Jean Gillain *jgi@n-side.com*

ESIG Conference 2026

EUropean Day-

Restricted data

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Market power operations are managed by Power Exchanges in close cooperation with TSOs.

	Power Exchanges (PX)	Transmission System Operators (TSO)
Primary Focus	Commercial trading, price discovery, and market efficiency	Physical security, stability, and reliability of the grid (keeping the lights on)
What they handle	Bids and offers for electricity (energy volume)	Physical electricity flows, frequency, voltage, and system imbalances
Revenues	Transaction fees from market participants	Often from grid access charges (tariffs on electricity transported)
Timeframes	Day-ahead, Intraday (and some longer-term products)	Real-time operation, day-ahead, and long-term grid planning
Key Cooperation	Market Coupling Operators (MCOs) for cross-border price coupling (e.g., PCR, SIDC)	ENTSO-E, regional operational centers (e.g., for balancing platforms like IGCC, MARI, PICASSO)

PCR: Price Coupling of Regions - the entity responsible for the European wholesales power market (SDAC & SIDC)
ENTSOE: association that coordinates Europe's electricity transmission system operators in EU.

Who decides? Governance of the EU wholesale power market

N-SIDE

EU level

European Commission

Legislator

Proposes & adopts energy market regulation: sets the overarching rules of the game.

ACER

EU regulatory coordinator

Coordinates national regulators and advises the Commision. Issues binding decisions on **cross-border** methodology.

National level

NRAs

National regulators

Approve national methodologies. Enforce ACER decisions locally.

TSOs

Grid operators

"Provide **cross-border capacity** to the market.

NEMOs / Power Exchanges

Market operators

Operate power auctions & continuous trading.
Can operate in **multiple** countries.

Market level

Market participants

Traders, BRPs, generators

Bid into DA & intraday markets. Bear imbalance risk.

MCCG

Consultative body

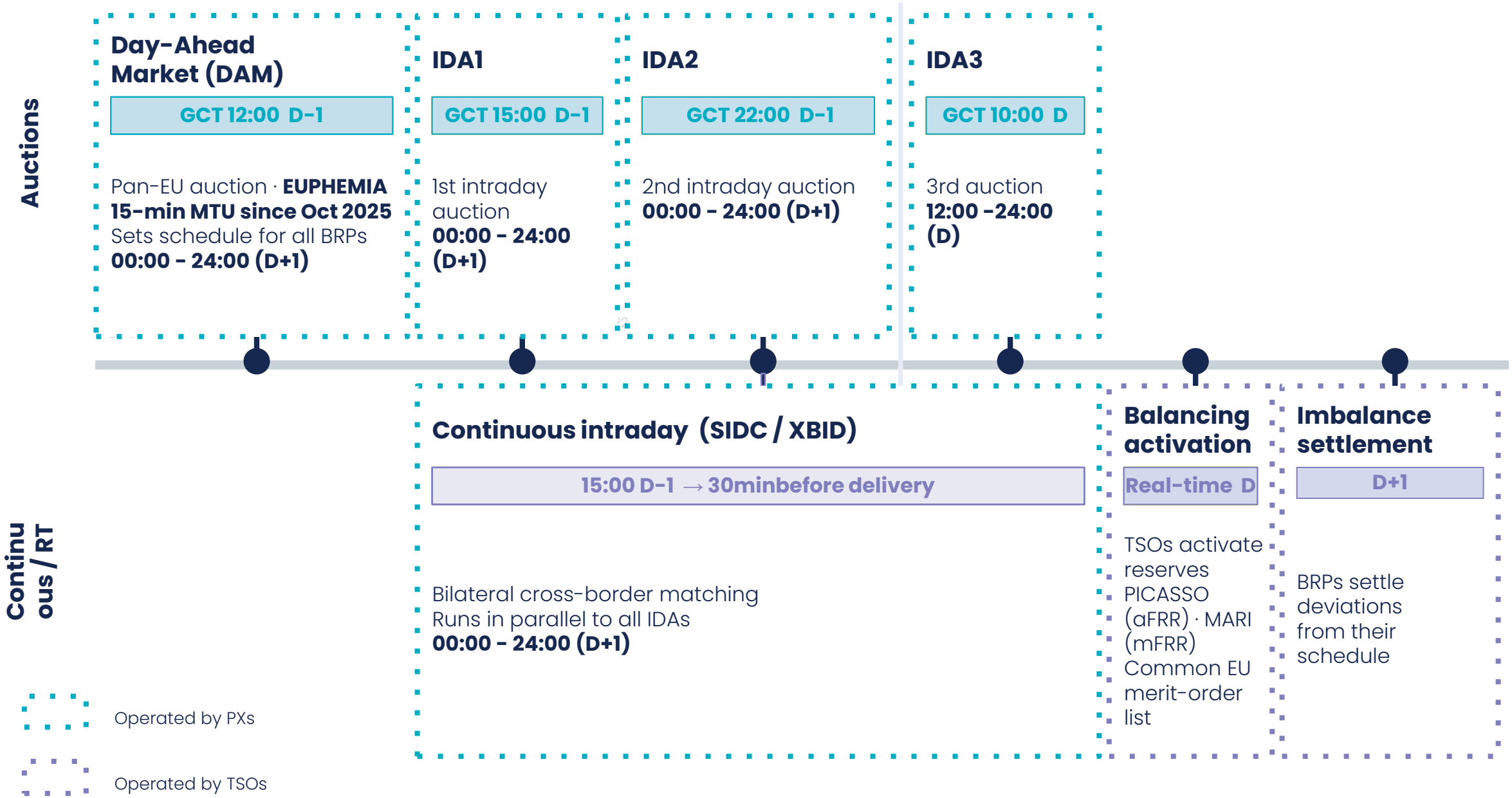
Multi-stakeholder forum: reviews market coupling decisions.

N-SIDE

Algorithm & software provider

Develops EUPHEMIA and its R&D

From day-ahead to real-time: the EU market sequence



Today's agenda

N-SIDE

EU Market General Overview

EUPHEMIA

The 15Min MTU Switch

A closer look to SDAC (Single Day-Ahead Coupling) covering 27 countries

1 single algorithm
27 countries
10-years anniversary in 2024
SDAC traded volume in 2023: 1696 TWh
Average welfare per session: 10.9 B €

The total volume traded **is as much** as the load on PJM, MISO and CAISO regions combined

Algorithm is provided by **N-SIDE**

Source: All NEMO committee - Newsletter April 2024

SDAC involves 30 TSOs and 17 NEMOs

Transmission System Operators (TSOs):

50Hertz Transmission, ADMIE, Amprion, APG, AST, ČEPS, Creos, EirGrid, Elering, ELES, ELIA, Energinet, ESO, Fingrid, HOPS, Litgrid, MAVIR, PSE, REE, REN, RTE, SEPS, SONI, Statnett, Svenska Kraftnät, TenneT DE, TenneT NL, Terna, Transelectrica, and TransnetBW.

Nominated Electricity Market Operators (NEMOs):

BSP, CROPEX, SEMOpx (EirGrid and SONI), EPEX, EXAA, GME, HEnEx, HUPX, IBEX, Nasdaq, Nord Pool, OMIE, OKTE, OPCOM, OTE, and TGE.

Sources : ENTSO-E and All NEMO committee

Comparison: Central Western Europe versus California

Central Western Europe

PJM

Market Design Options

Single or Two Settlement System	Network Representation	Co-optimization	Centralization	Simple or Multi-part Bids	Unit or Portfolio Bidding	Electricity System Actors
Two (or Multi) Settlement System	Zonal	Co-optimization of energy and transmission capacity only	Decentralized	Simple and Multi-part bids	Portfolio bidding	TSOs (= Elia, RTE, …) and PXs (= EPEX, NordPool, …)
Two Settlement System	Nodal	Co-optimization of energy, reserve and transmission capacity	Centralized	Multi-part bids	Unit bidding	ISO (= PJM)

Today's agenda

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From regulation to go-live was a lengthy process: 6 years time

2019

CACM mandate

The legal requirement to move to a 15-minute resolution came from from the EC.
ACER was responsible for defining and approving the technical methodologies

2021

Feasibility studies

In 2021, the NEMOs and TSOs concluded through EUPHEMIA could not handle the EC's mandated shift to a 15-minute MTU without major upgrades and an extension of the calculation time.

2023

Regulatory decision

NEMOs/TSOs submit technical methodologies to ACER to adapt the market coupling algorithm (CACM) for a 2025 15-min MTU Go-Live

2024

SIDC auctions go-live

The 15-minute MTU and new Intraday Auctions (IDAs) successfully went live across many European borders

1 Oct 2025

SDAC Go-live

After multiple delays and months of rigorous IT testing, the 15-minute MTU for the SDAC officially went live on September 30, 2025

Why 15-minute MTU?

Renewable integration

Better capture of solar ramps

Solar ramps of up to 3.1 GW/15 min already observed in Germany expected to double by 2030.

Harmonisation

Align DA with intraday & balancing

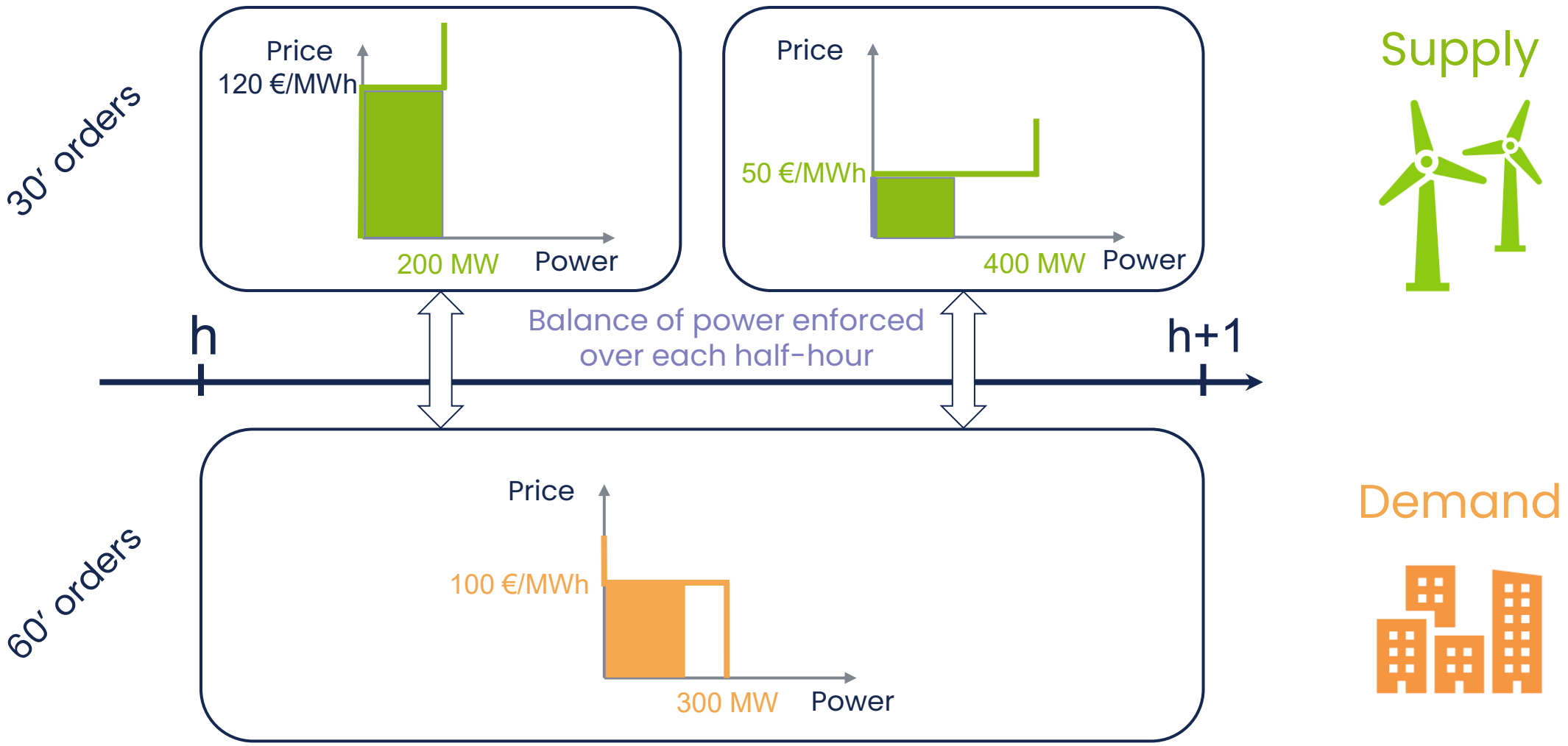
Intraday and balancing markets already operate at 15-min granularity. DA was the last to catch up.

Cross-period matching

Unique to DA — not available in intraday

2×30-min orders can be matched against a 60-min order, preserving liquidity across timeframes.

Example: 30' and 60' curves in a single BZ



Supply

Demand

EUPHEMIA performance improvements

Four key pillars to address 15-min MTU, ~10× constraint growth and cross-period matching

Hardware improvements

Larger machines: short-term capacity boost for EUPHEMIA solving (limited long-term scalability).
Distributed Computing: scalable, future-proof architecture independent of hardware.

Better mathematical modelling

Scalable complex orders: improved representation of minimum income condition of power plant operating conditions.
ELI: better integration of the LTTR domain within the flow-based model.

Mathematical software improvements

Solver-agnostic engine: EUPHEMIA can run on CPLEX, XPRESS and Gurobi in parallel, increasing robustness.
Outer approximation: new solver method to efficiently resolve quadratic problems.

Removal of non-convex features

PUN removal: eliminates Italy's non-convex constraint that forced a uniform demand price across differing production prices.

Volume impact

≈ unchanged

SDAC volumes

-36%

IDA1 volumes

3.5% → 2.2% of SDAC volumes in Oct.

DA volumes stayed flat

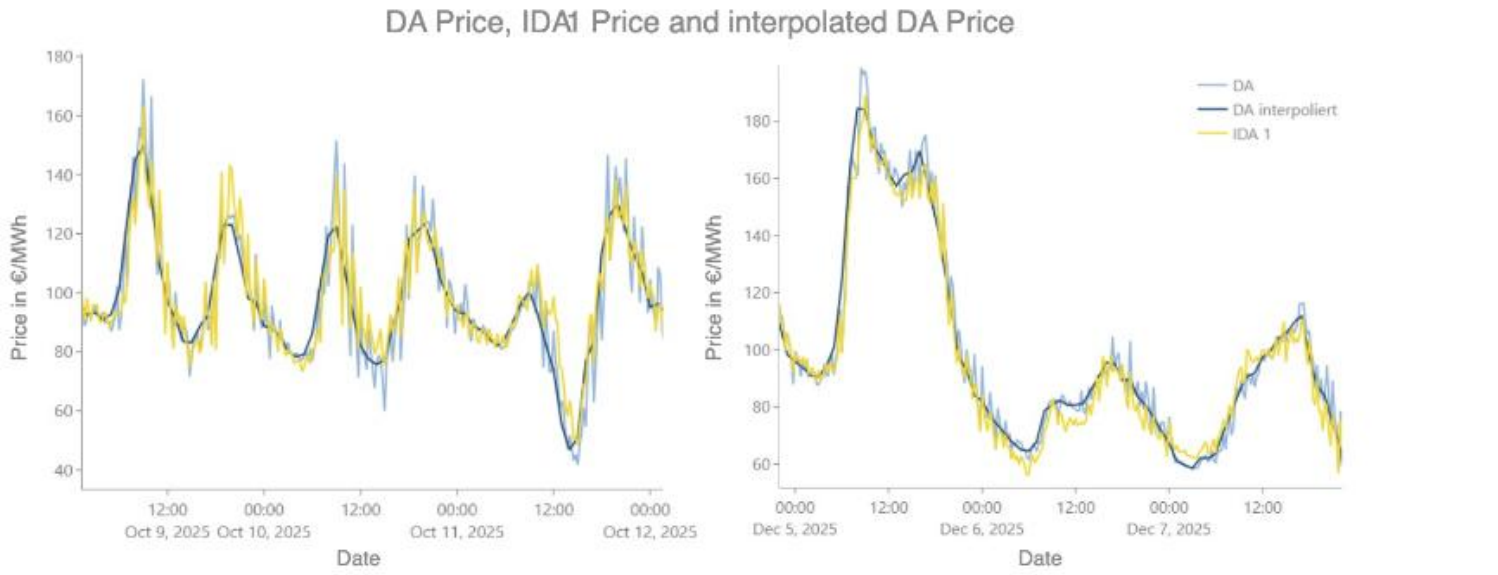
15-min MTU neither increased nor decreased day-ahead market activity. The change in resolution did not attract new participants or deter existing ones.

IDA1 substitution effect

IDA1 sits just after the DA auction. With DA now at 15-min granularity, traders have less need to adjust positions in IDA1, consistent with pre-go-live expectations.

Source: Breuing & Rewald (ENTSO-E), Strommarkttreffen, Oct. 2025

Price impact: the sawtooth pattern



Root cause: block orders still hourly

A significant share of order books still contains block bids starting and ending on the full hour (coal and gas), creating artificial price plateaus within each hour and sharp jumps at each quarter.

Pattern expected to fade

As participants adapt strategies to 15-min granularity, the sawtooth should diminish. Prices now closely resemble IDA1 patterns, a sign of better market integration.

Within morning hours, prices spike in the first fifteen minutes due to a supply deficit (solar), then drop in the last fifteen minutes as rising renewable output creates a surplus against inflexible flat hourly generation

Source: Breuing & Rewald (ENTSO-E), Strommarkttreffen, 17 Oct. 2025