

***EFET Insight into* Marginal Pricing in Wholesale Electricity Markets**

Where do prices in the wholesale electricity market come from?

In any market, the price stems from an agreement between sellers (or “supply”) and buyers (or “demand”) for a given quantity of a good or service. In wholesale electricity markets, this translates into sellers (e.g. producers of electricity) and buyers (e.g. retail companies serving domestic or industrial consumers) agreeing on a price (in EUR) for a given volume of electricity (in MWh).

Traditionally, sellers are interested in maximising the price, while buyers are interested in minimising it. Through negotiation – verbal or electronic – a buyer and a seller can agree on a price which is acceptable for both of them.



To avoid confusion

Wholesale vs. retail electricity price → the retail price is the price paid by end-consumers (households, SMEs, some industrial consumers). It is composed of:

- + the wholesale price of electricity reflecting production costs
- + charges imposed by electricity network operators
- + taxes and various levies (for renewables support, for social policies, etc.)

In Europe, each component represents on average one third of the end-consumer bill.

Electricity price vs. regulated tariff → the price paid by some residential consumers may be subject to a regulated tariff set by public authorities (government, energy regulator). In this case, the wholesale electricity price is not directly translated into the end-consumer bill.

When regulated tariffs underestimate the wholesale price of electricity, public funds are used to compensate the retail suppliers offering these tariffs to end-consumers. In the EU, regulated tariffs are set to disappear by 2025 at the latest, except for vulnerable consumers.

What is marginal pricing in wholesale electricity markets?

When market participants trade with each other, there needs to be a way of agreeing a price. This can be done:

- As a bespoke, bilateral agreement between two parties – sometimes facilitated by intermediaries called “brokers”
- By considering multiple buyers and sellers at the same time, gathered at a specific time in an auction – usually run on platforms operated by power exchanges.

In the case of auctions, demand offers will be aggregated while supply offers will be ranked from the cheapest to the most expensive (so-called “**merit order**”). All the cheapest selling offers will be matched with a demand offer until the aggregated demand is exhausted. In most cases in such auctions, all the transactions are then settled at the price of the last (or “marginal”) selected selling offer: this price setting is called **marginal pricing** (or “**pay-as-cleared**”).

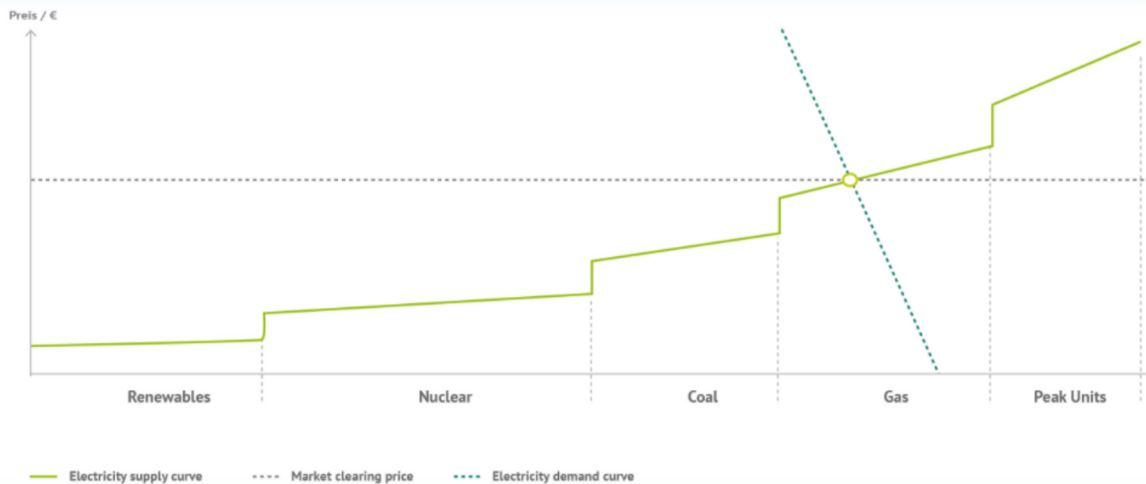
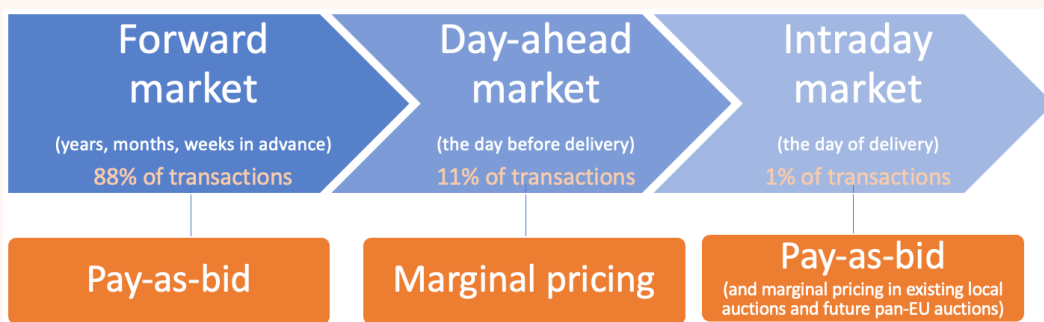


Figure 1: The marginal price in an auction is set for all transactions at the level where demand meets supply in the merit order (Source: Next Kraftwerke).



When is marginal pricing used in electricity markets?

Pricing in different timeframes → in the wholesale electricity market, the price is set differently depending on the configuration of the market (how many buyers and sellers face each other? is an auction organised?), which is also often linked to specific periods of transacting (“timeframes”):



The results of the day-ahead auction (or “**spot market**”), set at the marginal price, are used as a reference by market participants and commentators.

Why do we use Marginal Pricing?

Marginal pricing means that all the cheapest possible sources of electricity will be used, and the wholesale electricity price will be set by the price of the last selected offer, to meet demand. This price is paid or received by every successful participant in the auction. This has many upsides:

Marginal pricing keeps the wholesale price of electricity as low as possible.

In order to be selected in the auction, electricity sellers are incentivised to bid only their operating costs¹ (or “marginal costs”). The lower these are, the more likely an offer will be selected. Some renewable energy sources, such as wind and solar, are near-zero operating cost generators; once the wind blows or the sun shines, producing additional energy is almost free. Hence, they will be first to be selected to generate electricity.

By contrast, the operation of a thermal (gas or coal) power plant requires buying and burning gas or coal to produce electricity, as well as buying carbon emissions allowances, both of which come at a cost. Hence, they will be among the last to be selected in the merit order.

Therefore marginal pricing →

- i) provides a strong incentive to reflect operating costs in bid prices,**
- ii) means that electricity will be produced from the cheapest generation sources,**
- iii) means carbon emitting generation will only generate electricity when necessary to meet demand.**

Marginal pricing allows generators to recover investment costs.

In addition to operating costs, every electricity generator also incurs fixed costs to build a power plant. The fixed costs of power generation are essentially capital costs linked to building the plant. Generators need to recover these costs over the lifetime of their asset.

In an auction with marginal pricing where every generator gets the same wholesale price, generators with lower operating costs than the marginal price will earn money which will contribute to covering part of their investment costs. This is necessary for renewables for instance, who need to recover important upfront investment costs over their comparatively short lifetime², and to help plan new investments.

Therefore marginal pricing →

- iv) allows part of capital costs of investments to be recovered (which would otherwise have to come fully from subsidies or capacity mechanisms),**
- v) sends a signal about where new investment would be required.**

¹ For electricity generators, these operating costs include costs such as fuel, labour and maintenance costs. Operating costs differ between types of electricity generation.

² Wind farms and solar photovoltaic panels have a shorter lifetime (up to 20 or 30 years) compared to conventional thermal power plants (30 to 50 years), nuclear power plants (40 to 60 years) or hydropower plants (up to 100 years).

Marginal pricing is transparent and facilitates price discovery.

Marginal pricing allows one single price to emerge from an auction. It is transparently published, and it is easily understandable by buyers and sellers in the market. This allows them to trust this price, and to more accurately forecast it to make their offers as competitive as possible.

This reliability of marginal pricing is not only important for the spot auction itself, it is also vital for buyers and sellers who use this price signal for long-term transactions. The transparent and replicable price of the pan-European day-ahead auction serves as a reference for all the forward transactions concluded earlier by buyers and sellers to manage short-term volatility in the market, as well as other long-term contracts³.

Therefore marginal pricing →

- vi) creates a transparent reference price which builds confidence in the market.**

How does Marginal Pricing promote decarbonisation?

As mentioned before, marginal pricing in the wholesale electricity market allows operators of electricity generation units that have low operating costs to recover part of their investment costs over time. As the operating cost of producing electricity from most renewable sources is close to zero, operators of these units are the primary beneficiaries of marginal pricing. This allows them to recover large parts of their investment costs through the market and reduces the need for financial support from public budgets.

With new adaptive public support schemes⁴, financial support is automatically reduced at times of high prices. In such times, electricity consumers finance renewables through the energy component of their bill, rather than through their taxes.

As renewable electricity generation grows, more options will be needed for when the wind doesn't blow, or the sun doesn't shine. During these periods, other fuels need to be used to generate or replace electricity, or consumption needs to be reduced/adapted. Marginal pricing ensures that back-up technologies (peak electricity generation, battery storage or use of alternative energy sources like hydrogen), which may only run for a few hours in a year, can recover at least part of their investment costs. It also contributes to incentivising consumers to adapt their energy consumption patterns and sends signals for investments in new technologies and services.

Therefore marginal pricing →

- vii) contributes to the financing of renewables and reduces the need for public budgets to support renewable energy investors via subsidies,**
- viii) gives a signal for consumption adaptation,**
- ix) promotes innovation with a clear economic signal for investment in new technologies (peak generation plants, electricity storage or conversion).**

³ See our [EFET Insight into Forward Trading in Wholesale Electricity Markets](#).

⁴ Here we make reference to feed-in premia (FIP) or two-way contracts for differences (CfDs).

How does Marginal Pricing allow the best allocation of resources in Europe and enhances security of supply?

Electricity networks are interconnected in Europe. But to allow electrons to flow to where they are needed, reliable prices need to indicate where that is. This is done by connecting markets and running them using the same rules, irrespective of national borders.

Europe has created a system of pan-European auction in the day-ahead market. This auction ensures that the cheapest electricity sources are used throughout Europe to meet the demand of consumers. This system of “market coupling” is only possible because all markets in Europe use the same, efficient, marginal pricing methodology to price electricity. Matching demand and supply at a European scale via market coupling based on marginal pricing enhances price convergence between Member States and contributes to a reliable and secure energy supply.

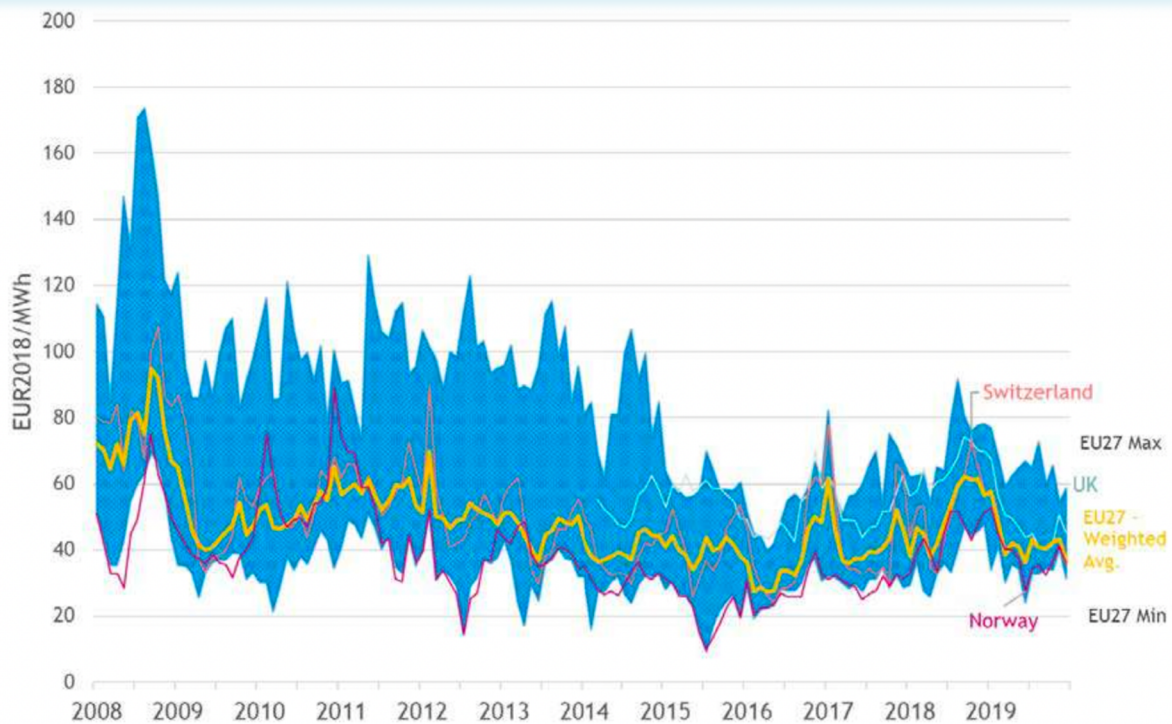


Figure 2: Electricity price convergence and minimisation of local price spikes due to greater integration driven by day-ahead market coupling based on marginal pricing (Source: European Commission).

Therefore marginal pricing →

- x) allows a better allocation of resources across the entire continent by connecting electricity markets across Europe,
- xi) contributes to security of supply by ensuring that electricity is produced and flows to where it is most needed.

And what about the end-consumer?

All the advantages of marginal pricing highlighted above help bring down the cost of buying electricity for end-consumers – and suppliers who serve them. Among the different components that end-consumers pay in their electricity bill, the cost of electricity itself was the only one to go down in the past decade: over the 2011-2020 period, the electricity component of the end-consumer bill has decreased by 10% for an average EU household.

So what happens when spot prices rise quickly, like in 2021/2022? Are end-consumers directly exposed to these fluctuating day-ahead prices? For most household customers, a change in the day-ahead price does not translate into an immediate change in the retail price. This is because firms buy and sell electricity far in advance of the actual production and consumption of electricity to manage the daily volatility of the marginal price in the day-ahead auction. These techniques (so-called “hedging strategies”) allow firms to offer fixed-price contracts to households (or to change prices less often).

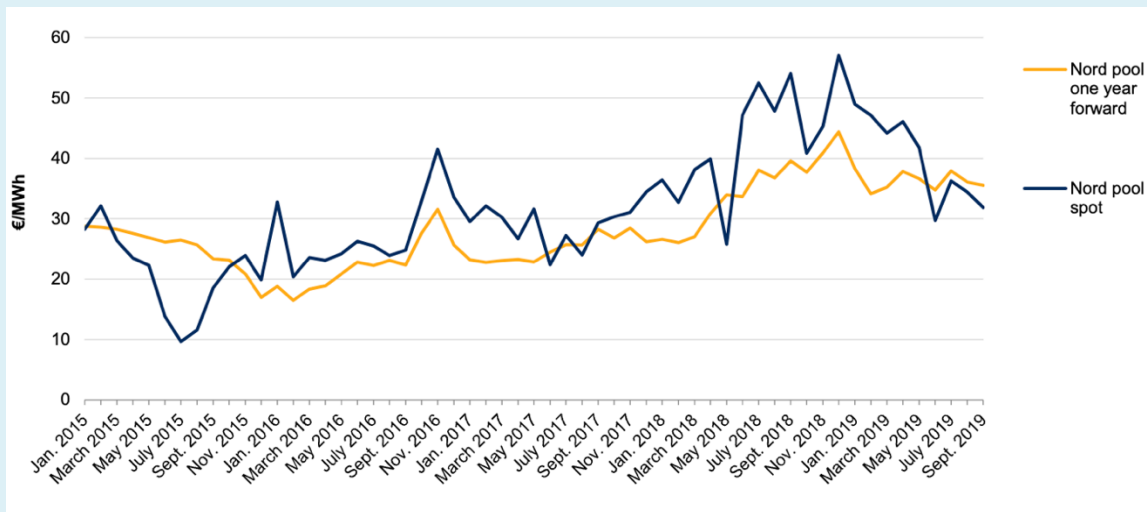


Figure 3: day-ahead spot prices and year-ahead forward prices in the Nordic countries (Source: Platts).

Covering risks far ahead from real time is performed on so-called “forward markets”, where buyers and sellers of electricity will transact electricity months to years in advance, in their country and beyond. The forward markets rely on a reliable and unified spot price signal in Europe, stemming from the marginal price of the day-ahead auction, to make appropriate forecasts of where the price is likely to head in the future. Hence, marginal pricing in the day-ahead auction is a pillar on which forward markets stand to help shield consumers from short-term price shocks.

Therefore marginal pricing →

- xii) serves as a reference for risk hedging strategies of producers and consumers of electricity,
- xiii) is part of the system providing stable prices for end-consumers, and
- xiv) has proven to bring down the costs of electricity for the consumer over the past decade.



In summary

Marginal pricing is a method used to price electricity in the wholesale market, more specifically in the day-ahead auction.

Marginal pricing means one price – set by the last selected electricity generation offer to meet demand – is paid or received by every successful participant in the day-ahead auction.

Marginal pricing has many advantages, including:

- cost minimisation by tapping on the cheapest sources of electricity production
- reduction of carbon intensity by prioritising low-carbon energy sources in the mix
- viability for existing and future investments thanks to the recovery of part of the investment costs
- contribution to the energy transition by providing signals for innovations (battery storage, conversion to and from hydrogen, etc.) and consumption adaptation
- optimal allocation of resources and security of supply at European level by allowing cross-border coupling mechanisms to function
- transparency of the day-ahead price signal that is used in long-term (forward) markets to help absorb short-term price shocks for consumers.

For more information, feel free to contact us at secretariat@efet.org