

## Fundamentals of European Electricity Markets

Electricity is a fundamental good, daily providing millions of people in Europe with light and warmth. The price of electricity paid by final consumers is therefore important to all of society. **But how does this price come about?**

At the end of every month, end consumers pay for the amount of electricity they used at the so-called retail price. This price is made up of three approximately equally large components, although the exact weight of each factor varies between countries: retail price = price for power consumed + network charges + taxes & levies.

The price of the **power component** in the final electricity bill is based on specific formulas, which vary between European states and suppliers. Its most decisive factor are prices in the wholesale markets, which is where producers sell electricity, and energy providers buy it to supply their customers, be it industrial or final consumers, in the retail market. In Europe, national wholesale electricity markets have been steadily integrated across-borders, a process made possible through two decades of cooperation and implementation between many stakeholders. The welfare gains created as a consequence are estimated at more than € 1 bn per year.<sup>1</sup>

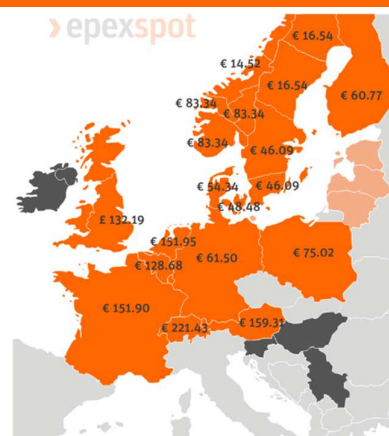
The wholesale power market is split into different timeframes, notably forward and spot markets. A separate balancing market is set-up by the transmission system operators.

Forward market	Spot market	Balancing market
Financial trade to mitigate risks of changes in spot prices, takes place up to several years before physical delivery.	Physical trade of electricity takes place one day up to some minutes before physical delivery.	Trade takes place in real time to avoid possible blackouts if demand and supply do not match.

In the **power spot market**, supply and demand are matched on close-to-real-time basis, creating a strong price signal, facilitating the integration of variable renewables. In the short-term, this price is decisive for generation and consumption decisions. In the longer-term, spot prices provide crucial investment signals for the build-up of new energy assets. In addition, spot prices are a key reference for other markets, not only the forward and balancing markets, but also for bilateral trade outside of organised marketplaces.

### Price Formation in European Spot Markets

- Price formation is based on marginal cost, which indicates how much it costs a producer to generate one additional MWh of electricity. Power plants are put on the market by the order of their marginal production cost, starting with the least expensive up to the most expensive plant, activated in that order to meet demand. The last activated plant sets the price. All producers are paid the same price €/MWh for the same product: electricity.
- The least expensive marginal production costs are usually renewables, the most expensive plants are gas and coal plants. The use of coal and gas generation in Europe needs to be covered by CO2 certificates, creating a direct connection between electricity pricing and CO2 pricing, as well as prices for coal and gas.
- The marginal cost pricing system enables all generators to cover their costs, ensuring security of supply, while incentivising generators to offer their production at a price not higher than their actual operating costs.



Every day, EPEX SPOT and other power exchanges across Europe publish electricity prices for the different European States. Through the cross-border integration of European markets, these processes have been optimised to maximise the benefits for the end-consumers. Welfare gains through this optimisation are estimated at over € 1 bn per year.

### Navigating Price Volatilities in an Energy System in Transition – The Way Forward

- The price signal best reflects the equilibrium of supply and demand at any point in time. In the current period of high energy prices, the market continues to provide robust price signals, reflecting market conditions accurately.
- To alleviate price volatility (be it very high or even negative prices), which we observe in Europe at the moment, more flexible capacity is needed in the system. As Europe transitions from fossil fuel dependency to higher shares of renewables, this need will only become more important and pressing.
- Multiple solutions can increase flexibility in the market: demand response, storage, sector coupling, local flexibility markets, increased interconnection capacities across countries, and closer to real time trading.

<sup>1</sup> Agency for the Cooperation of Energy Regulators: ACER Market Monitoring Report 2018 – Electricity Wholesale Markets Volume. 2018. Online: [https://documents.acer.europa.eu/Official\\_documents/Acts\\_of\\_the\\_Agency/Publication/ACER%20Market%20Monitoring%20Report%202018%20-%20Electricity%20Wholesale%20Markets%20Volume.pdf](https://documents.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Market%20Monitoring%20Report%202018%20-%20Electricity%20Wholesale%20Markets%20Volume.pdf) (Accessed on 25 October, 2021).