EFET Insight into Spot Trading in Wholesale Electricity Markets

What is spot trading in wholesale electricity markets?

In order to guarantee the continued supply of electricity to customers at least cost, buyers and sellers of electricity conclude transactions from years before energy is supplied until the last few minutes before a light switch is turned on ("delivery").

Any electricity transaction concluded more than a day before delivery is considered a "forward" contract (see our Insight on Forward Trading in Wholesale Electricity Markets). Any transactions concluded after this, i.e. from the day before delivery until the last few minutes ahead of delivery, are considered **"spot" contracts**.

Trading in the spot market is divided in two main segments:

- The **day-ahead market** → consisting of one pan European auction at noon the day before delivery; and
- The **intraday market** → where market participants can trade continuously from 15:00 CET the day before delivery until almost real time (one hour to 5 minutes before delivery).

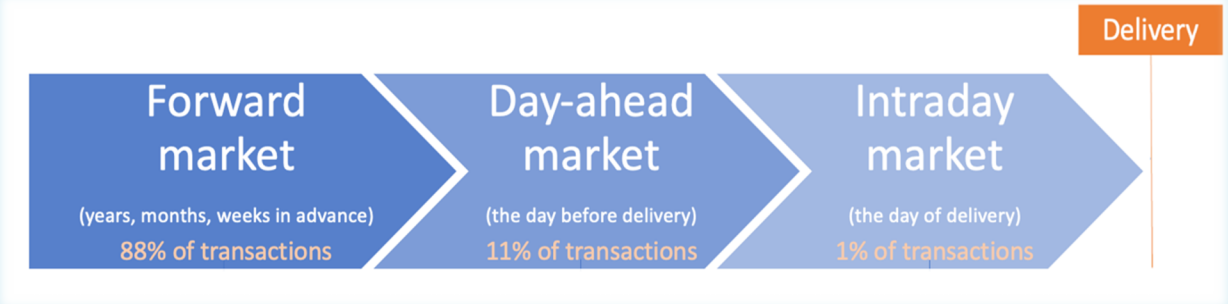

Figure 1: The spot market refers to transactions on the day before (day-ahead) and the day of delivery (intraday), until almost real time (transaction percentages in volume, 2020).

After spot markets close, Transmission System Operators (TSOs) operate mechanisms to maintain system balance in real time. These **balancing mechanisms** operate separately from spot markets. In balancing mechanisms, the TSOs buy pre-defined products and services from market participants to maintain the stability of the system.

Why do we use the spot market?

To ensure production matches demand at least cost

This is primarily the ***role of the day-ahead market***, which is a pan-European auction often termed "market coupling". In order for their offers to be selected, electricity sellers are incentivised to bid only their operating costs[1] (or "marginal costs"). The lower these are, the more likely an offer will be selected. Some renewable energy sources, such as wind and solar, have near-zero operating costs because 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.

To adapt to any changes in demand or supply, even at the last minute

This is primarily the ***role of the intraday market***, which allows buyers and sellers to transact with each other at any time of the day (so-called "continuous trading"). As there is still limited capacity to store electricity in the system, the production of electricity must match the demand from consumers at all times. To maintain this balance, the market needs the flexibility to react rapidly to changing circumstances.

The intraday market allows buyers and sellers of electricity to adjust their position on the market to match unexpected changes in supply (e.g. when the sun does not shine as expected to produce electricity from solar panels), transmission (e.g. when a cable or transformer develops a fault), and demand (e.g. when a whole country switches on their TV for a sport or entertainment event).

To serve as a reference for long-term contracts and more

The price of the day-ahead auction is often used as the "reference price" for electricity. Because it is transparently published, easily accessible, and replicable by any party, it is widely used:

- **As a reference for all the forward transactions or renewables PPAs** → to manage the risks linked to the volatility the spot market.
- **As a reference for dynamic supply contracts** → when consumers have opted for supply contracts that follow the evolution of spot prices
- **As a reference for many support schemes** → in particular those renewable electricity support scheme that adapt to market prices (so-called "feed-in premia")

The robustness of the day-ahead market allows market participants as well as public authorities to trust its price as a reference. This may also become a role for the intraday market as it grows in importance.

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

How does spot trading work in practice?

Spot markets are **physical markets**, where sellers and buyers agree on a price (in EUR) for the seller to deliver immediately or almost immediately ("on the spot") a given volume of electricity (in MWh) in a given area (or "bidding zone").

Differences between day-ahead and intraday markets

Though they both constitute what is called "the spot market", day-ahead and intraday markets function quite differently:

Day-ahead market: the reference market

- Trading and clearing once a day at 12:00 CET
- One single auction run by power exchanges: EUPHEMIA
- Marginal (pay-as-cleared) pricing
- Cross-zonal transmission capacity is priced implicitly (so one price for energy and capacity)
- Market participants place their orders to their local power exchange

Intraday market: the adjustment market

- Continuous trading throughout the day as of D-1 15:00 CET
- First-come-first-served matching service run by power exchanges: XBID
- Pay-as-bid pricing
- Cross-zonal transmission capacity is usually free of charge
- Market participants place their orders to their local power exchange

To date, spot markets are primarily operated by power exchanges (see our Insight on Exchange and OTC Trading). They are also **market coupled across Europe**, meaning that local markets and the use of cross-border transmission capacity between them are optimised together.

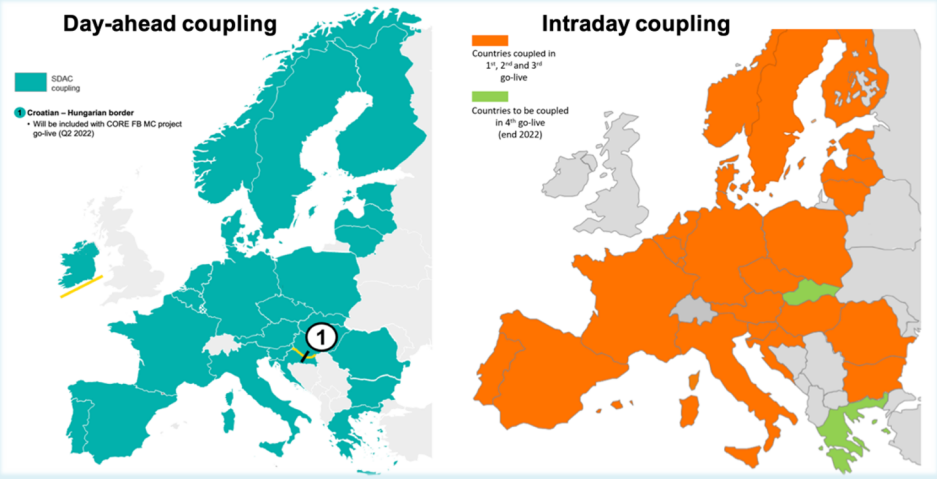

Figure 3: Day-ahead coupling (left): the whole EU is coupled, except the Croatian-Hungarian border. Intraday coupling (right): the whole EU is coupled, except Slovakia and Greece. Situation as of March 2022. (Source: SDAC and SIDC projects).

How do spot markets promote decarbonisation?

Make sure the cheapest technology runs first

The spot market allows operators of electricity generation units with low operating costs – mainly renewables – to be selected first to produce the electricity needed by consumer. This ensures that they are used as much as possible.

Let renewable producers cover investment costs

Thanks to marginal pricing in the day-ahead auction, renewable electricity production units can also recover part of their investment costs, which reduces the need for financial support from public budgets.

Make sure back-up is available when needed

As renewable electricity generation grows, more options will be needed for when the wind doesn't blow, or the sun doesn't shine. Spot markets, in particular in intraday, allow quickly reactive technologies such as peak electricity generation or battery storage, but also reactive consumers to offer their flexibility over short periods of time whenever needed.

What about the end-consumer?

Well-functioning and integrated spot markets provide electricity to consumers across Europe at the least cost. The Agency for the Cooperation of Energy Regulators (ACER) assessed that cross-border trade and the integration of markets (in particular day-ahead and intraday) has delivered **EUR 34 billion in benefits to Europeans in 2021**.[2]

Spot markets, accompanied with the appropriate technology or services (smart meters, aggregation services), also **allow consumers to adapt their energy consumption patterns** almost in real time. This can help them take advantage of times of low prices, while reducing or delaying their consumption in times of high prices.

How can we improve spot markets?

Develop more granular products

Most trading currently happens on a half hourly basis. Developing products which cover shorter time periods would more accurately match new ways of producing, storing and consuming electricity (for example 15 minutes, or even shorter). Aggregating these shorter products into blocks would allow the needs of all consumers to be covered.

[2] ACER Final Assessment of the Functioning of EU Wholesale Electricity Market Design, available at: https://acer.europa.eu/events-and-engagement/news/press-release-acer-publishes-its-final-assessment-eu-wholesale

Open intraday markets earlier and close them later, including across borders

Local intraday markets open at 15:00 CET on the day before energy is delivered. However, too often transmission capacity to trade from one bidding zone to the other is only available late in the evening (22:00 CET in most of continental Europe). The earlier markets are open and connected, the better the ability of buyers and sellers to optimise transactions and flows across the whole of Europe.

Letting intraday markets work as close to real time as possible is also key: for the moment they are only connected across borders until one hour before real time. Certain countries close their markets at that point while others let them run up until 5 minutes before energy is delivered. Ensuring that all markets run and are coupled until 15 minutes before real time would allow market participants to adapt to even last-minute changes.

Allow portfolio bidding everywhere in Europe

Portfolio bidding allows electricity sellers to aggregate the electricity produced from different units and technologies when offering it on the market. This efficient way of managing portfolios is used by market participants in most of Europe.

Portfolio bidding enables electricity producers to use the flexibility of their assets more effectively compared to individual unit bidding. Market rules in all Member States should allow market participants to optimise their portfolio as best as they can.

In summary

Although it represents a relatively small volume of electricity transactions (12% in 2020), spot markets are an essential element of our electricity system. They allow the optimisation of supply and demand across Europe thanks to market coupling. This benefits consumers directly, with EUR 34 billion in benefits in 2021 according to ACER.

Spot markets also contribute to the EU's decarbonisation efforts by favouring low-cost, low-carbon sources of electricity production. They also help value technologies and services necessary for the energy transition, including electricity storage and demand response.

Member States and European institutions have a role to play in reinforcing the role of spot markets and expand their reach. **We recommend the following actions be taken**:

- Develop more granular products catering to new demand and production patterns
- Open intraday markets earlier and close them later, including across borders
- Allow portfolio bidding everywhere in Europe

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