Don't blame the weather! Why power prices are so low

In the public debate, the rapid growth in wind and PV capacity is often blamed for low spot market prices. Fact is, while renewable developments contributed somewhat to the price decline, the main reason for low power prices on the Continent and in the Nordics are reduced fuel and carbon prices. Both economic theory, historical market data, and model simulations identify low short-run marginal costs for coal and gas as the main contributor to low power prices today. And also in the future, fuel and carbon prices will be crucial price anchors. This is not to say that renewables do not have an impact. For thermal plants in particular, the influx of renewables significantly lowers the income stream.

The public debate

In the public debate, renewable capacity extension is often blamed for low spot market prices for power. Several such claims have been made in newspapers and by politicians, and only last week Svensk Energy, the association of Swedish power producers, published a study claiming renewable developments are responsible for most of the price decline in recent years.

While it is true that renewable developments contribute to lower prices, the main reason for low power prices as of today is low coal, gas, and carbon prices, resulting in low short-run marginal costs for thermal generation. And also in the years to come, fuel and carbon prices will play a crucial role for price developments, despite some people claiming that in the near future energy will be for free (see also our last Insight 2016-03).

The fact that fuel and carbon prices continue to be *the* major price driver is supported by economic theory, historical market data, and model simulations.

Understanding the Nordic market

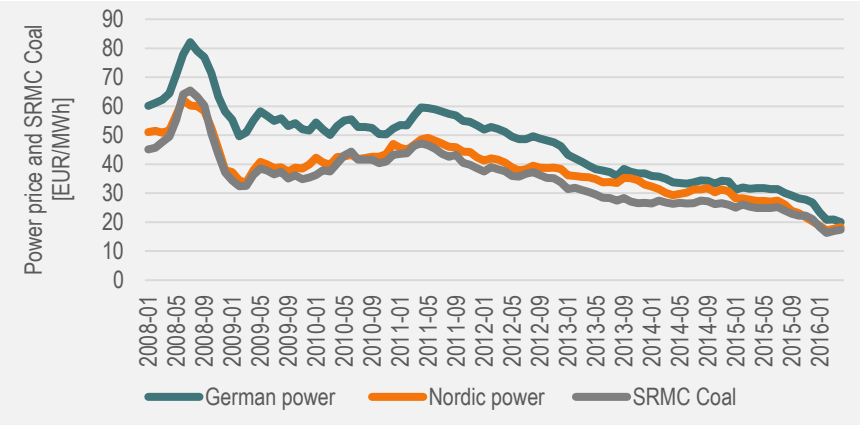
The Nordic market is characterized by a large share of hydro power (in particular in Norway), nuclear (Sweden and Finland), Combined Heat and Power (CHP in Sweden, Finland, and Denmark), and renewables. With a high degree of flexibility, this implies that the Nordic market is rather energy constraint than capacity constraint (except from a few periods in cold winter months).

Price levels are determined by so-called water values. There are different theories as how to explain or calculate water values, but they all have one thing in common: They link the water value to the alternative value of generation or the value of export/import. In both cases, thus, they anchor in the short-run marginal costs of either domestic thermal generation or generation abroad.

In short, water values are given by short-run marginal costs of thermal generation, corrected by the balance in the Nordic market. Thus, the more inflow or renewable generation there is, the lower is the Nordic power price *relative* to the cost of thermal generation or prices abroad. The less inflow or less nuclear generation there is, the higher is the Nordic power price *relative* to thermal costs or price abroad.

While this balance effect is not negligible, it is always relative to the price of thermal generation or prices abroad. Thus, if costs for thermal generation or abroad decline or increase, the Nordic market follows suit. This is also the reason why traders and utilities follow fuel and carbon markets very closely. Also, when fuel prices (incl. exchange rates) and carbon prices move, one observes a direct move in the power contracts.

Figure 1: Power prices and SRMC Coal developments since 2008



Historical developments

This is also in line with historical price developments. Since liberalization of the power markets in the Nordics, the power price level has been determined by the short-run marginal costs of coal fired generation, corrected for inflow, nuclear availability, and other balance relevant parameters like demand and renewable developments.

This is also reflected in Figure 1, showing expected power price in Germany and the Nordics based on 2-year ahead contracts, together with short-run marginal costs for coal based on forward contracts at the time. The reason we use 2-year forward prices is to eliminate the hydrological impact on day-ahead prices, or the effect of other short-term deviations (e.g. plant availability, extreme demand, etc.). The figure shows a clear parallel movement of power prices in both Germany and the Nordics and the developments for short-run marginal costs for coal.

So who's to blame?

The figure above only gives a visual indication for the developments, but does not allow a clear conclusion. One can argue that while coal and carbon prices have fallen, renewables have increased at the same time. Thus it would be difficult to precisely identify the culprit.

But, first, there are statistical methods to estimate the impact on renewable generation and balance on the Nordic market, as well as the influence of generation costs. Running regressions on historical market data clearly identified the short-run marginal costs as the main driving force of power prices in the Nordic market.

Second, one has simulation models that can simulate power prices under hypothetical set of assumptions. We have done so using our power market model TheMA, which is a well-established and advanced power market simulation tool for European power markets, used by THEMA and many of its clients. As a reference point, we used the year 2008, where power prices on the Continent peaked.

We have run simulations for the year 2017, with the following assumptions:

- With fuel and carbon prices, and other developments as expected or as in forward markets
- With renewable installed capacities as in 2008 in both Germany and the Nordics
- As above, but with EU-ETS prices as in 2008
- As above, but with fuel prices as in 2008 in addition.

Figure 2 summarizes the price effect of the different components. The modelled price for the base case is around € 21 per MWh. Without any additional renewables in the Nordics *and* Germany since 2008, the price would increase by around € 6.5 per MWh. Note that if we only considered the effect of the Nordic renewable built-out, the effect would only be around € 3.8 per MWh.

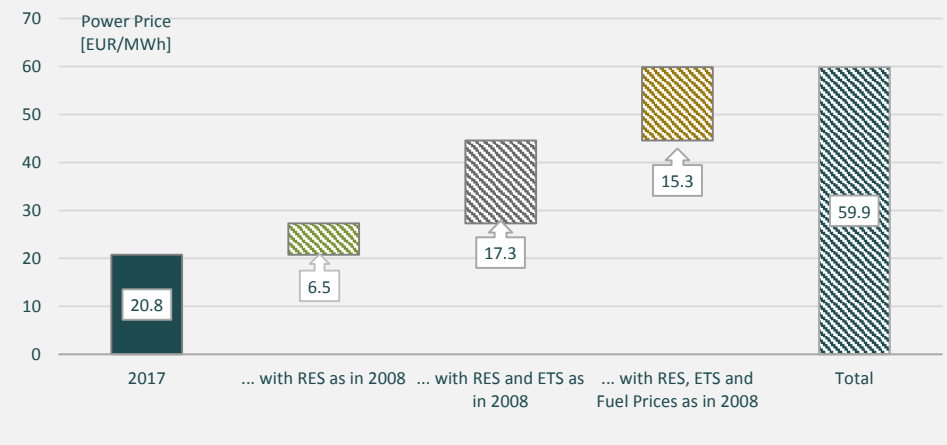
But if we now increase carbon and fuel prices to 2008 levels, the price increases by € 17.3 per MWh and € 15.3 per MWh respectively. Thus, the combined price effect of carbon and fuel prices is five-fold the price effect of renewables in Germany and Nordics combined.

While the effect of the renewable extension is not as high as that of fuel and carbon prices, it should be noted that it has severe revenue effects for thermal plants. With falling fuel and carbon prices, also costs fall. But the renewable extension (in particular PV) suppresses prices in peak hours when many generators used to recover their investments costs. Without renewables, revenues and operating hours would be much higher.

Future outlook

Despite increasing amounts of renewable generation, thermal generation costs will continue to play an important role. With continuing phase-out of nuclear capacities in Germany, and decommissioning of old coal and lignite plants, we do expect gas fired power plants to become the price anchor in the period post 2020. This is also reflected in our model simulations, where price sensitivity to gas prices increases drastically after the phase-out of nuclear and old coal plants.

Figure 2: 2017 Hypothetical Nordic power prices under different assumptions



Thus, yes, renewable contribute to lower prices. But it is a long way until thermal generation costs become irrelevant. Until then, one should enjoy the sun, but not for the reason of low power prices.

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