EXPLORER markttrends

SPECIAL 12.2010 | GENERATION

The wholesale electricity market from the perspective of both producers and sellers

A FIVE-YEAR SETBACK: TOUGH TIMES AHEAD FOR ELECTRICITY PRODUCERS

Electricity prices have fallen back to the 2005 level due to very intense competition which has been caused by growing overcapacity in electricity production, a very flat merit order for all natural gas combined cycle and coal-fired power plants along with changed market behaviour among players. The market outlook for 2011 and 2012 is sidewards. Electricity prices are not expected to recover until power plant capacities have been shut down on a large scale, raw material prices have risen sustainably and buyers in fear of rising prices on the futures markets will be »long« again. The producer margin is not expected to recover either until a sustainable increase in prices sets in. From a producer perspective, there is a residual risk that margins will still fail to recover and policy intervention will be necessary in order to enable margins that foster sustainable investment incentives. There are three key factors that drive electricity prices: fuel prices, prices for carbon certificates (EUA) and competition intensity.

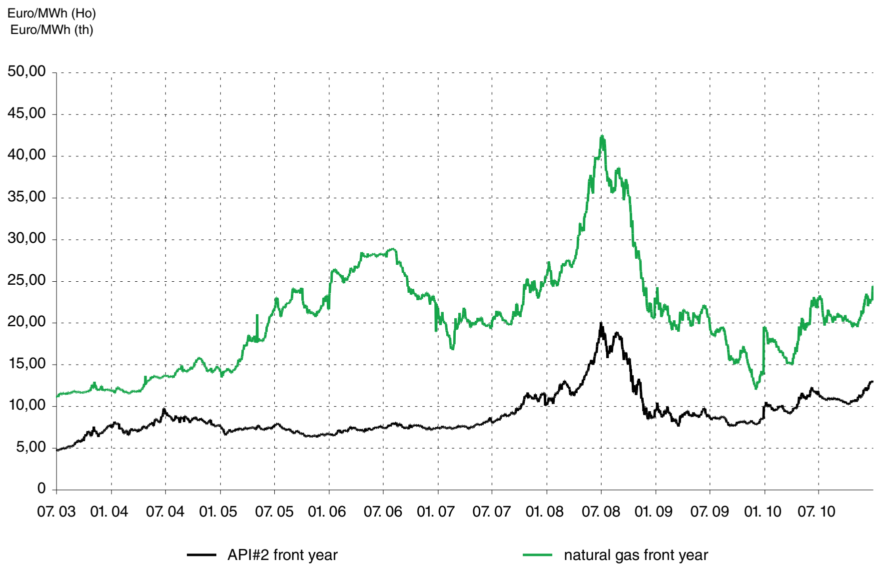

Figure 1: Development of fuel prices; source: Reuters, natural gas price: from 2 July 2007: EEX, EGT or NCG market territory, prior to that TTF, as per: 30 November 2010.

Fuel prices

Since 2008 coal prices have risen relative to prices for natural gas. Since mid-2008, there has been a relatively parallel price curve pattern for both fuels compared to the time before. Prices doubled, reaching their peak in mid-2008 after which time gas prices fell more strongly than coal prices. In the second half of 2010, the price for natural gas is on the same level as in the second half of 2007, however, the coal price is at a higher level. Figure 1 shows this clearly.

The gas market is marked by persistent overcapacity. At the same time, the market regime is shifting from long-term, bilateral, oil-indexed contracts to procurement portfolios that are based on standard products on the wholesale markets. LNG is networking regional markets. Once an importer of natural gas, the US has become a largely independent producer. Declining import demand is upping the pressure on LNG and competition between pipeline gas and LNG in Europe is also becoming stronger.

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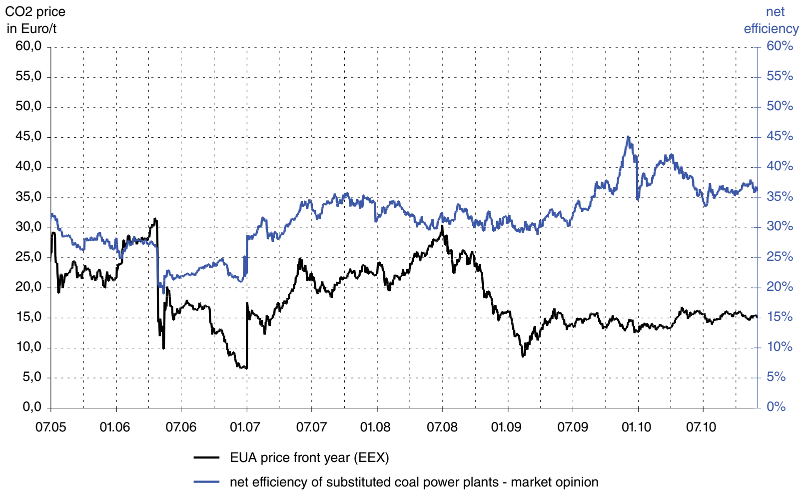

Figure 2: Development of the EUA price and efficiency of the coal-fired power plants substituted in line with market opinion (due to coal, natural gas and EUA prices); source: EEX, Reuters, LBD analyses; as per: 30 November 2010.

$$CO_2\left[\frac{euro}{t}\right] = \frac{(AP_{gas} - AP_{hc})\left[\frac{euro}{MWh}\right]}{\left(\frac{\text{emission factor}_{hc}\left[\frac{t}{MWh}\right]}{WG_{hc}}\right) - \left(\frac{\text{emission factor}_{gas}\left[\frac{t}{MWh}\right]}{WG_{gas}}\right)}$$

AP_{gas} – marginal costs, excluding carbon costs, of the ousting combined cycle power plant

AP_{hc} – marginal costs, excluding carbon costs, of the coal-fired power plant last ousted

emission factor – tons of carbon emissions of each fuel heat volume used, natural gas or hard coal, respectively

WG_{gas} – efficiency of the ousting combined cycle power plant

WG_{hc} – efficiency of the coal-fired power plant last ousted

Formula 1: Equation to determine the fundamental value of EUAs according to the fuel-switch method.

As the global economy picks up, coal prices will increase. A weak US dollar will soften the price increase in euro per tonne. The intensity of competition on the European gas market will remain high, at least until new growth markets in Asia boost demand for LNG and as long as importers are unable to cut down on their long positions under long-term procurement contracts through price reviews without adverse effects on the market.

In the near future, there is no expectation that the competitive strength of coal will improve compared to natural gas.

Prices for carbon certificates (EUA)

EUAs are priced on the market according to the fuel-switch concept. This concept is based on the assumption that the European carbon reduction targets can only be reached when electricity from natural gas ousts electricity from coal. For this to happen, the marginal costs (clean) of natural gas power plants must be lower than those of coal-fired power plants.

The fuel-switch concept enables the fundamental value of EUAs to be determined. If the gas price rises in relation to the coal price, the price for EUAs also rises. If the gas price falls in relation to the coal price, the EUA price also falls.

What's decisive for competition between fuels is the efficiency of coal-fired power plants most recently ousted in the merit order. The reliability of this concept can be verified on the basis of the calculated efficiency of the coal-fired power plant ousted. Figure 2 shows that from mid-2007 to mid-2009 efficiency ranged between 30 % and 35 % and then rose to and remained above 35 % (refer to the blue time series). EUA prices will only rise when the price of natural gas increases in relation to coal. A contrary trend is mostly likely to be seen in the near future.

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The fuel-switch concept leads to a very flat merit order for all natural gas combined cycle and coal-fired power plants. Figure 3 shows an increase in marginal costs of just 10 euro per MWh in the demand range from 36,000 MW to 70,000 MW (vertical grid load in the transmission grid). Natural gas combined cycle power plants are used before coal-fired power plants. Gas-fired steam power plants usually range behind coal-fired power plants. This very flat structure leads to very low producer margins. With an actual power peak of less than 60,000 MW in the transmission grid, neither natural gas combined cycle power plants nor coal-fired power plants competing on a marginal cost basis can cover their operating costs not to mention generate contribution margins for capital costs.

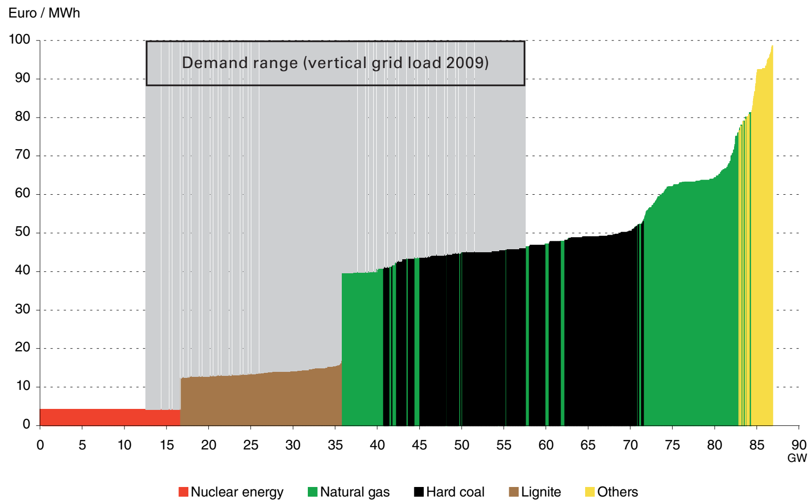

Figure 3: Merit order of available power plants feeding into the transmission grid to cover vertical grid load in Germany; source: Platts 2009, 50Hertz, Tennet, Amprion, EnBW, LBD analyses; Stand 30.11.2010).

Producer margins as the best indicator for competition intensity

Producer margins have fallen drastically. The contribution margins to be generated do not fully cover the fixed operating costs of older power plants (price basis: spot market 2010, futures market 2011).

Figure 4 shows the development of producer margins since 2005 which were generated in order to cover fixed operating and capital costs. Power plant use (8,760 h) is analysed on the basis of daily trading settlement prices for electricity, gas, coal and EUAs for the front year. The result is the sum of expected contribution margins.

The contribution margin level in November 2010 (for the front year) is comparable with the level in mid-2005. Today, combined cycle power plants generate a contribution margin level comparable with that of coal-fired power plants with an efficiency of 39 %. This is also a consequence of the fuel-switch price concept on EUA markets. The

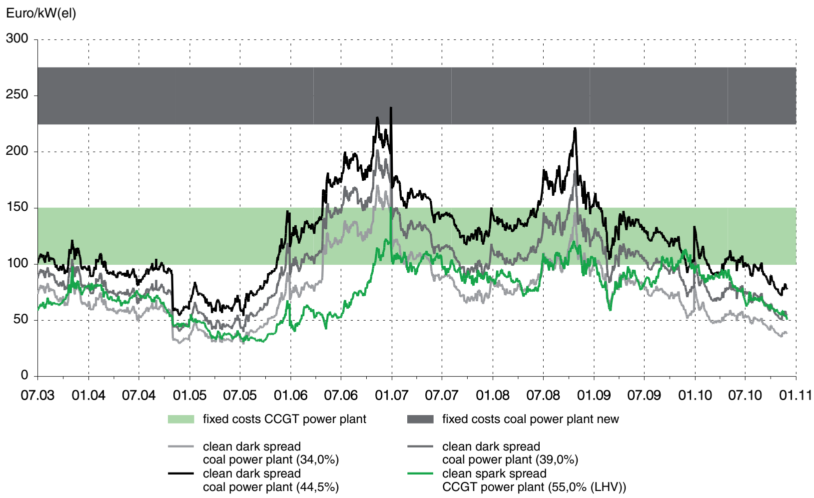

Figure 4: Development of specific contribution margins of various power plants with domestic sites in the NCG market territory. The grey and light green bars in the background show the bandwidth of fixed costs for coal-fired or combined cycle power plants; source: EEX, Reuters, LBD analyses; as per: 30 November 2010.

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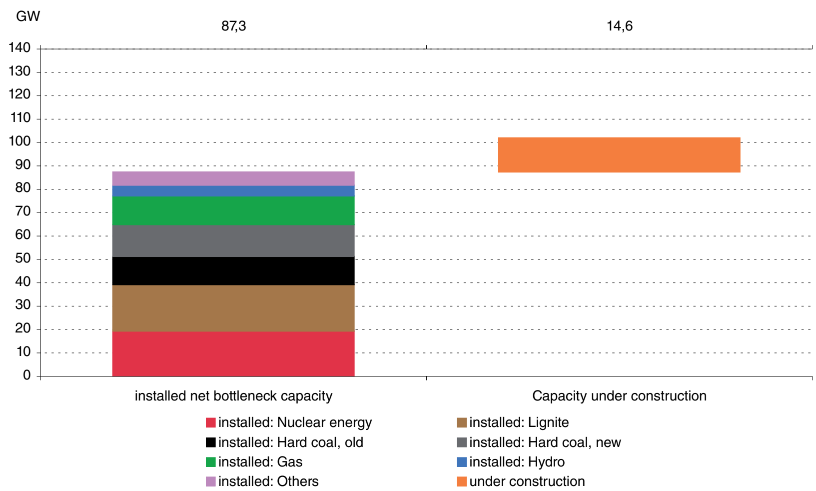
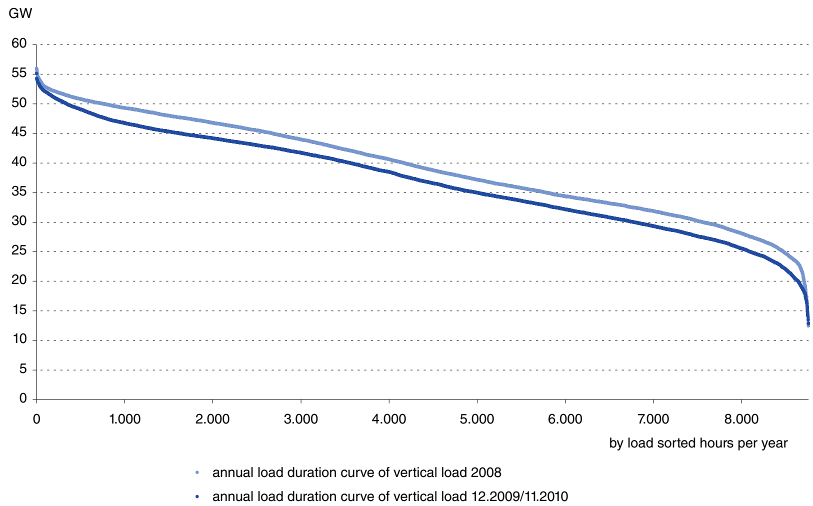


Figure 5: Power plants of German TSOs and plants under construction. The plants and the load in the transmission grid are used as a basis for comparison because they are competing on the wholesale market in order to cover the load of must-run power plants for EEG and cogeneration on the lower grid levels. Sources: Platts 2009; LBD analyses, as per: 30 November 2010.



Year	Vertical grid load	Work	Full use time
2008	12–56 GW	343.7 TWh	6,139 h
2010	13–55 GW	323.3 TWh	5,870 h
Difference	**ø 2.32 GW**	**20.4 TWh**	**269 h**

Figure 6: Comparison of vertical grid load in 2008 and 2010 (past 12 months); sources: 50Hertz, Tennet, Amprion, EnBW; as per: 30 November 2010.

latest-generation coal-fired power plants (efficiency of approx. 45 %) generate a contribution margin of around 80 euro per kW p.a. New construction projects are entering a hard-fought market, there is no sign of the required contribution margins for full costs of between 220 and 250 euro per kW p.a., an economic fiasco in the years to come seems certain.

Over-capacity feed-in into the transmission grid calls for 22,000 MW to be shut down

This is due to significant overcapacity combined with a steep increase in feed-in from regenerative power plants. Figure 5 shows installed power capacity (around 87,300 MW) and power plant capacity under construction (around 14,600 MW). The analysis is limited to feed-in on transmission grid level. This power capacity is opposed to demand (vertical grid load) of 55,000 to 60,000 MW.

This ultimately means that over the next two years, installed power capacity of 80,000 (- x) MW will have to be reduced, i.e. around 22,000 MW will have to be shut down. Such a volume of shut-downs will mean an additional loss of power on the market for the big producers.

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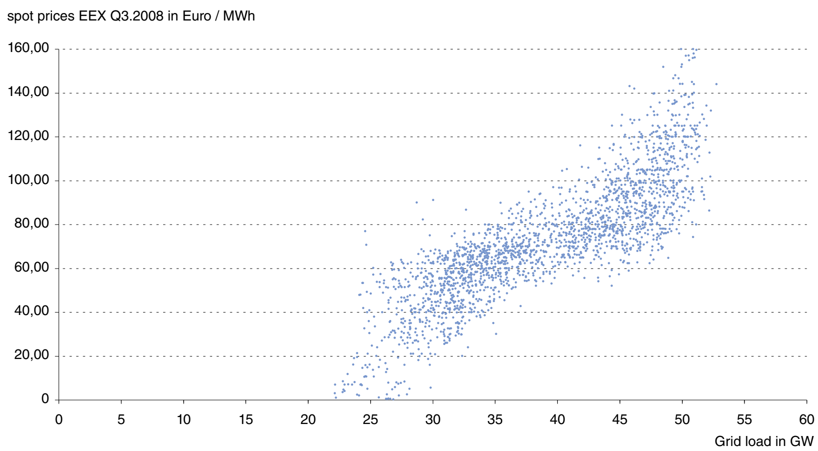
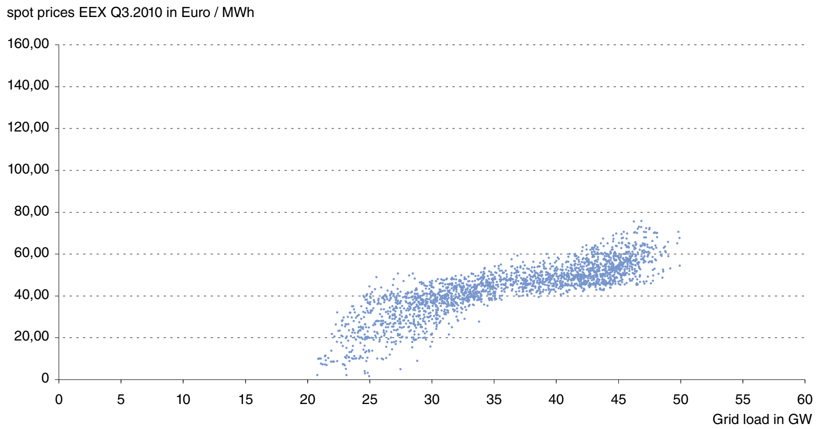
Reduced price spread for hours with identical demand power on the spot markets

The height of vertical grid load is determined, on the one hand, by electricity demand, but also to a growing extent by the supply of regenerative power. Figure 6 shows a comparison of the annual load duration curve of vertical grid load for the years 2008 and 2010.

What becomes clear is the relationship between hourly vertical grid load and hourly spot market price. Figures 7a and 7b show a comparison of the values for the third quarter of the years 2008 and 2010. While a huge price spread in spot market prices was reached in Q3 2008, with demand remaining flat (vertical grid load), the price spread in Q3 2010, however, was only slight. The volatility of spot prices has declined significantly. The diagrams indicate that 2008 was marked by speculation and 2010 by intense competition.





Figures 7a and 7b: Dot clouds of value pairs from vertical grid load and the spot market price at the same time. For reasons of scale, prices above 160 euro per MWh in 2008 are not shown; sources: EEX, 50Hertz, Tennet, Amprion, EnBW; as per: 30 November 2010.

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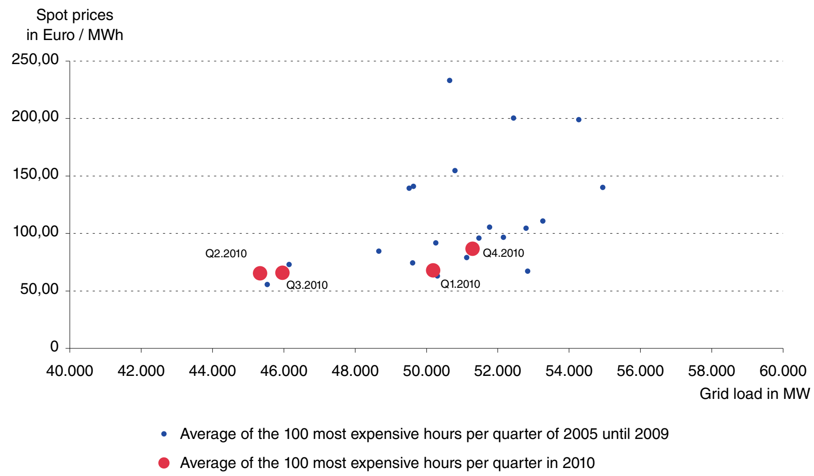

Figure 8: Value pairs from mean values of the 100 most expensive spot market prices per quarter vs. the mean value of the grid load at that time; source: EEX, 50Hertz, Tennet, Amprion, EnBW; as per: 30 November 2010.

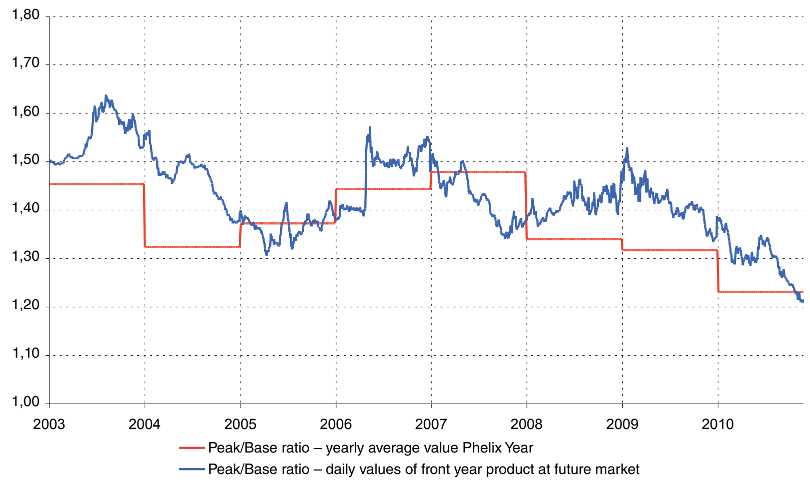

Figure 9: Peak-to-base ratio of the Phelix year and daily values of the front year products on the futures market; sources: EEX, as per: 30 November 2010.

Figure 8 shows this for the 100 most expensive hours of each quarter prices for the third quarter in 2010 were much lower than the previous years' prices. The analysis also indicates that vertical grid load has fallen strongly in the most expensive hours. Figure 9 shows the peak-to-base ratio with regard to the spot market and the front year. The value of 1.48 recorded for 2003 compares to the value of 1.23 recorded in 2010.

The »collapse« in super peak prices is due to the high level of feed-in from wind and solar electricity during peak times. More and more fossil fuel power plants are competing for lower demand.

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VERTICAL GRID LOAD

Vertical grid load is the sum (expressed by a mathematical sign) of all power transferred through directly connected transformers and power lines to distribution grids and end consumers. After consideration of all feed-ins by must-run plants (EEG, cogeneration) on downstream grid levels, it represents the remaining demand in the transmission grid. Price formation at the major trading markets primarily takes place through competition between power plants on this grid level.

EEG[1)] direct marketing on an hourly basis dominates the market

One of the main drivers is EEG direct marketing of transmission system operators (TSOs) on the European Energy Exchange (EEX). At the beginning of 2010, there was a sudden increase in supply liquidity (refer to Figure 10). During certain market hours, EEG electricity at times dominates the spot market. Due to the feed-in volume, it influences the price. The open price bid distorts the formation of market prices. The direct marketing mechanism will have to be developed further in the 2012 revision of the Renewable Energy Sources Act.

Pain felt by producers will be bearable in 2010. But the future looks tough. Large volumes have been sold forward. The spot markets have been used to optimise use with the aim being to optimise the last euro in marginal costs. This has increased competition intensity because nobody took a price-supporting stand. After all, the money had already been earned on the futures

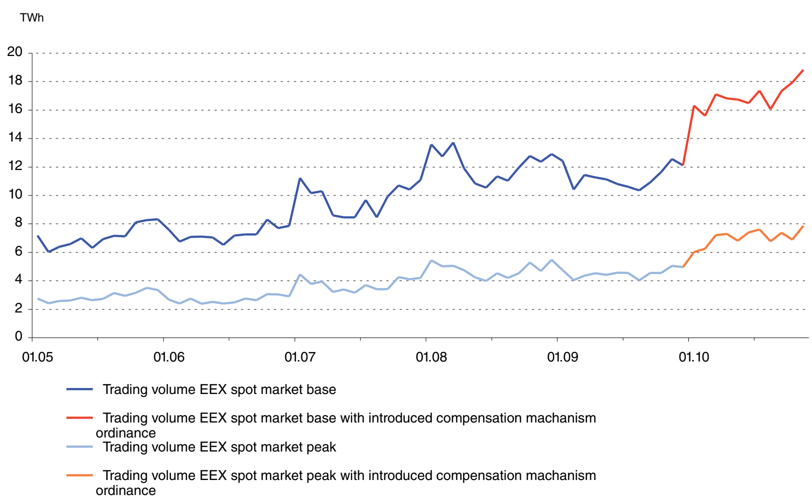

Figure 10: Development of liquidity on the EEX and EPEX spot market, respectively, according to base and peak hours; sources: EEX; as per: 30 November 2010.

1 EEG – Renewable Energy Act.

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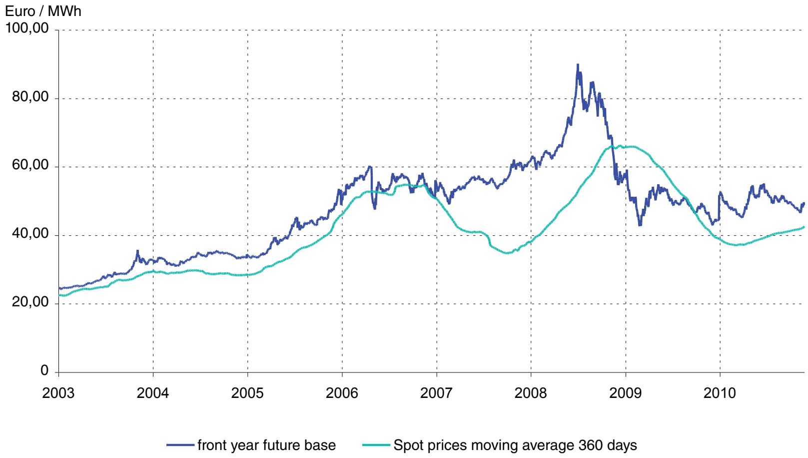

Figure 11: Development of liquidity on the EEX and EPEX spot market, respectively, according to base and peak hours; sources: EEX; as per: 30 November 2010.

market. The spot markets have dragged down the futures markets. Compared to the 360-day mean value of the spot market, the premium of the futures market for the front year totals around 7–10 euro per MWh or 15–20 %, respectively (refer to Figure 11). From a producer perspective, the front year price is too low. Selling forward results in the loss. From a seller point of view, the front year price is too high because a premium of 15–20 % compared to the spot appears to be far too high considering the risks that go hand in hand with spot market volatility. Producers can only be advised to still cover their backs on the futures market because it is very unlikely that the spot market will recover in 2011. The strategy pursued should be designed to »limit losses«.

EEG remuneration – outlook

While EEG feed-in volumes are putting pressure on the market and keeping prices low there, the EEG levy as an end customer price component will continue to rise steeply. Figure 12 shows the historical development of EEG feed-in and levies along with the bandwidth of future developments in the current medium-term forecast by TSOs. Feed-in of EEG electricity will increase from approx. 90 TWh in 2010 to approx 150 TWh (lowest scenario) and 195 TWh (highest scenario). This corresponds to approx. 37 % of German demand for electricity. The EEG levy will rise from approx. 35 euro per MWh in 2011 to 43–65 euro per MWh depending on the scenario. Figure 13 shows that even with a moderate increase in electricity market prices along the lines of current expectations for the futures market and an increase in the EEG levy along the lines of the lower scenario of the medium-term forecast, these components of end customer prices will rise on a lasting basis above the previous highest level recorded in 2008.

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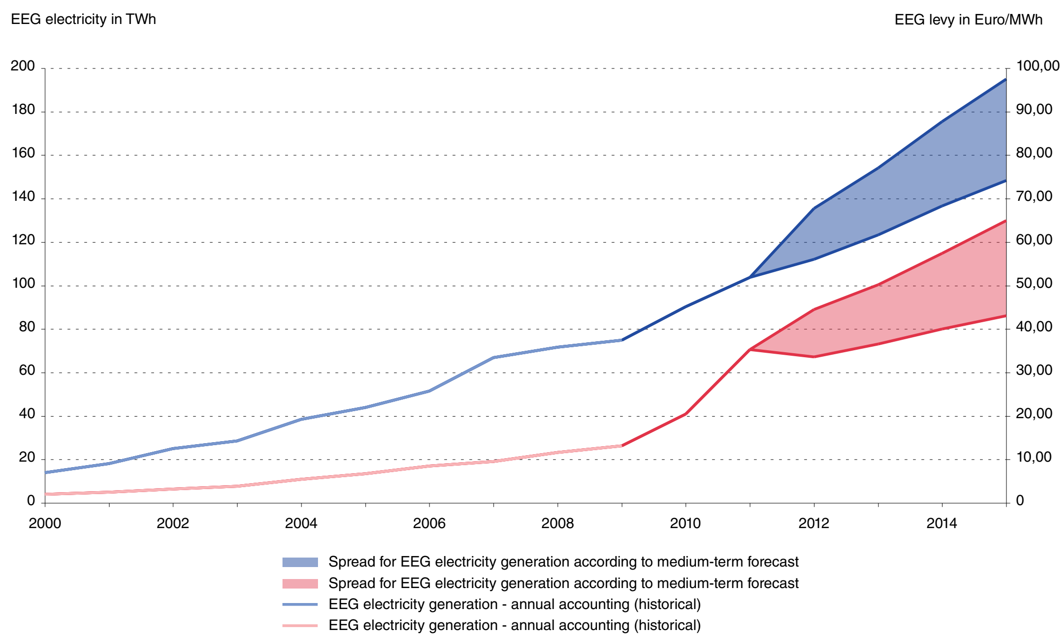

Figure 12: Development of EEG feeding and levy on the basis of historical data (until 2009 EEG annual accounting by the TSOs) and preliminary values of the EEG levy forecasts (for 2010 and 2011) and the medium-term forecast (2012 to 2014) of the TSOs. Sources: www.eeg-kwk-net, LBD analyses.

Figure 13: Sum of 12-month mean values of the front year futures (until 2010) or 20-day mean values of the futures market products (beginning 2011) and the EEG levy. Future development of the levy according to the lower scenario of the medium-term forecast; source: EEX, www.eeg-kwk.net; as per: 30 November 2010.

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Procurement strategy 2012 based on the experience from rolling procurement in 2011

In persistently growing markets, easy money can be earned with long-term rolling procurement. When the turning point is reached, the market experiences a lasting slump. If no stop-loss limits are set, the long lead time in procurement triggers considerable losses.

Figure 14 shows that loss risks are lowest with market-near procurement and in the near future, 3-month procurement (3-3-12) bears the lowest risk. Open items can be held for the spot market. They do, however, require mark-to-market limiting against in-year futures market products.

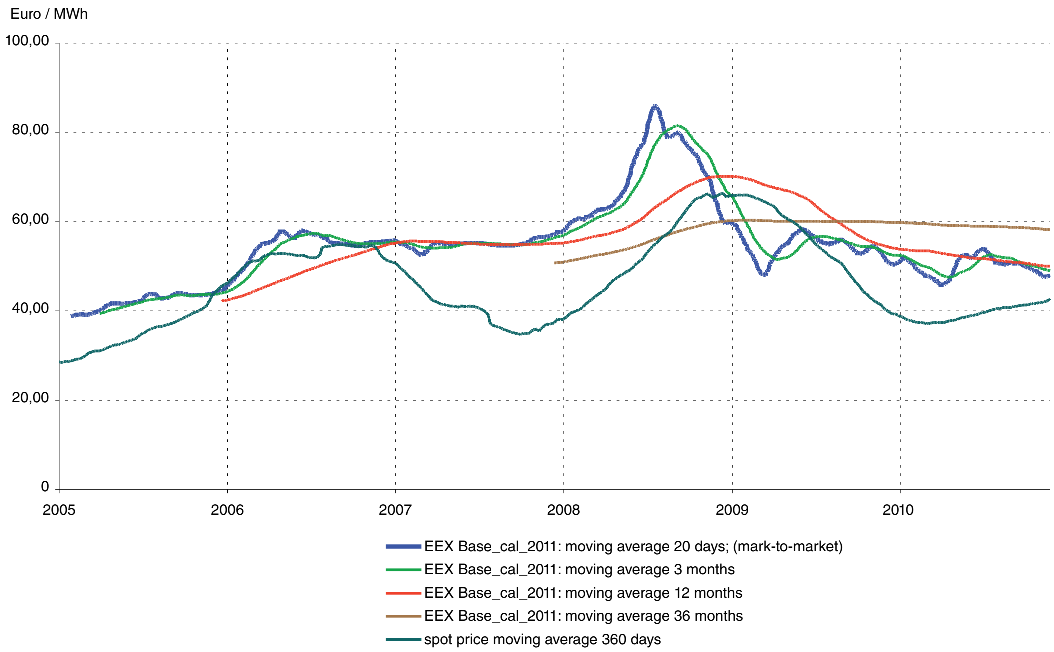

Figure 14: Moving average values compared to different procurement periods; source: EEX; as per: 30 November 2010.

GENERATION

POLITICAL INTERVENTION TO SECURE INVESTMENT INCENTIVES FOR LOW-CARBON AND AT THE SAME TIME AVAILABLE POWER PLANT CAPACITIES

It is unlikely to be in the interest of market players if, due to the structural conditions of the market, operators of available power plant capacities are unable to cover their operating costs not to mention generate contribution margins for capital costs. Investments in Europe's power plants, which are geared towards reducing carbon emissions, also require suitable investment incentives.

This is where political intervention is called for. During the further revision of the Renewable Energy Act (EEG) beginning in 2012, it should be discussed whether, by virtue of legislation, the EEG in its current form creates market dominance (at least for a large number of hours in the year) which results in distorted price formation on the wholesale market and also to rising EEG levies.

Transmission system operators (TSOs) in their role as »portfolio managers of renewable energy« are required to act in a market-independent manner in line with their legal function (no bid at the day-ahead auction on the EEX). A system that allows operators of EEG plants to market directly (rather than via the TSOs) would perhaps lead to less distorted prices on wholesale markets and the chance to make way for lower EEG levies. Moreover, a market model must be created for the wholesale market that allows the profitable operation of low-carbon and at the same time available power plant capacities to supplement electricity generation from renewable energy sources.

LBD-Beratungsgesellschaft mbH

Stralauer Platz 34
EnergieForum
(D) 10243 Berlin

CONTACT

Phone: +49 (0)30. 617 85 310
Fax: +49 (0)30. 617 85 330
www.lbd.de
ben.schlemmermeier@lbd.de

Contact:
Ben Schlemmermeier

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OTHER PRODUCTS

Procurement risk analysis

LBD has developed a model to analyse risks in procurement. Using a development method, we can generate the following statements regarding your procurement:

- Where do your procurement costs in the portfolio stand in comparison with the market and other procurement strategies?
- Is your procurement strategy geared towards your corporate goals, the customer segments and your company›s products?
- Which requirements exist for venture capital, liquidity and security as a result of your procurement strategies up to now?
- How can the portfolio be improved?

These and other questions will be answered as soon as you complete and send to us a standardised questionnaire with details regarding customer segments and quantitative information, portfolio structures as well as quantities and procurement costs per portfolio.

Contact: Ralph Klebsch

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