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The Renewables Market and Information Network
Teasers, Data Analytics, News, and Networking

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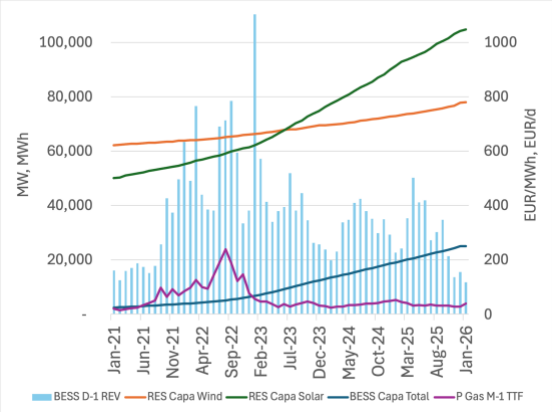
What Drives Battery Revenues in Germany?

*Dear Readers, in this issue's lead article, we recycle some of the structured market data we gather as we develop neural-network-based forecasting tools. We use a subset of that data in a **simple multiple linear regression** to build and confirm intuition around the **key drivers of battery revenues**.*



We analyse **BESS revenues in the German day-ahead market**, expressed in **EUR/day for a 1 MW / 1 MWh system with 90% round-trip efficiency**. The data covers **the period from January 2021 until today**. We use monthly averages of daily BESS revenue (our calculation) and run a linear regression against TTF month-ahead gas prices, as well as BESS, wind, solar capacity data (our calculation based on Bundesnetzagentur data).

Key Drivers for DE BESS revenues in D-1 power markets

- **Installed wind capacity (MW)**
  Coefficient **+ 0.04** (t = **0.81**)
- **Installed solar capacity (MW)**
  Coefficient **+ 0.12** (t = **2.17**)
- **Total installed battery capacity (MWh, small + large)**
  Coefficient **- 0.31** (t = **–2.51**)
- **Month-ahead TTF gas price (EUR/MWh)**
  Coefficient **+ 0.76** (t = **1.01**)

How much can we explain?

Despite the complexity of power markets, this compact model explains a **meaningful share of revenue dynamics**: **R^2 =** 41%

For a system dominated by regime shifts, this level of explanatory power is already informative within the time frame considered, while also clearly pointing to **nonlinearity and missing explanatory features** not covered in our simple linear model.

What the coefficients tell us

Solar expansion supports battery revenues

Confirming intuition, installed solar capacity shows a **positive and statistically significant effect**. Each additional MW of solar capacity adds (everything else being equal) approximately **+ 0.12 EUR/day** in potential BESS revenue. Growing solar penetration increases intraday price volatility, compressing prices at midday and steepening evening ramps, which batteries can monetise effectively.

Wind capacity plays a secondary role

Wind capacity enters with a smaller positive, **statistically insignificant** coefficient. Compared to solar, wind generation creates a less consistent price structure for day-ahead battery arbitrage.

Gas prices matter, but not linearly

TTF gas prices show the **largest coefficient in absolute terms**, yet with **low statistical significance** as measured by the t-statistic. This highlights an important point: gas prices strongly influence power prices when thermal generation is at the margin. However, their impact on battery revenues depends on nonlinear market, scarcity, and dispatch dynamics, which a linear model cannot capture consistently. The low statistical significance is best understood as a **limitation of the model**, not an indication of economic irrelevance.

Battery build-out compresses margins

Total installed BESS capacity has a **significant negative coefficient**, reflecting cannibalisation effects. As more batteries come online, competition for the same arbitrage opportunities increases, leading to **structural margin erosion**.

What this means for investors

The regression confirms several structural trends:

- **Solar (and, to a lesser extent, wind) growth is a structural tailwind for battery revenues. 13.5 GW of new solar PV** as well as **5.1 GW of new wind** added to the German system over the past 12 months is good news for BESS investors.
- **Increased battery supply adds real and measurable downward pressure.** Additions to BESS capacity are still dominated by household/small installations, which contributed **70% of the 6.1 GWh** added to the German system in the past year. These dynamics warrant close attention from utility-scale developers, particularly as aggregators seek to offer household BESS capacity into ancillary service markets.
- **Fuel prices matter but in complex, nonlinear ways.** Reliance on the forward curve is pointless for investments of this overall size and complexity, and the next price shock is impossible to predict.
- **Our model results are illustrative.** The linear model was not set up for deep extrapolation.

At Capra, we offer **down-to-earth, transparent data analytics**, we advance **NN-based forecasting behind the scenes**. Expect to see more.

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In case you have missed our Market News Feed in January...

Power Purchase Agreements (PPAs)

PPAs continue to underpin renewable investment across wind, solar and hybrid assets, providing long-term price certainty for offtakers and bankability for developers. Activity spans physical PPAs and VPPAs involving technology firms, industrials and public-sector buyers, with traders and advisers active in structuring and optimisation.
Companies mentioned: Amazon, BKW, Capital Dynamics, Cisco, D.TRADING, Exus Renewables, Global Switch, Iberdrola, Knight Frank, Microsoft, Reden, R.Power, RWE, SNCF Énergie, Statkraft, SWM, Syngenta, TotalEnergies, UrbanChain.

Wind

Wind activity is driven by offshore CfD awards, strategic partnerships and onshore portfolio transactions. Offshore development is concentrated in the UK, Germany, France and Denmark, while onshore wind sees continued acquisitions, financings and asset rotations across Europe including Ukraine, often supported by PPAs or state-backed revenue frameworks.
Companies mentioned: Allianz Global Investors, Aneo, Ardian, Banque des Territoires, Big Mega Renewable Energy, Blue Elephant Energy, EDP Renováveis, ENGIE, Enordic Evergreen, ERG, Greenvolt Power, Horizon Capital, JERA Nex BP, KKR, Notus Energy, Ocean Winds, OX2, PNE AG, Qualitas Energy, RES, Skyborn Renewables, Sumitomo, Vendée Énergie, WIND-projekt.

Solar

Solar deployment spans utility-scale, distributed and portfolio transactions, supported by PPAs, feed-in tariffs and auction frameworks. Italy, Poland, Romania and the UK dominate European activity, alongside very large projects in the Middle East and Africa. Co-location with storage is increasingly standard for new large developments.
Companies mentioned: Anesco, BKW, BPER, Capital Dynamics, Danske Commodities, DTEK Group, Econergy Renewable Energy, Egyptian Electricity Transmission Company (EETC), Emirates Water and Electricity Company, Enfinity Global, ENGIE, European Energy, Inox Neo Energies, Masdar, Quest Energy, R.Power, Scatec, Skyworth PV, Tokyo Century, Downing, Uniper, Zelestra.

Battery Energy Storage Systems (BESS)

BESS remains one of the fastest-growing segments, covering standalone, co-located and multi-hour systems. Projects are supported by capacity market contracts, optimisation agreements and merchant exposure, with strong backing from banks and infrastructure investors, alongside growing platform-level development.
Companies mentioned: ADS-TEC Energy, Aer Soléir, Alpiq, Aquila Clean Energy, Axpo, BayernLB, Capture Energy, ContourGlobal, EDF, Econergy, Elements Green, Energy Gates, Greenvolt Power, Grenergy Solutions, Harmony Energy, Nord/LB, Nuvve, RWE, Santander UK, Siemens Financial Services, Statera Energy, Tauron Group, Terralayr, Trina Storage, UniCredit, Zenobé.

Other Developments

Beyond wind, solar and storage, projects span biomass, biochar, green hydrogen, renewable ammonia, sustainable aviation fuel, hybrid hydro-solar and long-duration storage. These developments reflect increasing sector diversification, stronger links to industry and transport, and

greater focus on system flexibility and integration.
Companies mentioned: ACCIONA Energía, AM Green Ammonia, Austria Wirtschaftsservice GmbH, Donut Lab, EDP, ELQ, European Hydrogen Bank, Haffner Energy, IGNIS P2X, Klere, OMV, Polish National Recovery and Resilience Plan, Promet-Plast, RheEnergise, Sibelco, Uniper.

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