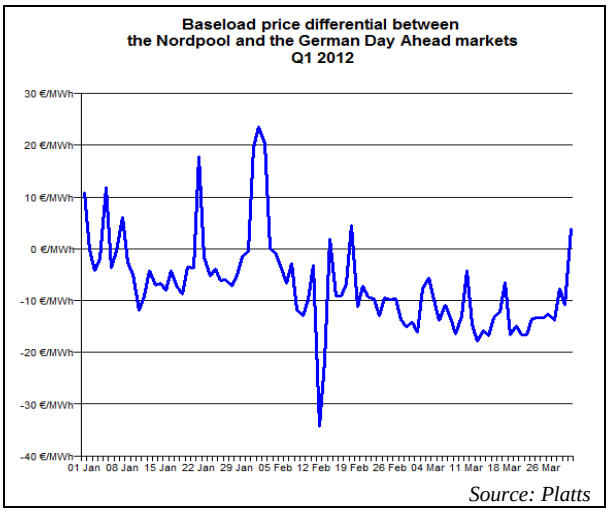
Source: NPS



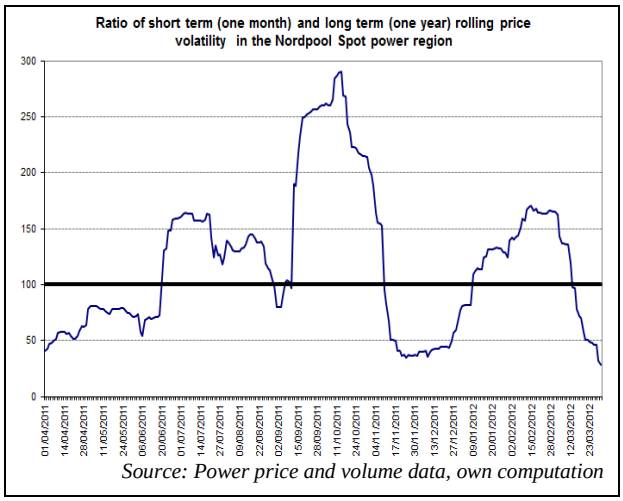
Source: ENTSO-E Vista



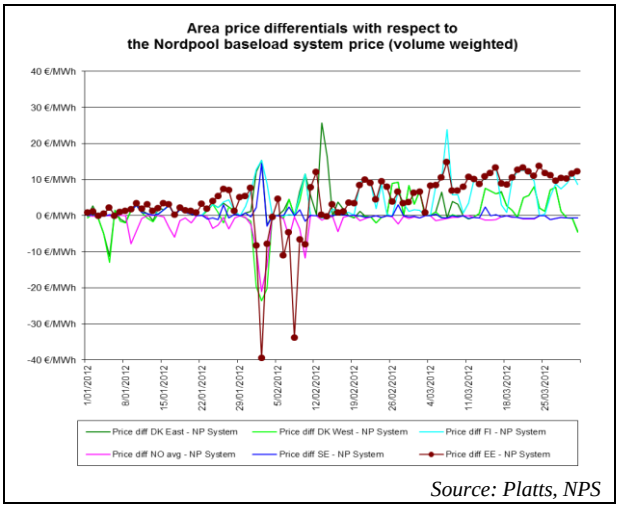
Source: NordpoolSpot



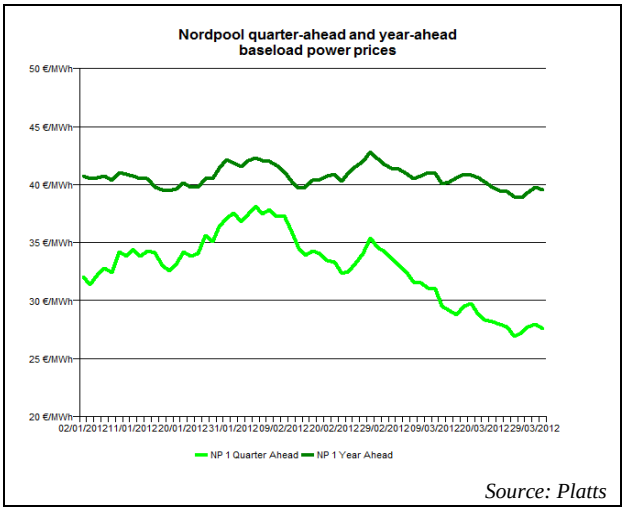
Source: Platts



Source: Power price and volume data, own computation



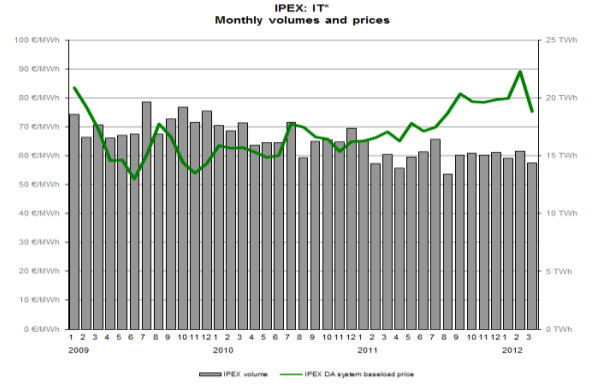
Source: Platts, NPS



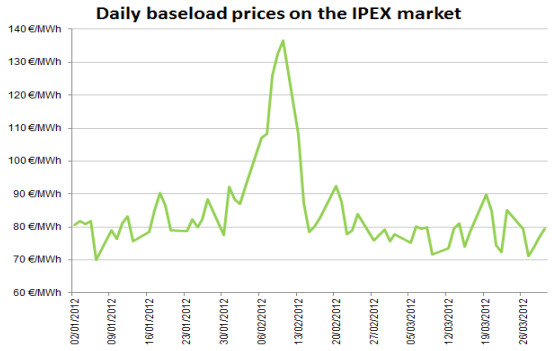
Source: Platts

Apennine Peninsula (Italy)

- Similarly to the previous quarter, in January 2012 the monthly average baseload power price in the Italian market was slightly less than 80 €/MWh. Daily average power prices did not show a high degree of volatility either, they fluctuated in a range of 75-85 €/MWh during most of the first month of 2012. Temperatures corresponded to the long-term seasonal average and both gas prices in the PSV hub in Italy and crude oil prices in Europe showed a high degree of stability during January 2012.
- The cold spell in early February 2012 triggered by a strong increase in gas prices on the Italian gas hub. The gas price recorded on the 8th of February (65 €/MWh) was almost three times as high as the typical West European hub price. This development had a significant impact on the baseload power prices (132-136 €/MWh on 9-10 February). Such a high level in baseload power prices has not been seen in the Italian market since July 2006. Although normal weather conditions returned in the second half of the month, the monthly average baseload power price in February 2012 (89 €/MWh) was the highest since October 2008.
- During the coldest period of February Italy exported power to France which is a rare event given that Italian market normally has a significant price premium to France. The ratio of adverse flows was 5% in Q1 2012, up from 1% measured in Q4 2011. More than 40% of these adverse flows fell into the largest price differential range (more than 10 €/MWh), reflecting that under extreme conditions day-ahead price differentials cannot always give a proper indication on the direction of the realised power flows on the following trading day.
- In March 2012 mild weather conditions and Italian domestic gas prices retreating to low values last seen in August-September 2011 enabled baseload power prices to return to a range of 75-85 €/MWh, though high crude oil prices limited the fall in prices. Volatility of Italian power prices showed a perceivable increase only in mid-February and after the end of the cold spell it returned to low levels measured in January 2012.
- Both Sicilian and Sardinian area prices showed a measurable premium to the national system price in Q1 2012 and Sardinian prices were particularly volatile in March 2012. There were a number of days in this month when hourly prices in Sardinia were higher than 200 €/MWh during the evening hours, possibly reflecting a decrease in solar and wind generation during this evening period of the day.



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



Source: Platts.

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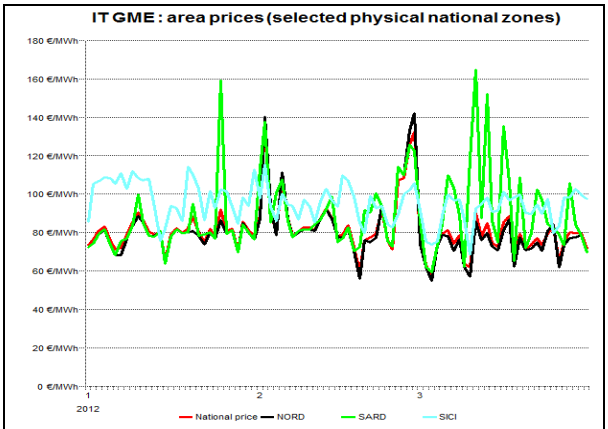
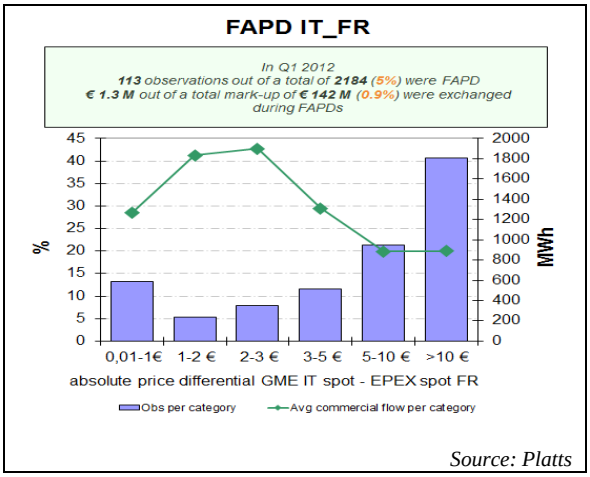
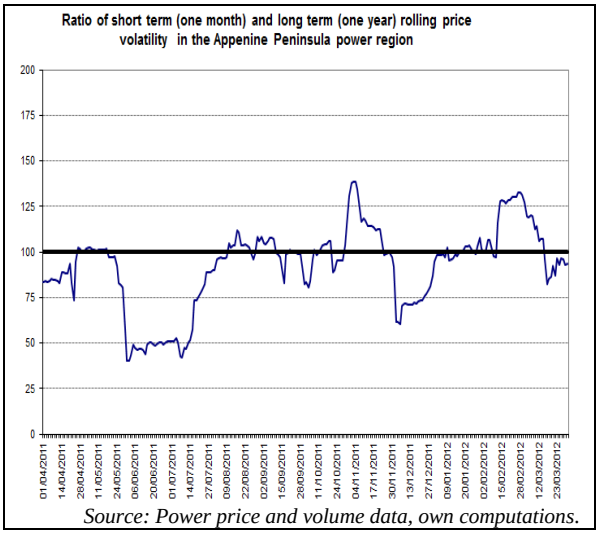


Source: Gestore mercati energitici



Source: Platts

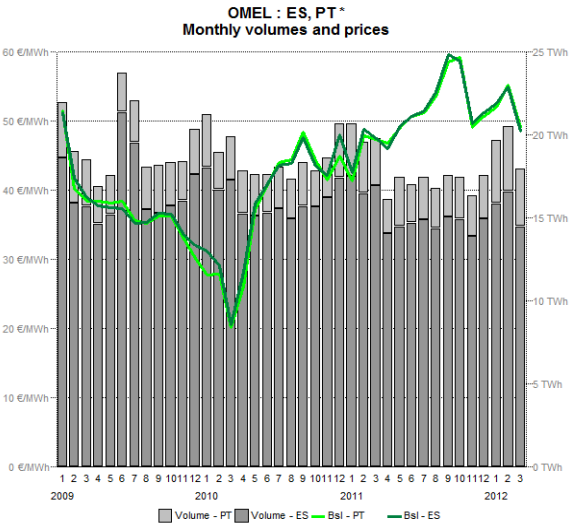


Source: Power price and volume data, own computations.

Iberian Peninsula (Spain and Portugal)

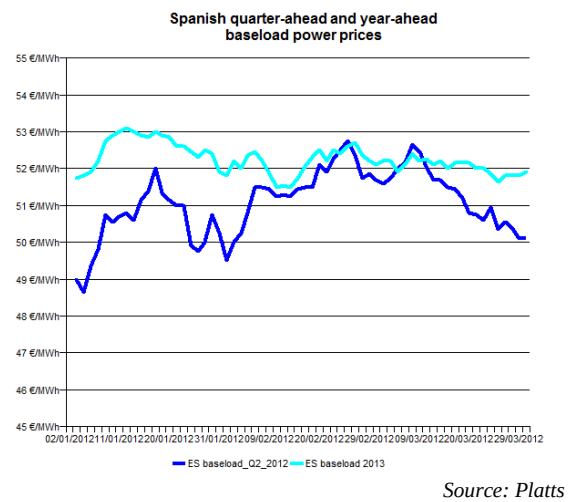
- At the beginning of January 2012 daily baseload power prices in Spain were below 50 €/MWh, due to the mild weather, strong wind power generation and lower industrial demand in the holiday season. Later on, as wind availability started to decline, the share of coal and gas-fired generation increased and electricity prices finished the observed period in a range of 50-60 €/MWh.
- Unlike many other European countries, Spain and Portugal were not so harshly affected by the cold weather in February 2012 and power price peaks within the month remained significantly below those of other markets in Western Europe. In the first ten days of February 2012 the main driving factor behind the increase in the Spanish power prices was not the cold weather, rather the increasing power exports to France. In that period the Spanish generators were reacting to strong price signals from the other side of the border. Daily baseload power prices reached their peak later; on the 21st of February (67 €/MWh) as cold temperatures coupled with low wind and hydro availability and on-going power exports to France increased the domestic power demand and reduced the power supply.
- An important factor influencing the evolution of power prices in Spain was the availability of hydro resources. In Q1 2012 the hydro reservoir content level fell below the ten-year median value and the difference between the actual and long term hydro reserve level kept growing during the whole quarter; reaching more than 8 percentage points at the end of Q1 2012. March 2012 was especially dry; in this month hydro-based power generation only contributed by 5.6% to the power generation mix as opposed to a contribution of 17.3% in March 2011.
- Although in March 2012 the share of both hydro-based and wind-based generation in the Spanish power mix was less than a year before. Prices decreased to a range of 45-55 €/MWh for most of the month after high prices in February. The weather was generally milder than usual, though a price hike was triggered by a short-lived cold snap, bringing even snowfalls on the 21st of March. On the 29th of March prices fell below 40 €/MWh on a working day for the first time in three months ahead of a general strike, which impacted the industrial power demand. Rainfalls at the end of the month also improved the availability of hydro resources, assuring less costly power generation.
- Interestingly, the highest price volatility in the OMEL market could be measured in the second half of January 2012 during the whole quarter. This might be related to the impact of the holidays at the beginning of the year as consecutive holidays resulted in frequently and rapidly changing power demand and prices. As the price spike in mid-February was not as significant as in other markets of Europe, this latter event could not exert such a big influence on price volatility.
- Quarter-ahead power prices in the Spanish market were mainly driven upwards by the increasing oil, gas and emission allowance prices in the first two months of 2012. In March 2012 this trend broke and on the back of the cheaper spot market and retreating

emission prices the quarter-ahead contracts became cheaper. Year-ahead power prices showed a greater stability, though they decreased slightly in Q1 2012.

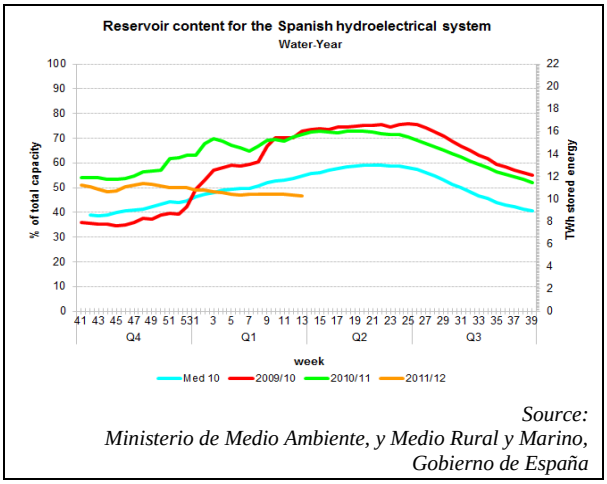


Source: Platts

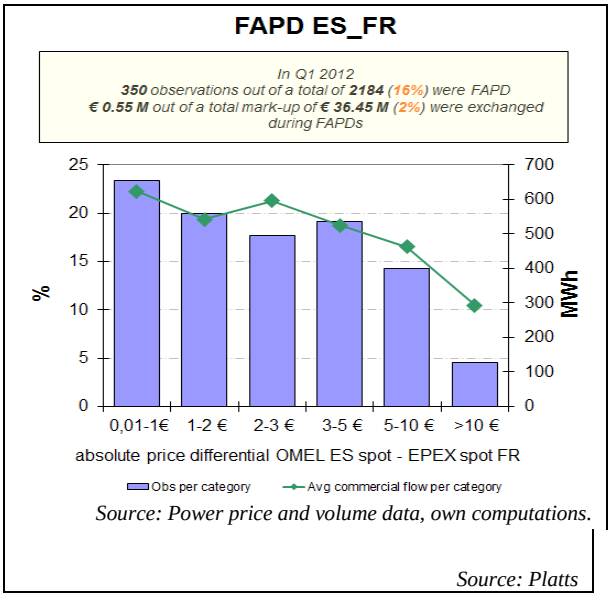
** Trade on Italian (IPEX), Greek (DESMIE) and Iberian (OMEL) electricity markets is incentivised by regulatory means.*



Source: Platts

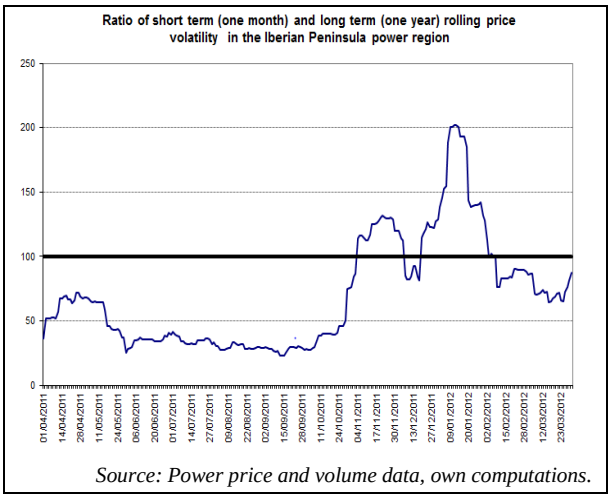


Source:
Ministerio de Medio Ambiente, y Medio Rural y Marino, Gobierno de España



Source: Power price and volume data, own computations.

Source: Platts



Source: Power price and volume data, own computations.

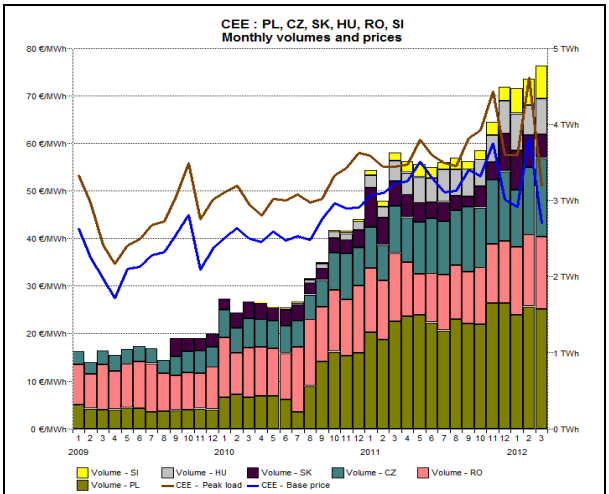
Central Eastern Europe (Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia)

- In January 2012 monthly average power prices in the Central East European Region (CEE)[***] reached their lowest levels since autumn 2010. This was mainly due to a milder-than-usual weather and the abundant wind and solar power generation in Germany. This situation rapidly changed during the last couple of days of January 2012 when a harsh cold spell was forecasted for the whole region.
- In the first two weeks of February 2012 regional baseload and peakload day-ahead power prices reached unusually high levels as power markets reacted strongly to severe weather conditions. The behaviour of each single market in the CEE region depended on its geographical position and interconnector capacities to the neighbouring markets.
- Daily power prices in Romania, Hungary and Slovenia reacted with a high volatility to changes in power demand in the Balkan countries. The first time in Q1 2012, when Hungarian baseload prices reached 100 €/MWh was on the 24th of January, when a coal miners' strike started in Bulgaria and the government decided to halt to country's power exports in order to satisfy domestic needs. Hungarian baseload power prices reached their quarterly peak on the 16th of February (145 €/MWh) when the cold weather was the harshest in the Balkans, freezing of river Danube threatened the functioning of some hydro plants in Serbia and hydro-based generation was generally poor in the whole region. The Bulgarian government in these days ordered for the second time to halt to country's power exports. The tightness of the grid was further intensified by lower renewable energy generation in Germany, reducing the regional power supply.
- In the case of the Hungarian market cross border capacity restrictions concerning power inflows from Austria, Slovakia and Romania also caused price spikes during this period.
- Prices in Romania and Slovenia were also very high during the first two weeks, though in Romania higher ratio of domestic hydro-generation, as well as other sources, assured cheaper prices than in the other two countries.
- Increasing demand from southeast Europe had an unexpected impact on the coupled power market between the Czech Republic and Slovakia; there were four days in January and February 2012 when the two markets decoupled. This might be explained by high demand from southeast Europe, as the interconnector capacity between the two countries could not satisfy the increased export demand and therefore Slovak prices sharply increased, while Czech ones remained on a moderate level.
- During the first quarter of 2012 Polish, Czech and Slovak prices showed a higher correlation to each other than to the other three countries in the CEE region. Prices in Poland were normally stabilised by higher domestic generation and by the exporting

[***] 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

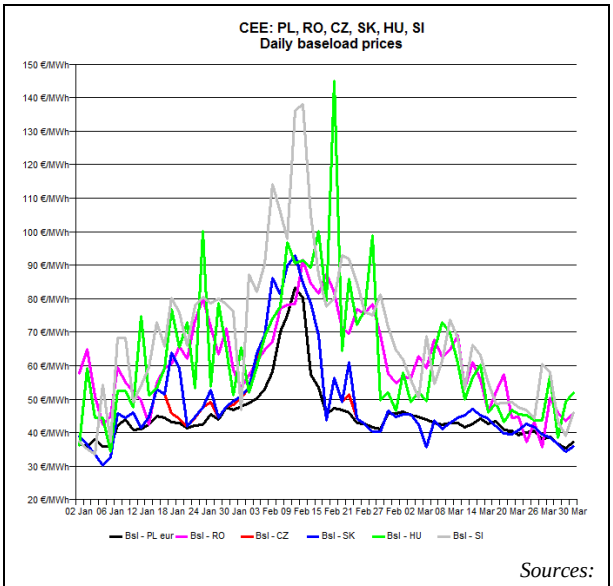
opportunities to the neighbouring markets.

- From the second half of February 2012 after the end of the cold spell prices returned to more usual levels. As temperatures became milder and the excess power demand from the Balkans disappeared from the system prices of the six countries began to converge again. March 2012 was a particularly mild month resulting in a lower heating demand.
- Polish and Czech quarter-ahead prices did not react so fiercely to prompt events in the markets; they were more or less stable or slightly increasing during the first half of Q1 2012. In the second half of Q1 2012 quarter-ahead contracts started to decrease, reflecting a decreasing demand of power during the forthcoming spring months. Slightly increasing year-ahead prices were influenced by rising oil and gas prices and by their West European peers.
- Price volatility reached particularly high levels in the second half of January 2012 when the impact of renewable generation in Germany and rapidly changing demand from the Balkans exerted an influence on the price level. Volatility increased again in the second half of February 2012 when prices started to fall at the end of the cold spell. The presence of high adverse power flow ratios signals the low effectiveness of trading between neighbouring markets in the CEE region.

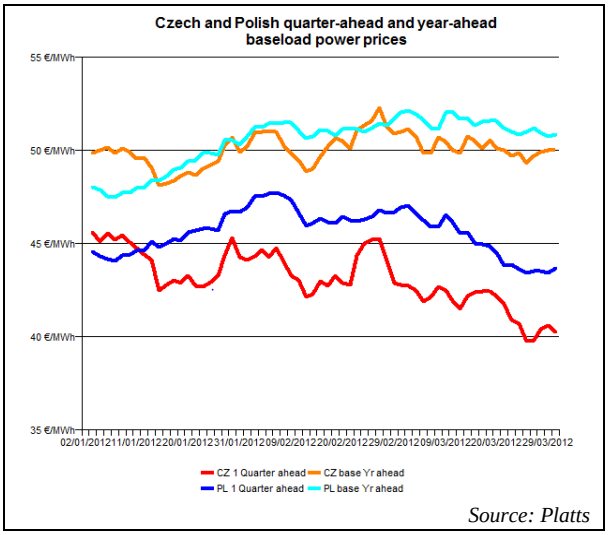


Sources:
TGE (PL),OTE(CZ, SK), OPCOM(RO), HUPX(HU), BSP (SI)

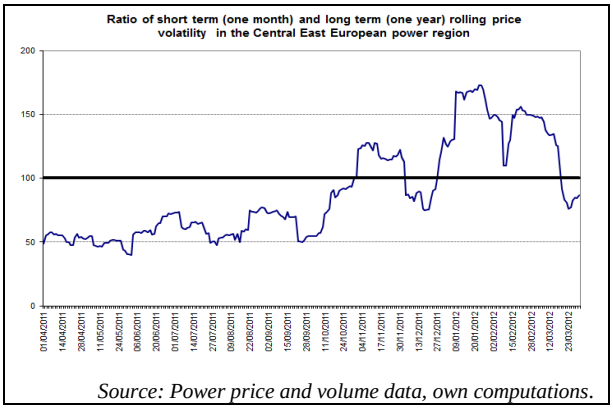
Monthly average baseload power prices (€/MWh)			
2012	January	February	March
Hungary	56.1	75.8	48.3
Poland	40.7	51.4	40.2
Czech Republic	40.6	55.9	39.1
Slovakia	41.8	56.4	39.1
Romania	55.2	69.9	47.8
Slovenia	58.6	85.8	51.2



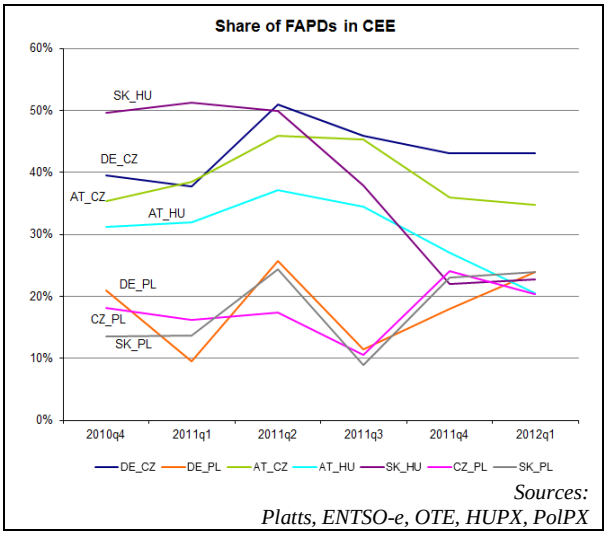
Sources:
TGE (PL),OTE(CZ, SK), OPCOM(RO), HUPX(HU), BSP (SI)



Source: Platts



Source: Power price and volume data, own computations.



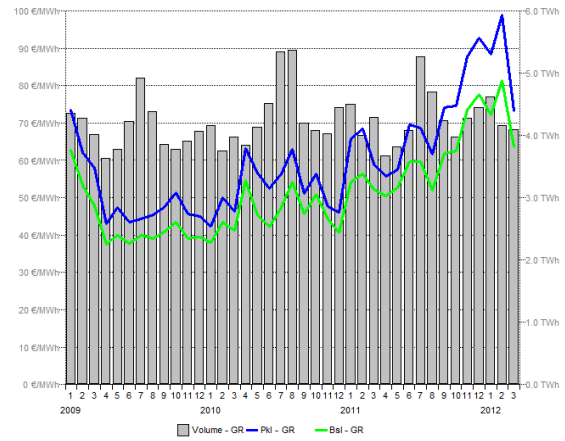
Sources: Platts, ENTSO-e, OTE, HUPX, PolPX

South Eastern Europe (Greece)

- After a significant increase in baseload and peakload power prices in Q4 2011 monthly average power prices decreased by 4-5 €/MWh in January 2012 compared to the previous month. The monthly average of baseload power prices was 81.4 €/MWh while peakload prices reached 98.8 €/MWh on average.
- In January 2012 temperatures in most of the European countries could be characterised as corresponding to the normal seasonal values or the weather was even milder than usual. In Greece however, the weather was colder and this can be tracked on the evolution of the daily baseload and peakload prices, reaching their monthly peak on the 16th of January (93.5 €/MWh and 122.5 €/MWh, respectively).
- The oil embargo on Iran (see page 2) might also have contributed to higher power prices in Greece, as oil and oil products have a non-negligible share in Greece's power generation mix (around 10%) and the share of Iranian oil sources within the country's total oil imports was the highest in 2011 among all EU Member States.
- February 2012 was also colder than normal in Greece and the coldest period came in the middle of the month. Harsh winter conditions coupled with decreasing power imports from Bulgaria following the Bulgarian government's decision on suspending power exports (see page 19) assured high prices in this period. Power prices reached their quarterly peak on the 17th of February (baseload: 120.4 €/MWh, peakload: 145 €/MWh). Greece also had

difficulties with assuring its domestic natural gas needs; additional shipments had to be imported from Russia and this must also have affected the power generation amid the mid-February spike in natural gas prices in Europe.

- After the end of the cold period and resuming imports from Bulgaria prices went back to more usual levels, though the market remained quite volatile until the end of Q1 2012. Short term price volatility jumped over the long term value (the RVI indicator* rose above 100) first in mid-January following a short-lived spike in the power prices, then for the second time in February. At the end of March 2012 the RVI indicator decreased significantly following the normalising situation in the power market.
- In Q1 2012 Greek baseload power prices showed a significant premium to both of the Romanian market. On some occasions the premium was more than 50 €/MWh above the Romanian benchmark as imports from Bulgaria and Romania were significantly reduced. The Greek power prices reached their peak a couple of days later than prices in most of other the markets.
- Greek and Italian prices were diverging significantly in Q1 2012. In a single week in the beginning of February the price differential swung by almost 100 €/MWh, with the Greek prices starting the week being more than 50 €/MWh cheaper and finishing the week by being almost 40 €/MWh more expensive than the Italian benchmark.



Source: Platts

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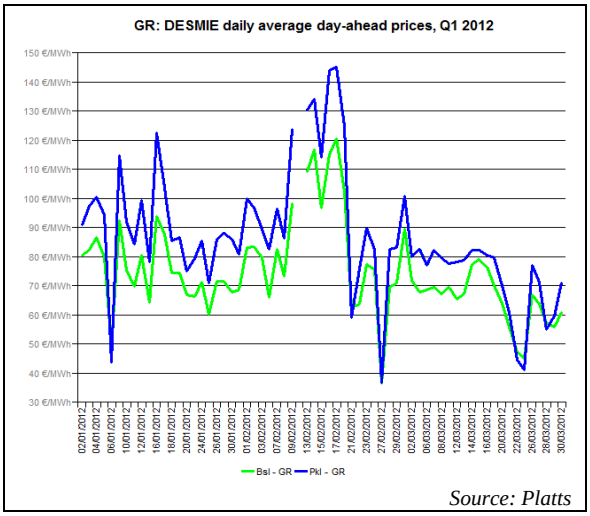
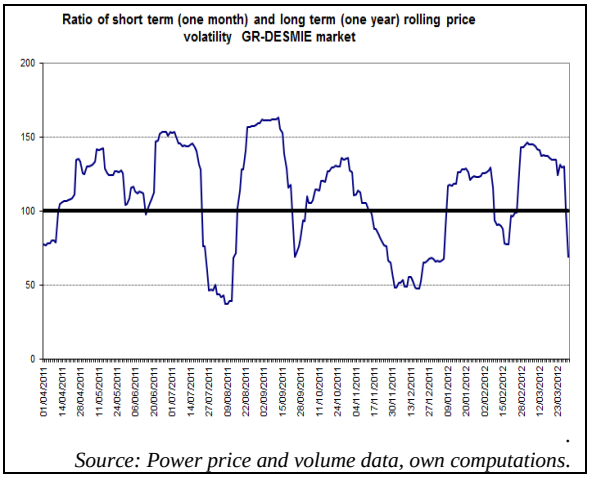
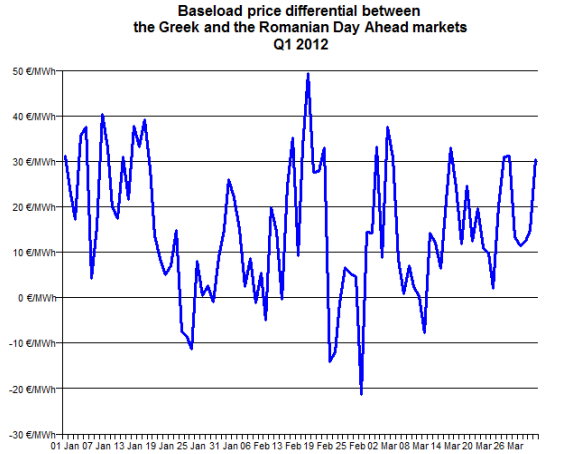


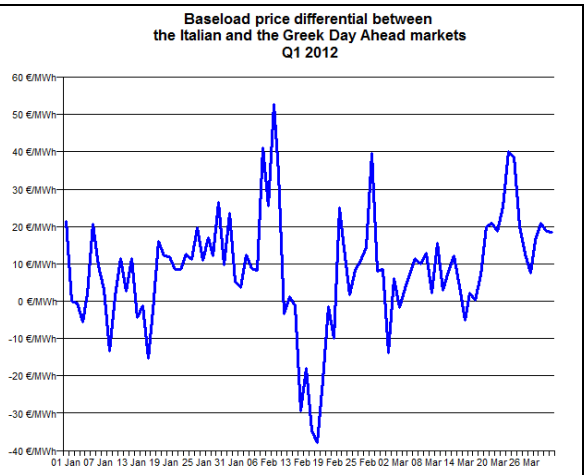
Source: Platts



Source: Power price and volume data, own computations.



Source : DESMIE, OPCOM s.a.



Source: IPEX, DESMIE
Source: Platts

A. 2 Retail markets

Dear readers,

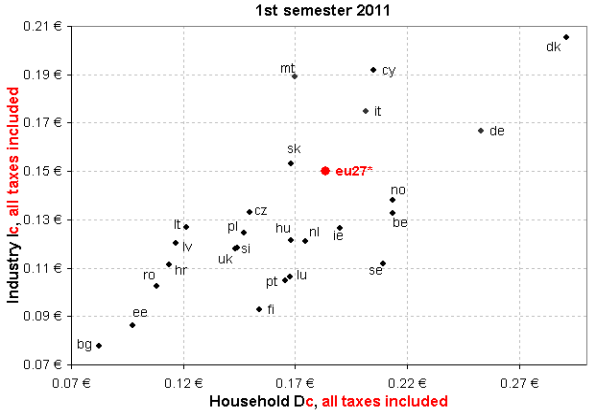
From this quarter onwards, we will have to align the reporting on developments in the retail markets across Europe with the data dissemination frequency of our principal data provider.

We will provide detailed analysis on the European retail electricity markets only in each second issue of our reports (respectively Q2 and Q4 of each year), to match the half yearly data release on household and industrial electricity price data by Eurostat.

However, we will continue to present in each quarterly publication scatter plots, charts and maps showing the latest data on retail electricity prices paid by households and industrial customers.

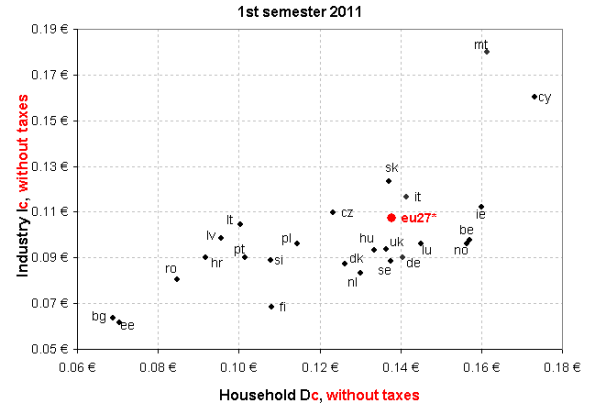
We will resume the detailed quarterly reporting when harmonised and up-to-date retail data becomes available at a higher frequency.

Thank you for your understanding.



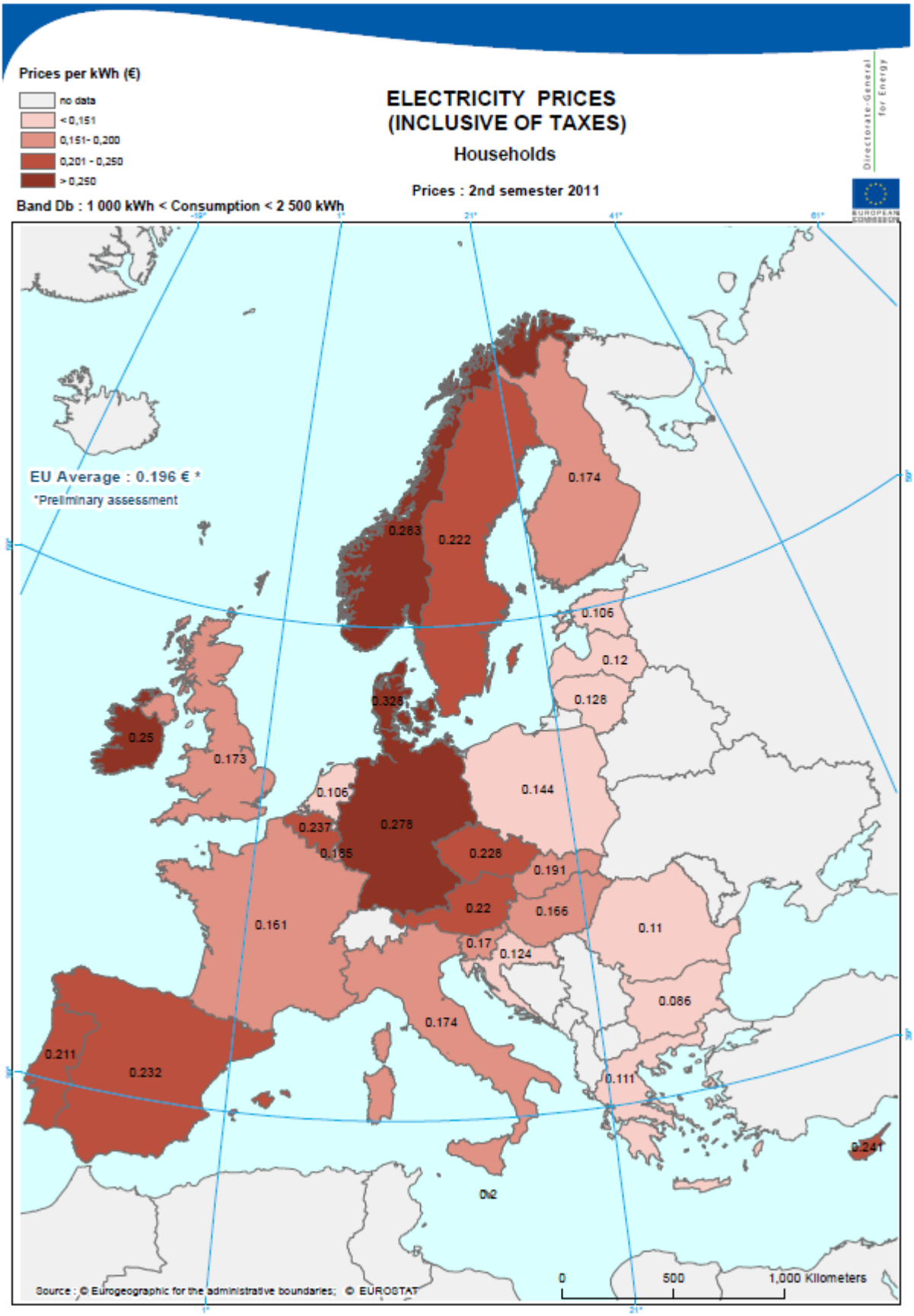
Source : Eurostat
Range for annual consumption of :
Household band Dc : [2.500 kWh – 5.000 kWh] ;
Industry band Ic : [500 MWh – 2.000 MWh]

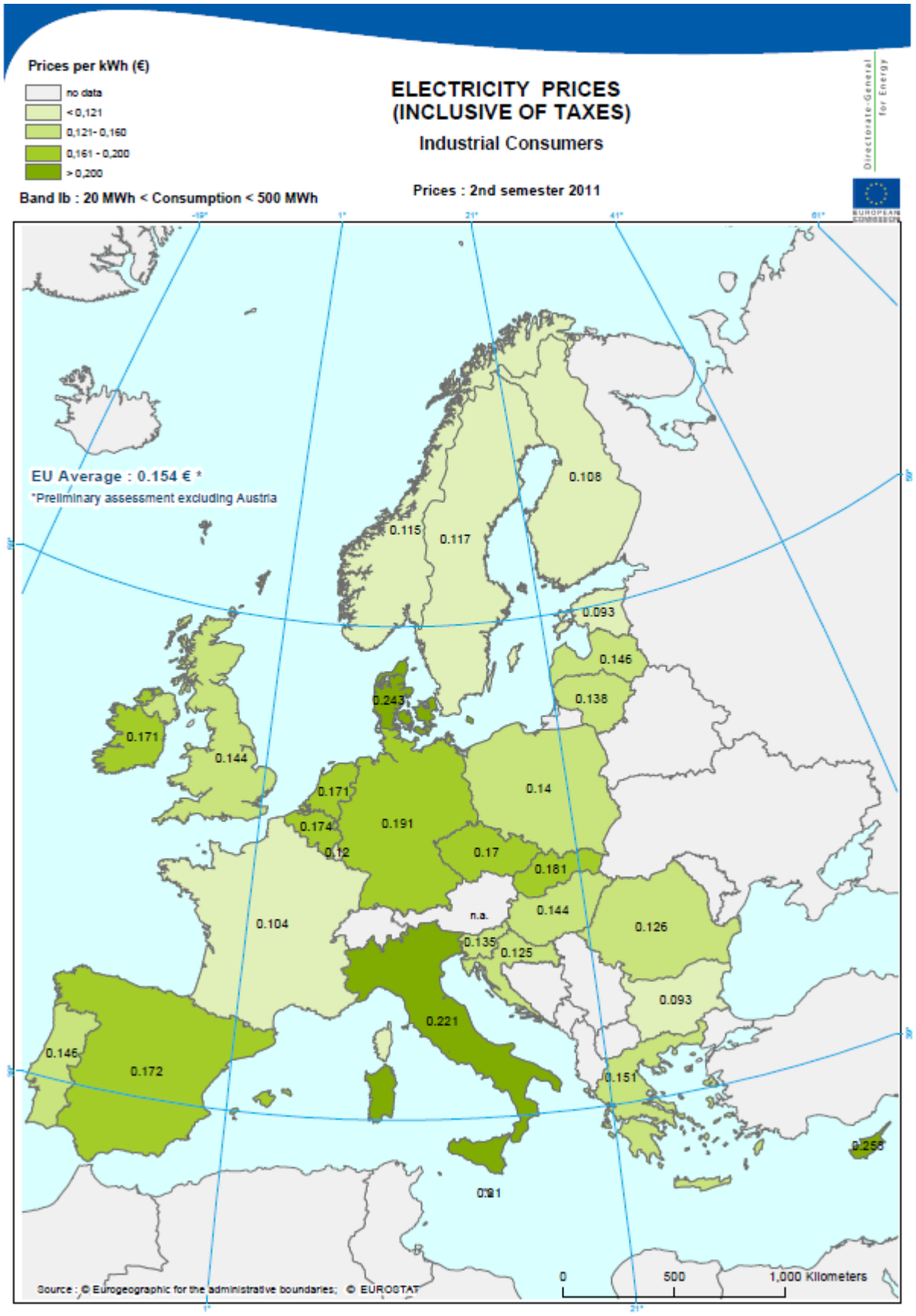
Notes: Data for Austria, Spain, France, Greece, Turkey are not available: eu27 is the last available weighted average, as of 2nd semester 2010.*



Source : Eurostat
Range for annual consumption of :
Household band Dc : [2.500 kWh – 5.000 kWh] ;
Industry band Ic : [500 MWh – 2000 MWh]

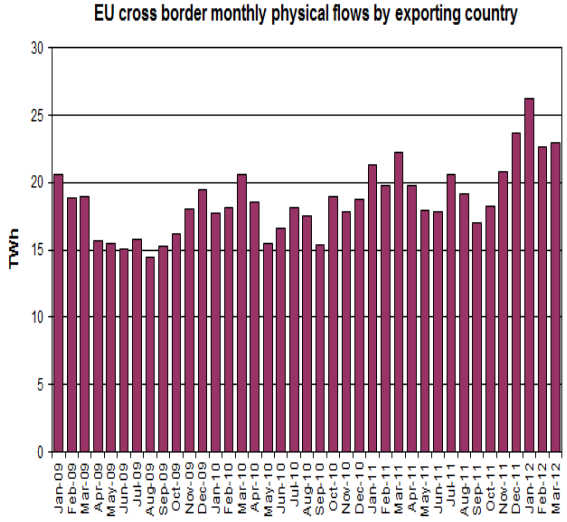
Notes: Data for Austria, Spain, France, Greece, Turkey are not available: eu27 is the last available weighted average, as of 2nd semester 2010.*


Prices per kWh (€)
no data
< 0,151
0,151- 0,200
0,201 - 0,250
> 0,250
ELECTRICITY PRICES
(INCLUSIVE OF TAXES)
Households
Prices : 2nd semester 2011
Band Db : 1 000 kWh < Consumption < 2 500 kWh
Directorate-General for Energy
EU Average : 0.196 € *
*Preliminary assessment
0.174
0.283
0.222
0.106
0.12
0.128
0.328
0.25
0.173
0.106
0.144
0.237
0.278
0.165
0.228
0.191
0.22
0.166
0.161
0.17
0.124
0.11
0.086
0.174
0.211
0.232
0.111
0.241
0.2
0
500
1,000 Kilometers
Source : © Eurogeographic for the administrative boundaries; © EUROSTAT


Prices per kWh (€)
no data
< 0,121
0,121- 0,160
0,161 - 0,200
> 0,200
ELECTRICITY PRICES
(INCLUSIVE OF TAXES)
Industrial Consumers
Band Ib : 20 MWh < Consumption < 500 MWh
Prices : 2nd semester 2011
Directorate-General for Energy
EU Average : 0.154 € *
*Preliminary assessment excluding Austria
0.108
0.115
0.117
0.093
0.146
0.138
0.243
0.171
0.144
0.171
0.174
0.12
0.191
0.14
0.17
0.181
0.144
n.a.
0.135
0.125
0.104
0.126
0.093
0.221
0.146
0.172
0.151
0.258
0.181
Source : © Eurogeographic for the administrative boundaries; © EUROSTAT
0
500
1,000 Kilometers

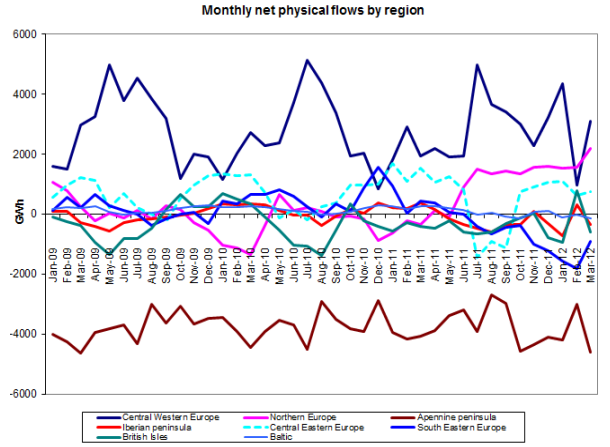
B. Building the internal market for electricity: cross border flows and trade

- In Q1 2012 the monthly amount of cross-border physical flows in the EU-27 reached the highest value (26.2 TWh) since the beginning of the available time series (January 2007). In the first quarter of 2012 the total volume of the quarterly physical power flows grew by 13.4% compared to the same quarter of 2011. The growth in cross-border flows significantly outperformed the growth in traded volume of power (4.9%) and the slight decrease in the gross inland electricity consumption (-0.2%). Increasing cross-border trade signals better integrated wholesale electricity markets in Europe which may contribute to a better realisation of the European internal electricity market.
- High prices in February 2012 resulted in some interesting evolution of the net power flows in that month. The CWE regions net position fell back significantly as France imported a huge amount of power to satisfy its domestic heating needs. The British Isles, a region which is normally a net importer reached its strongest net exporter position since the beginning of the available time series. South Eastern Europe experienced its strongest monthly net importer position in January and February 2012 as a consequence of high domestic prices. As Italy exported power to France, which is a quite unusual event, the Apennine peninsula's net import position temporarily improved.
- In March 2012, as the situation in the European power markets normalised, monthly net flow positions more or less returned to their situation prior to the February cold snap. Cheap power prices in the Nordic markets assured Northern Europe's strongest monthly net power exporter position registered ever in the last month of Q1 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.



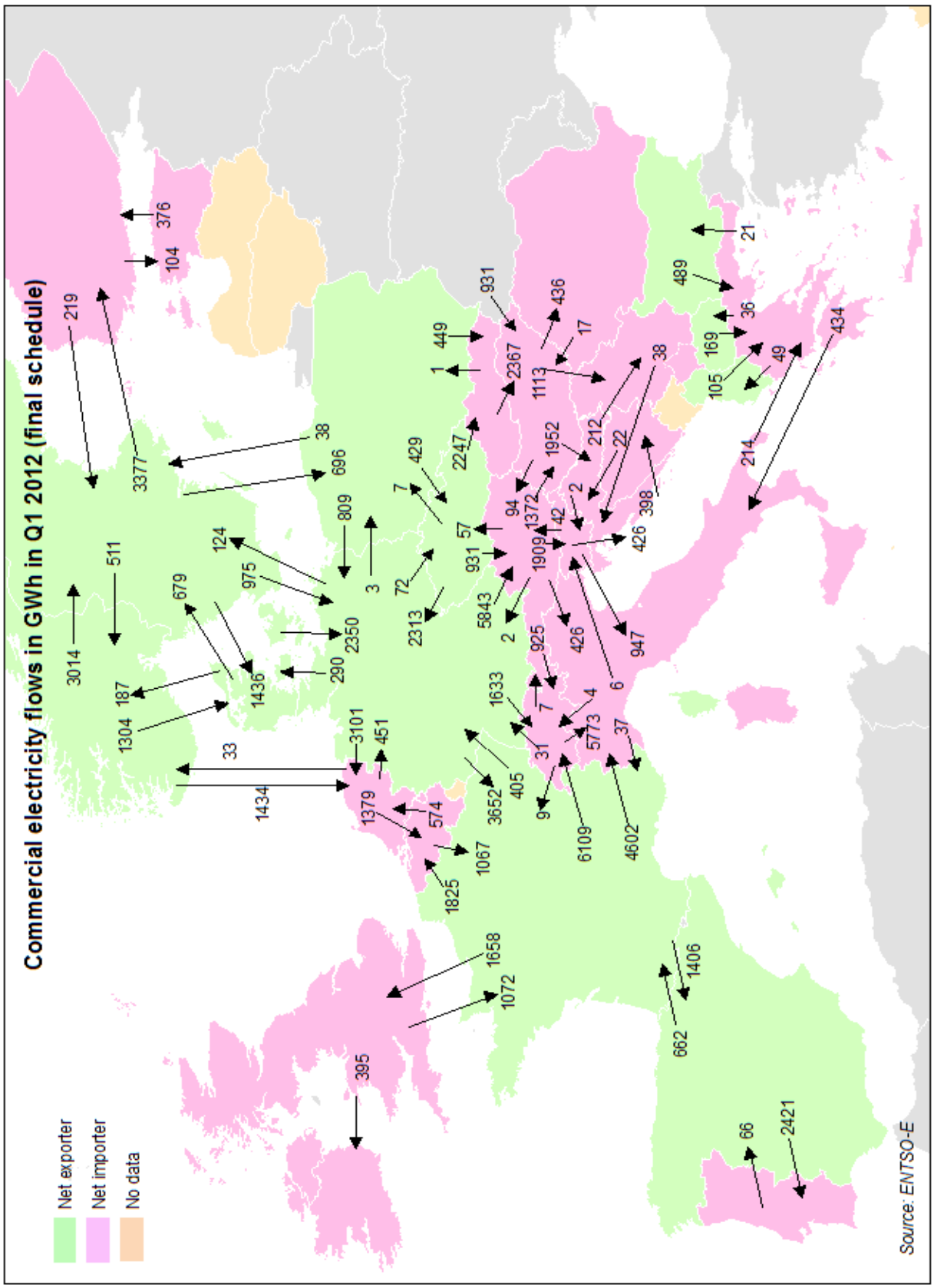
Source: ETSO.

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*

Note to the map on the next page:

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.


Commercial electricity flows in GWh in Q1 2012 (final schedule)
Net exporter
Net importer
No data
Source: ENTSO-E
376
104
219
3377
38
696
809
3
511
3014
124
975
679
1436
187
1304
33
1434
3101
451
2350
290
72
2313
7
429
2247
931
57
1
5843
2
931
449
1
2367
1113
436
17
931
1952
212
22
38
1372
94
2
42
1909
426
398
925
426
947
6
1633
7
4
5773
37
31
9
6109
4602
3652
405
1379
574
1067
1825
1658
1072
395
662
1406
66
2421
489
21
36
169
105
49
434
214

C. *Focus on ... network charges in electricity prices for household consumers*

The Market Observatory for Energy has analysed price developments on the retail markets for electricity and natural gas (domestic and industrial consumers) in all Member States of the EU, Norway, Croatia and Turkey. The analysis covers the years from **1998** to **2011**, a period of market opening, and is using data from the energy statistics of Eurostat. Based on preliminary findings[4], the following can be observed with respect to electricity retail prices:

- **Average retail prices of electricity**, net of taxes and measured in constant 2005 EUR, for median domestic and industrial consumers for the group of EU 15 (old Member States), **have remained stable throughout the observed period**, the difference between the highest and lowest level being less than 15%. These developments are to be compared against a significant appreciation of the prices of energy commodities.
- In contrast with retail, the wholesale electricity prices moved much in line with the prices of crude oil and natural gas. This development suggests that **margins were gradually reduced along the supply chain**, especially for vertically integrated companies. Even in a fully unbundled situation this development may have negative impacts on investment decisions in the upstream (generation) or passing-over effects to the downstream (sales companies).
- The **variation of retail electricity prices**, net of taxes was actually **comparable to the variation of the general price level** in the EU for the observed period (as measured by the harmonised index of consumer prices). One could therefore argue that in 2010 domestic and industrial consumers have paid as much for the electrical energy and associated delivery costs (network and distribution) as they did in 1998.
- Whereas retail markets have been open to competition, **the majority of Member States continue to regulate prices** for selected domestic and industrial users.
- **National taxation policies exert a lasting impact on end consumer prices.** The relative share of the taxes for the group of EU 15 varies from 5% (UK) to more than 50 % (Denmark). It seems that the share of taxes is gradually increasing.

[4] The report is available at http://ec.europa.eu/energy/observatory/electricity/doc/analysis_retail.pdf .
The price analysis approach provides only a partial picture of the developments in the retail markets for electricity and gas. In addition key data that could provide a wider perspective (household expenditure, switching rates, etc.) is still unavailable.

With these developments in mind, this section looks into the breakdown of retail prices of electricity for household consumers.

Prior to 2007 three sets of prices were reported by the Eurostat energy database: pre-tax price (including energy, transmission and distribution), price including taxation (except for VAT), and price including all taxes. Starting from 2007 Eurostat collects additional data, which splits energy and transport. Data breakdown is now between energy supply costs, network costs and overall taxation (including VAT and other taxes and duties applicable).

Network charges cover costs related to the secure operation, maintenance and upgrading of transmission and distribution grids.

The next figures present the breakdown of electricity prices in energy and supply costs and network costs for household consumers (consumption band Dc), all taxes and levies included in the second half of 2011[5].

Figure 1 shows that the share of network costs in retail electricity price paid by households (consumption band DC) ranges between 13% in Malta and more than 50% in the Czech republic. The lowest share of network costs in relative terms is observed in island countries, namely Malta, Cyprus, the UK, Italy, and Greece. In contrast the highest share of network costs in household retail prices is observed in the Czech Republic, Romania, Norway, Luxembourg and Slovakia.

Figure 2 presents the same data in absolute terms, showing the breakdown of retails prices into energy supply, network and taxation in Eurocent/kWh. It shows that the Member States that have a relatively low share of network costs – including Malta, Cyprus, the UK and Italy - indeed have very high energy supply costs in absolute terms. High energy costs of island systems are linked to, among others, the need to operate parallel and in some cases expensive backup power units to ensure reliable operation of their systems that have limited interconnections with other energy systems. These problems are compounded further in the case of stand-alone grids for isolated areas or small islands where interconnections to the main grid may not be feasible.

[5] The Market Observatory for Energy has also undertaken a similar analysis of the breakdown of energy prices paid by industrial consumers (consumption band IC).

Figure 1. Breakdown of electricity prices for household consumers, all taxes included, 2011s2 (in %)

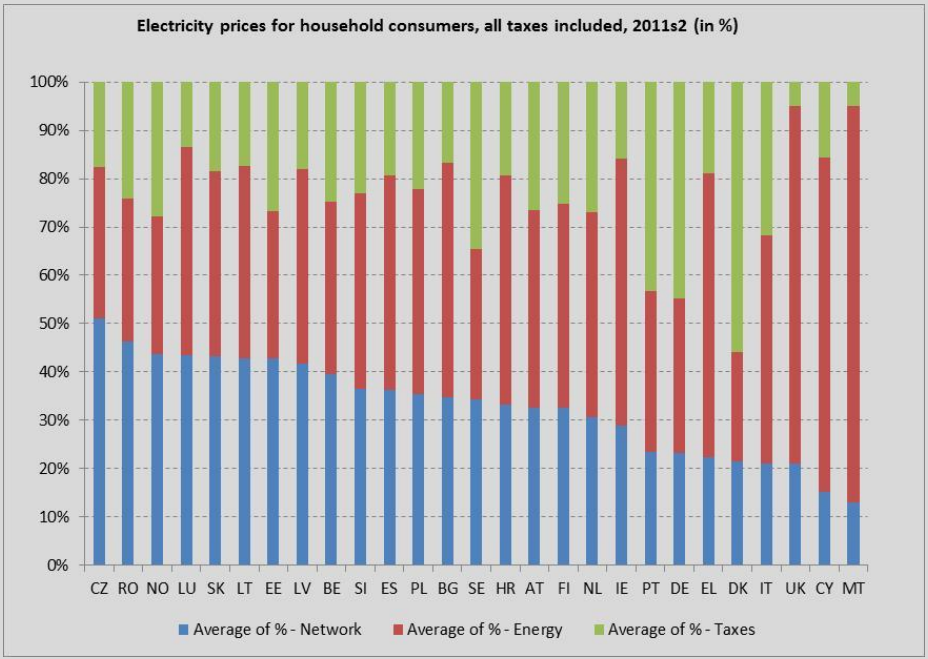
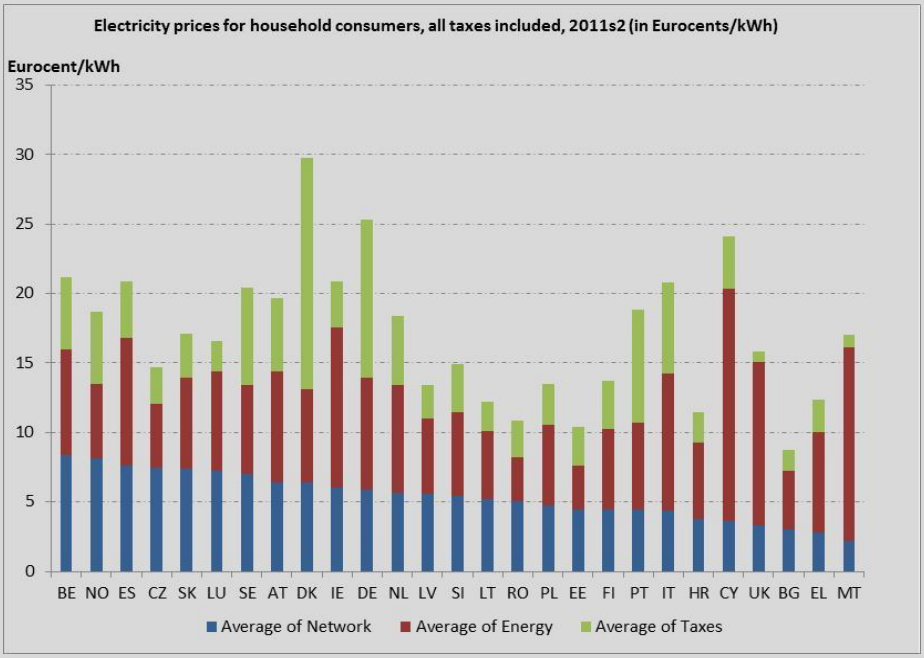


Figure 2. Breakdown of electricity prices for household consumers, all taxes included, 2011s2 (in Eurocents/kWh)



While Annex II of Directive 2008/92/EC concerning the transparency of gas and electricity prices charged to industrial end-users specifies the methodology for collecting and compiling electricity prices, reporting on network tariffs does not seem to be fully harmonised. The Directive defines 'network' price as the ratio between the revenue related to transmission and distribution tariffs and (if possible) the corresponding volume of kWh per consumption band. It further stipulates that 'network' price will include the following costs: transmission and distribution tariffs, transmission and distribution losses, network costs, after-sale services, system service costs and meter rental.

However, the exact composition of network tariffs is not identical across Member States. Some Member States may include in the network tariff components that other Member States may consider as taxes and duties. For example, Denmark and Germany have rather high taxation in both relative and absolute terms, but moderate network costs. In contrast, countries with very high network costs, such as Belgium, Norway, Spain, the Czech Republic and Slovakia have fairly low taxes on electricity retail prices.

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.

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