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THE POWER PROOF

POWER BAROMETER

2026

Foreword

In 2026, Europe was once again reminded that energy security and economic competitiveness are inseparable. Renewed conflict in the Middle East sent oil and gas prices sharply higher, exposing the continent to the volatility of global fossil fuel markets. Yet European electricity prices initially proved far more resilient than in previous crises, as the continued expansion of clean electricity and flexibility helped reduce the power sector's exposure to imported fossil fuels.

Across Europe, tangible examples showed what a more flexible and electrified energy system can deliver. In Bulgaria, rapid battery deployment helped shift abundant daytime solar generation towards periods of higher evening demand, while in Finland, electric boilers increasingly provided flexible demand that could respond to changing power-system conditions.

At the same time, the summer of 2026 demonstrated that important vulnerabilities remain. A severe June heatwave, combined with soaring cooling demand, low wind and hydropower generation, and reduced nuclear availability, put renewed upward pressure on evening electricity prices. Europe's challenge is therefore evolving: it is no longer only about producing more clean electricity, but ensuring that it is available **when and where it is needed**. This requires faster investment in grids, storage, firm capacity, and both supply- and demand-side flexibility, alongside continued growth in clean generation and stronger incentives for electrification.

The **Power Barometer 2026** captures this rapidly changing European power system through the latest market data and trends. Its findings underline that clean electrification, supported by adequate infrastructure and flexibility, is becoming not only a pathway to decarbonisation, but a cornerstone of Europe's energy security, resilience and long-term competitiveness.

Kristian Ruby
Secretary General Eurelectric

About

Eurelectric's Power Barometer is the annual flagship data report providing a fact-based assessment of the European power sector and its links to the wider energy and climate transition. It tracks developments in electricity generation, markets, grids and electrification, while examining how the power system is responding to changing economic, geopolitical and climate conditions.

Beyond the power sector itself, the report explores wider questions of energy security, competitiveness and resilience. It highlights how clean electricity, electrification and flexibility can reduce Europe's exposure to imported fossil fuels, while also identifying the infrastructure and investment needed to support a more resilient energy system.

Unlike reports based on a fixed set of indicators, the **Power Barometer evolves each year** to reflect the most relevant developments in Europe's energy landscape. This approach combines the latest market and system data with analysis of emerging trends, keeping the report closely aligned with the challenges facing the sector.

The **2026 Power Barometer** reviews the key developments of 2025 and 2026, with a particular focus on Europe's response to renewed geopolitical and fossil-fuel price volatility. It examines the growing role of clean electrification, storage and demand-side flexibility, while highlighting the need for faster investment in grids and flexible resources to ensure electricity is available **when and where it is needed**.

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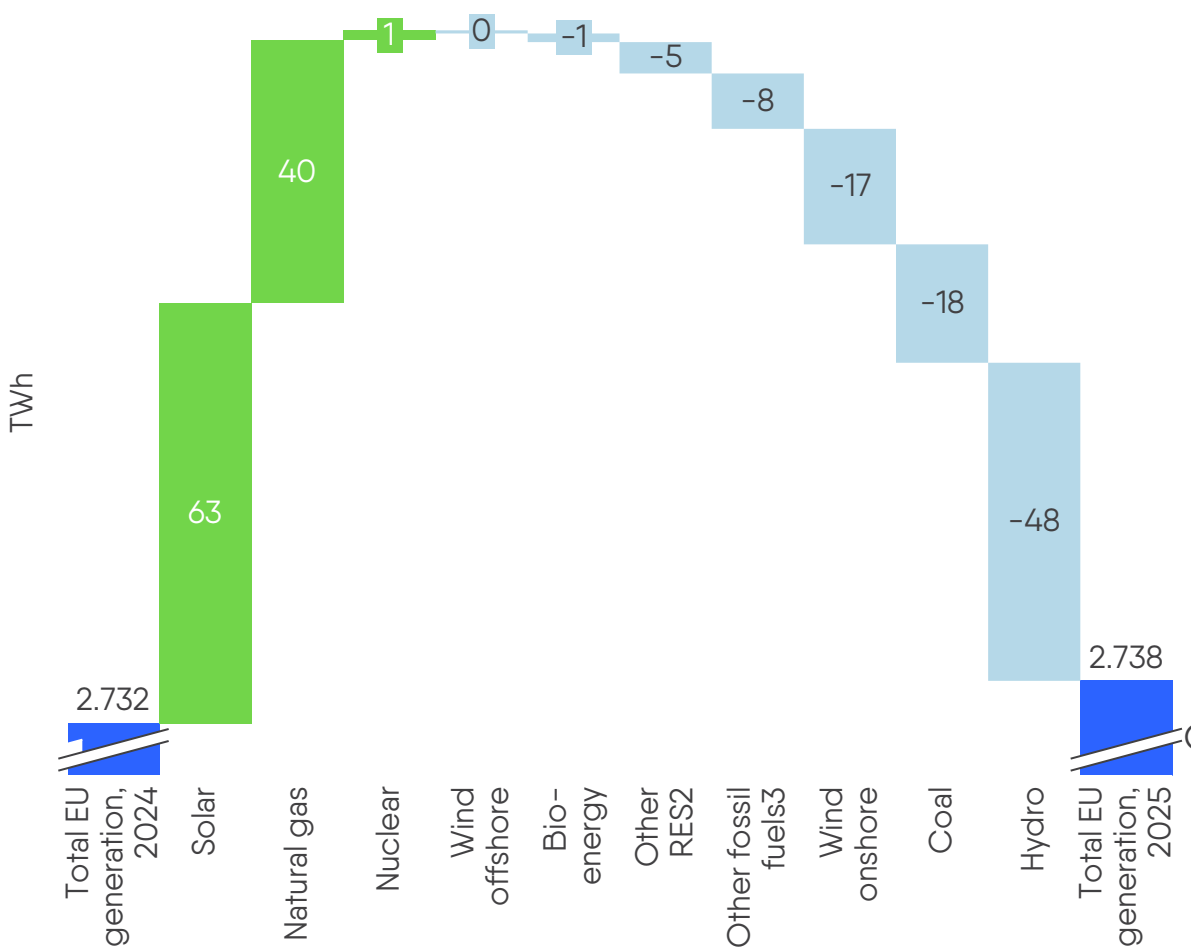
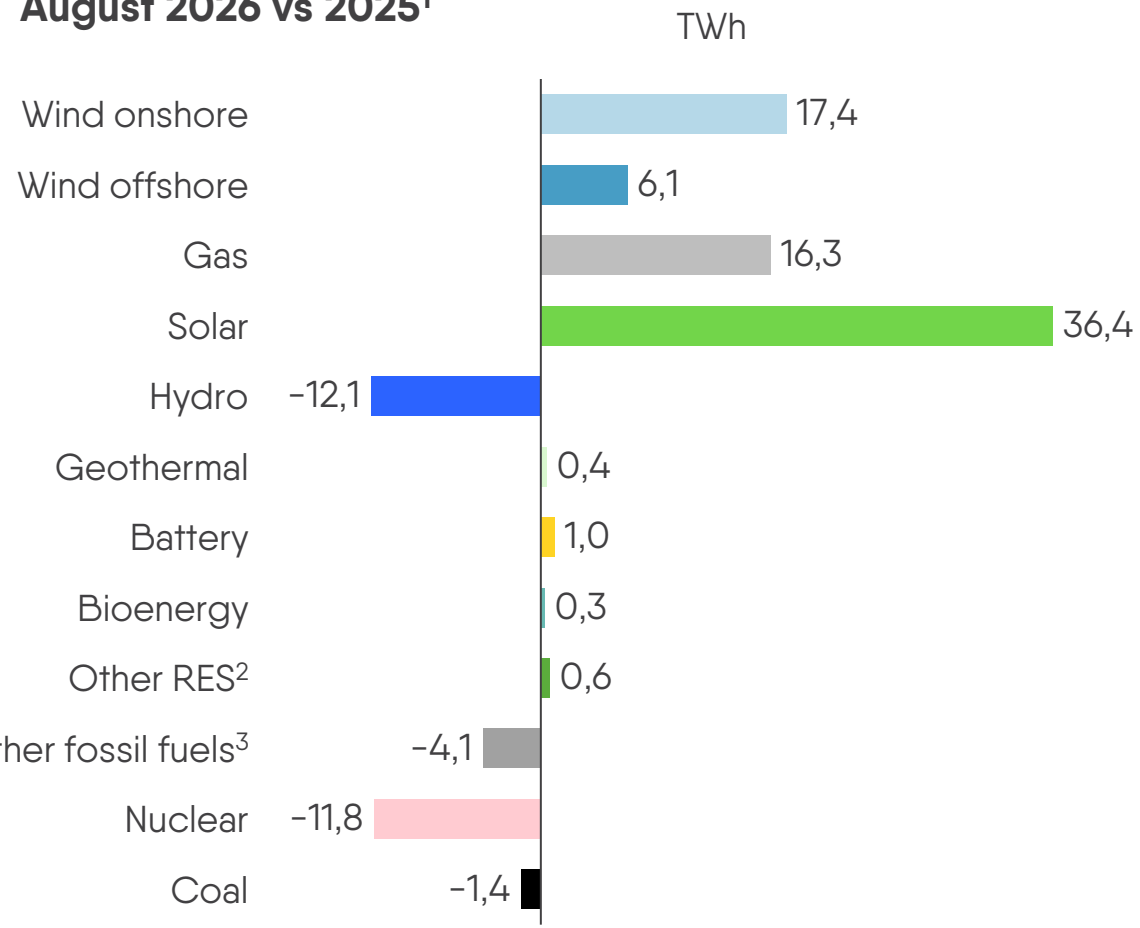
2025 saw solar growth and gas offset coal's decline; in 2026 YTD, solar and wind are leading further gains

Year-on-year changes in electricity generation mix, EU[1]



Year-on-year changes in EU generation mix, January – August 2026 vs 2025[1]

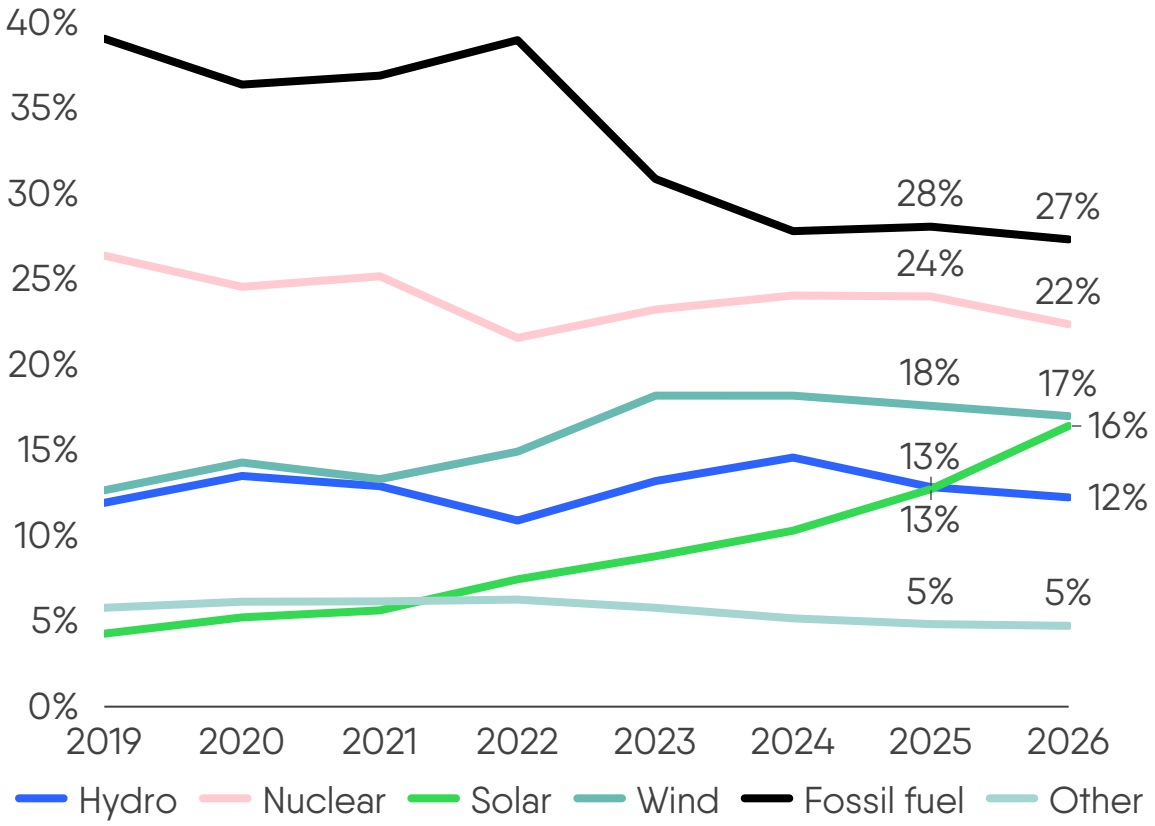


Notes: 1) Figures sourced from Elda and ENTSO-E. 2) Other renewables include geothermal energy, tides, wave and ocean energy. 3) Other fossil fuels include oil generation, non-RES waste, manufactured gases and oil shale. Sources: Elda, ENTSO-E, EEA.

Wind and solar reached 30% of EU generation in 2025, pushing fossil power below 30% and driving record-low emissions for the power sector

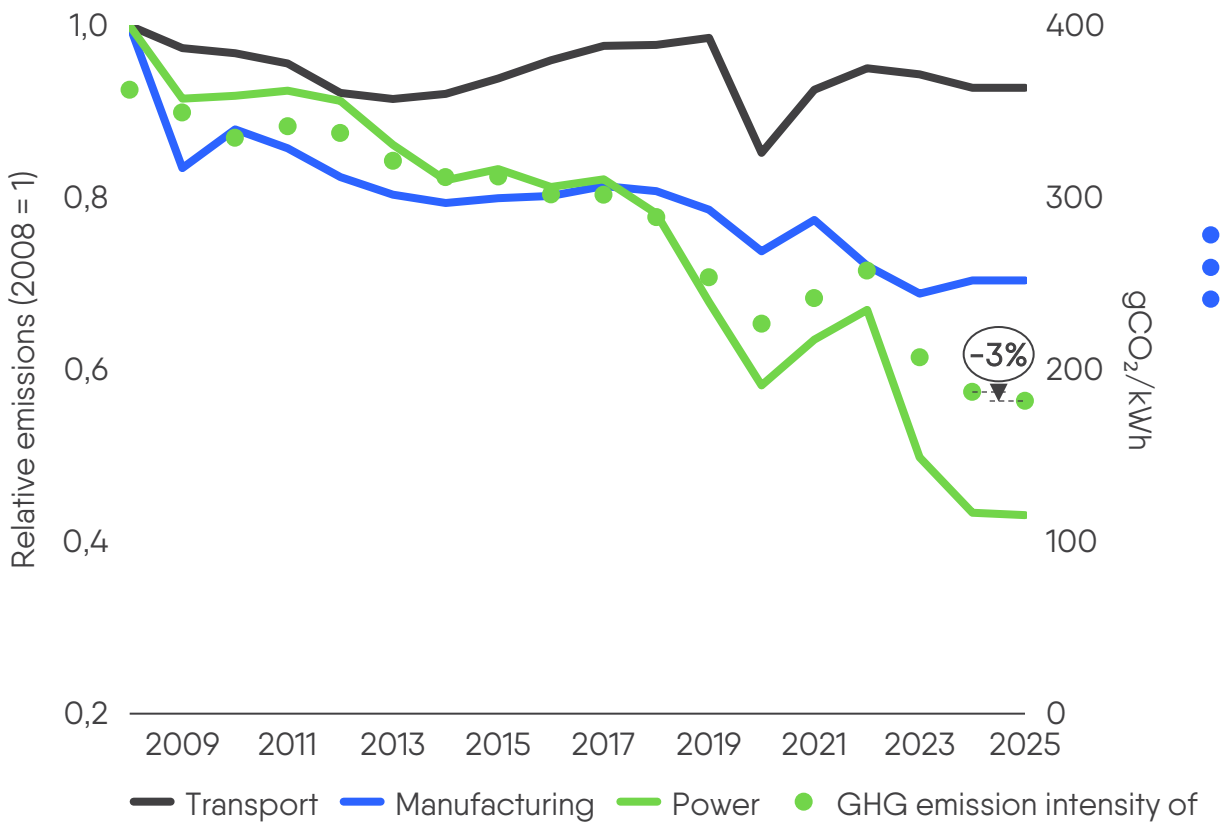
Annual share of electricity generation by technology, EU[1]

- In 2025, fossil generation remained well below 30% of the power mix, while wind and solar together reached 30% for the first time – roughly doubling their share over the past six years.



Emission reductions of selected sectors, EU[2]

- As coal and oil generation continued to shrink in the power mix, emissions intensity fell further hitting a record low of 182 gCO_2/kWh in 2025. total power-sector emissions dropped to 64% below 2008 levels.

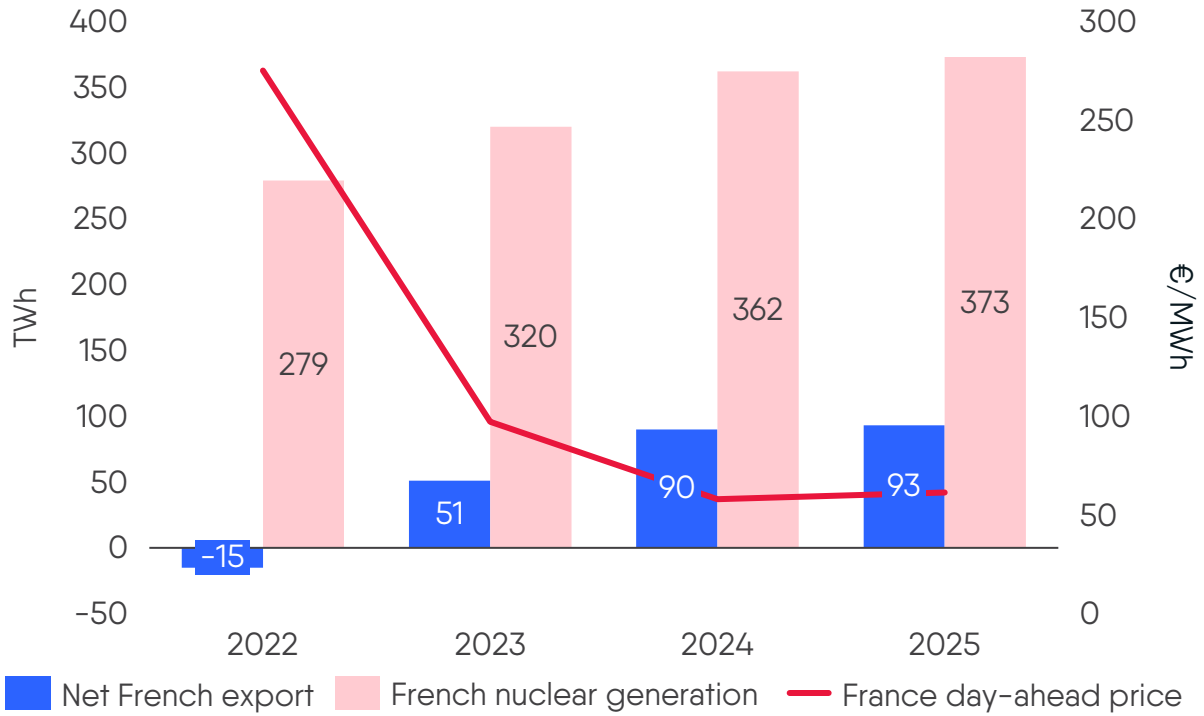


Notes: 1) Figures sourced from Elda. 2) Power figures from Elda and EEA. Transport and manufacturing figures from EEA. Sources: Elda, EEA.

As the EU's largest individual technology providing electricity, nuclear remains a key part of Europe's power system

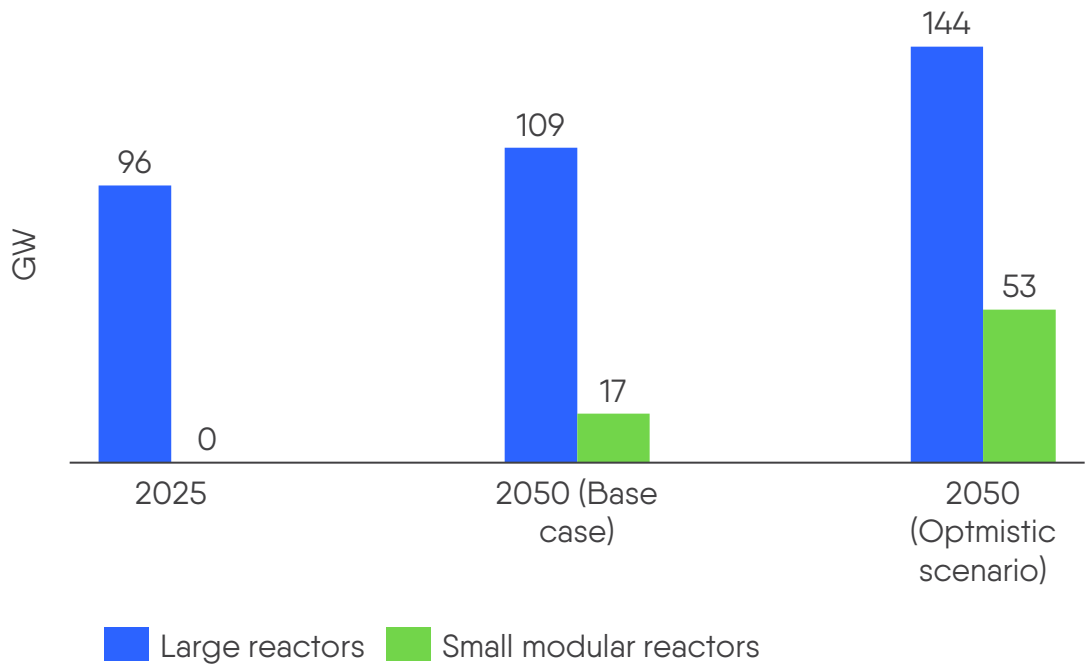
French nuclear generation vs. power prices[1]

- In 2022, technical issues forced a large part of the French nuclear fleet offline simultaneously – output collapsed to its lowest in 30 years – turning France into a net importer for the first time in decades.
- Once restored, nuclear generation rebounded to 397 TWh by 2025, flipping France into Europe's largest net power exporter, with average spot prices falling to among the lowest on the continent.



Nuclear capacity pipeline, EU[2]

- Renewed EU institutional momentum signals a turning point for nuclear energy as in March 2026, the Commission published its Small Modular Reactors' Strategy targeting the first units online by the early 2030s, with Commissioner Jørgensen stating that "nuclear energy has a role to play in building a resilient and cleaner energy system."
- Moreover, the Commission's nuclear programme projects EU installed large reactors capacity growing from 96 GW today to between 109 and 144 GW.



Notes: 1) Figures sourced from Elda. Power prices refer to annual average of hourly day-ahead power prices. 2) Figures sourced from Elda for 2025 and from the European Commission's eighth Nuclear Illustrative Programme (PINC) for 2050. 2) Sources: Elda, ENTSO-E.

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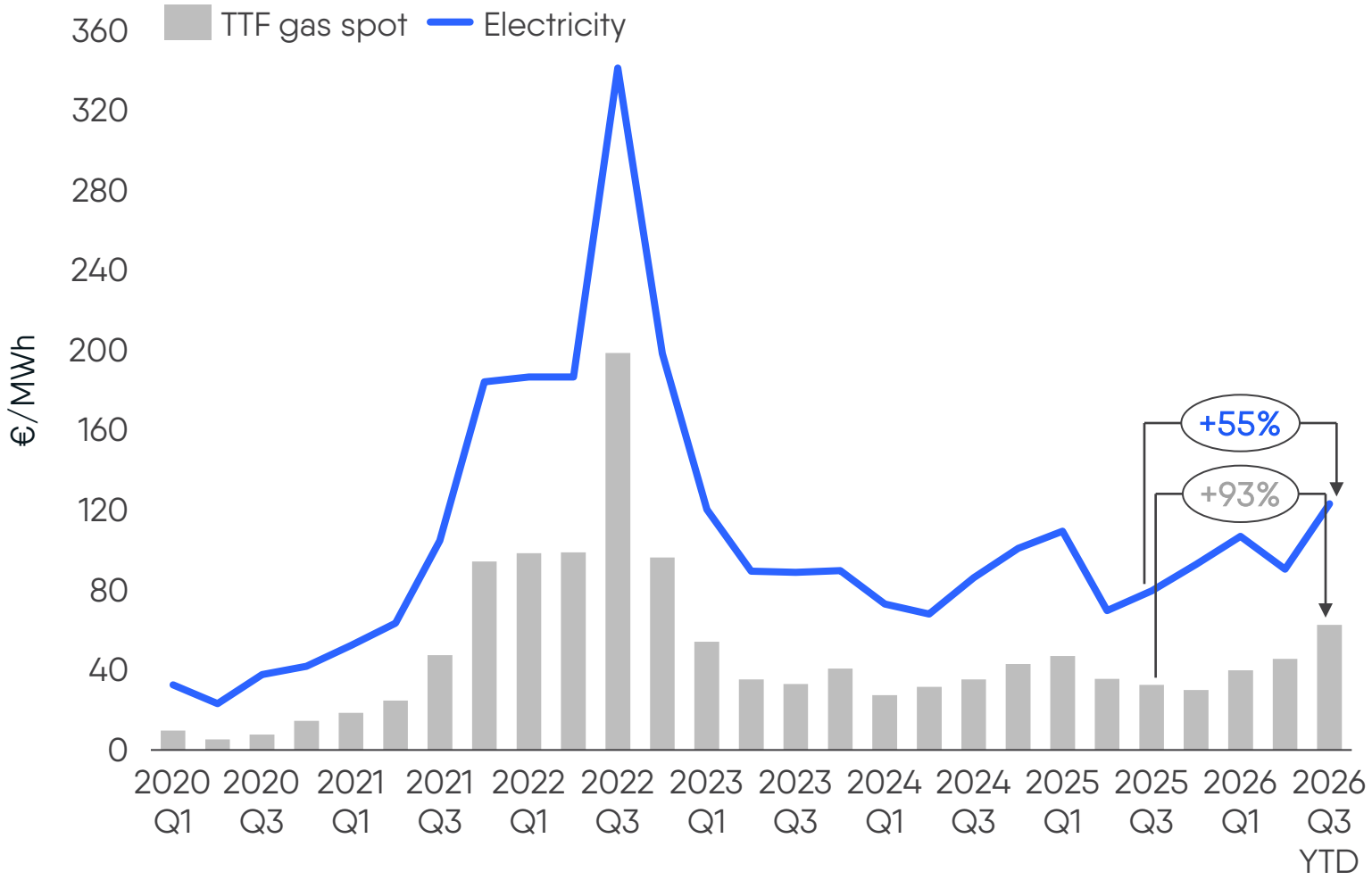
Unlike 2022, today's energy stress is concentrated in gas markets while power grids remain far more resilient than 4 years ago thanks to a higher renewables build-out

Quarterly EU power vs. TTF gas prices[1]

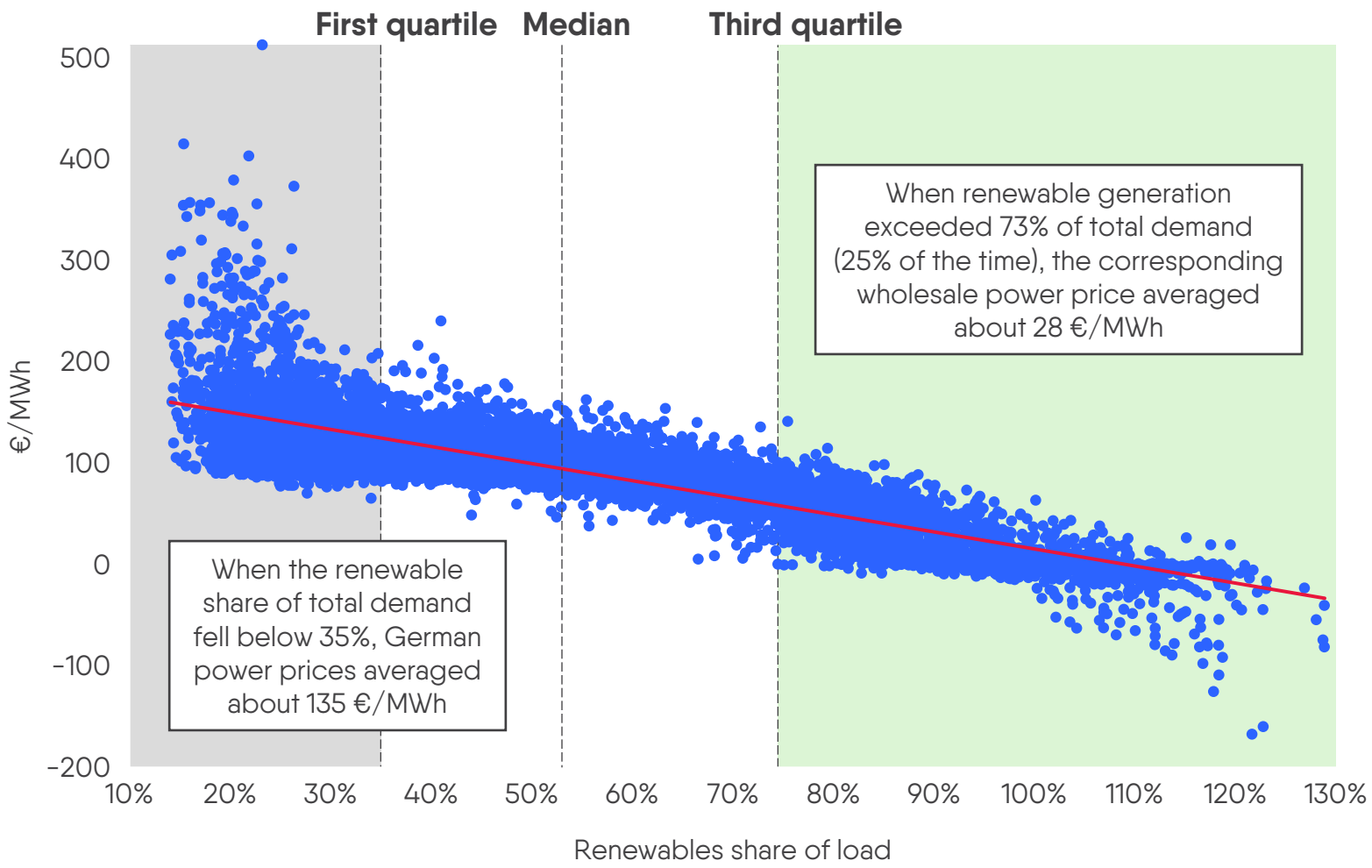


- **Today's price environment remains fundamentally different from 2022:** European wholesale electricity prices are still far below crisis peaks, despite renewed pressure from gas markets.
- The current stress is rooted in oil and gas markets, not the power system itself. The Strait of Hormuz closure pushed TTF prices to double – a gas price shock that transmits into electricity prices because gas prices influences the marginal technology price during scarcity.
- Q3 2026 brought renewed upward pressure on power prices across Europe, most pronounced during evening peaks as solar generation faded, amid higher gas prices, heat-related nuclear constraints and weaker hydro conditions.
- Continued investment in **clean power, storage and flexibility**, will be key to further limiting the transmission of gas-price shocks into electricity prices.

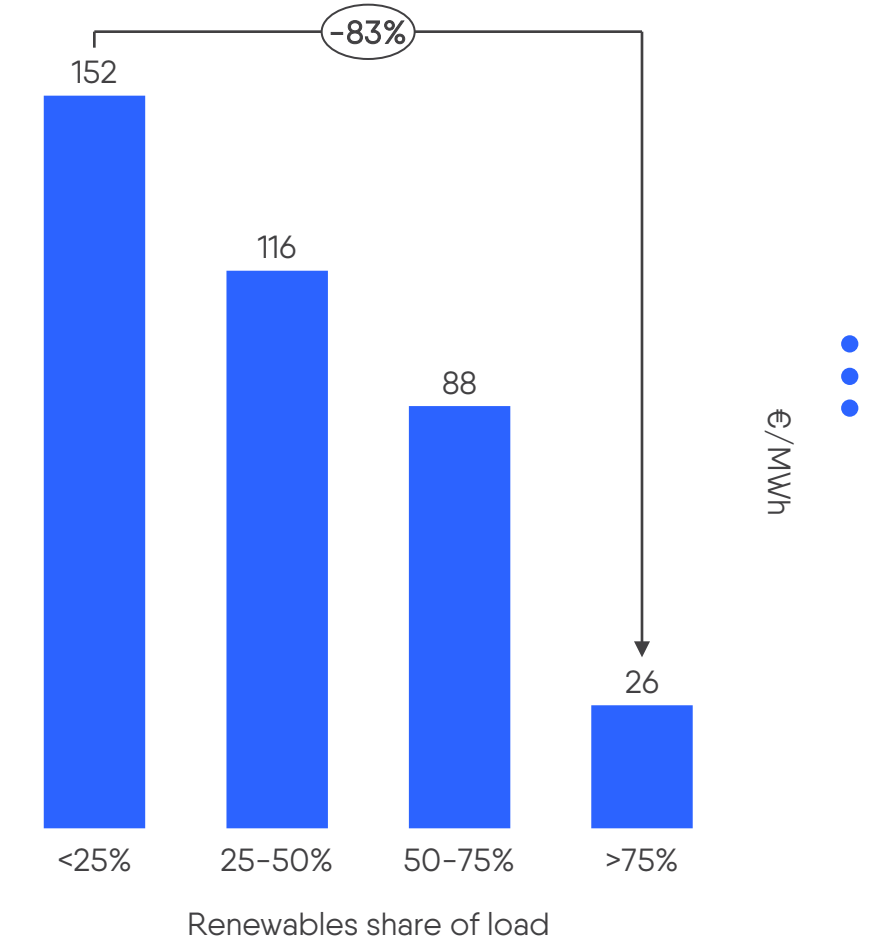
Notes: 1) Figures for power prices sourced from Elda. Figures for gas prices sourced from Elexys. TTF quarterly average is computed as a simple average of monthly TTF gas spot index quotations. EU power price quarter average is a simple unweighted average of day-ahead prices across EU bidding zones, irrespective of volumes traded. Sources: Elda, ENTSO-E, Elexys.

Renewables can drive German power prices down by more than 80%, with prices averaging below €30/MWh when renewables meet at least 73% of load

German hourly power prices, 2025[1]



Average hourly power prices by renewables penetration level[1]



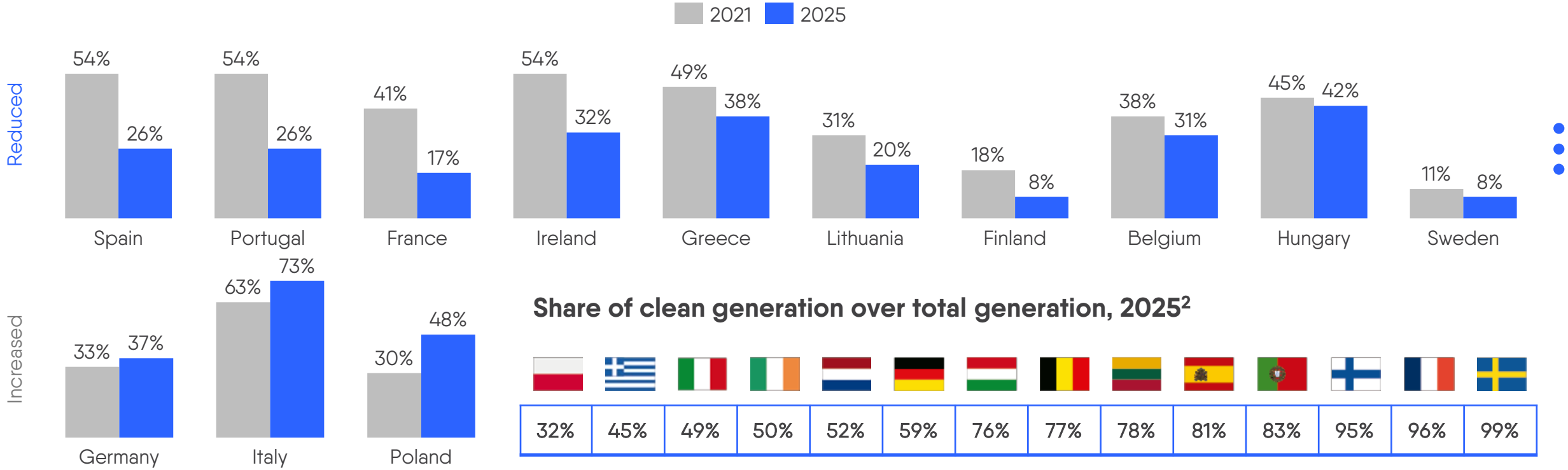
Notes: 1) Wholesale day-ahead electricity prices for DE-LU bidding zone sourced from Elda. Sources: Elda, ENTSO-E.

From price-setter to backup: gas is retreating, but the transition needs flexibility and storage to finish the job

Gas-at-the-margin frequency in selected EU electricity markets[1]

Share of yearly hours (%)

- Solar and wind now cover a record 30% of EU electricity, and together with nuclear's low-marginal-cost generation, are increasingly displacing gas in the merit order. This reflects a structural shift that is intensifying as VRE deployment accelerates, as seen in the first half of 2026.
- Italy, Germany and Poland stand out, however: Italy faced structurally weak industrial demand, while Germany and Poland are bridging coal retirement with gas.



Share of clean generation over total generation, 2025[2]

32%	45%	49%	50%	52%	59%	76%	77%	78%	81%	83%	95%	96%	99%

Notes: 1) The SRMC of gas-fired generation is the range between a lower and upper bound. The lower bound equals the TTF natural gas futures price (GCV basis, converted to LHV) divided by a net LHV efficiency of 58%, plus the EUA carbon price multiplied by an electric-output emission factor of 0.348 tCO_2/Mwh_{el} (derived from the standard natural gas LHV emission factor of 0.202 tCO_2/MWh_{th} divided by the 58% efficiency). The upper bound is a 50% markup on the lower bound. Sweden and Italy figures refer to the Sweden 3 and Italy Centre-North bidding zones 2) Figures sourced from Elda. Clean generation include renewables and nuclear energy. Sources: Investing.com, Elda, ENTSO-E.

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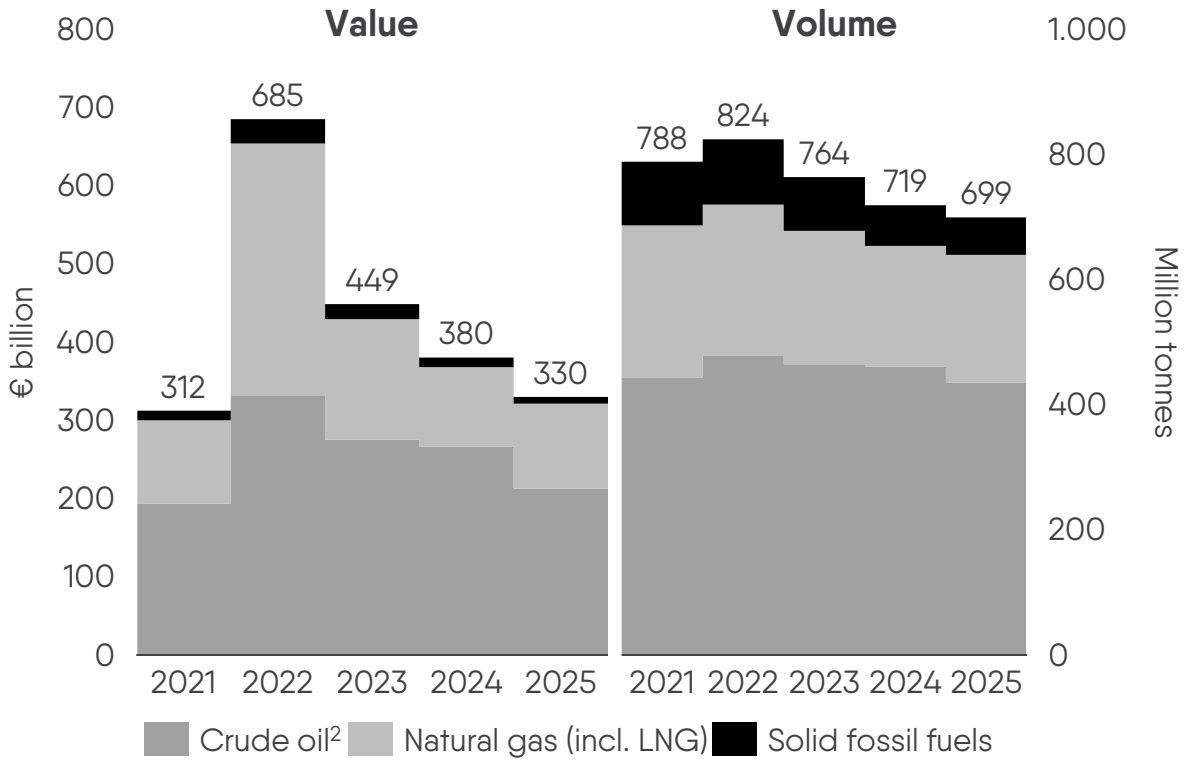
Total EU fossil-fuel imports fell in 2025 while both gas imports and demand rebounded slightly due to colder weather

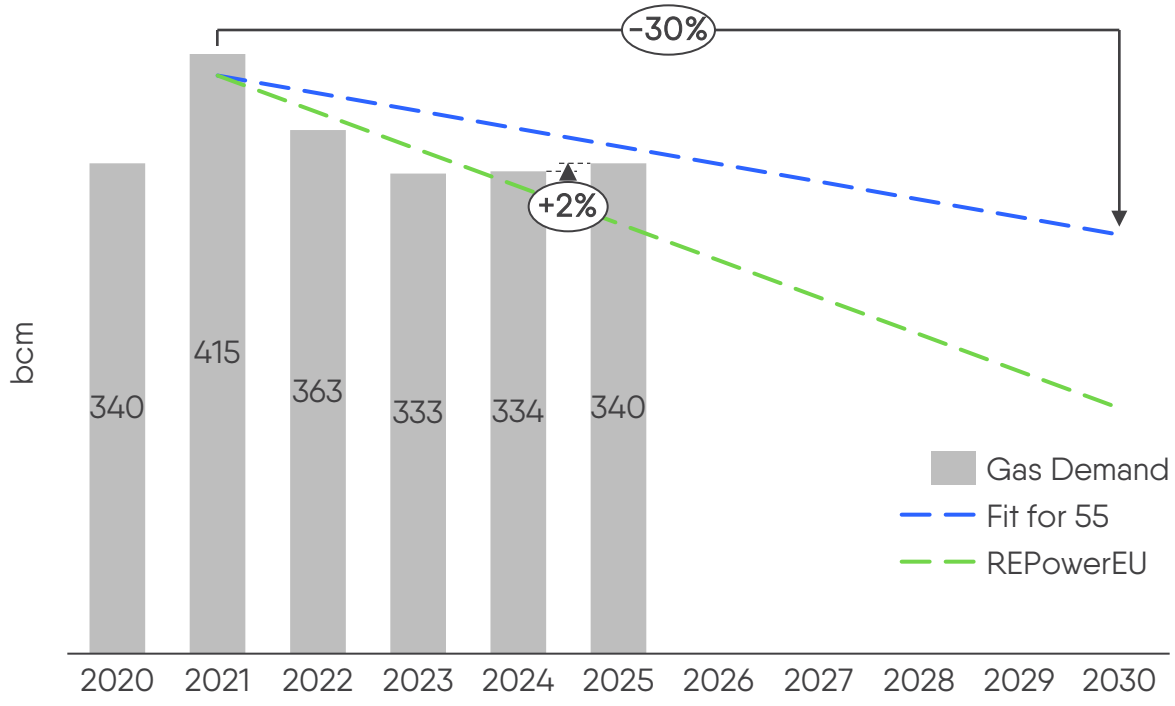
Value vs. volume of extra-EU imports of fossil fuels[1]

- In 2025, both the volume and total value of the EU's extra-EU imports fell, due to lower crude oil and coal purchases.
- The overall import bill has dropped to nearly the low levels recorded in 2021, although import prices are still higher than they were that year.



Natural gas consumption, EU[3]

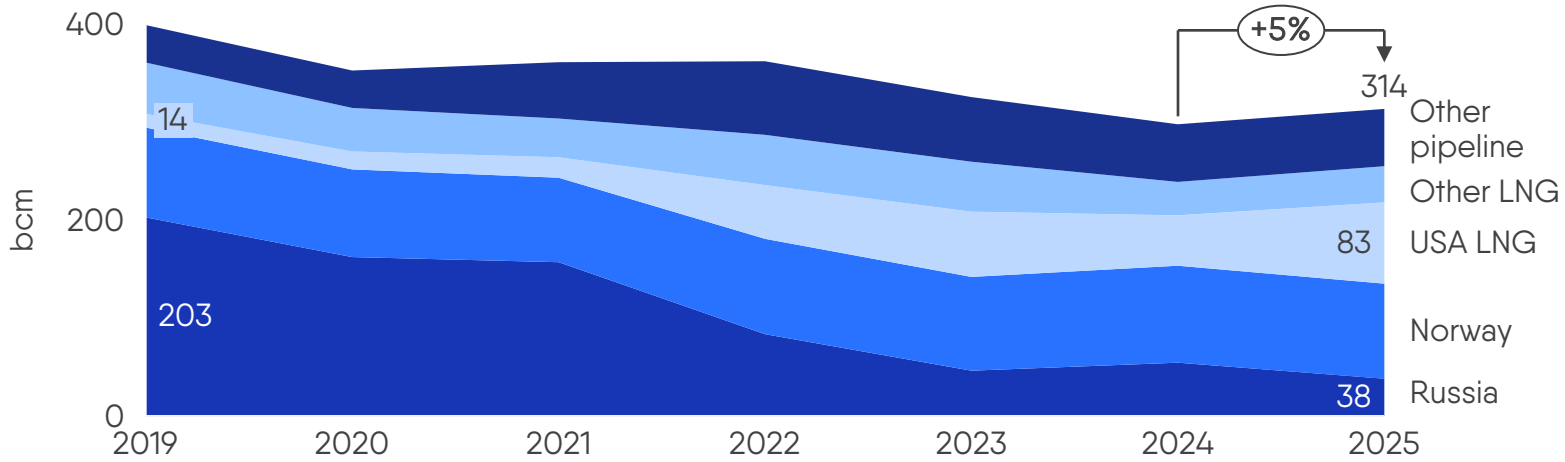
- Gas consumption climbed 2% to around 340 bcm in 2025 due to a colder winter, nonetheless well below levels seen prior to the Russian invasion of Ukraine.
- The EU remains on target to meet Fit for 55's goal of cutting demand by 30% from 2019-2021 average[4], but sustaining reductions in 2026 will be critical to keeping the target within reach.



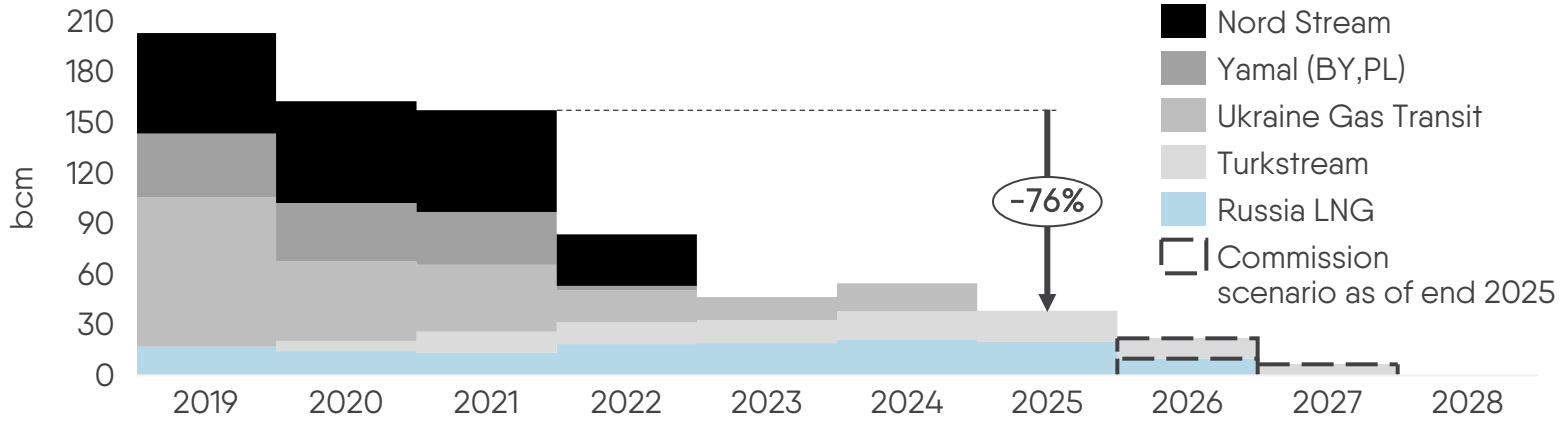
Notes: 1) Figures from Eurostat. 2) Include natural gas condensates. 3) Figures from Eurostat. 4) Targets available here. Sources: Eurostat, Bruegel, European Commission, IEA.

As Russian gas is phased out, EU has become increasingly reliant on US LNG, now accounting for almost a quarter of its natural gas imports

Natural gas imports to EU by country[1]



Russian gas imports to EU[1,2]



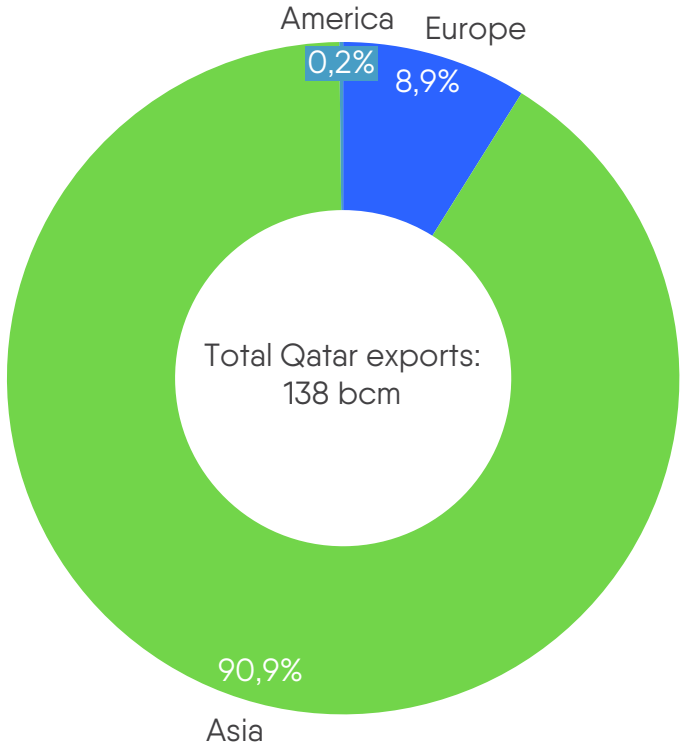
- Russian gas supplies to the EU collapsed in 2022, dropping from around 150 bcm to under 10% of total gas European demand in 2025 and triggering severe price shocks.
- In January 2026, the Council and the European Parliament agreed to ban Russian LNG imports from 1 January 2027 and to fully phase out Russian pipeline gas by 30 September 2027.
- With flows via Nord Stream and Yamal already halted, the impact will fall mainly on Hungary and Slovakia, which still receive Russian gas through Turkstream, the last remaining operational route.
- The decline in Russian gas was largely offset by higher imports of LNG and increased pipeline supplies from Norway and Algeria. Particularly, US LNG rose from about 3.5% of EU gas imports in 2019 to more than a quarter by 2025.
- While this reduced Russian dependence, it creates new political and economic vulnerabilities as Europe is now heavily exposed to US energy policy decisions and American LNG pricing raising concerns about both price volatility and reduced strategic autonomy.

Notes: 1) Figures from **Bruegel Dataset**. 2) Figures for 2026, 2027, 2028 reflect projected linear reductions based on the EU's scheduled Russian gas phase-out. Sources: Bruegel, ENTSO-G, AGSI, Eurostat.

Although Qatar exports little gas directly to the EU, European prices stay elevated because gas trades on a globally integrated market, linking prices worldwide

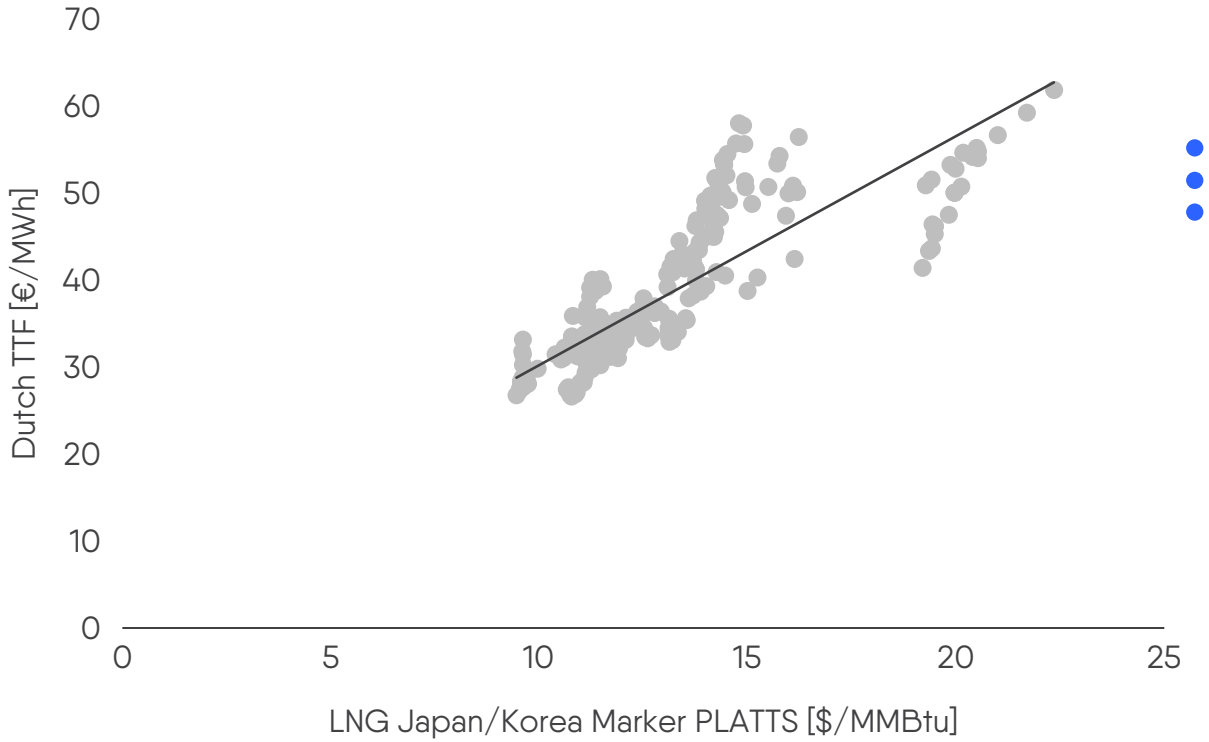
Qatar's LNG and other liquefied gases exports by region, 2025[1]

- Qatar directly supplies only 12 bcm to Europe which corresponds to less than 4% of total EU gas imports in 2025. Yet when the Iran crisis disrupted Qatari LNG exports in early 2026, TTF surged over 70% within days, despite Europe having no direct exposure to the Strait of Hormuz. Because gas is now priced globally, any regional tightening of LNG supply triggers a bidding war between Europe and Asia for flexible cargoes, driving prices up for everyone.



European vs. Asian gas benchmarks, 2025 - April 2026[2]

- Gas is now a global commodity as shown by the correlation between Dutch TTF and LNG JKM which reached a record of 0.95 in 2025 (up from just 0.15 in 2015) driven by the 70% growth in global LNG trading since 2016 and Europe's post-2022 shift away from Russian pipeline gas toward flexible spot LNG. Regional prices no longer move in isolation: supply shocks anywhere ripple everywhere.

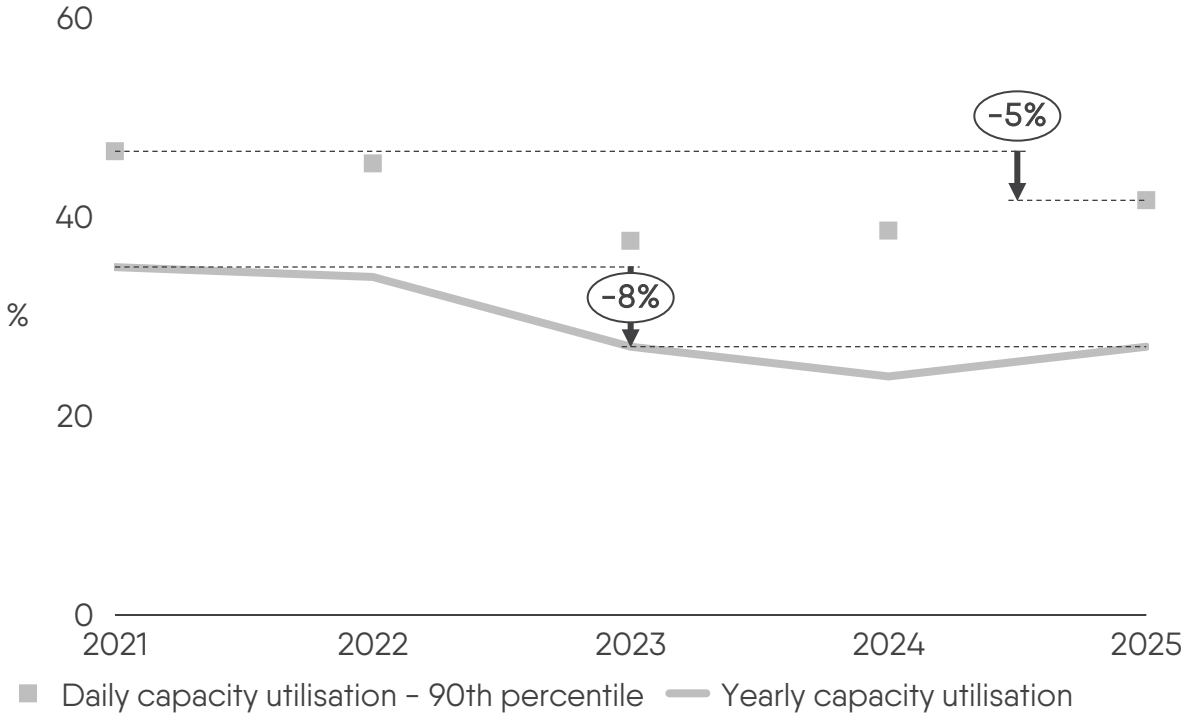


Notes: 1) Figures sourced from Qatar Open Data. 2) Figures sourced from investing.com. Sources: investing.com, Qater Open Data.

Gas generation is increasingly conditional on residual load, positioning it as a transitional bridge toward the clean flexible capacity the grid will rely on

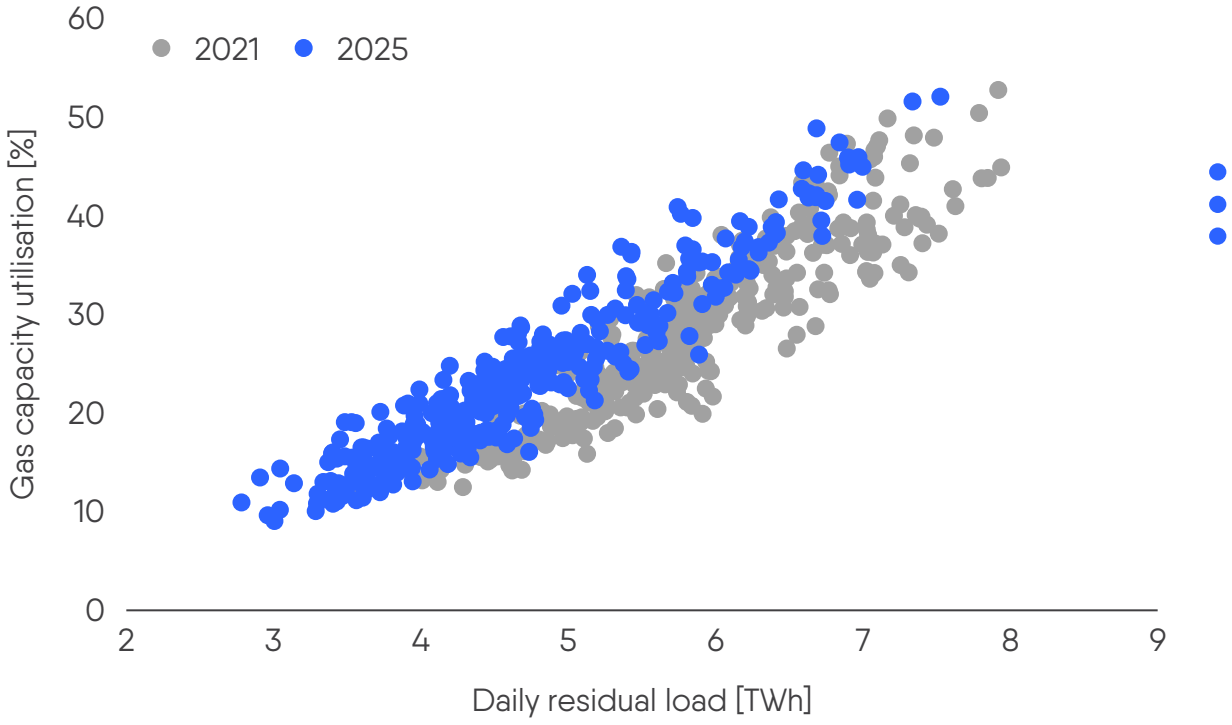
Historical utilisation of gas-fired power plants, EU[1]

- Between 2021 and 2025, both average gas capacity utilisation and high-utilisation outcomes declined indicating that gas-fired generation is used less frequently overall and reaches peak output less often.
- The increase between 2024 and 2025 on the average utilisation is due to different weather conditions and lower wind and hydro generation.



Correlation between residual load and gas utilisation, EU[1]

- Compared to 2021, the stronger response of gas utilisation to residual load in 2025 shows that gas-fired generation is increasingly deployed as a scarcity and balancing resource, primarily during periods of low renewable output.
- The steepening of the relationship reflects a structural shift in the role of gas from mid-load generation toward a flexibility- and scarcity-driven function.



Notes: 1) Figures from Elda. EU figures refer to a simple average between all EU member states. Sources: Elda, Eurostat.

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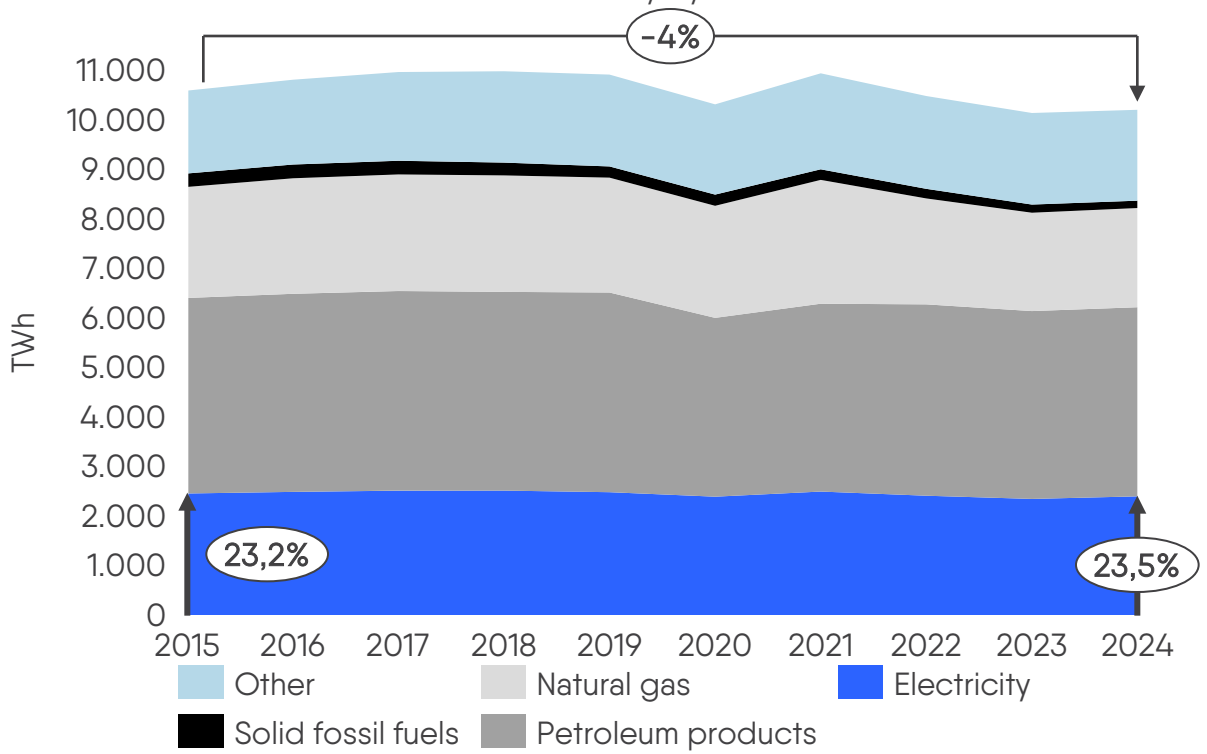
Rising electrification in transport and households partially offset industrial decline, keeping overall EU electricity consumption stagnant in the last decade

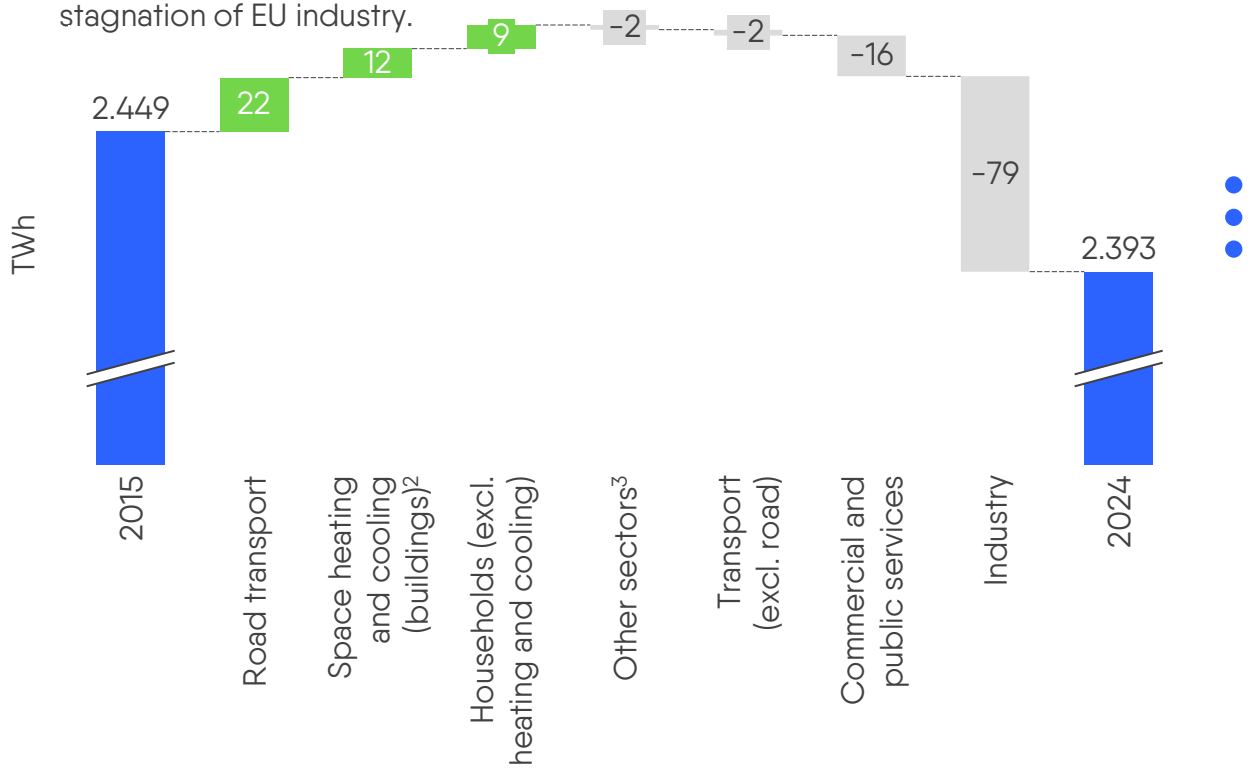
Final energy consumption by fuel, EU27[1]

- Over the past decade, energy use has fallen by 4%, reflecting energy-efficiency measures, structural shifts in the economy, higher energy prices and milder winters.
- In this period, aggregate electricity demand has contracted by roughly 2% as the electrification rate has increased only by modest 0.3%.



Final electricity consumption by sector, EU27[1]

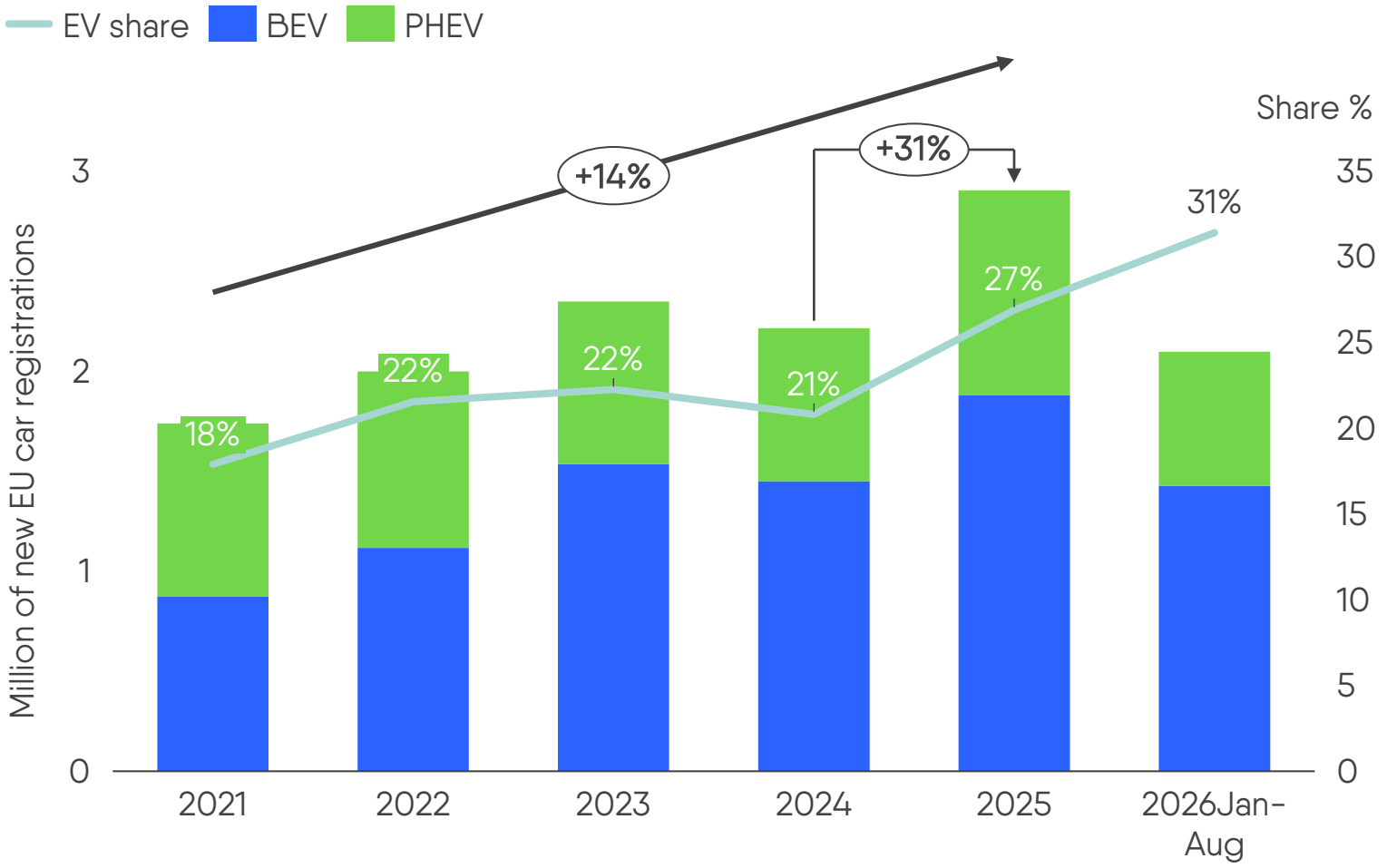
- Since 2015, electricity consumption has undergone significant structural shifts. The transport sector saw the strongest growth at 35%, driven by rising EV adoption, while the residential sector posted a modest 3% increase due to the broader uptake of heat pumps. Conversely, the industrial sector contracted by nearly 80 TWh – reflecting both improved energy efficiency and the broader stagnation of EU industry.



Notes: 1) Figures sourced from Eurostat. They refer to energy use only. 2) Data refers to 2023 as 2024 is not available. 3) Other sectors include agriculture, forestry, fishing and sectors not specified.
Sources: Eurostat.

Electric vehicles sales rebound in 2025 with almost 3 million of new cars registered marking a 31% increase from the previous year

Annual sales of passenger car EVs and share in total new EU car sales[1]



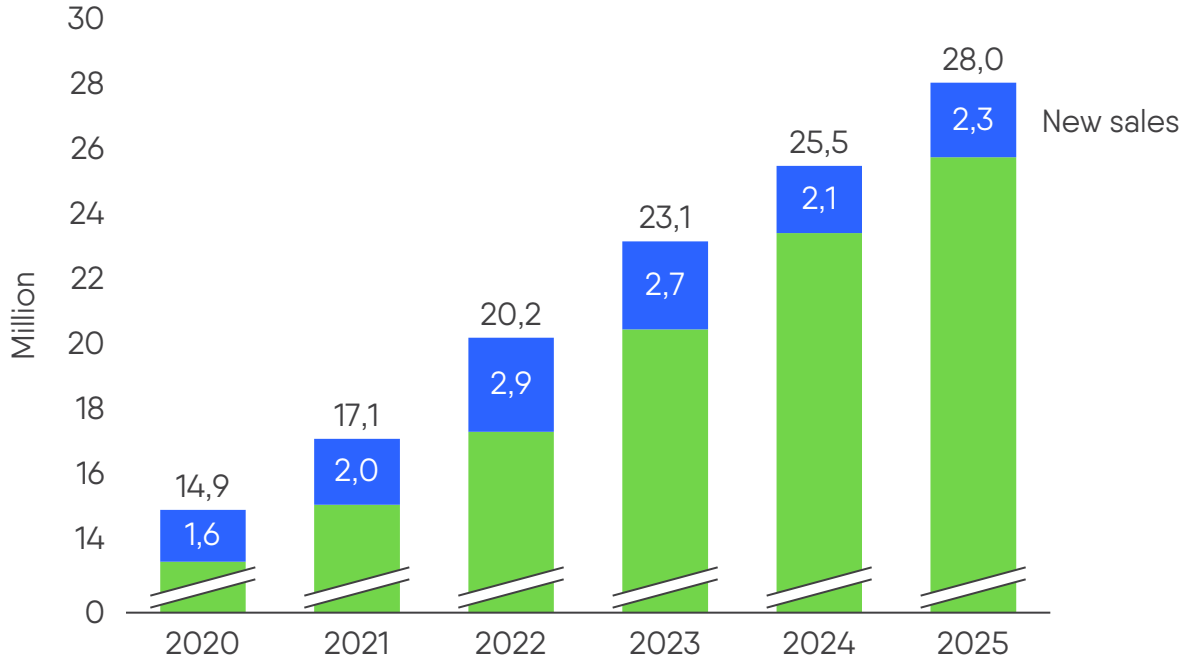
Notes: 1) Figures from ACEA. Sources: European Alternative Fuels Observatory, ACEA, JD Power Autovista.

- As of 2026 August EU EV car registrations share reached 31 %, a remarkable growth from 24 % in 2024 and 27 % in 2025, broadly matching expectations for the year but still signalling significant headroom for further expansion if the transition is to remain on course.
- Across 2025, the EU recorded 1,88 million newly registered BEVs, equivalent to that 17.4% share. Momentum was strongest in the EU's four biggest BEV markets (together responsible for 62% of registrations) with increases in Germany (+43.2%), the Netherlands (+18.1%), Belgium (+12.6%), and France (+12.5%).
- Even so, hybrid-electric models remain consumers' top choice overall, while plug-in hybrids continue to strengthen and stabilize their foothold in the market.
- Global sales of electrified vehicles climbed 25% in 2024, reaching 17.8 million units and pushing their share of the light-vehicle market up to 19.9%.
- The increase was powered mainly by continued strength in China and a faster rise in plug-in hybrid demand; EVs are estimated to make up 56.4% of all light-vehicle sales in 2025, with PHEVs alone accounting for 42.3%.

EU's heat pump market stabilizes after a sharp contraction, yet the rebound remains uneven as sustained policy support is critical to sustain momentum

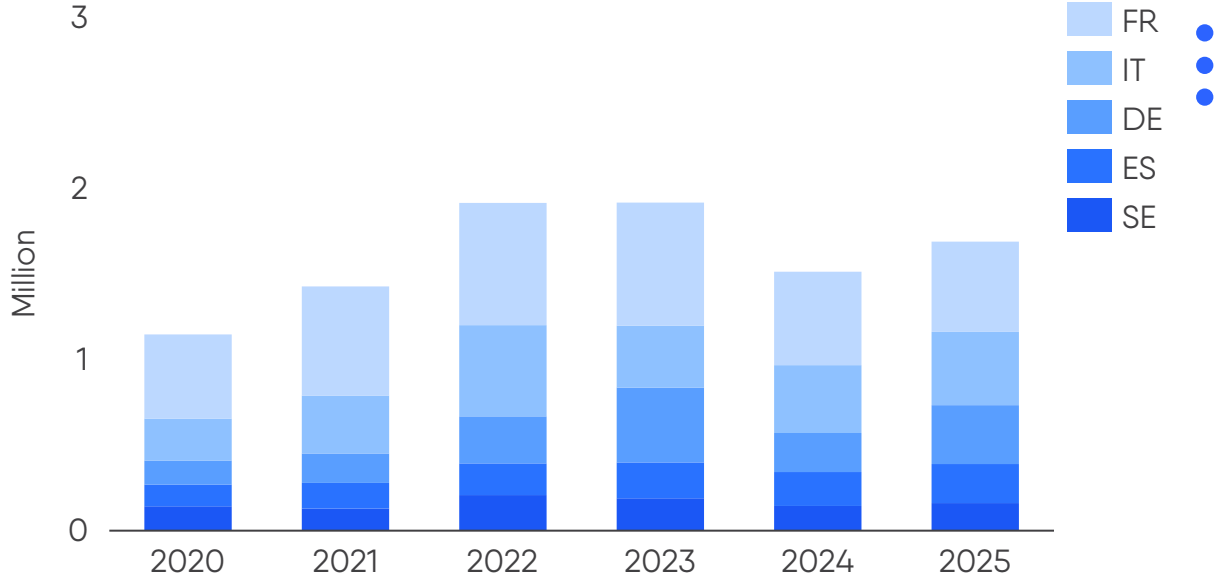
Stock of installed heat pumps in 13 EU countries[1]

- Following a sharp 23% contraction in 2024, European heat pump sales recovered 11% in 2025, as the market stabilized after two years of correction from the artificially elevated demand of 2022–2023.
- The simultaneous arrival of a new generation of retrofit-compatible heat pump models, and more competitive electricity tariffs collectively lowered both the technical and financial barriers to adoption, restoring consumer confidence.



Installed heat pump stock, selected EU countries[1]

- France remained the largest market but structurally challenged as it saw installation rates declining yearly from 720,000 units in 2023 to just over half a million in 2025. On the other hand, Germany, which experienced the sharpest decline in 2024, saw the strongest rebound in the EU in 2025 reaching 345,000 units sold.
- The Nordics, driven by cold-climate necessity, high electricity grid reliability, and decades of policy continuity, continue to strongly lead sales on a per-household basis.



Notes: 1) Figures sourced from EHPA. Selected countries include France, Italy, Germany, Spain, Sweden, Netherlands, Belgium, Finland, Poland, Portugal, Austria, Czech Republic, Denmark. Sources: EHPA.

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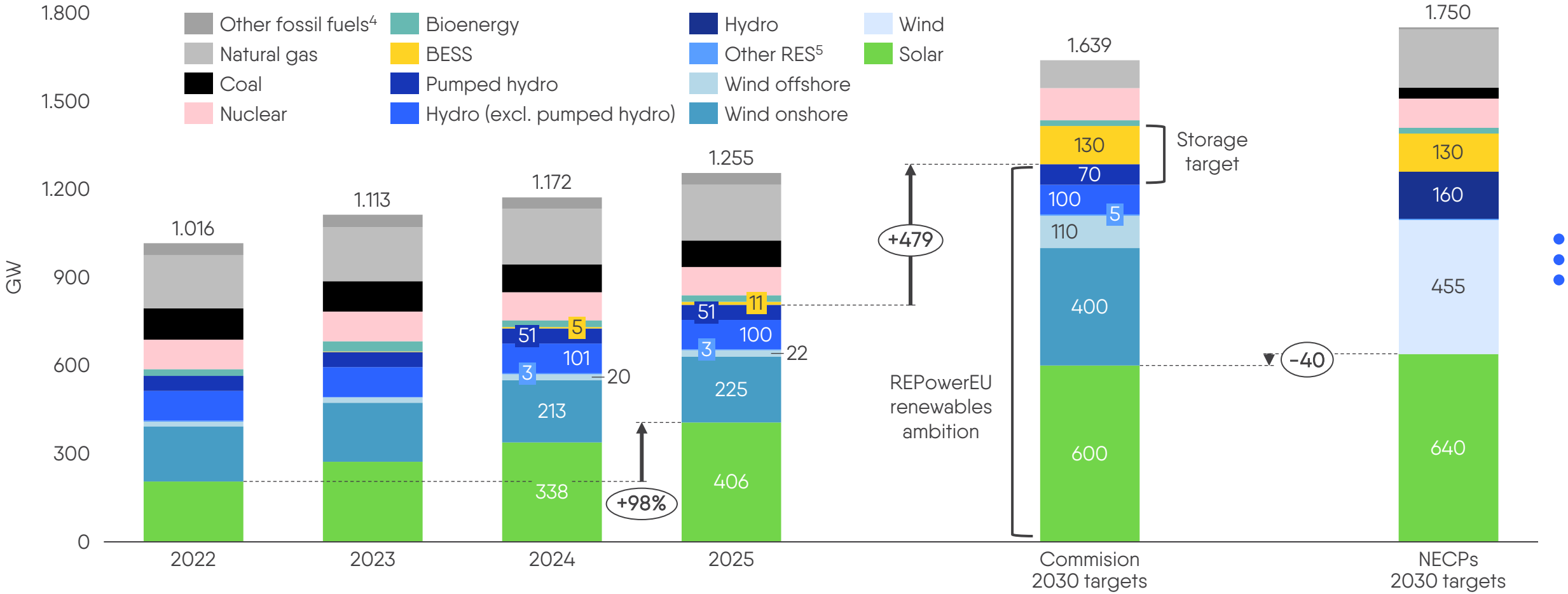
EU needs more than 450 GW of new renewable capacity by 2030 to meet Commission and NECPs' targets

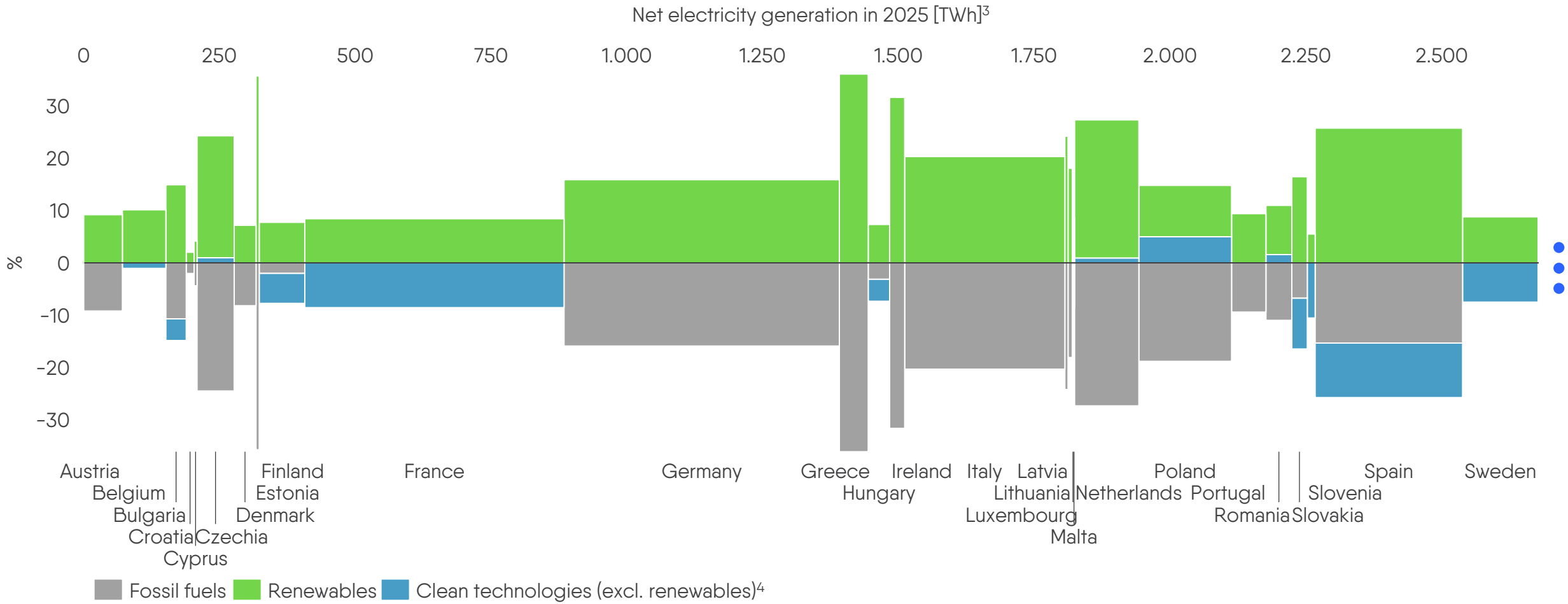
Installed capacity with Commission and NECPs 2030 targets[1,2,3]



Notes: 1) Historical data sourced from Elda and European Commission. 2) NECPs targets are sourced from Ember. 3) For fossil fuels, NECPs expect a robust decline in generation but maintain build-out for security of supply and capacity-mechanisms. Commission's assumptions are instead based on generation. 4) Other fossil fuels include oil generation, non-RES waste, manufactured gases and oil shale. 5) Other renewables include geothermal energy, tides, wave and ocean energy. Sources: Elda, ENTSO-E, European Commission, JRC, LCP Delta, IEA, Ember Center on Global Energy Policy at Columbia.

Renewables' share of electricity generation is projected to rise on average by 15 p.p. by 2030 across EU member states

Change in technology share between 2025 actual power generation and 2030 planned generation[1,2]



Notes: 1) 2025 figures sourced from Elda. 2) NECPs 2030 targets sourced from Ember are used for 2030. In cases where countries do not have explicit NECP targets, Ember applies effective targets, derived from the latest national policy announcements or from modelling conducted by Ember or other trusted sources. 3) Difference between actual generation and net imports. 4) Include nuclear and abated fossil fuels. Sources: Elda, Ember, ENTSO-E, European Commission.

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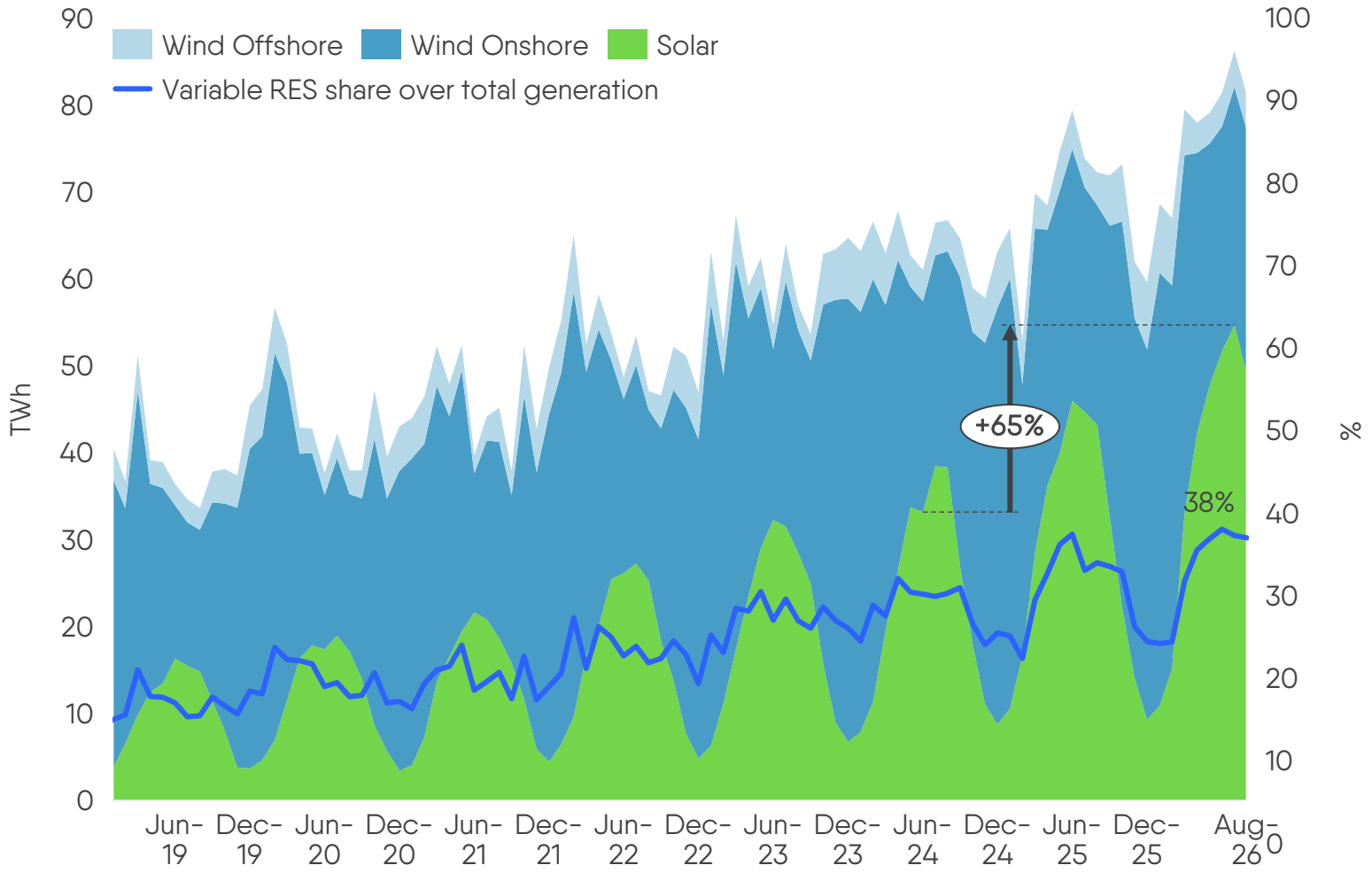
Wind and solar accelerate Europe's power transition in 2025 and 2026, with variable renewables nearing 40% of total EU electricity generation in June

VRE installed capacity, EU[1]

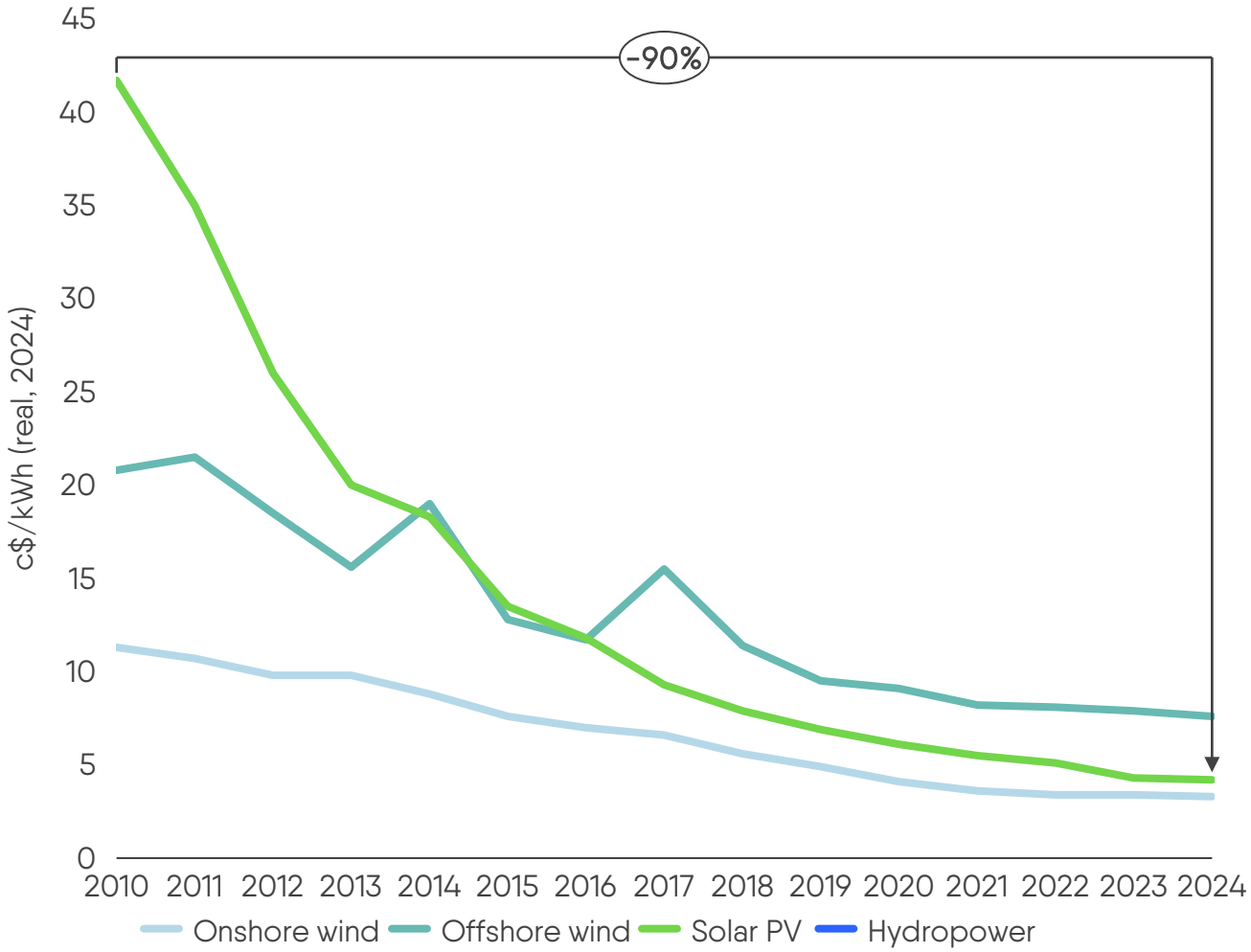


- Wind and solar generation in Europe has expanded rapidly since 2019, with combined output rising from 470 TWh to 824 TWh in 2025 and averaging roughly 11% growth per year over this period.
- By mid-2020s, wind and solar have become central to the EU power mix: together they supplied about 28% of EU electricity in 2024 exceeding for the first time the combined output of all fossil fuels.
- Record solar generation in July 2026, with more than 55 TWh of monthly output (+65% compared to two years ago), pushed total variable renewables to more than 90 TWh of generation that month, and their share of total EU electricity generation almost reached 40%.
- Short-term variability remains a system challenge. For example, wind generation dipped in early 2025 and also in Q2 2026 while solar surged, illustrating exposure to weather shocks and the need for grid reinforcement, storage and flexible demand to integrate growing volumes of variable renewables without compromising security of supply.

Notes: 1) Figures sourced from Elda. Sources: Elda, ENTSO-E.

Variable renewable electricity costs have plummeted since 2010, costing now well below c$10 /kWh

Global weighted average of LCOE by technology[1]



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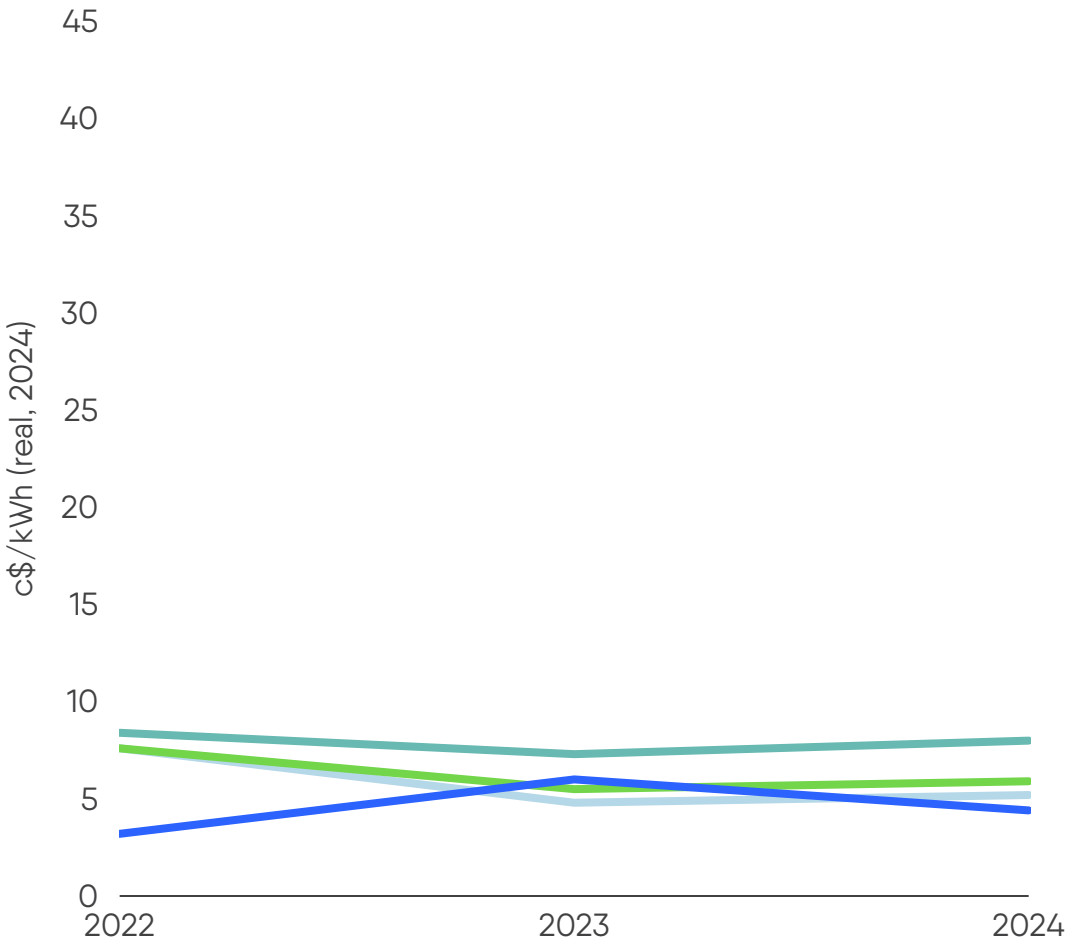
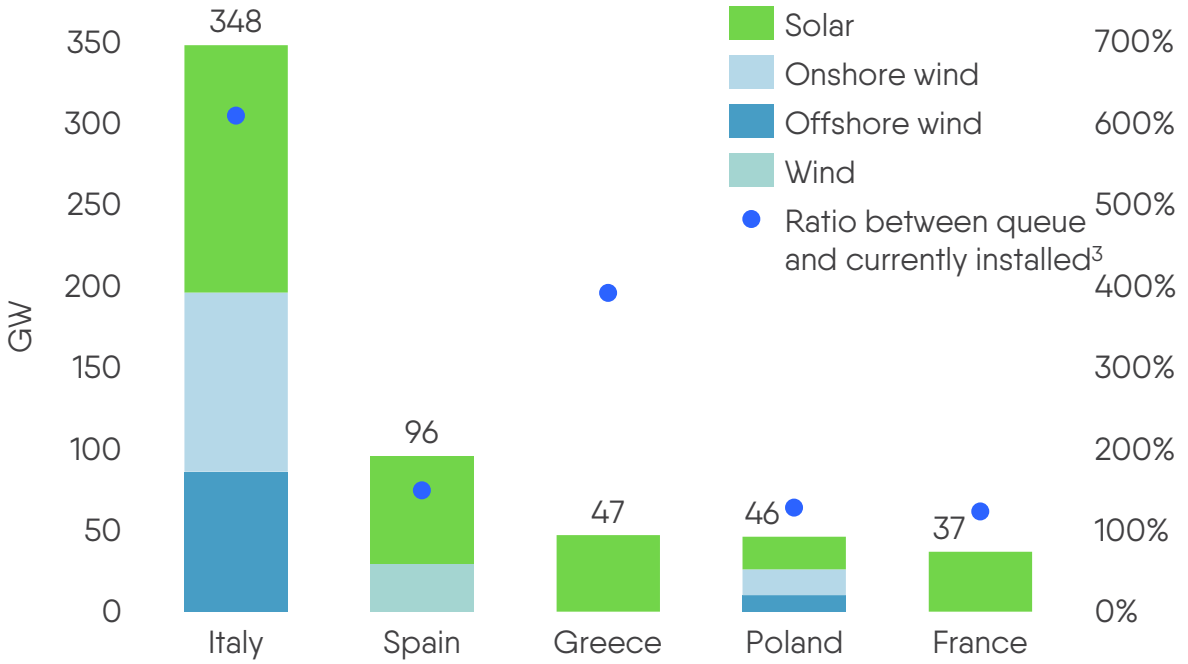


Notes: 1) Figures sourced from IRENA. Sources: IRENA.

Massive renewable and storage connection queues reflect strong investor interest, but permitting must be streamlined to enable timely connections

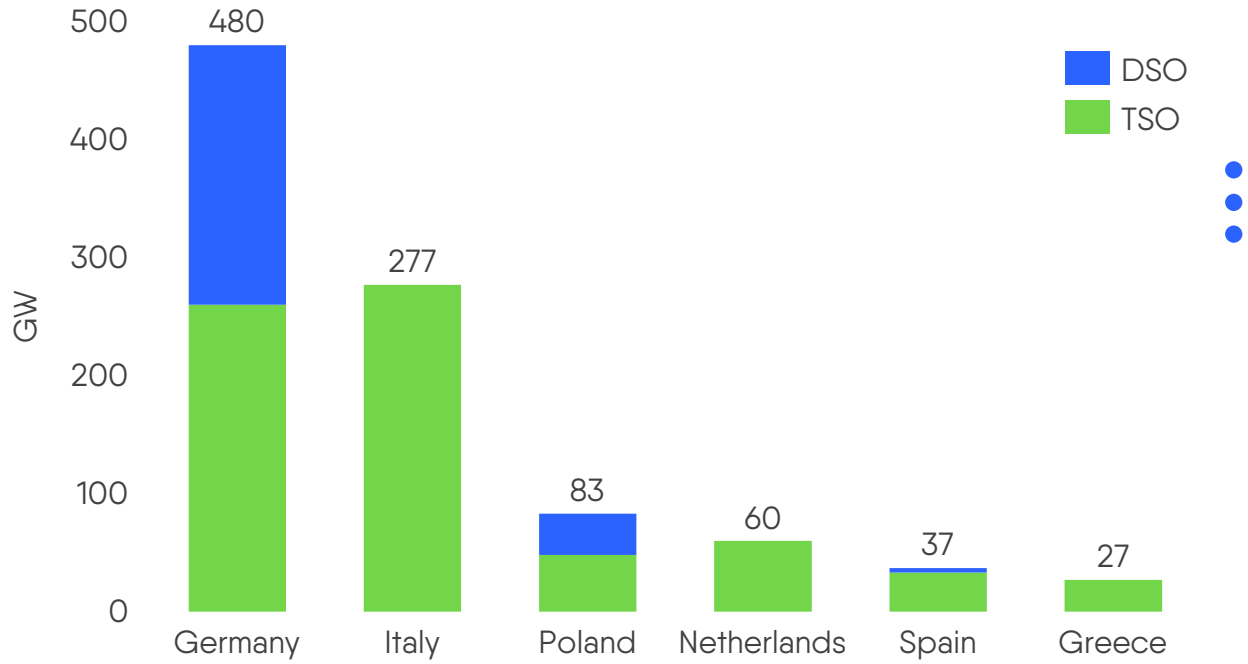
Renewable energy grid connection queue by country[1]

- Across the EU, the pipeline of variable renewable energy projects awaiting grid connection has grown substantially, outpacing available network capacity. Italy leads with 348 GW (almost six times higher than its currently installed VRE capacity) in queue partly reflecting Terna's reporting methodology, which counts all submitted requests regardless of viability.



Battery energy storage grid connection queue by country[1,2]

- Demand for battery energy storage system grid connections is equally significant, with Germany recording the largest queue at 480 GW – driven by a large volume of distribution-level requests across its 900 DSOs – followed by Italy at 277 GW at TSO level. In most markets, only a small fraction of queued capacity is expected to ultimately reach commissioning.

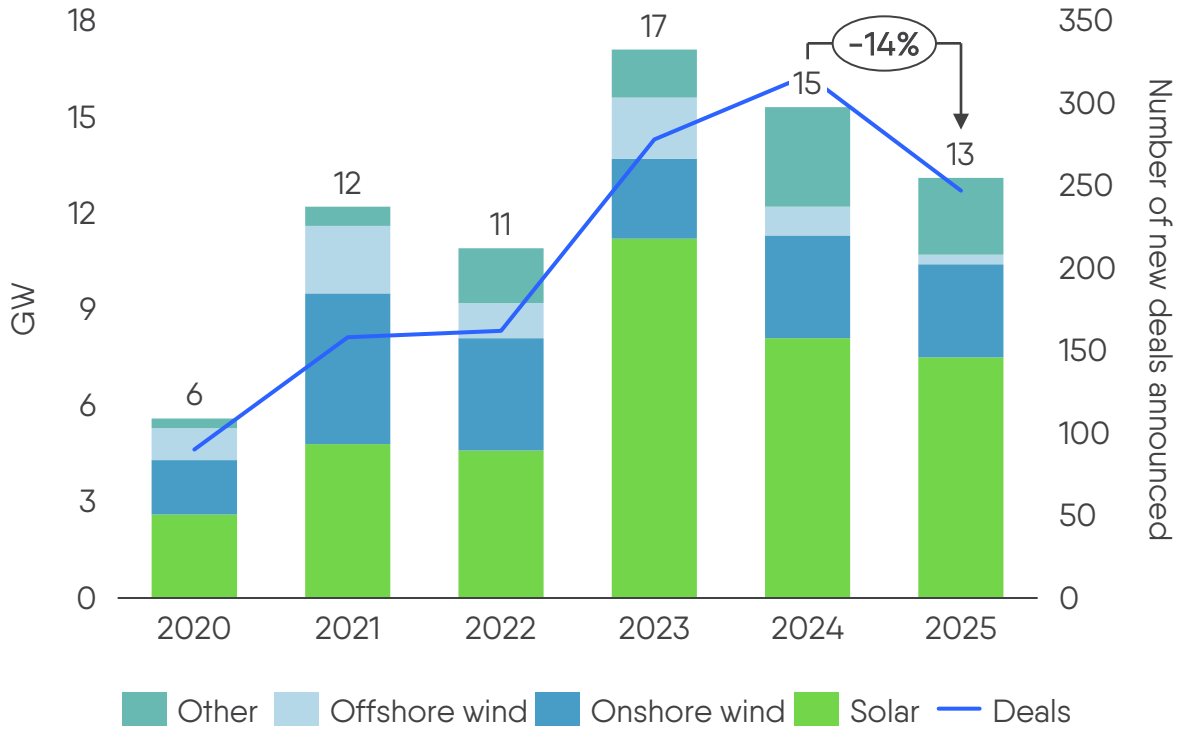


Figures: 1) Figures include all projects awaiting connection terms regardless of permit stage. Where figures are not reported, this reflects the absence of publicly accessible. Figures for Germany sourced from PV Magazine. Figures for Italy from Terna (as of December 2024). Figures for Spain from REE (as of May 2026), and APPA (as of March 2025). Figures for the Netherlands from ESS (as of September 2025). Figures for France from SDES (as of September 2025). Figures for Poland from PSE (as of March 2026). Figures for Greece from Balkan Green Energy News (as of December 2024) and Energy Mag (as of February 2026). 2) All storage projects include both standalone and co-located. 3) Figures for currently installed capacity are sourced from Elda. For all countries expect France and Greece, the figures for currently installed capacity refer to total VRE installed capacity. For Greece and France, only to solar.

Energy transition capital pivots to flexibility as in 2025, BESS and FPA deals volume nearly triple from 2024 while long-term PPAs volume declines by 14%

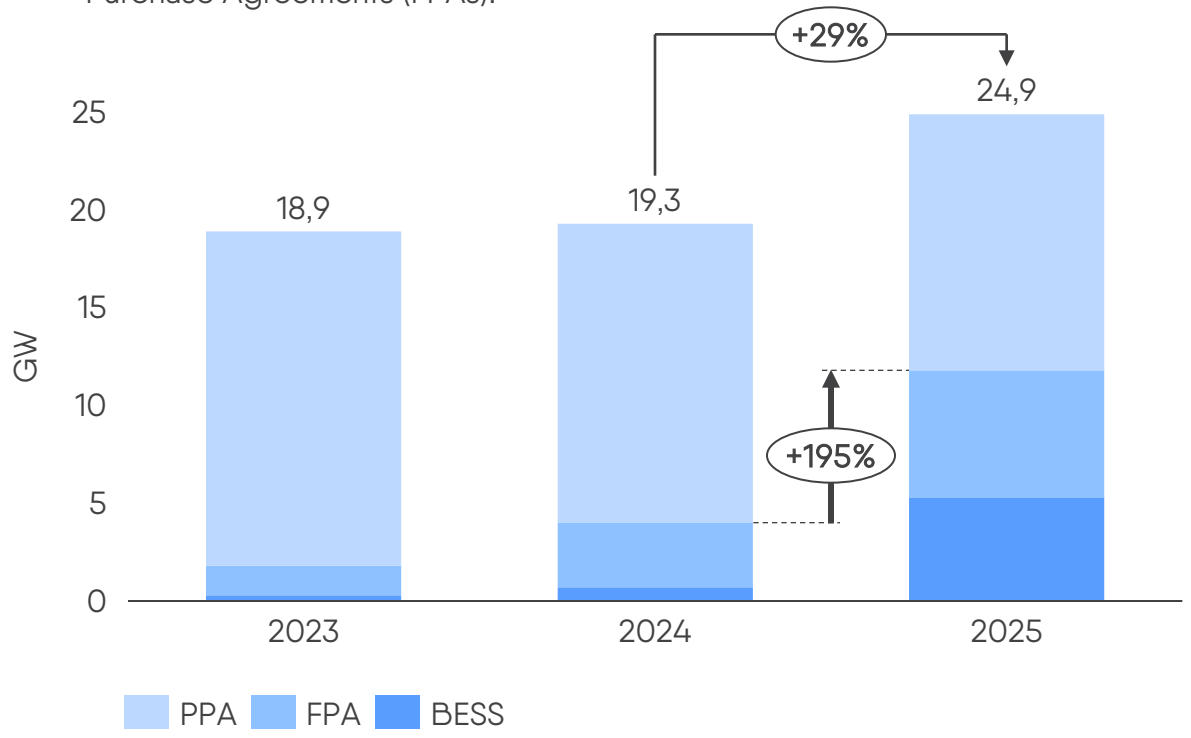
New PPA deals by technology, Europe[1]

- Renewables price cannibalisation weighed on both the number and volume of PPA deals. Solar remained the dominant technology, while the IT sector continued to lead corporate procurement despite a broader slowdown in demand in 2025. Part of this decline reflects many large corporations meeting their 2025 procurement targets earlier than expected.



New PPA and BESS deals, Europe[1]

- The drop in long-term PPA volumes does not indicate reduced funding for the energy transition. Instead, as challenging power market conditions have slowed funding for new merchant generation, capital deployment remains strong with more capital being directed toward flexible assets. This is highlighted by the surge in BESS offtake agreements and in Flexibility Purchase Agreements (FPAs).



Notes: 1) Figures sourced from Pexapark. Europe includes EU27 + Norway and UK. Sources: Pexapark.

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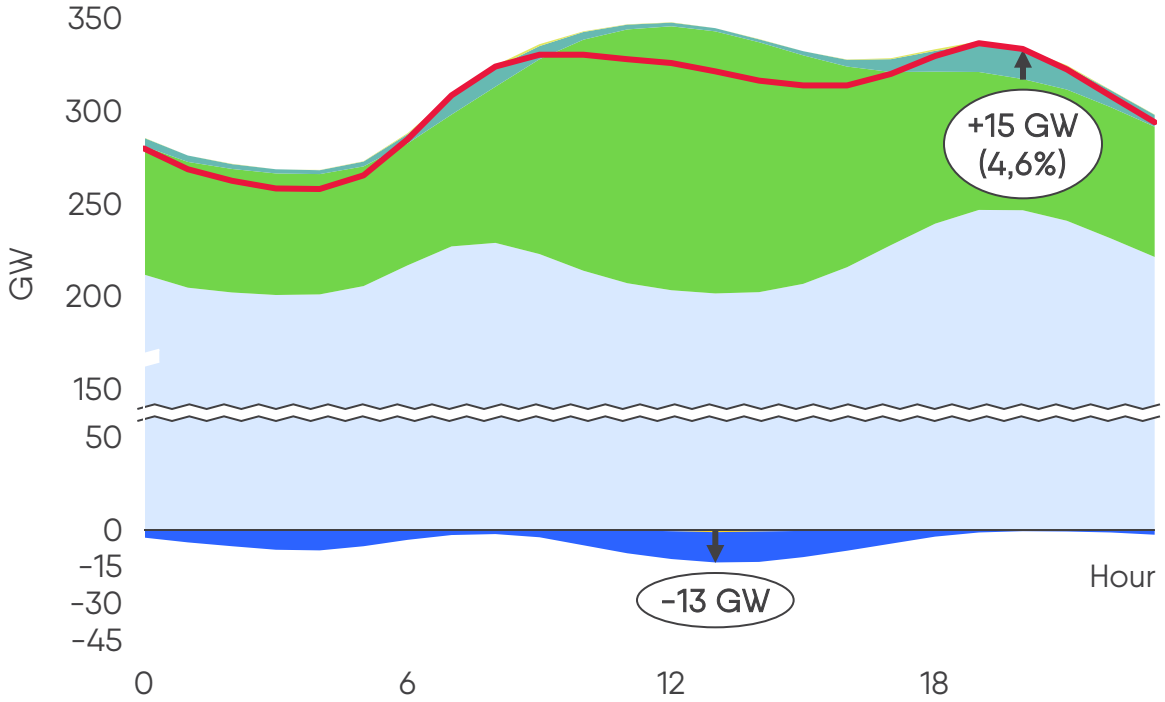
Pumped hydro proves storage works – but Europe's storage pipeline must scale for a flexible, clean power system

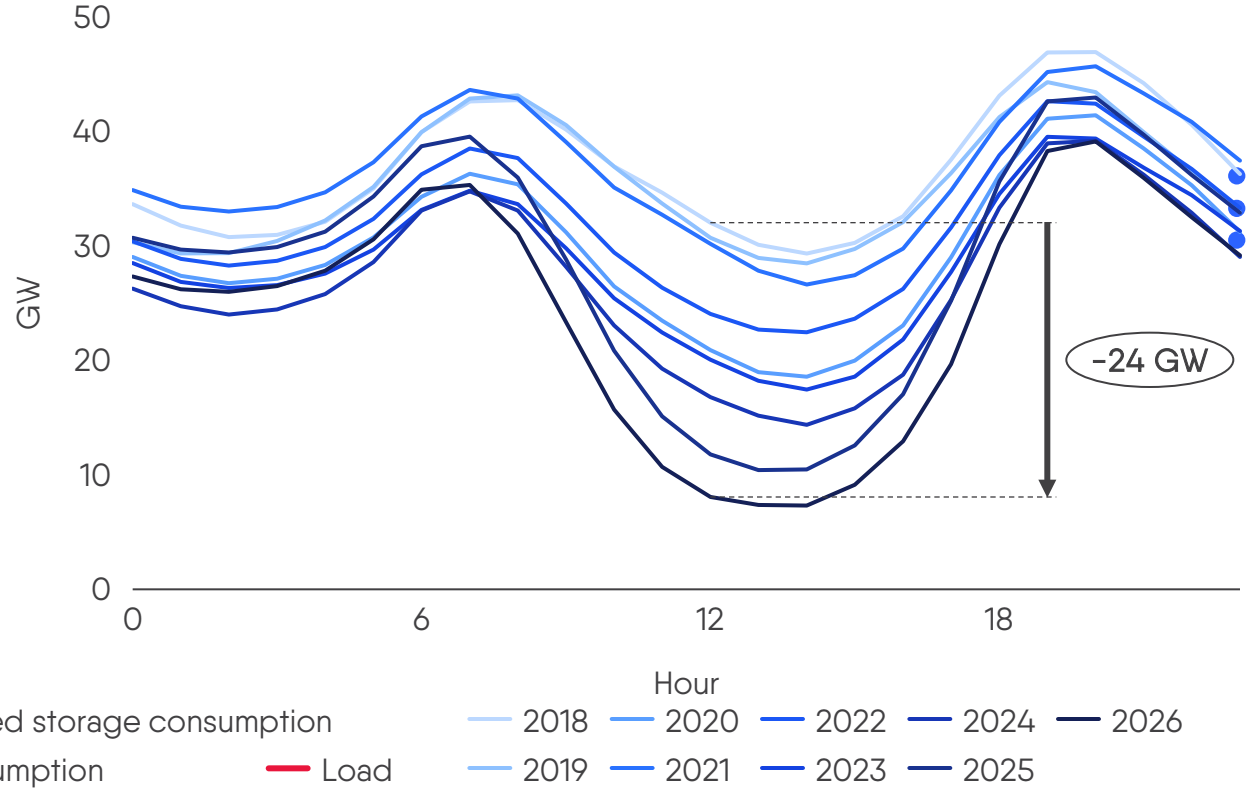
Average hourly EU generation mix, January – April 2026[1]

- Pumped hydro storage is the EU's backbone storage technology – absorbing up to 13 GW of surplus power during off-peak midday hours and injecting it back into the grid after sunset, contributing to 4.6% of total EU generation during peak evening demand hours; as VRE penetration grows and curtailment risk rises, the need for additional storage capacity will become increasingly critical.



Average hourly residual load in April across years, Germany[2]

- Germany's April residual load has plunged by 24 GW over less than a decade at midday, as solar generation increasingly displaces dispatchable output during peak irradiance hours; while the evening ramp remains sharp and demand-driven, the accelerating belly depth signals that without proportional storage expansion, midday curtailment and negative prices will become structurally unavoidable.

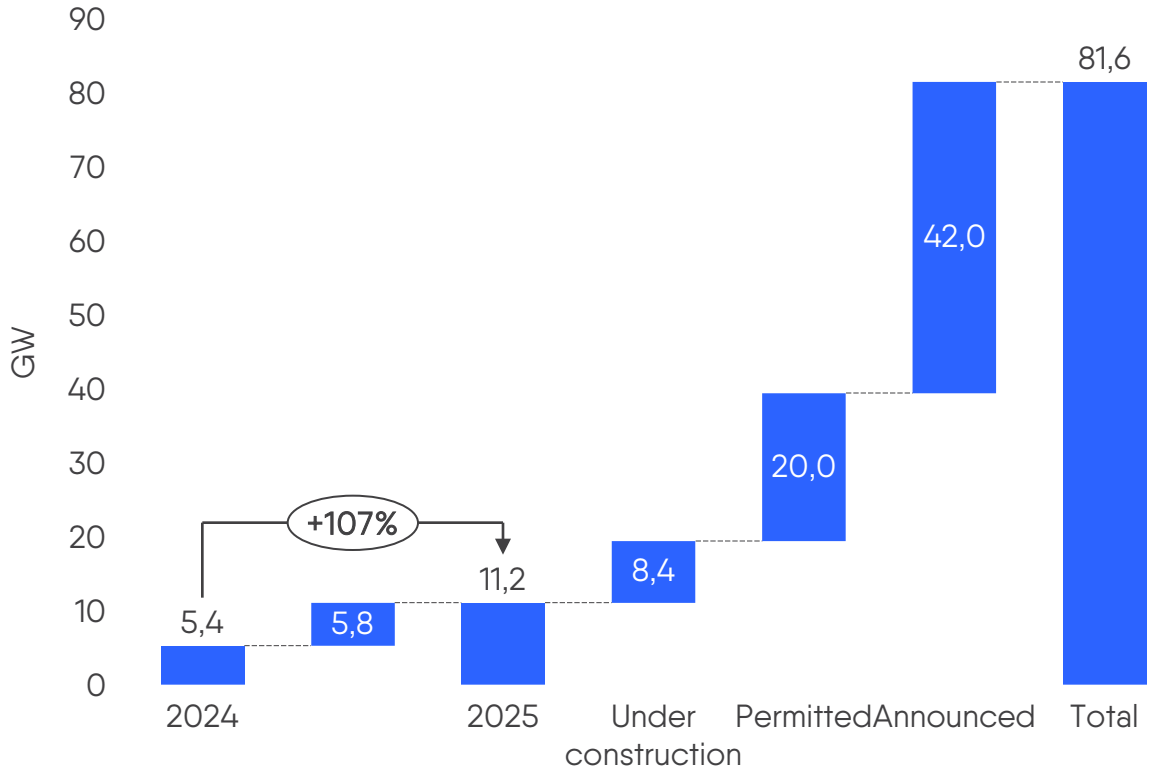


Notes: 1) Figures sourced from Energy-Charts. 2) Figures sourced from Elda. Sources: Energy-Charts, Elda, ENTSO-E.

EU operational grid-scale BESS more than doubles in 2025, surpassing 11 GW – with Poland, Germany, and Italy on track to exceed 10 GW each in the near term

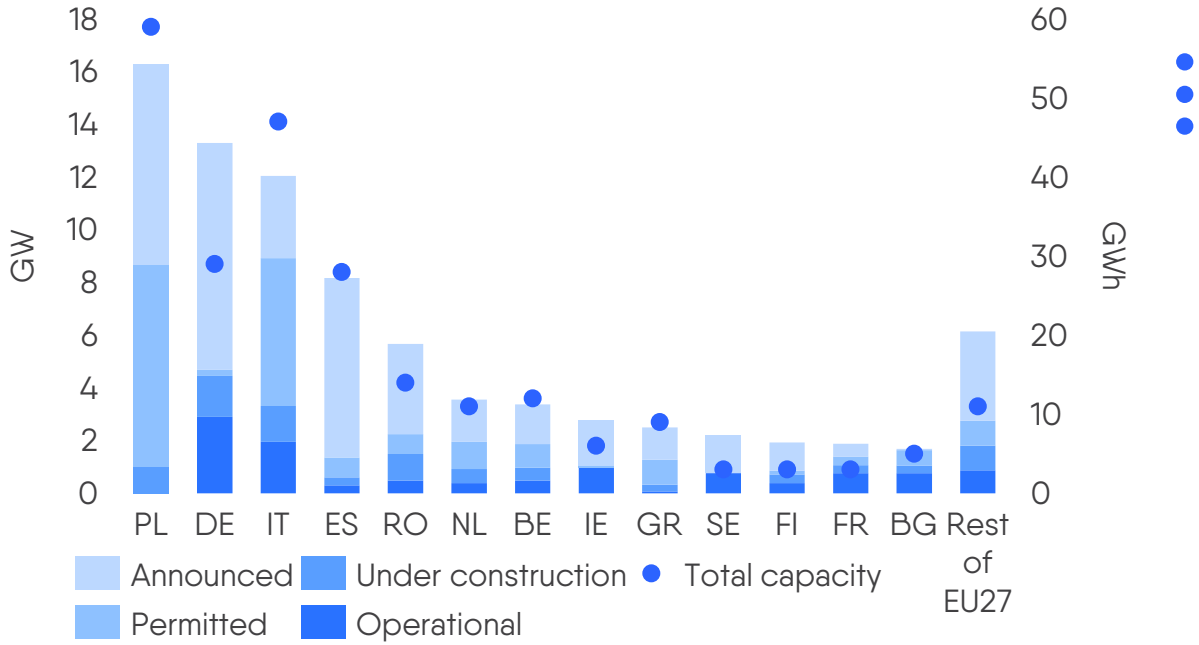
Electrochemical utility-scale battery storage installed, EU27[1]

- The EU27 added over 5 GW of battery storage between 2024 and 2025, bringing total operational capacity to 11.2 GW in early 2026. If all announced projects materialise, the pipeline could reach over 80 GW and 230 GWh – reflecting a growing shift toward longer-duration storage.



Electrochemical utility-scale battery storage by country[1]

- Poland leads the EU in anticipated BESS deployment, with 2025 subsidy calls and capacity market auctions awarding a combined 34.5 GWh in a single year.
- Italy follows in total GWh terms, driven by MACSE's long-duration storage contracts, with the country projected to reach 12 GW and 47 GWh of installed capacity.
- Germany, meanwhile, currently holds the top spot in operational BESS with 2.9 GW already live and over 10 GW expected to come online in the near term.



Notes: 1) Data sourced from JRC and accessed in late February 2026. Data for 2024 was accessed in April 2024. Figures include FoM grid-connected plants. Sources: JRC, Wood Mackenzie.

The EU cannot build a storage market with 27 different rule books – flexibility is critical capability, not an afterthought

Double Taxation on Storage

Electricity taxed when stored and again when reinjected into the grid, a distortion absent in any generation-only asset. Removing this double taxation on levies and fiscal charges, while maintaining cost-reflective grid tariffs, is essential to unlock merchant storage economics across multiple member states.

Generation-Asset Permitting

Storage subject to multi-year permitting procedures designed for large generation plants. Hybrid solar and storage projects face double permitting – each component treated separately.

Revenue Stacking Barriers

Ancillary service markets fragmented across 27 member states. Rules vary on simultaneous stacking of frequency response, capacity markets, and arbitrage preventing optimal storage business cases.

RED III Transposition Failure

EC launched infringement proceedings against 26 of 27 member states in July 2025 for failing to transpose the Renewable Energy Directive (RED III) on time. Storage-specific provisions remain unimplemented.

No Harmonised EU Framework

No single EU-wide permitting standard for storage. Spain, Germany, Italy, Romania all operate divergent rules – creating regulatory arbitrage and deterring cross-border investment.

Connection Queues Do Not Reward Project Readiness

Legacy queue rules delay grid-friendly storage and other grid-friendly projects, penalising them through "net demand at peak" assessments that overstate their grid impact. The Grids Package should be a first step towards fixing this through a "first-ready, first-served" model that prioritises connections based on project readiness and grid benefits.

Notes: 1) Information sourced from Eurelectric, European Commission, Paul Hastings, Synertics, Roedl, Energy Storage News.

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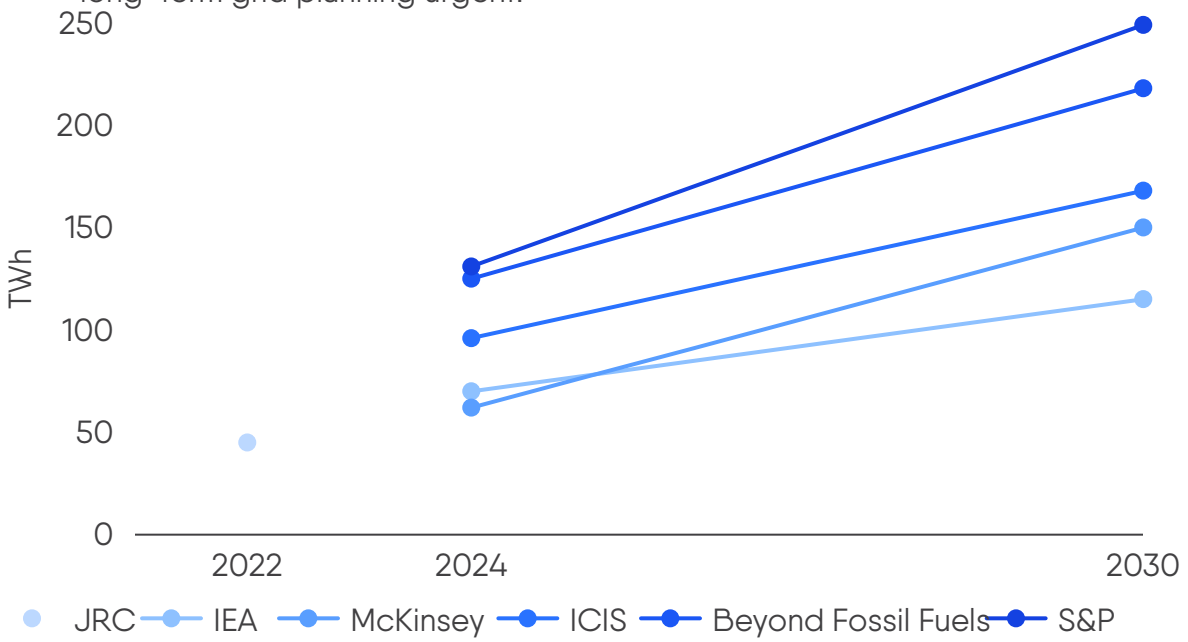
Europe's data centres are driving economic and energy growth, but grid planning must rise to the challenge

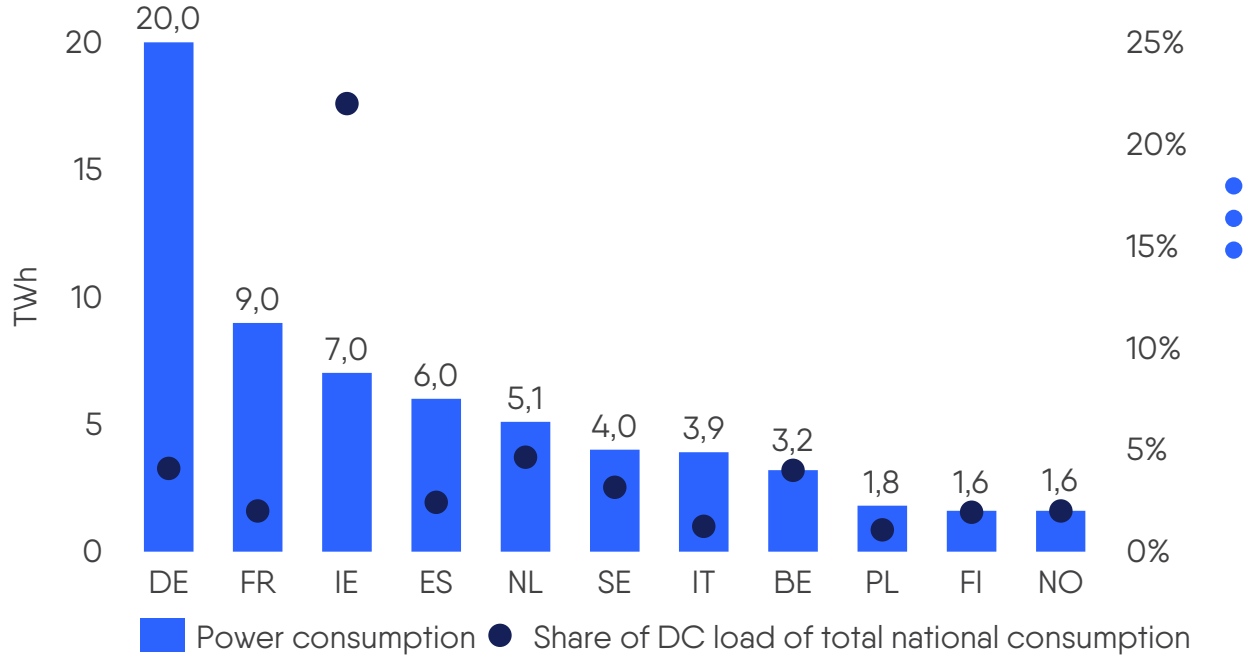
data centres' estimated power consumption, Europe[1]

- Data centres consumed roughly 65–130 TWh across Europe in 2024 depending on methodology. By 2030, even the models assuming high efficiency (e.g. IEA) project more than 100 TWh, while upper-range forecasts reach 250 TWh, the equivalent of the power demand of Spain in 2025. The wide band between forecasts reflects genuine model uncertainty making long-term grid planning urgent.



Data centres' estimated power consumption, 2024[2]

- In 2024, data centres in Ireland consumed an estimated 22% of its national electricity load. Small, electricity-dependent economies like Ireland, the Netherlands, and Belgium face disproportionate grid pressure relative to their size forcing policymakers to treat data centre load not as an industrial add-on but as critical infrastructure requiring dedicated capacity planning.

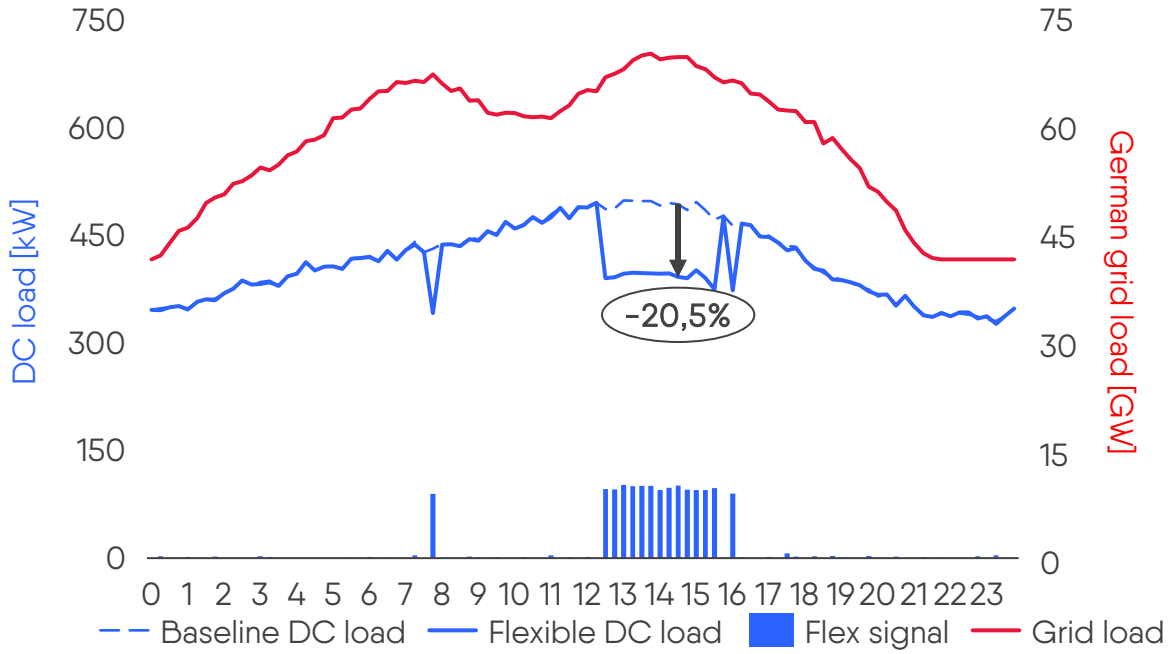


Notes: 1) Europe refers to EU27 plus the UK, Norway, Switzerland and Iceland. Figures sourced from JRC, IEA, McKinsey, ICIS, Beyond Fossil Fuels, S&P Global 451 Research (18.7 GW installed in 2024 and 36 GW forecast for 2030, converted to TWh assuming an 80% load factor). All historical figures are model-based estimates derived from assumptions on PUE, server utilization, and load factors; direct measurement remains methodologically challenging. To address this, the EC operates a public data centre dashboard and, under Article 12 of the recast Energy Efficiency Directive (EU) 2023/1791, mandates annual reporting of energy performance KPIs by all data centre operators with an installed IT power demand of at least 500 kW. 2) Figures sourced from Bundestag (Germany), ADEME (France), DNV (Spain), CSO (Ireland), CBS (Netherlands), Energiforsk (Sweden), PSE (Poland), BCG (Belgium), KEY (Italy), Business Norway (Norway) Nordea (Finland).

Flexibility is possible: data centers can react to grid signals and reduce power procurement costs by half by 2040

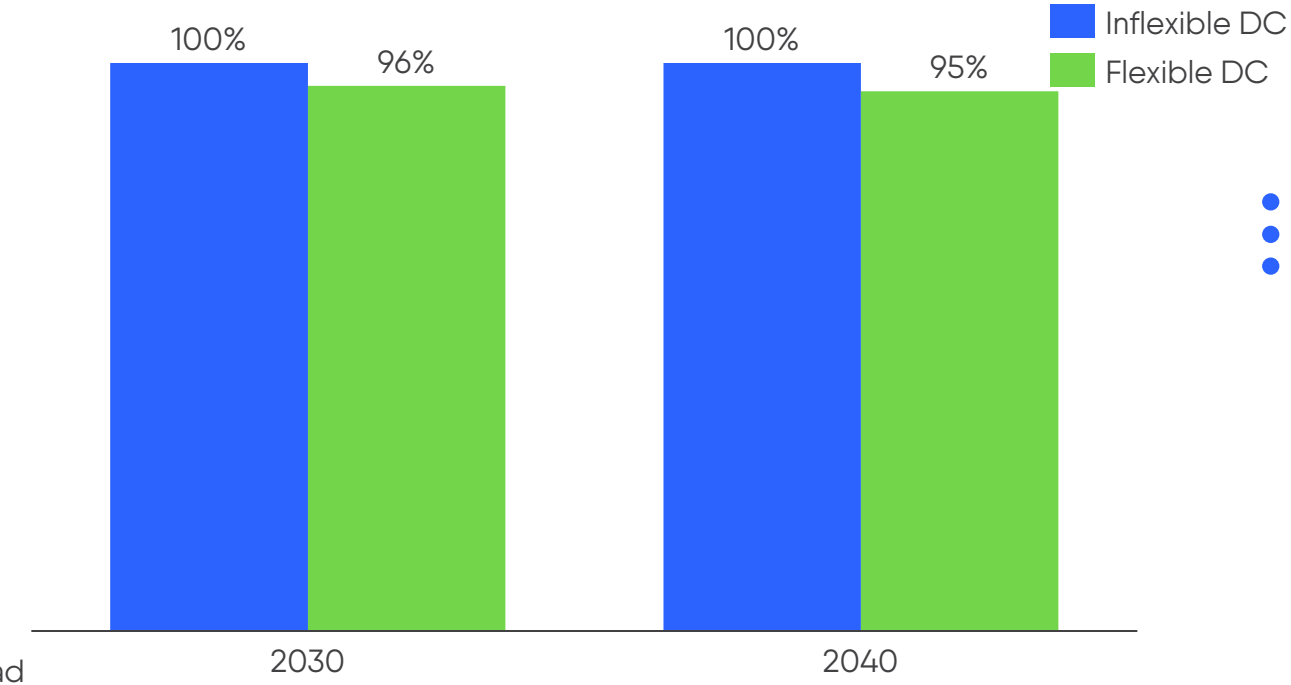
Simulated flexible load of a data centre[1]

- A data centre can become flexible under grid stress by temporarily reducing non-urgent power demand rather than interrupting critical services. In practice, this means deferring batch jobs, slowing non-latency-sensitive compute, pre-cooling before the event, slightly relaxing cooling loads within safe margins, or using on-site batteries so the facility draws less power from the grid while the stress event lasts.



Impact of data centres flexibility on its power procurement costs[2]

- Enabling data centres to operate flexibly has the potential to redirect their energy demand toward off-peak hours. According to Eurelectric estimate, data centres could shift up to 10 TWh of consumption to off-peak periods by 2030, rising to 20 TWh by 2040 – reducing power procurement costs across the EU by that same year.

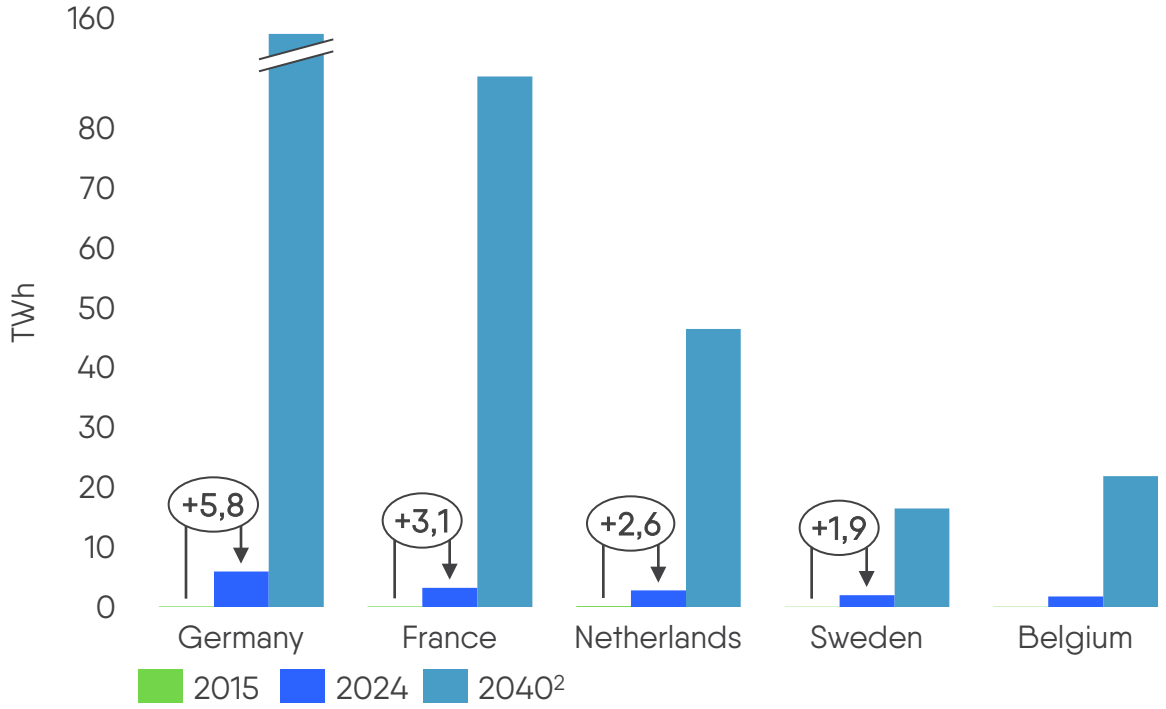


Notes: 1) Figures for German grid load are sourced from SMARD at 15-minute resolution for 14 January 2025. Grid stress is defined as intervals where national load exceeds the day's 85th percentile, while data-centre flexibility is represented using an Alibaba-inspired cluster model in which deferrable batch workloads are paused or slowed during those stressed intervals. Baseline DC power is derived from a stylised CPU-utilisation profile mapped to IT power and scaled by a PUE of 1.45, and a conservative 20% curtailment with a 30-minute ramp is applied during stress periods. 2) Based on Eurelectric's flexible scenarios analysis using PyPsa. EU data centre power demand assumed to reach 250 TWh by 2040. In the flexible scenario, 5% of data centre demand can be shifted for up to 12 hours.

Europe's electricity demand is surging across transport and homes, and stronger infrastructure investment is needed to sustain electrification

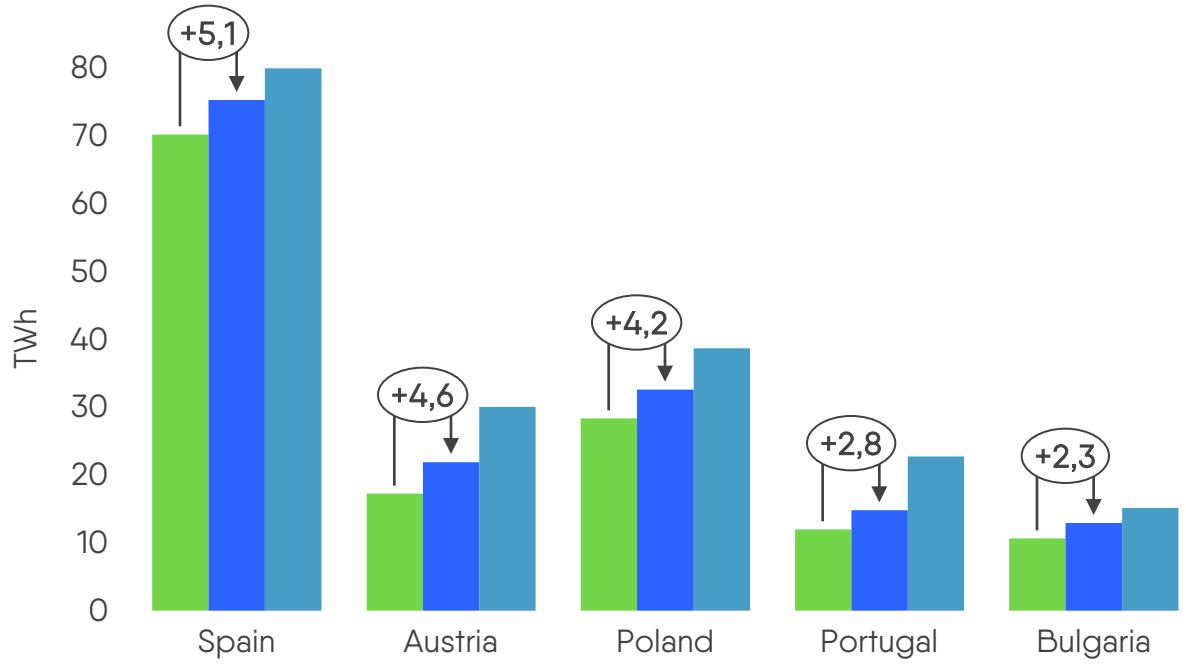
Electricity consumption in road transport[1,2]

- Over the last ten years, road transport electricity consumption has increased across Europe, with growth varying by country; the strongest increases have been in Central/Western and Northern Europe, with Germany, France, the Benelux countries, and Sweden leading in absolute terms. This is due to higher EV adoption supported by stronger charging infrastructure and government policies.



Electricity consumption in households[1,2]

- Over the past decade, residential electricity consumption has increased almost everywhere in Europe, except in already highly electrified countries (e.g. Sweden and France). Particularly strong growth has been seen in the Iberian Peninsula, driven by heatwaves and a surge in AC adoption, as well as across Central and Eastern Europe, where growing economies experienced mass uptake of household appliances and a broader switch toward electric solutions for heating (e.g. heat pumps).



Notes: 1) Figures sourced from Eurostat. The selected countries represent the countries with the highest growth amongst in the two sectors. 2) Forecast sourced from ENTSO-E TYNDP 2024 Distributed Energy scenario. Sources: Eurostat, ENTSO-E.

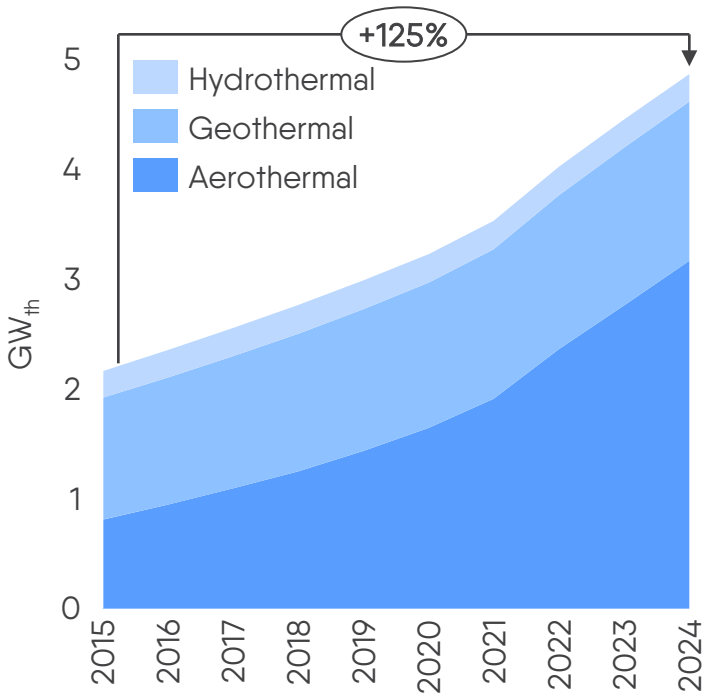
Austria's policy mix such as bans, subsidies, and a structurally low electricity-to-gas price ratio turned policy intent into measurable household electrification

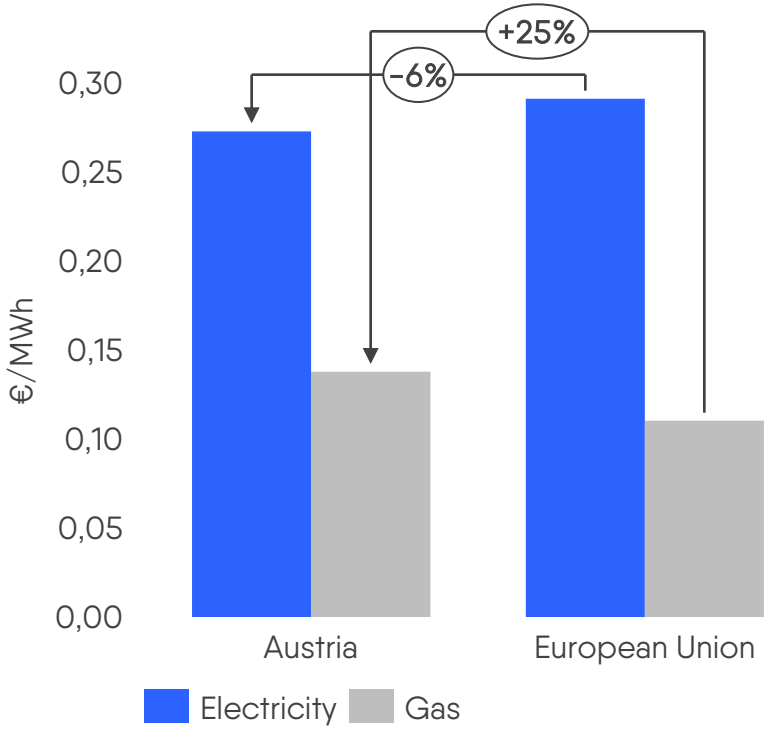
Installed thermal capacity of heat pumps, Austria[1]

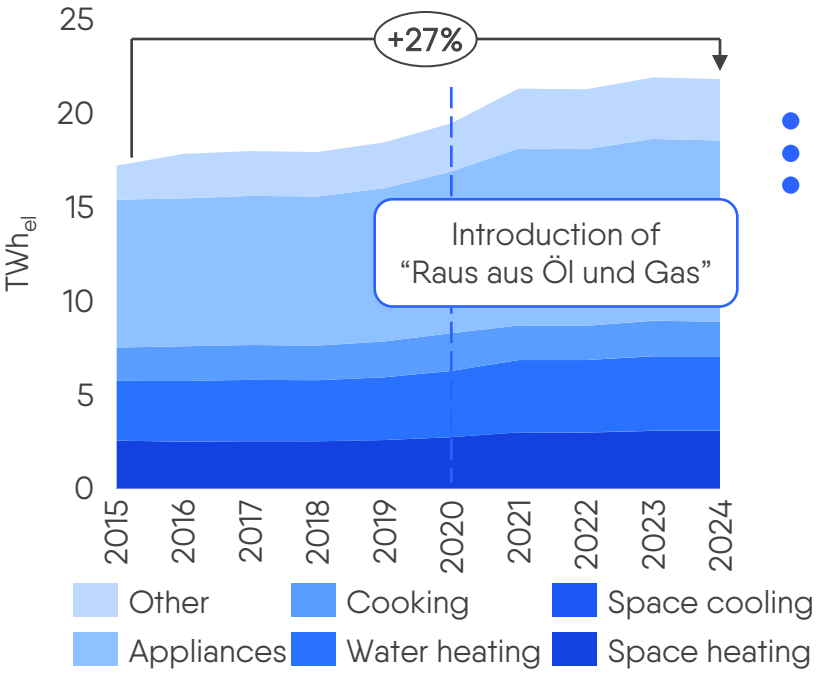
Electricity and gas prices for household consumers, 2024[1,2]

Electricity consumption in households by use, Austria[1]

- Austria combined regulatory bans (2020–2023), a federal boiler-replacement subsidy scheme "Raus aus Öl und Gas", and state-level grants to accelerate residential heating electrification. Annual heat pump sales grew from 38,000 in 2016 to a peak of 60,000 in 2022, reaching almost 5 GW_{th} of total installed heat pumps in 2024. Moreover, Austria's pricing environment actively rewards electrification. Electricity costs run 6% below the EU average; gas costs run more than 25% above it. The electricity-to-gas price ratio of under 2 is one of Europe's most heat-pump-friendly, lowering the running-cost barrier that stalls uptake elsewhere.







Notes: 1) Figures sourced from Eurostat (multiple data products) and BMLUK. 2) Includes taxes. Sources: Eurostat, Federal Ministry of Agriculture and Forestry, Climate and Environmental Protection, Regions and Water Management of the Republic of Austria.

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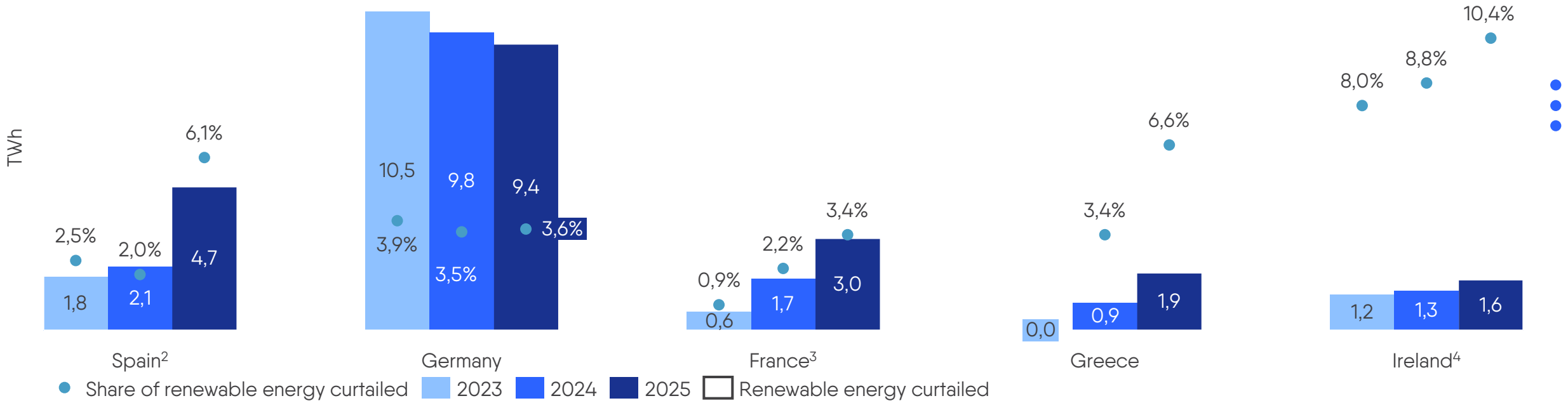
Variable renewables face rising curtailment across the EU, driven by both grid congestion and certain market conditions that discourage generation

Historical curtailments of renewable energy[1]

- Across Europe, wind and solar plants are increasingly curtailed for two distinct reasons: physical grid constraints (where transmission networks, interconnectors, and system stability limits cannot absorb new capacity) and economic curtailment, where frequent zero or negative prices, inflexible thermal must-run output, and support-scheme rules lead producers to voluntarily reduce generation even when grid capacity is available.
- Particularly, Spain, Greece, and Ireland have seen the sharpest jumps in curtailed shares of renewables. Greece's rate roughly doubled in 2025, reaching almost 2 TWh of RES curtailed, Ireland climbed to above 10%, and Spain more than doubled the total renewable volume curtailed.

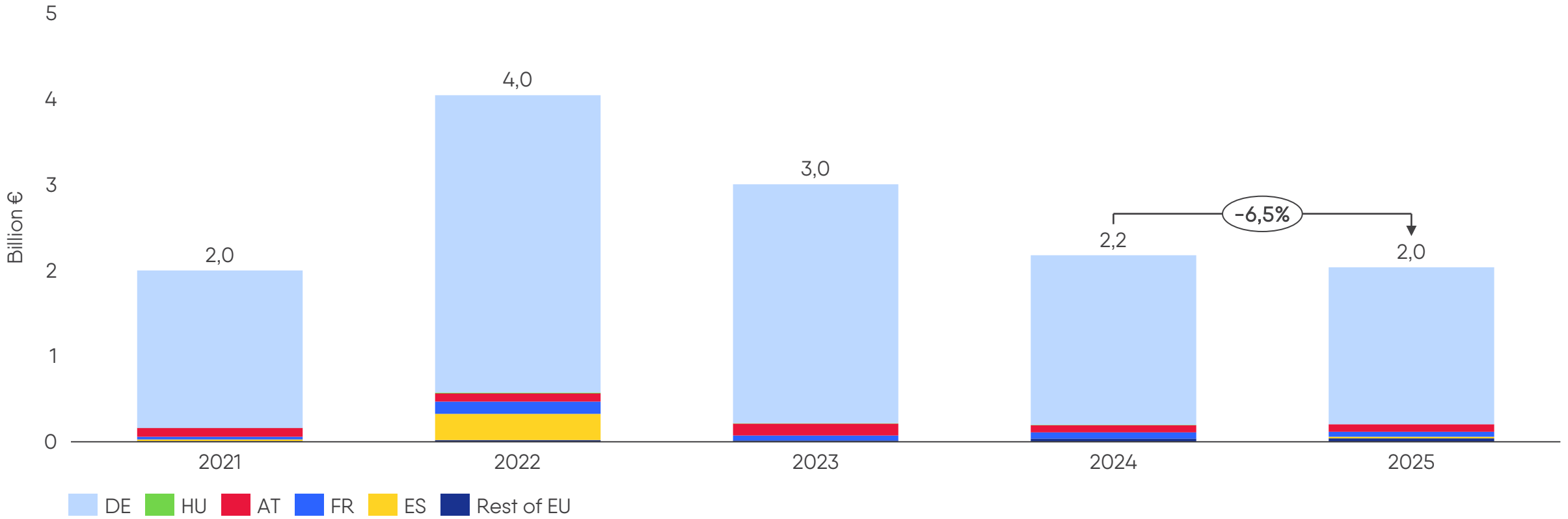


Notes: 1) Figures sourced from Admie (multiple reports), Bundesnetzagentur (multiple reports), Eirgrid, Netztransparenz, REE, RTE. 2) Figures refer to technical curtailments only. For Spain, data from 2025 onwards is also materially influenced by the TSO's "reinforced operation" measures introduced following the April 2025 blackout, which triggered systematic redispatch of synchronous generation (mainly gas) and additional curtailment of renewables to preserve system inertia and stability; this operational factor is not accounted for in the curtailment volumes shown and may reflect for a significant share of the observed year-on-year increase. 3) Here, commercial curtailment (écrêtage prix négatifs) accounts for roughly 97% of total curtailed renewable energy. 4) Figures refer to dispatch down, which is the combined total of curtailed and constrained renewable energy for the Republic of Ireland. In 2025,. Sources: Admie, Bundesnetzgangentur, Eirgrid, REE, RTE.

Redispatch and countertrading costs peaked in 2023 but remain structurally elevated, signalling persistent grid congestion challenges

Total congestion costs, EU[1]

- Congestion management costs (encompassing redispatch and countertrading) reached €4 billion across selected EU countries in 2023, before declining through 2024 and 2025. Germany consistently accounts for the bulk of these costs, reflecting persistent structural bottlenecks between its high-renewable north and demand centres in the south. While the recent decline is encouraging, it largely mirrors lower wholesale price spreads rather than a resolution of physical grid constraints, underscoring the continued need for targeted network investment and coordinated cross-border congestion management frameworks.

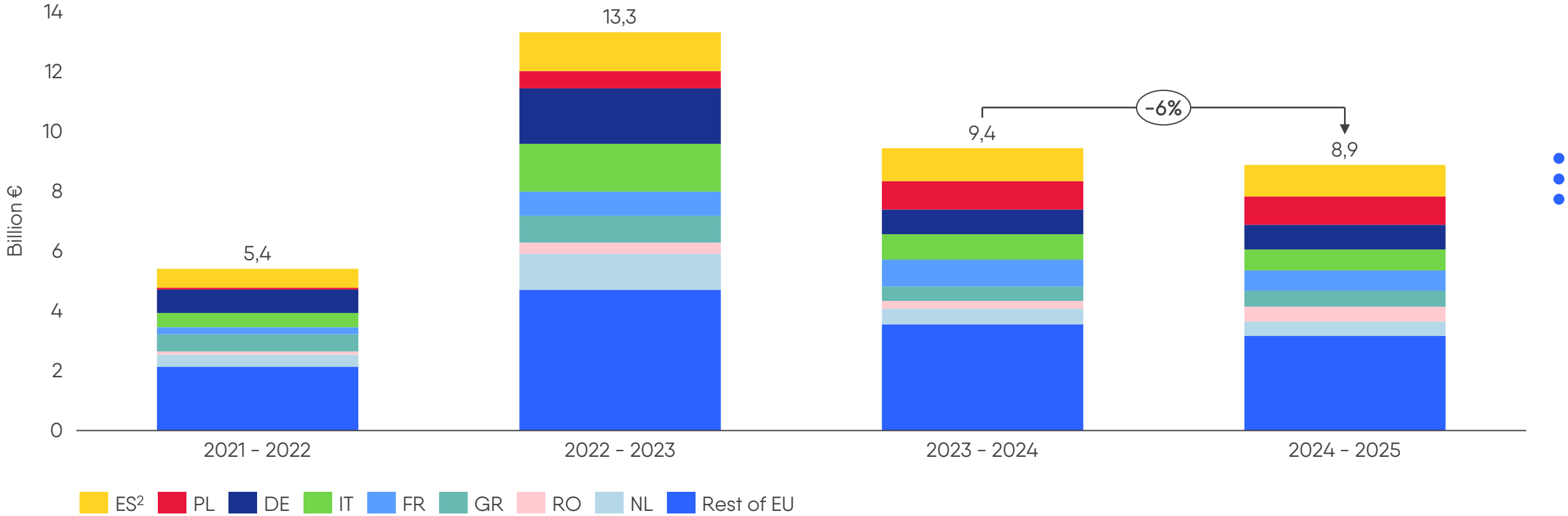


Notes: 1) Figures sourced from ENTSO-E. Sources: ENTSO-E.

EU balancing costs are normalising after crisis peaks, presenting a strategic window to lock in efficiency gains through targeted market design and cross-border coordination

Total cost of grid balancing by EU country[1]

- Ancillary costs peaked at €13 billion in 2022–2023 during the energy crisis but have since normalised to €9 billion, that is, a 6% year-on-year decline driven primarily by the stabilisation of wholesale markets and lower energy price volatility. While this normalisation is welcome, locking in durable efficiency gains will require targeted market design reforms and deeper cross-border coordination, as the structural drivers of high system costs remain unresolved.



Notes: 1) Data reflects TSO expenditure on ancillary services, aggregated from ENTSO-E Market Reports (multiple reports). Each reporting period spans the second half of the prior year through the first half of the indicated year). 2) Spain's 2024–2025 figures reflect elevated TSO expenditure associated with reinforced system operation measures introduced following the April 2025 Iberian blackout and are not fully comparable to prior periods. Sources: ENTSO-E.

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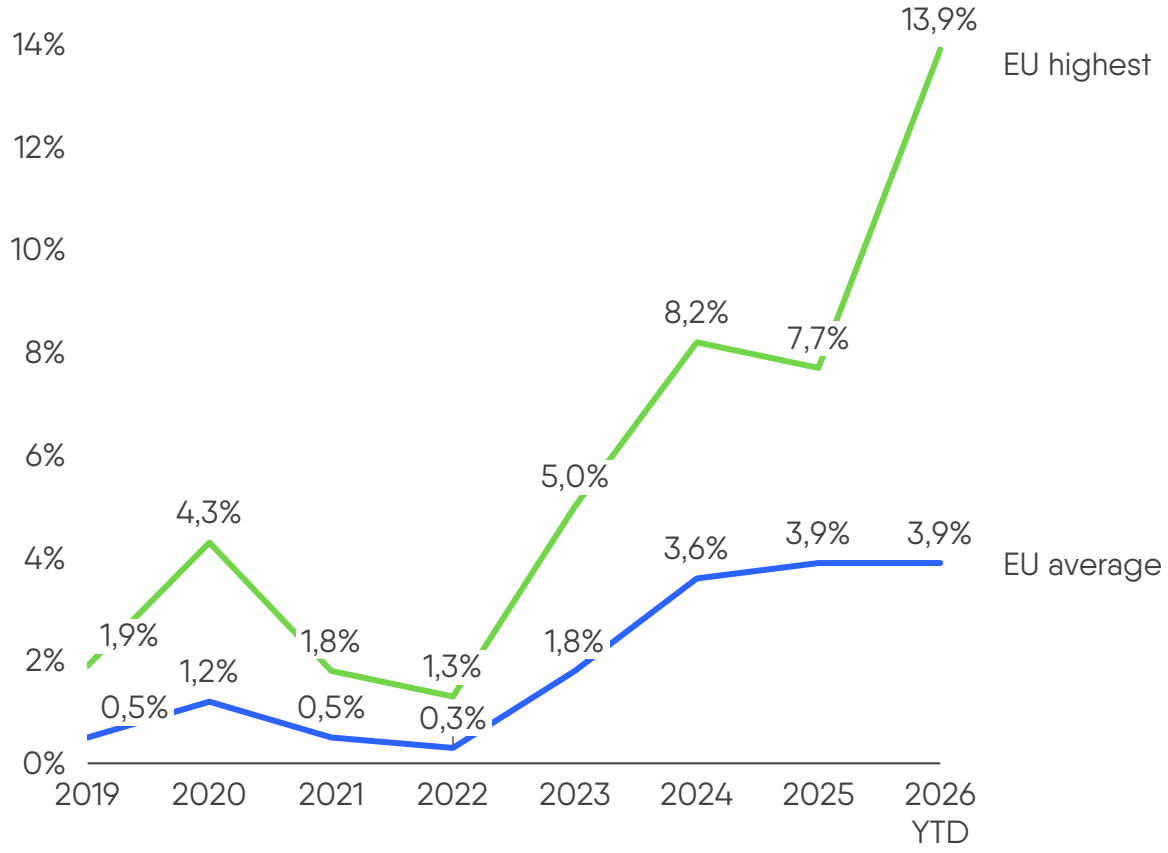
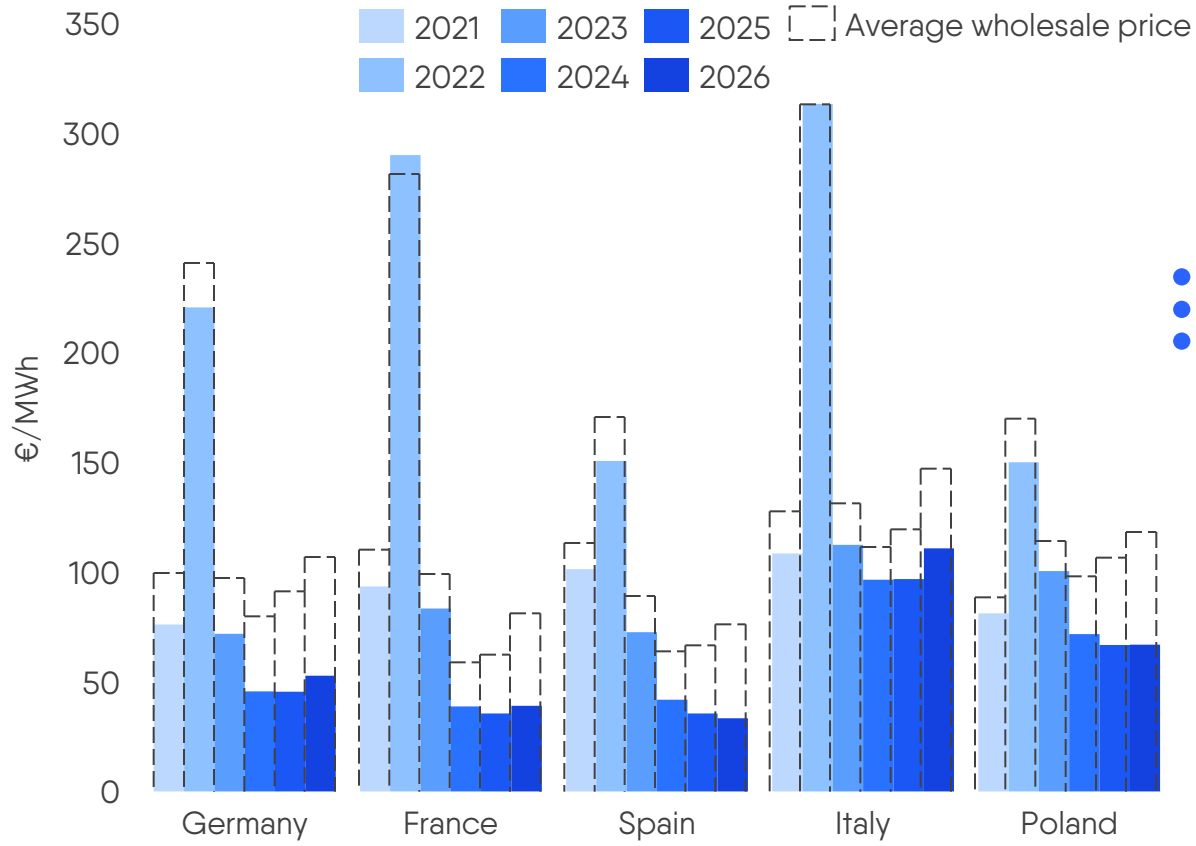
Negative prices have eased somewhat in 2026, but congestion and flexibility challenges persist

Share of negative price hours in day-ahead markets, EU[1]

Capture prices for solar PV, selected EU countries[1,2]

- Negative-price events remain frequent, although stronger summer demand has helped absorb more renewable generation in 2026. However, congestion, curtailment and periods of surplus generation continue to highlight the need for faster grid expansion, storage and demand-side flexibility.



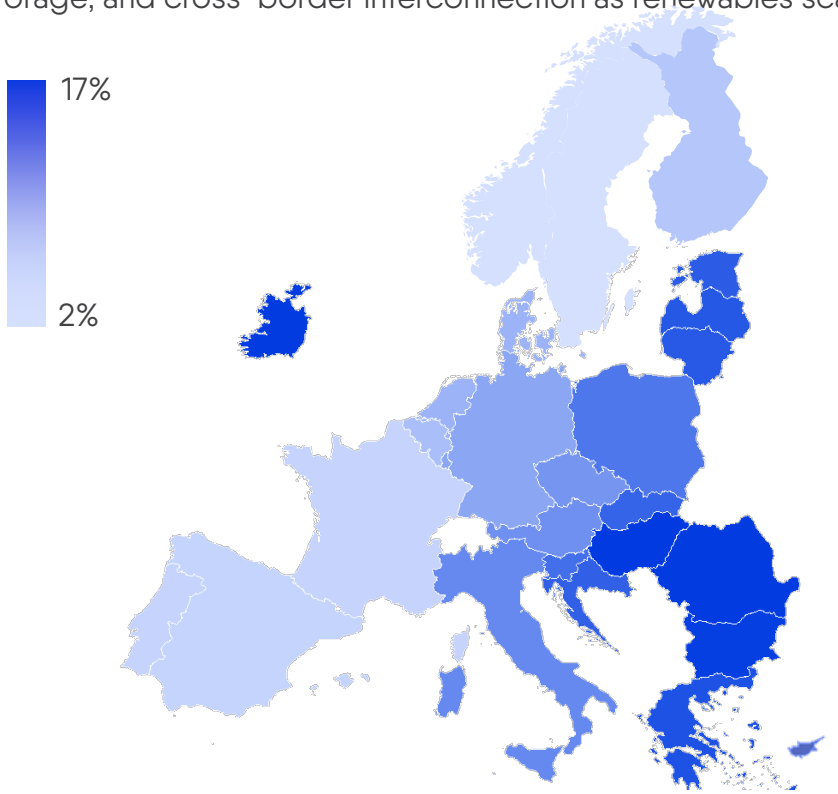


Notes: 1) Wholesale day-ahead hourly electricity prices sourced from Elda. Italy was effectively the EU power market that still had no negative day-ahead prices in 2025 as its market rules kept prices floored at 0 €/MWh. 2) Generation figures sourced from Elda. For Italy, the Center-North bidding zone price has been used. Sources: Elda, ENTSO-E.

Price spikes became less extreme but more frequent across Europe in 2025, showing that system flexibility and interconnection are increasingly critical as renewables scale

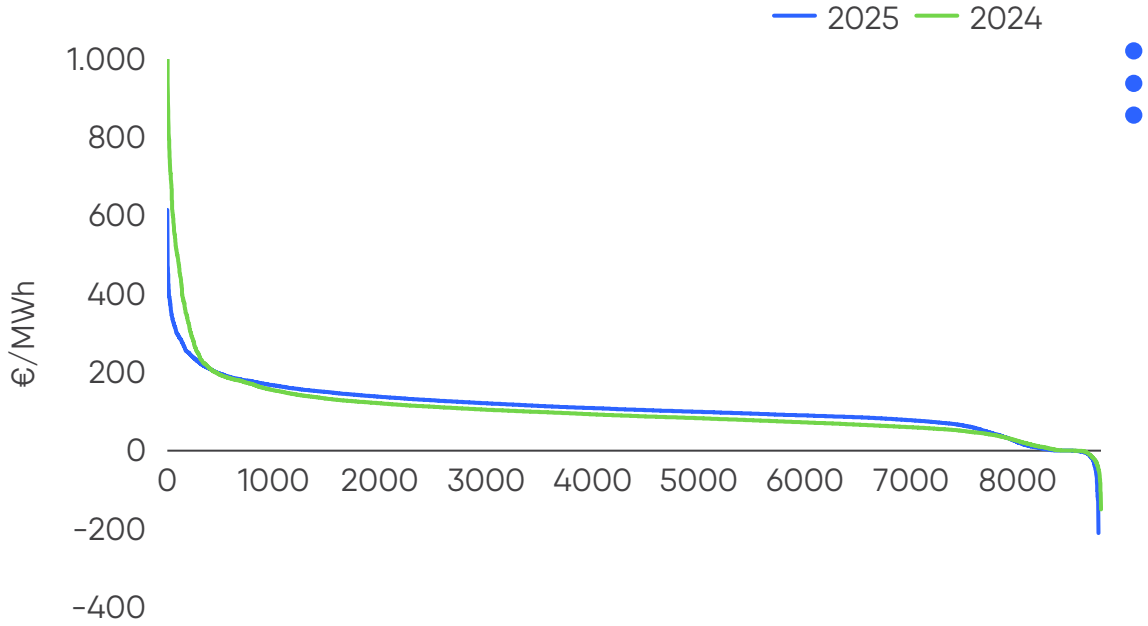
Distribution of hours with prices above €150/MWh, 2025[1]

- Europe saw more frequent high-price episodes in 2025 than in 2024, with the increase largely linked to higher gas prices, lower wind and hydro generation in Q1, and persistent transmission constraints particularly during summer peak periods, reinforcing the need for more system flexibility, storage, and cross-border interconnection as renewables scale.



Power price curves in Hungary, 2024 vs. 2025[2]

- Hungary recorded one of the highest numbers of high-price hours in 2025. However, although these events became more frequent than in 2024, the most extreme price spikes were less severe: the threshold for the top 1% of hourly prices fell from €507/MWh to €300/MWh, while the threshold for the top 5% of hourly prices remained unchanged at €202/MWh in both years.
- This suggests that the most extreme price outliers were less severe, helped by the continued Hungarian expansion of renewables.



Notes: 1) Figures sourced from Elda. For countries with multiple bidding zones, the bidding zone with the highest load has been used. Price data refers to the day-ahead market. Sources: Elda, ENTSO-E.

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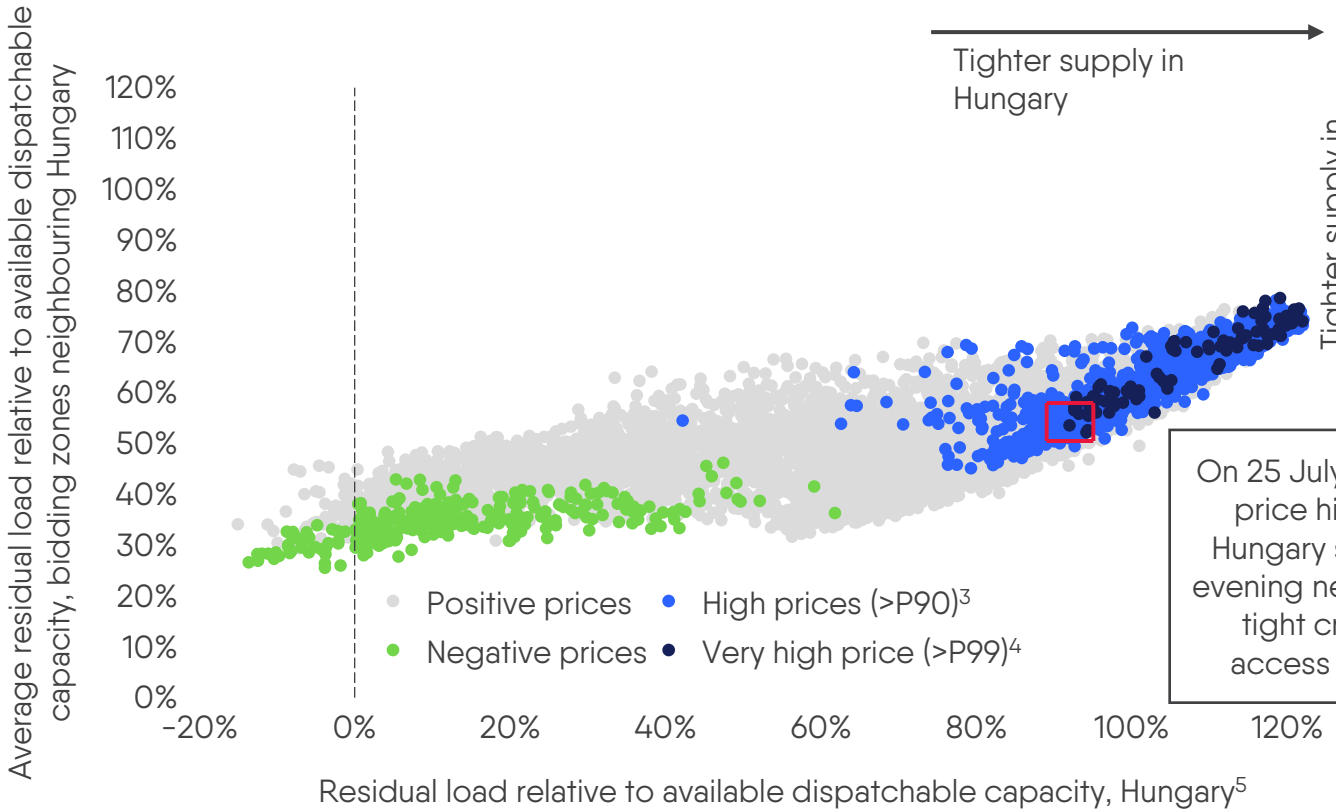
Eastern EU markets face the highest price stress – flexible capacity, stronger interconnection and better use of grid rules in stress events are the priority response

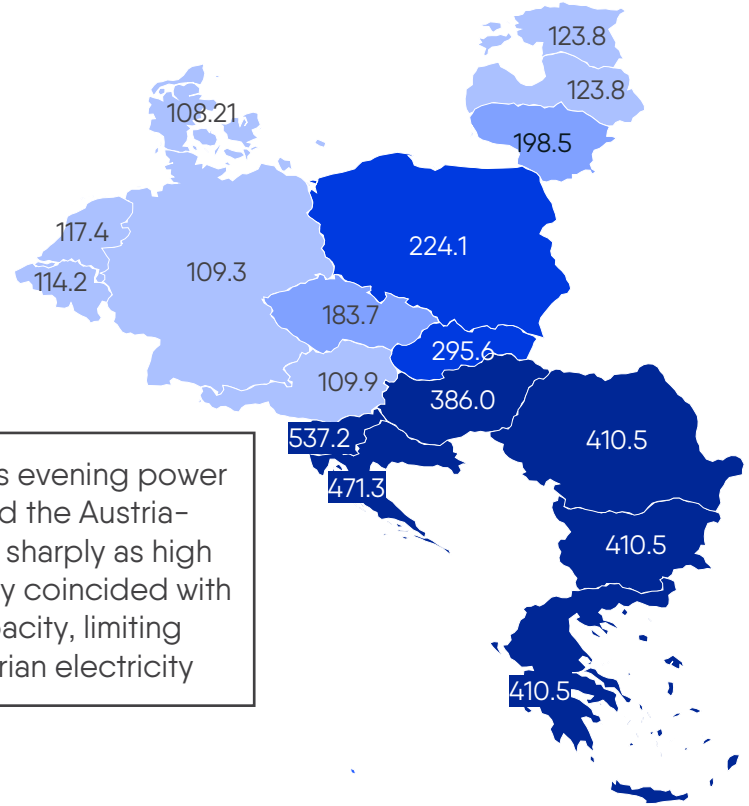
Clean technology penetration and interconnection flows in Hungary, 2025[1]

Day-ahead power prices at 20:00, 25 July 2025[2]

- Hungary has seen exceptionally high electricity prices mainly for two connected reasons: first, during the 2025 heatwave, evening electricity demand remained high just as solar generation dropped after sunset, increasing net load and tightening domestic supply. Second, under EU flow-based market coupling, limited cross-border capacity during the evening peak prevented cheaper foreign electricity from reaching Hungary and Romania, amplifying the price stress in those markets.



On 25 July 2025, Hungary's evening power price hit €386/MWh, and the Austria-Hungary spread widened sharply as high evening net load in Hungary coincided with tight cross-border capacity, limiting access to cheaper Austrian electricity

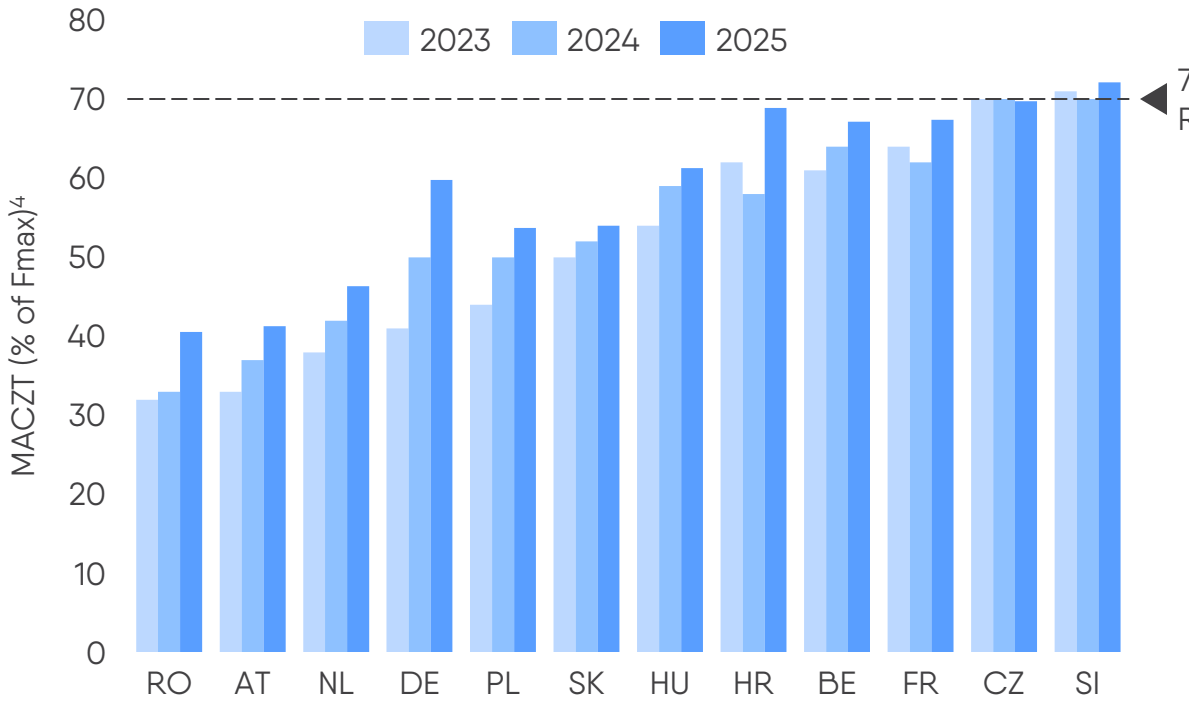


Notes: 1) Figures sourced from Elda. Methodology based on analysis by IEA, 2025. Similarly, here, available dispatchable capacity equals total installed dispatchable capacity less outages at dispatchable units. A negative residual load-to-dispatchable-capacity ratio indicates that wind and solar output exceeds demand, creating surplus generation available for export to neighbouring markets. The average across neighbouring bidding zones is weighted by transfer capacity to Hungary and covers AT, SK, SI, HR, RO, and RS, with UA excluded. 2) Figures sourced from Elda. Countries with multiple bidding zones are represented by a national average. 3) Prices above the 90th percentile, that is, above €172.3/MWh. 4) Prices above the 99th percentile, that is, above € 300.2/MWh. 5) Includes renewables and nuclear energy.

Cross-border capacity progress in Core is real but insufficient. Stricter enforcement would contribute to mitigate price spikes across central and eastern Europe

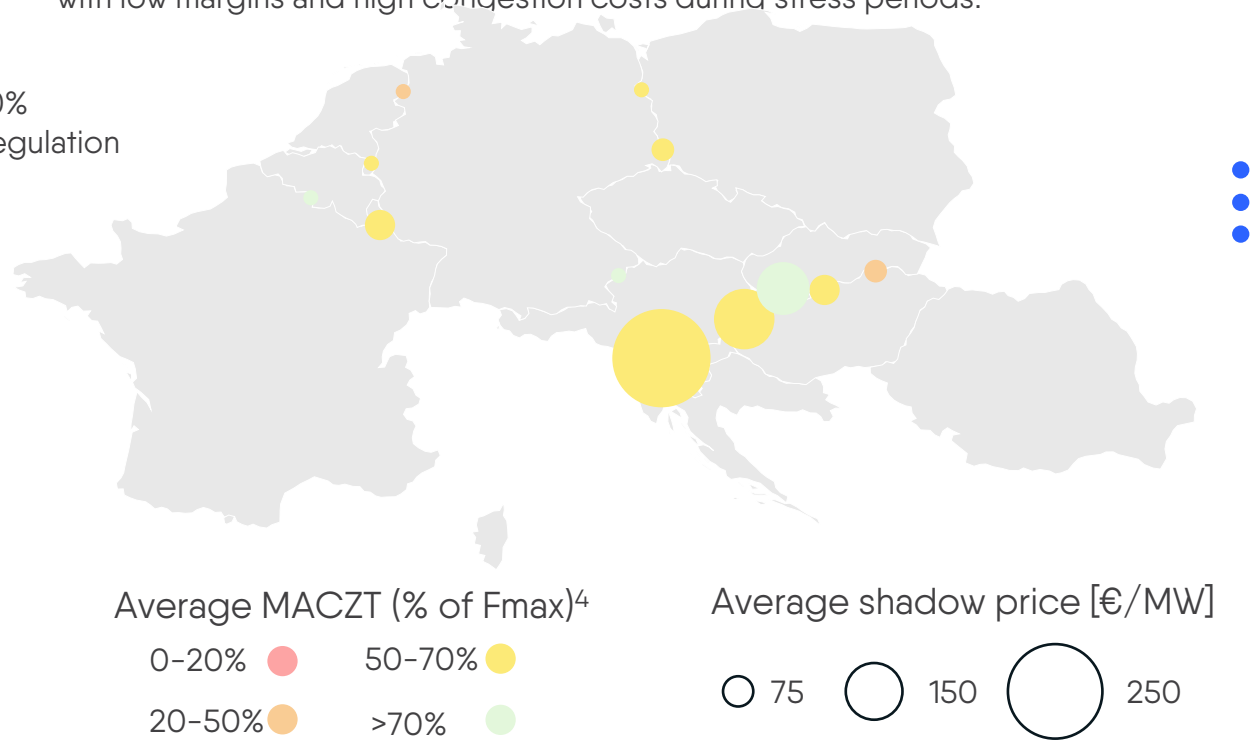
Average minimum hourly MACZT in Core by member state[1,2]

- In the EU, every TSO must make at least 70% of each critical network element's physical capacity available for cross-border electricity trading.
- Progress towards the implementation of this requirement was broad but uneven in 2025 with most member in Core states improving their average minimum MACZT, but only Slovenia, Czechia, Belgium and France being near or above 70%.



Active constraints in Core at 19:00-21:00, July to September 2025[2]

- Active binding constraints[3] clustered in central Europe during evening peak hours in summer, highlighting where capacity restrictions most severely affect market coupling.
- Meeting the 70% average does not eliminate binding episodes – even better-performing TSOs show critical network element under a specific contingency (CNECs) with low margins and high congestion costs during stress periods.



Notes: 1) 2023 and 2024 figures are sourced from ACER. 2) 2025 figures sourced from Amun Analytics, based on JAO. Only CNECs with at least 5 instances are considered. 3) Active binding constraints refer to CNECs that are tight in a given market-coupling hour, meaning they limit the market outcome and have a non-zero shadow price. 4) MACZT (Margin Available for Cross-Zonal Trade) is the share of a transmission line's physical capacity that TSOs make available for power trading between bidding zones. Sources: Amun Analytics, JAO, ACER.

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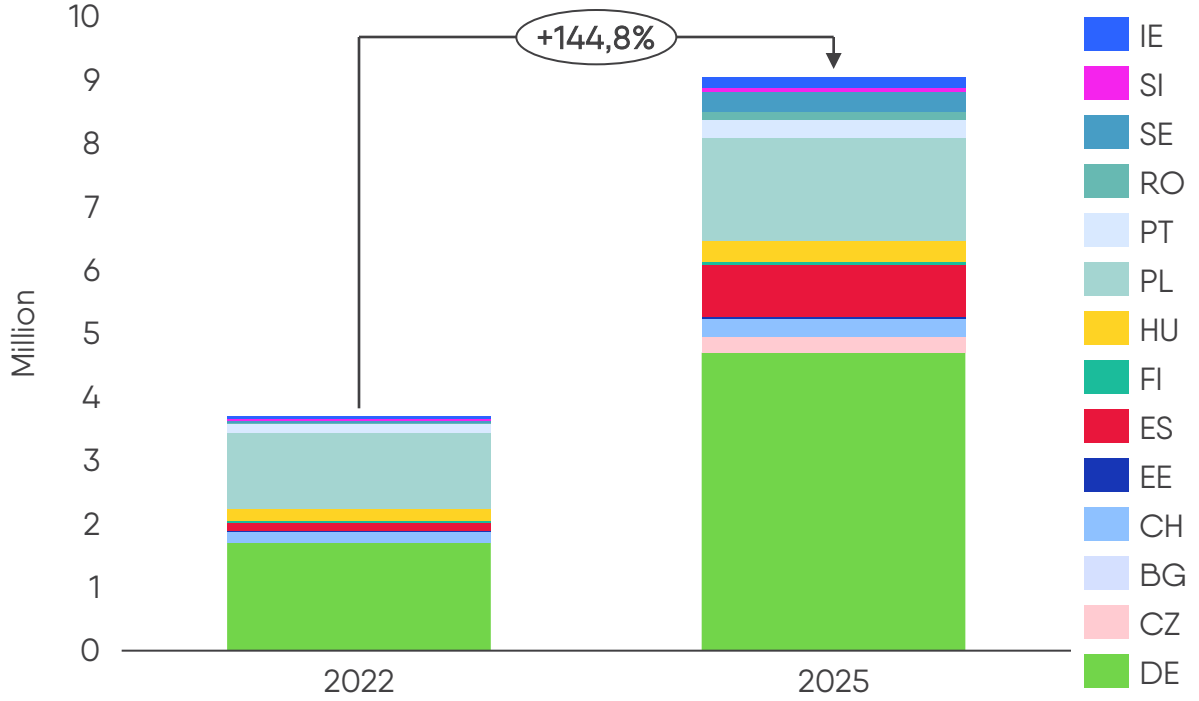
Prosumer boom and soaring industrial requests underscore distribution grids' central role in Europe's energy transition

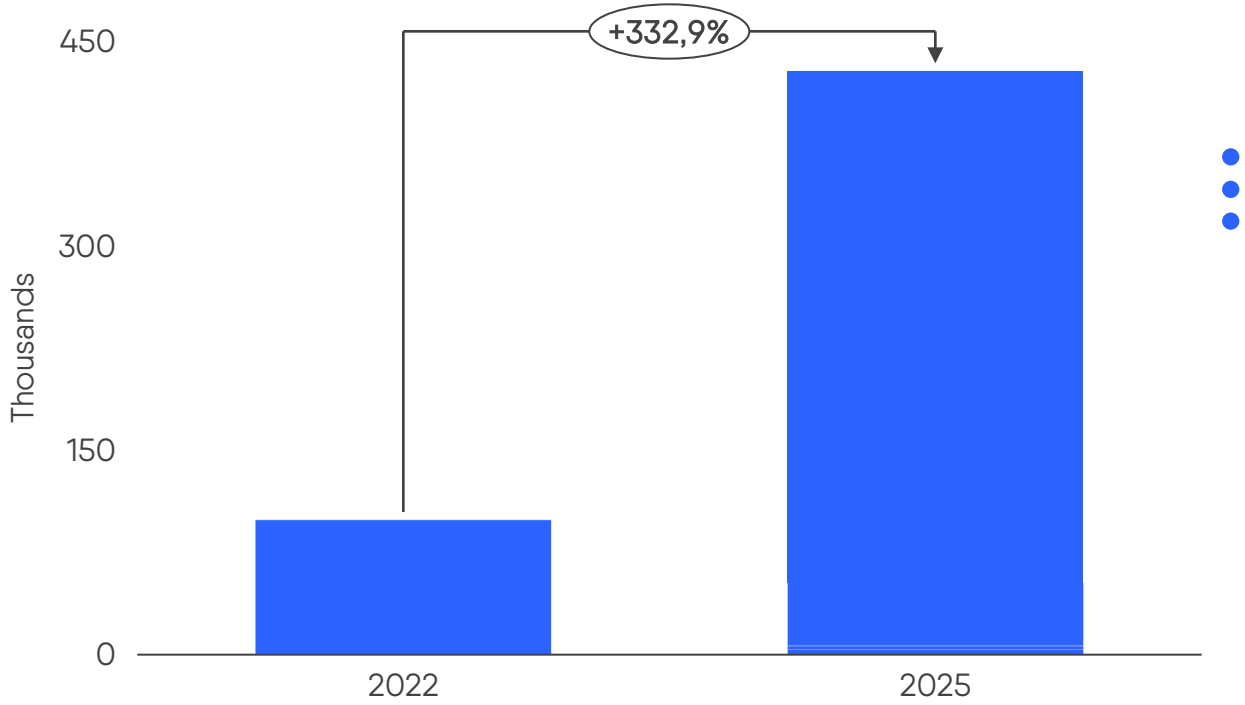
Prosumers connected to DSOs, selected European countries[1]

- In recent years, the number of prosumers has grown dramatically across Europe. On average, between 2022 and 2025, European DSOs experienced a fourfold increase in prosumer customers. The trend reflects the rapid uptake of rooftop solar PV, batteries, and smart meters, fundamentally shifting the role of end-users from passive consumers to active participants in distribution networks.



Industrial consumers requests to DSOs, selected EU countries[1,2]

- Connection requests to DSOs from industrial consumers have also risen sharply between 2022 and 2025, reflecting how growing economies — particularly in Central and Eastern Europe and on the Iberian Peninsula — are increasingly relying on distribution networks to support industrial expansion.

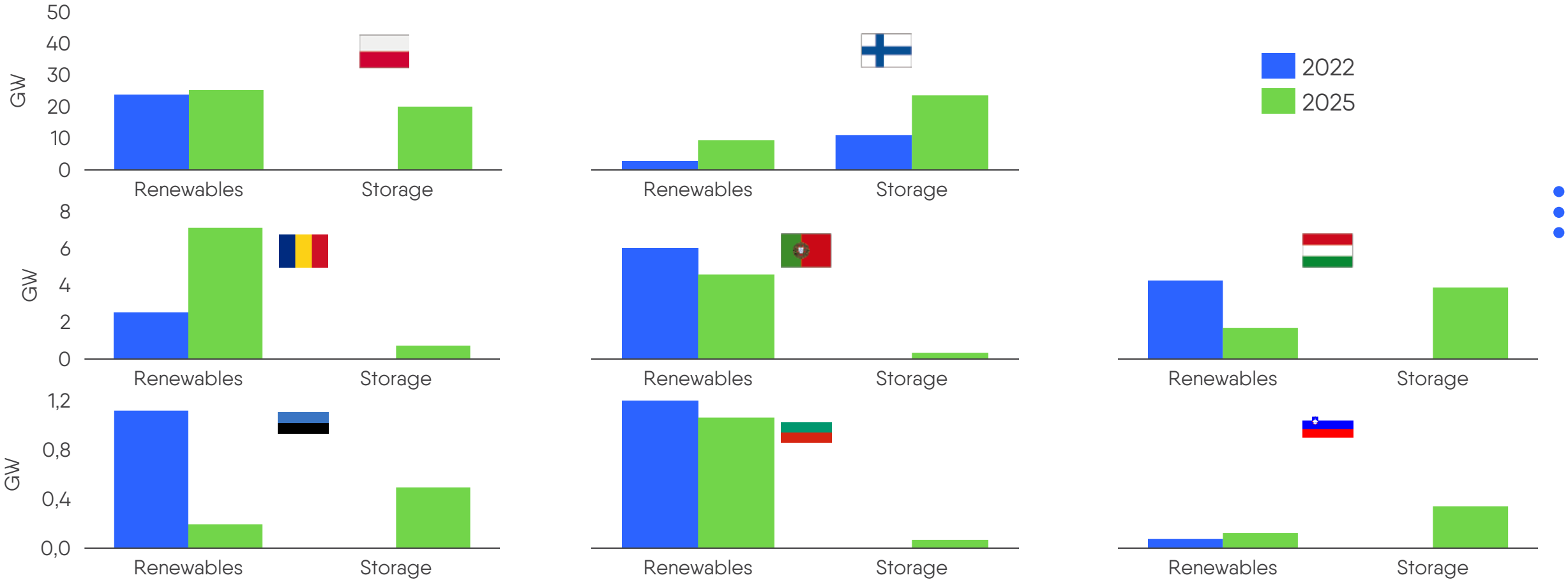


Notes: 1) Data were collected through surveys conducted across national DSO associations. For Switzerland and Slovenia, 2024 data were used in place of 2025 data, which is unavailable. No 2022 data were reported for Czechia. Romanian data covers 55% of national customers. 2) Data refers to Czechia, Denmark, Estonia, Spain, Hungary, Finland, Poland, Portugal, Romania and Slovenia. Definition of industrial may vary across countries. Poland, Spain and Finland include data centers requests. Data for Czechia, Poland and Spain is not available for 2022. Denmark data include TSO figures. Sources: Eurelectric.

DSO connection queues reveal a flexibility imperative and an urgent permitting challenge

DSO connection queues by technology, selected EU countries[1]

- Renewable energy connection requests to DSOs show mixed trends across EU Member States with capacity queues growing in some countries but stagnating or declining in others between 2022 and 2025. Storage, by contrast, is rising universally, underscoring grid flexibility as a EU-wide imperative. Yet, storage deployment may struggle to keep pace with the pace of variable renewable connections, and permitting processes remain bottleneck that could delay the integration needed to accommodate these requests at scale.

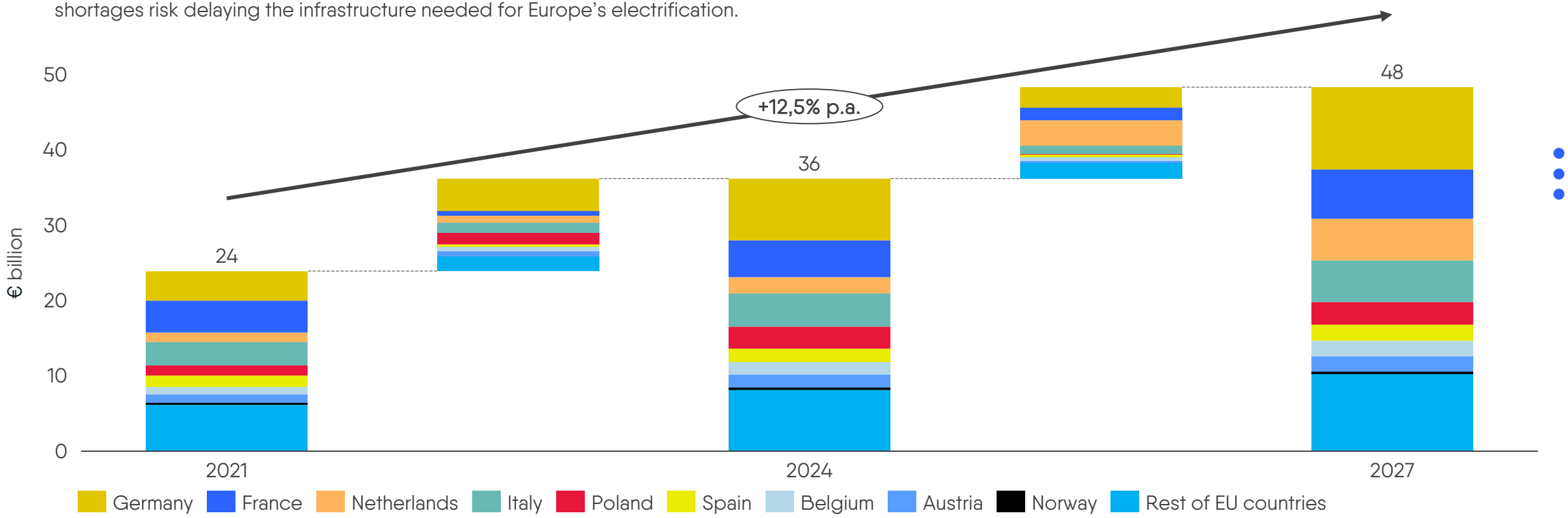


Notes: 1) Data were collected through surveys conducted across national DSO associations. Danish figures include both TSO and DSO data. Romanian data covers 55% of national customers. Sources: Eurelectric.

Distribution-grid investment could reach €50 billion by 2027 as DSOs accelerate the build-out – but faster permitting and fit-for-purpose regulation are needed to deliver

DSO investments trends, EU+NO[1]

- EU distribution grid investment is growing at +12.5% per year, reaching €36 billion in 2024 and heading toward €48 billion (nearly doubling in six years) with DSOs channelling record capital to enable electrification and renewable integration.
- The investment ambition is there; delivery conditions must catch up. Permitting delays, slow cost recovery, regulatory uncertainty, supply-chain bottlenecks and skills shortages risk delaying the infrastructure needed for Europe's electrification.



Notes: 1) Figures sourced from ACER, which includes DSOs with more than 100,000 customers. Germany's 2027 figure was derived by solving for a linear annual increment across the reported €50.1 bn cumulative total (2024–2028). Denmark and Bulgaria had no 2027 data, so both were linearly extrapolated from their 2021–2024 growth trend. Source: ACER.

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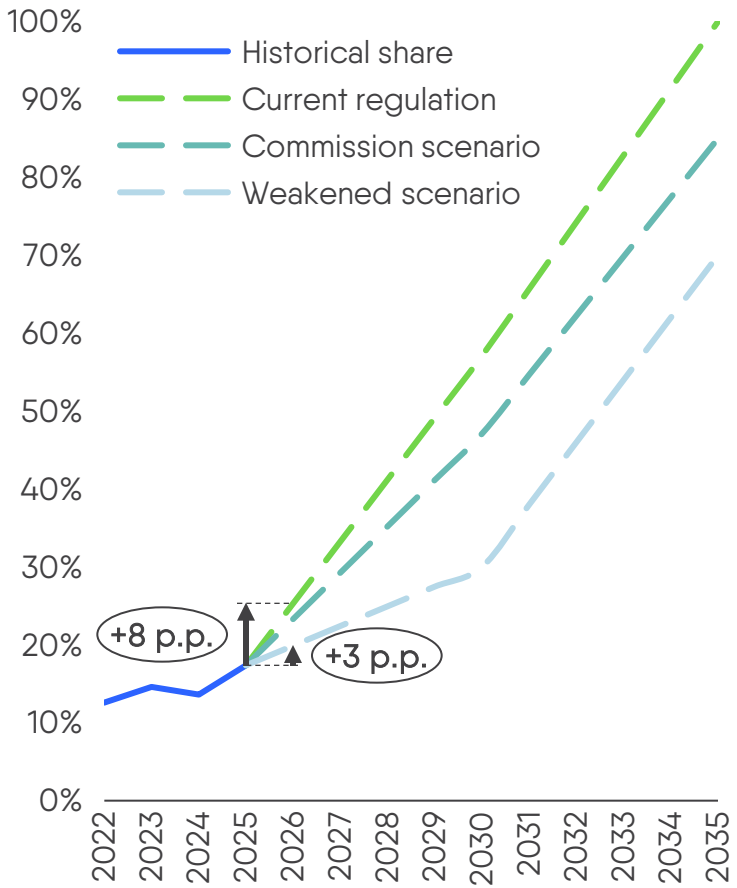
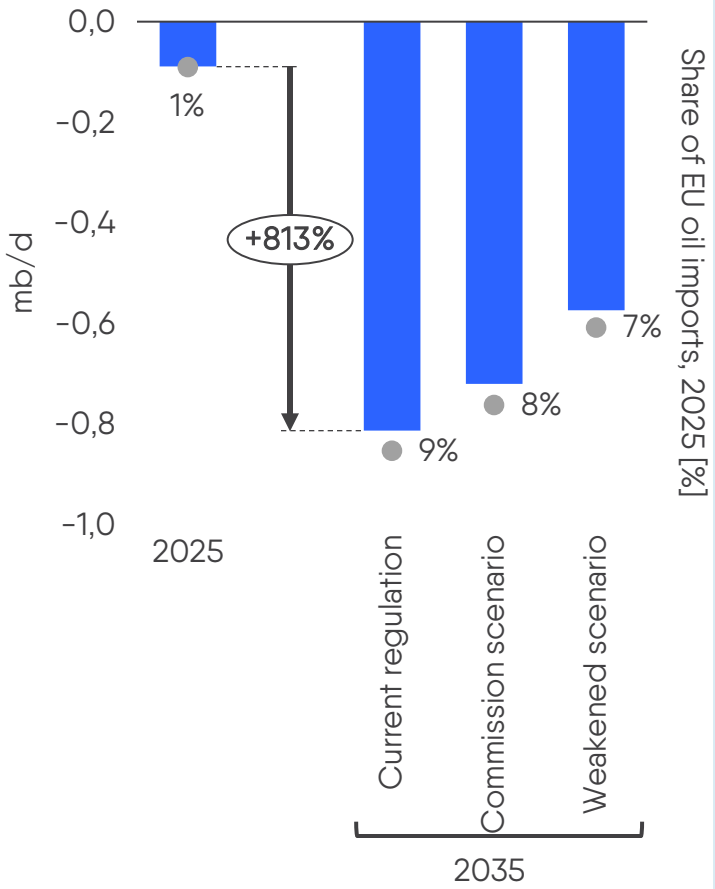
Diluting EV standards could cost the EU 250,000 barrels of oil per day by 2035, that is, 2% of oil imports in 2025

Sales share of BEV in EU27 by scenario[1]



Oil displacement by scenario[2]



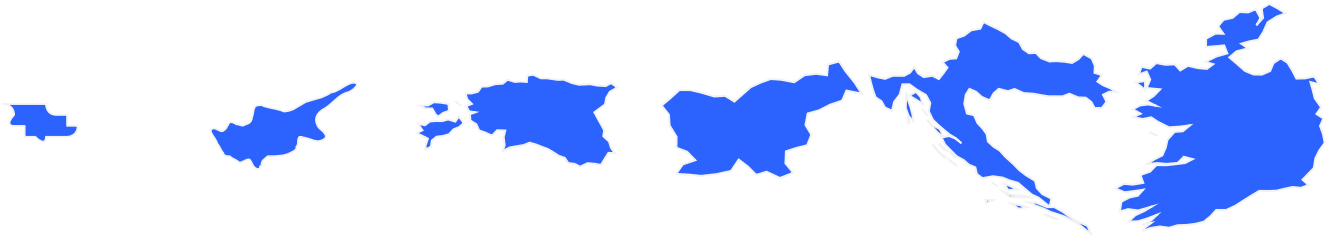
- The European Commission published in December 2025 a proposed revision of the EU car CO_2 regulation after industry pressure to change targets and allow options like alternative fuels and hybrids after 2035.
- Transport & Environment modelled this revision into two scenarios. In the first scenario, a 2035 target of 90% CO_2 reduction vs 2021 is assumed. This, then, translates BEVs reaching about 47% of new sales in 2030 (vs 57% in the current-regulation baseline) and about 85% in 2035 (vs 100%).
- The second scenario aligns with additional industry demands – an 80% CO_2 reduction target in 2035, which then means BEVs falling to 32% of new sales in 2030 and 70% in 2035.
- Eurelectric estimates that the current regulation would displace 0.81 million barrels per day (mb/d) of petrol vs current 0.008 mb/d (corresponding to 1% of EU oil imports in 2025), whereas the Commission proposal would displace 0.72 mb/d and the industry's preferred option 0.57 mb/d – reducing the potential for EVs to curb petroleum imports.

Notes: 1) Figures from Transport & Environment based on EC. 2) Oil displacement estimation follows a similar methodology as in IEA. The EU passenger car's average annual mileage (12346 km, according to ACEA) is equated to an EV's average mileage and then by translating it into the fuel an equivalent ICE would have used to drive the same distance with an assumed EU average of 0.0562 l/km (see Odyssee-Mure). For PHEVs, only kilometres driven on electricity are counted (see Fraunhofer); the method assumes like-for-like replacement and similar driving patterns. Sources: T&E, IEA, ACEA, Odyssee-Mure, Fraunhofer, EC.

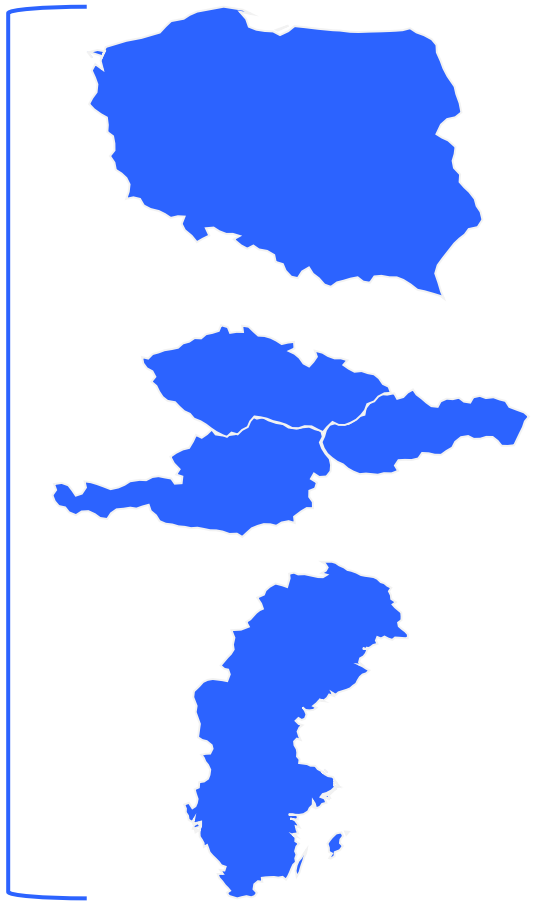
Road transport electricity demand matched Ireland's total demand in 2025 and could reach a level between Sweden and Poland by 2035

Road transport electricity consumption compared to EU Member States 2025 electricity demand[1,2]

2020	2021	2022	2023	2024	2025*e*
3.5 TWh	6.7 TWh	10.6 TWh	16.6 TWh	22.6 TWh	28.8 TWh
≈	≈	≈	≈	≈	≈



Malta	Cyprus	Estonia	Slovenia	Croatia	Ireland
3.2 TWh	5.8 TWh	8.9 TWh	13.8 TWh	19.8 TWh	30.9TWh



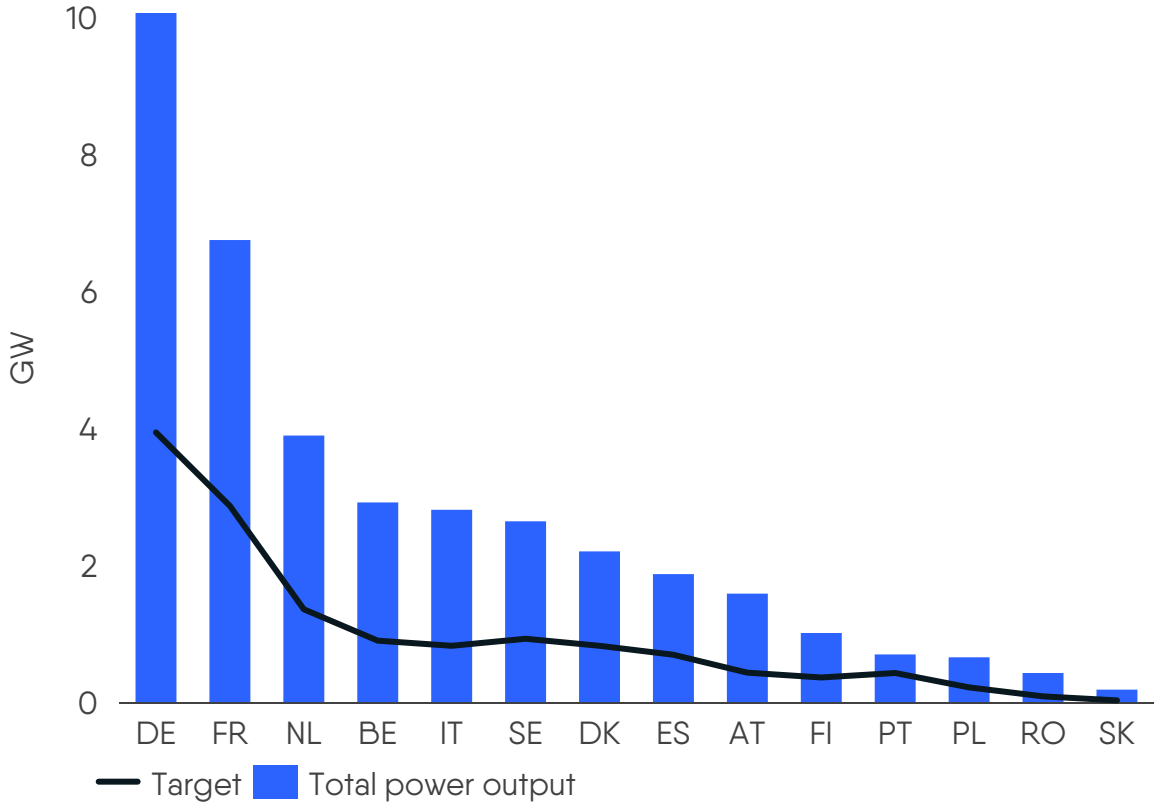
Scenario	2035
Current regulation	185.6 TWh
≈	
Poland	172.0 TWh
Commission scenario	164.8 TWh
≈	
AT + CZ + SK	168.2 TWh
Weakened scenario	131.2 TWh
≈	
Sweden	138.1 TWh

Notes: 1) Road transport data sourced from Eurostat Energy Balance. The estimates combine proportional historical demand and the stock shown in the previous slide; for 2035, they are adjusted downward by 10% to account for future efficiency gains. For PHEVs, only electric-mode kilometres are counted (see Fraunhofer). 2) Data for countries' loads sourced from Elda. Sources: Eurostat, Eurelectric, Fraunhofer, T&E.

Europe has built the infrastructure ahead of the curve, but without faster EV uptake the investment risks going to waste

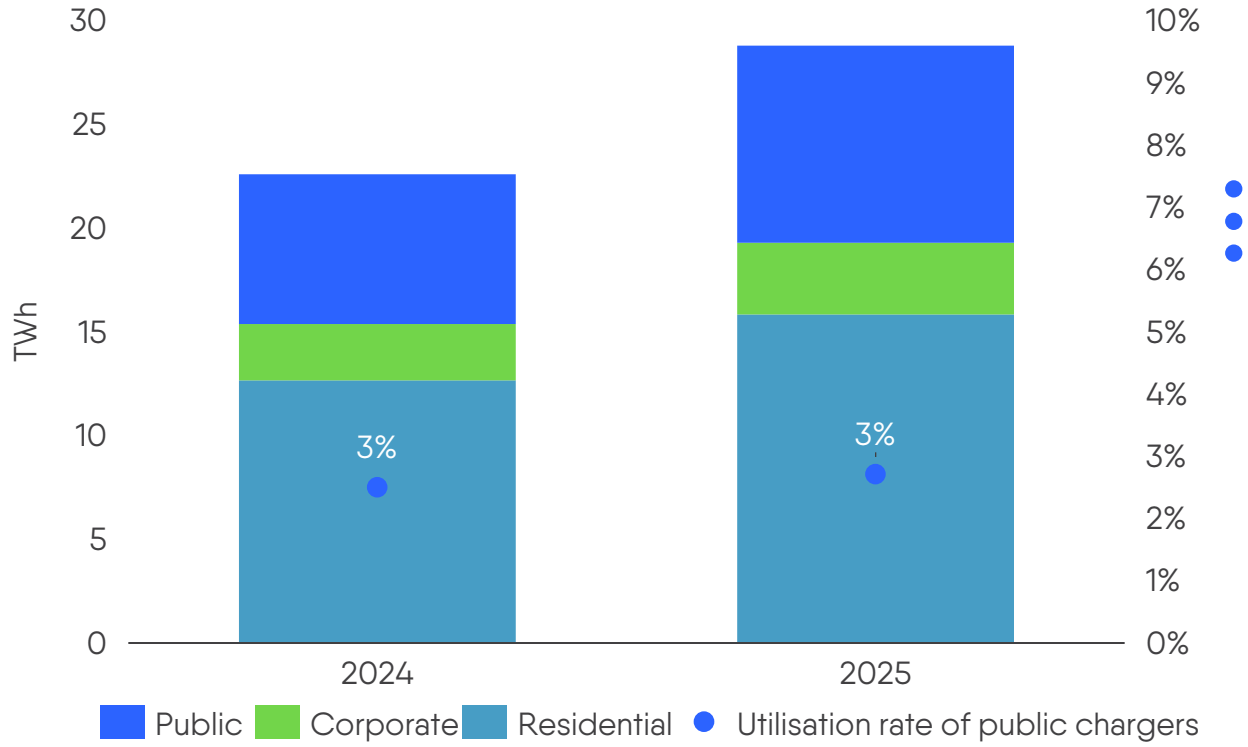
Total power output per AFIR fleet-based target, EU[1,2]

- Although deployment is still uneven across Member States, all have met the 2025 AFIR target. Public EV chargers in Europe now provide a combined 40 GW of power output.



EV chargers' electricity consumption by sector, EU[3]

- Despite EV demand rose in 2025, the utilisation rate of public chargers remains flat around 3%. Infrastructure has been deployed ahead of demand, meaning the bottleneck is now the size of the EV fleet, not the availability of chargers. Accelerating EV adoption and stimulating demand through tariff reform, consumer incentives, and fleet electrification mandates are the critical next steps.



Notes: 1) Figures sourced from Alternative Fuels Infrastructure Regulation (AFIR). 2) AFIR requires member states to provide at least 1,3 kW charging power per BEV and 0,8 kW per PHEV registered in their fleet. 3) Figures for charging distribution sourced from ChargeUp Europe. Utilisation rate calculated as total road transport electricity consumption divided by total installed public charging capacity multiplied by 8,760 hours per year. Sources: EAFO, ACEA, European Commission, Chargeup Europe, AFIR. EAFO T&E, ChargeUp Europe.

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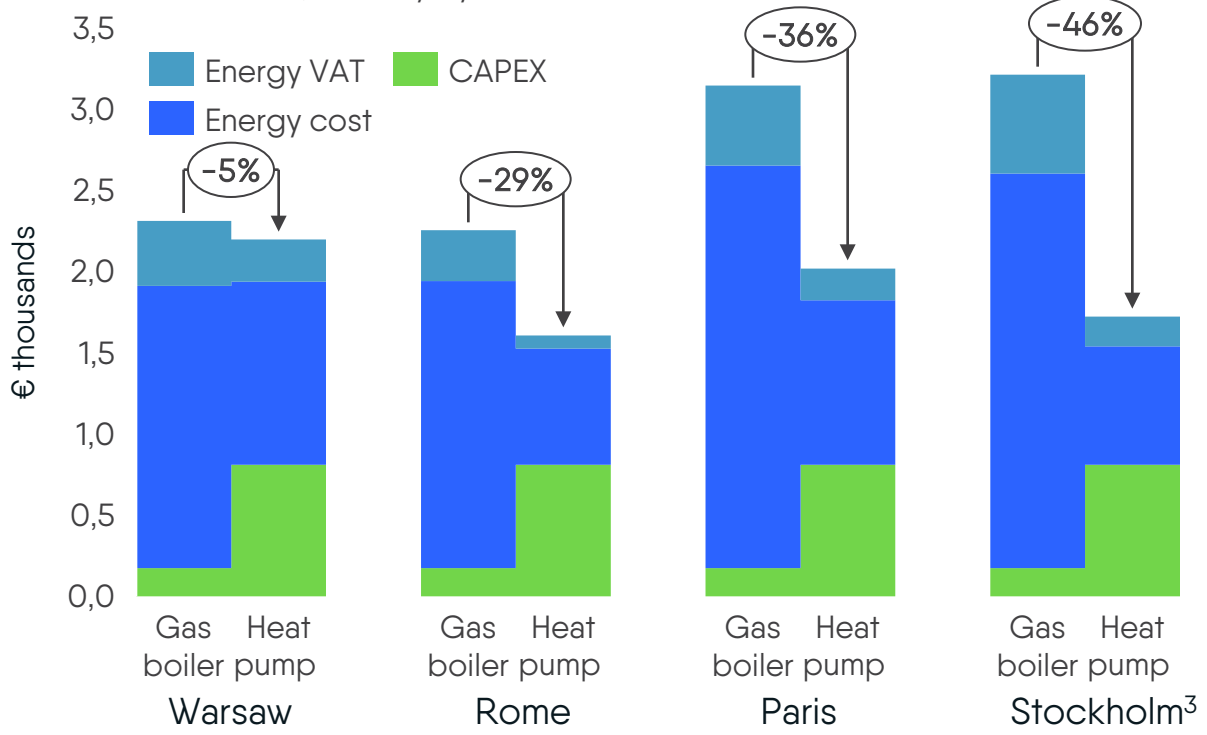
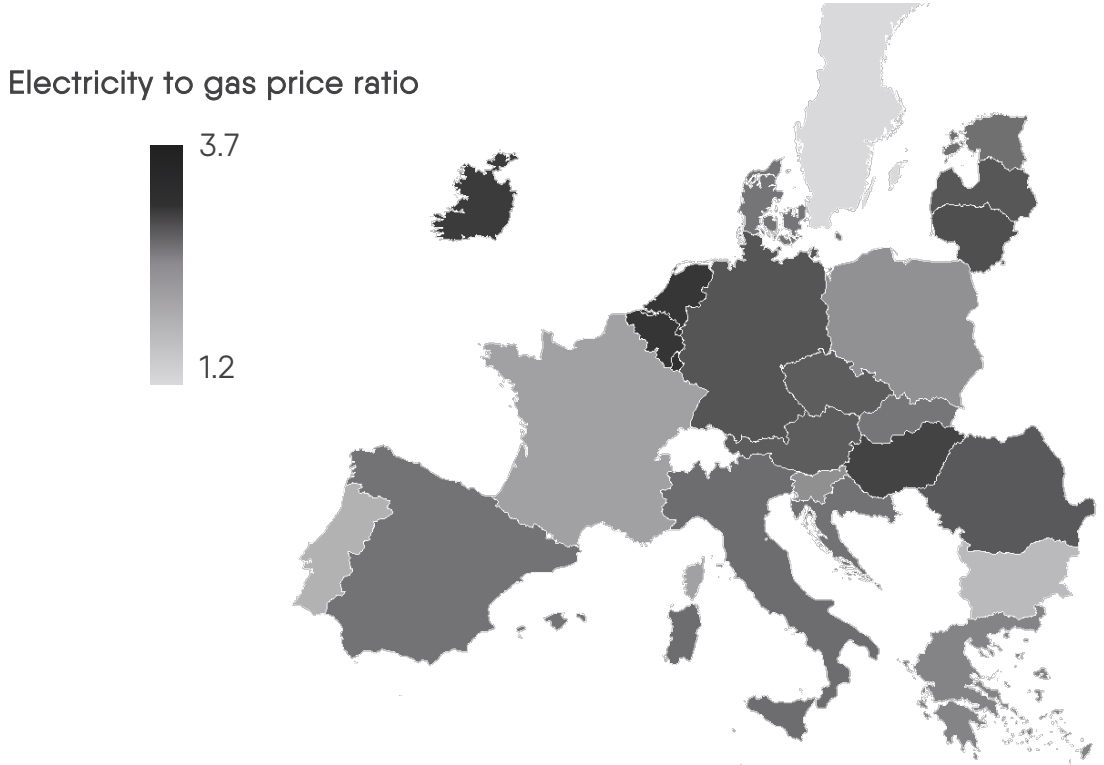
Heat pumps can be cost-effective across Europe in new and renovated houses, even where electricity prices are up to three times higher than gas prices

Annualised costs of gas boiler vs. heat pump in new single houses[1]

Household consumer electricity to gas price ratio, 1H 2025[2]

- Thanks to their higher efficiency relative to gas boilers, heat pumps achieve lower running costs in every country for new houses, even where electricity prices are nearly three times higher than gas prices. This also aligns with the recast Energy Performance of Buildings Directive[3], which makes zero-emission buildings the standard for all new buildings from 2030, with public new buildings covered from 2028. Since heat pumps already deliver lower running costs than gas boilers in new houses across EU countries, the economics are already consistent with that direction of travel and support making heat pumps the default technology in new construction now, not only by 2030.

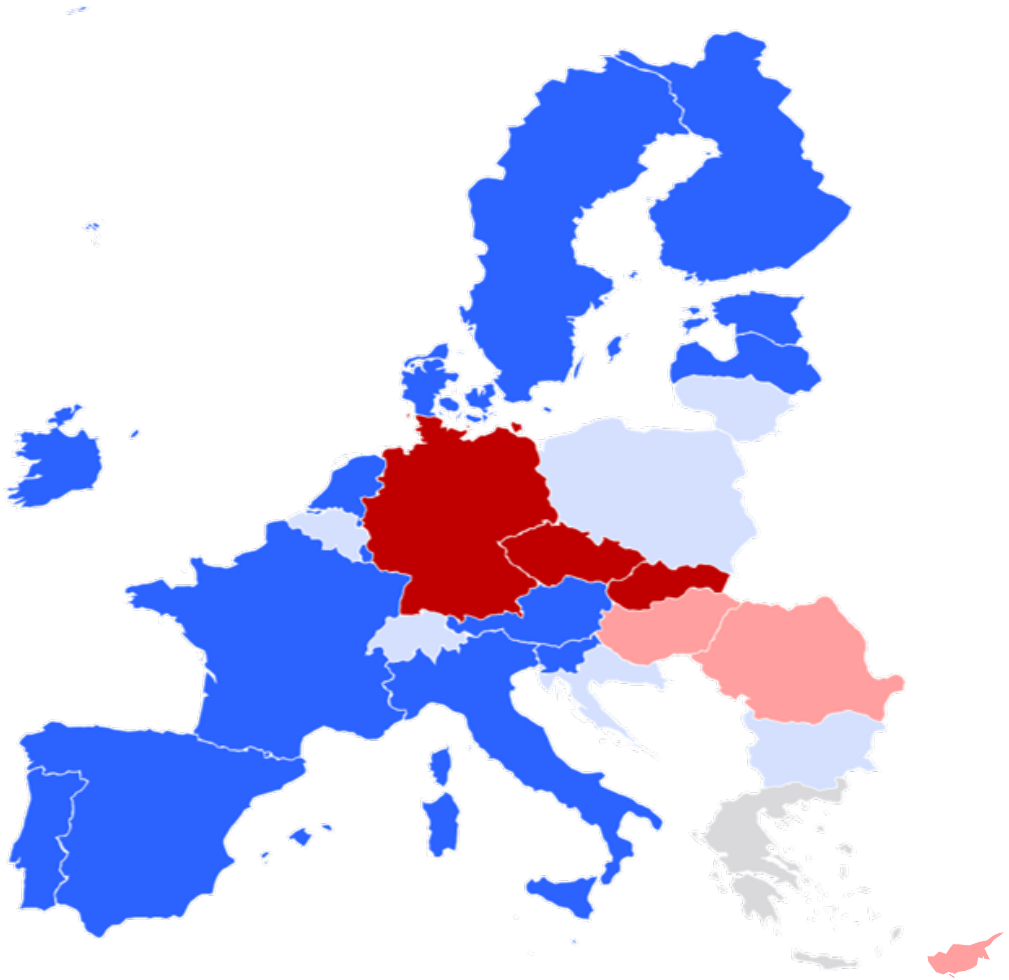




Notes: 1) The analysis is based on CAPEX estimates reported by the DEA (in real EUR 2025). Total energy costs were derived using the EHPA calculator, incorporating average 2025 household energy price (incl. VAT) data from VaasaETT and assuming a 7kw$_{th}$ boiler and air-to-water heat pump used for space heating and water supply (assumed 2h a day) in a new single house. The assumed COP refers to a leaving water temperature of 40°C. All figures are annualised assuming a 20-year lifetime for both technologies and applying a 5% discount rate for capital costs and 2% rate for variable costs. 2) Figures sourced from Eurostat. Polish figures correspond to the second half of 2024. 3) EPBD available here. 4) As Swedish households rarely rely on gas boilers, only heating purposes are included.

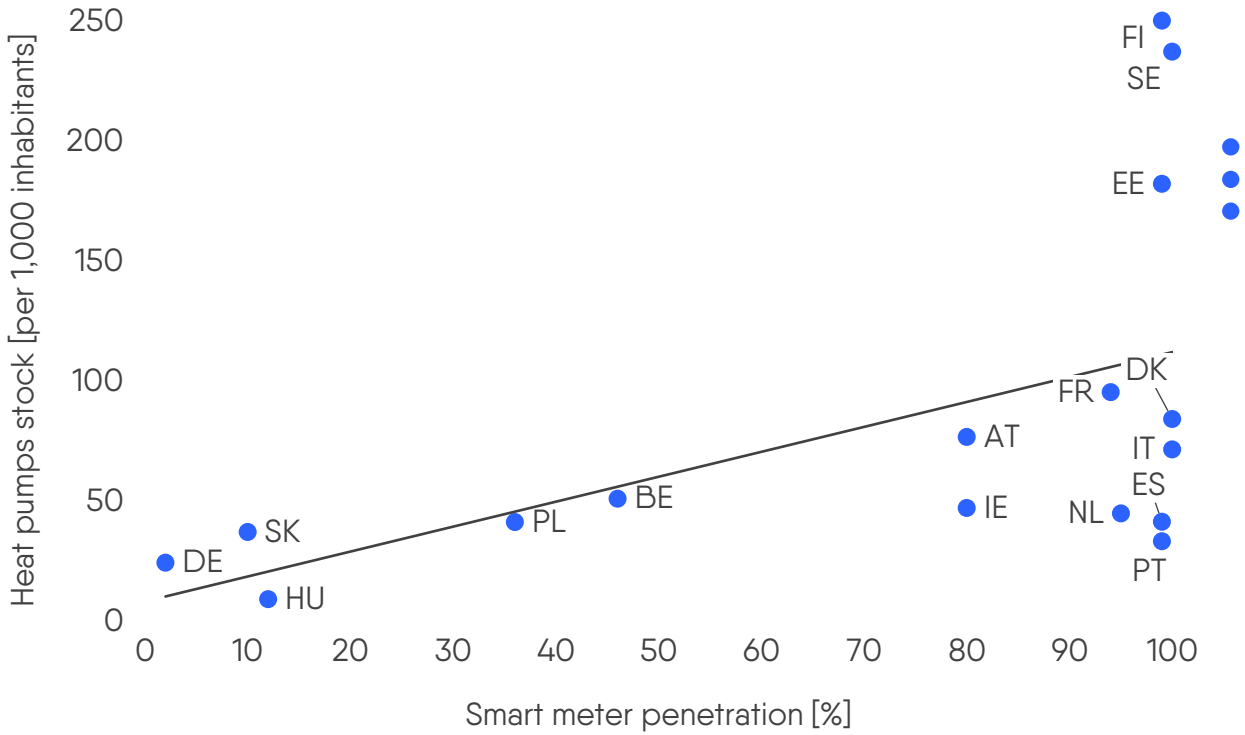
Smart meter rollout is a driver for heat pump adoption as most of the countries that have digitised their grids lead on electrified heating

Smart meter roll-out across the EU+CH, 2024[1,3]



Heat pumps units vs. smart meter roll-out, 2024[1,2]

- Countries with smart meter penetration above 80% consistently show higher heat pump density, while laggards like Germany (below 10%) remain far behind on both metrics. The data points to a clear policy lever: accelerating smart meter deployment is not just a grid modernisation goal — it is a prerequisite for enabling households to adopt flexible, low-carbon heating at scale.

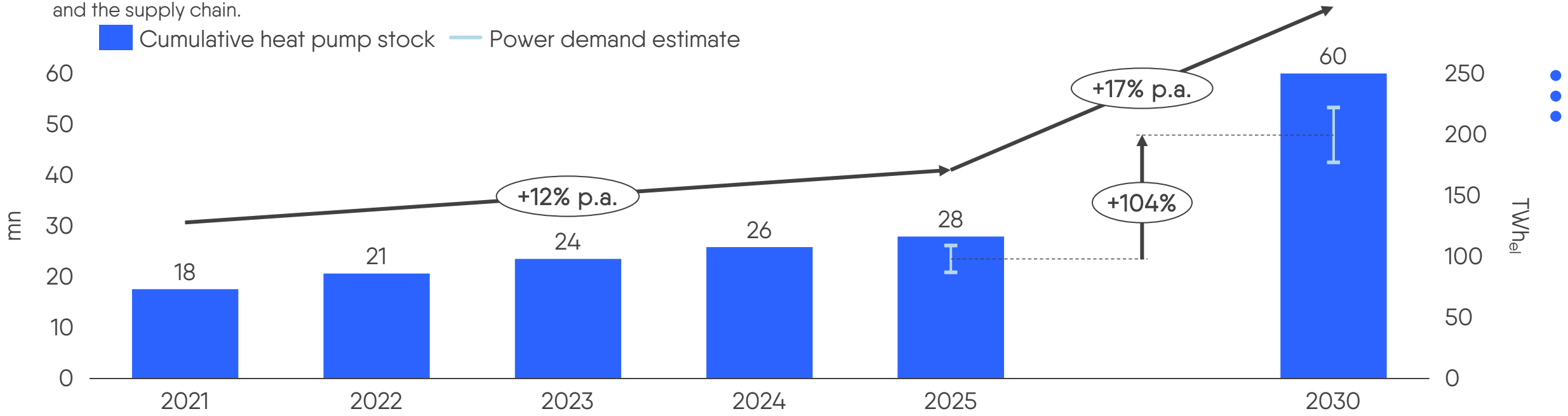


Notes: 1) Most of the data are sourced from Eurelectric member survey and the Rest of figures are sourced from ACER/CEER. 2) Figures sourced from EHPA 3) The percentage displayed for the roll-out of smart meters in Bulgaria refers, in the absence of a legal definition of smart meter functionalities, to meters supporting smart metering.. Sources: Eurelectric, ACER/CEER, EHPA.

EU installed heat pumps reach above 28 million, but doubling the fleet by 2030 demands a step-change in deployment pace

Stock of installed heat pumps in 13 EU countries and electricity demand estimation[1]

- Installed heat pumps across the EU have surpassed 28 million units, with air-to-air and air-to-water technologies accounting for most of the installed base. This corresponds to more than 210 GW of thermal capacity, generating an estimated electricity demand in the range of 85 to 110 TWh_{el} annually. Under the REPowerEU plan, the EU has set a target of 60 million installed heat pumps by 2030, more than doubling the current fleet within five years.
- Achieving this would require annual installation growth of approximately 17% (CAGR), a marked acceleration from the 12% CAGR recorded over the past five years. Bridging this gap will demand decisive and coordinated policy action. Priority measures should include making heat pump-specific electricity tariffs mandatory across Member States to restore cost competitiveness against gas and reforming subsidy mechanisms to ensure stability and forward visibility for both consumers and the supply chain.



Notes: 1) Stock data sourced from EHPA. Demand estimates are based on author's analysis, drawing on a total installed fleet of 217 GW across 28 million units. Efficiency is modelled at a Seasonal COP of 3.0 for the current fleet, rising to 3.15 by 2030, reflecting a 5% improvement driven by the gradual rollout of newer, more efficient models. Annual full-load operating hours are assumed at 1,200 hours under a conservative scenario and 1,500 hours under a central scenario. The 2030 projection scales all parameters proportionally to the target fleet of 60 million units Sources: EHPA, JRC.

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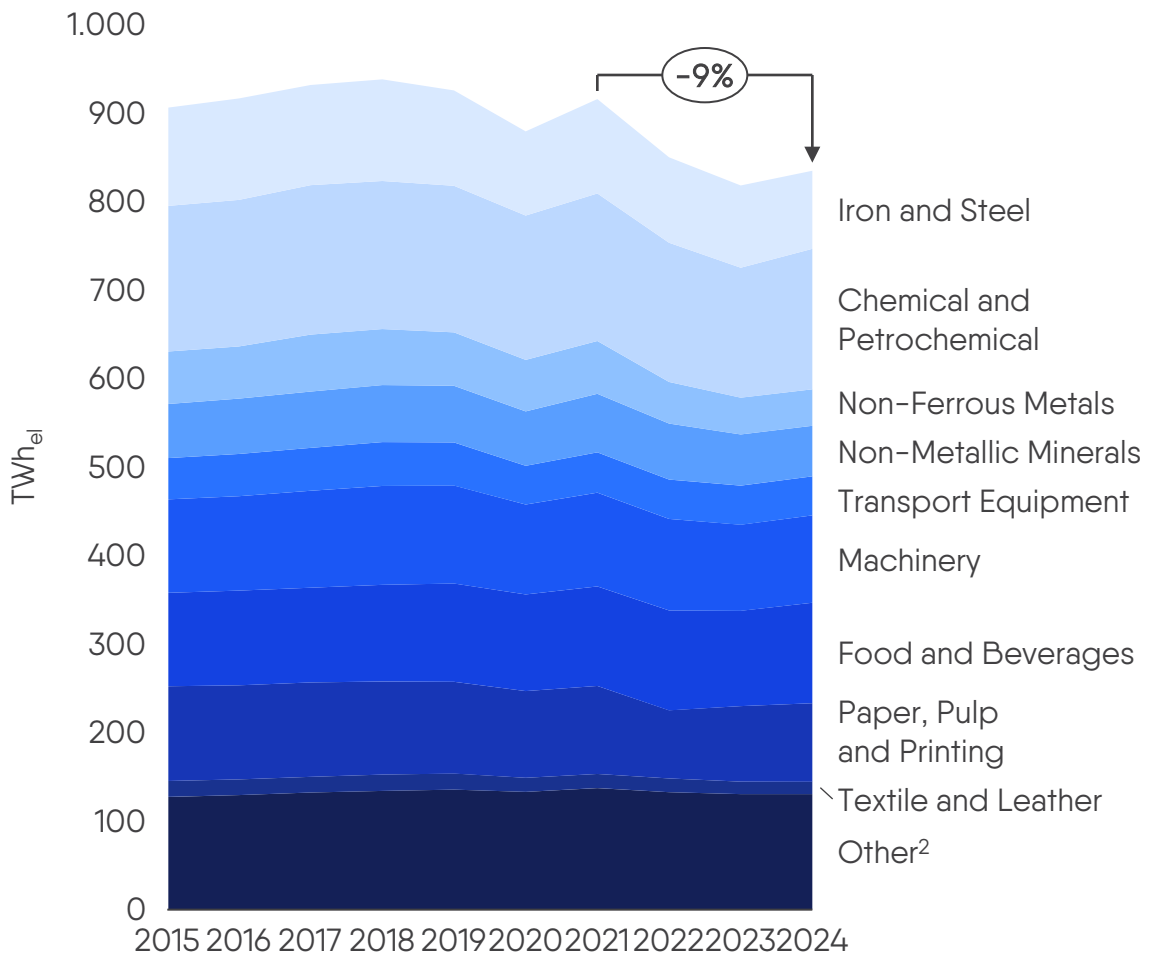
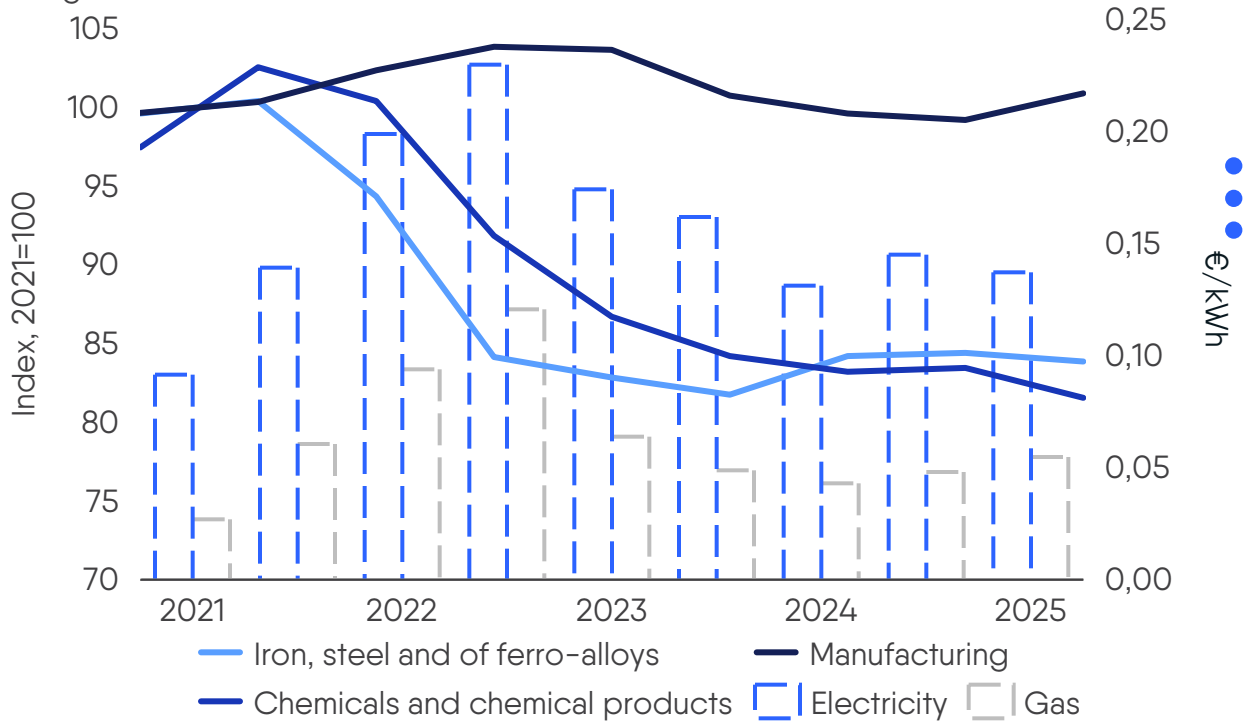
EU industry consumed 9% less electricity by 2024 as energy-intensive sectors which were hit hardest by the 2022 crisis have yet to recover their pre-crisis production levels

Final consumption of electricity by industry, EU[1]



Production in manufacturing and industrial energy prices, EU[3]

- The 2022 energy crisis sent gas prices to historic highs, cascading into the power sector and hammering energy-intensive industries — iron, steel, and chemicals have never recovered to their 2021 baseline. While electricity prices have gradually stabilised, driven by rapid renewables expansion across Europe, gas remains a vulnerability due renewed geopolitical tensions and tightening global LNG markets.

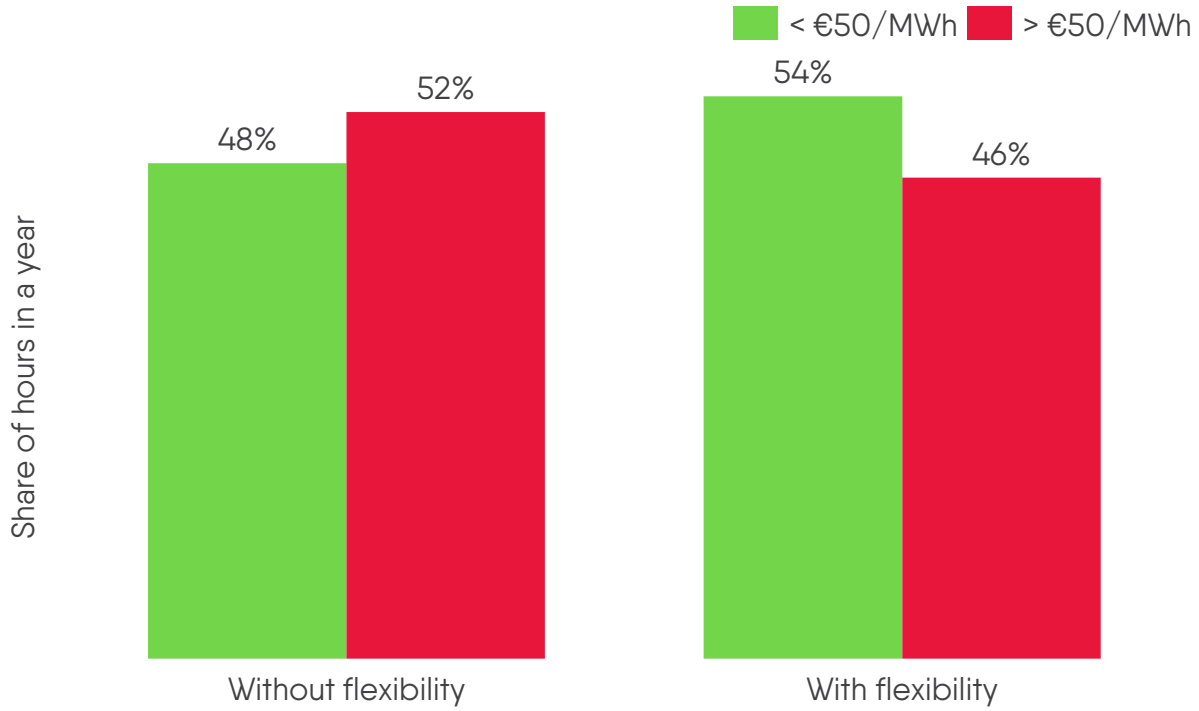


Notes: 1) Figures from Eurostat. 2) Other sectors include mining, wood, construction and sectors unspecified in Eurostat Energy Balance. 3) Figures sourced from Eurostat. Energy prices refer to electricity prices for non-household consumers with consumption above 150,000 MWh and to gas prices for non-household consumers with consumption above 4,000,000 GJ. Sources: Eurostat.

Beneficial impact of demand-side flexibility on industrial power price shows its importance in scaling it across all EU

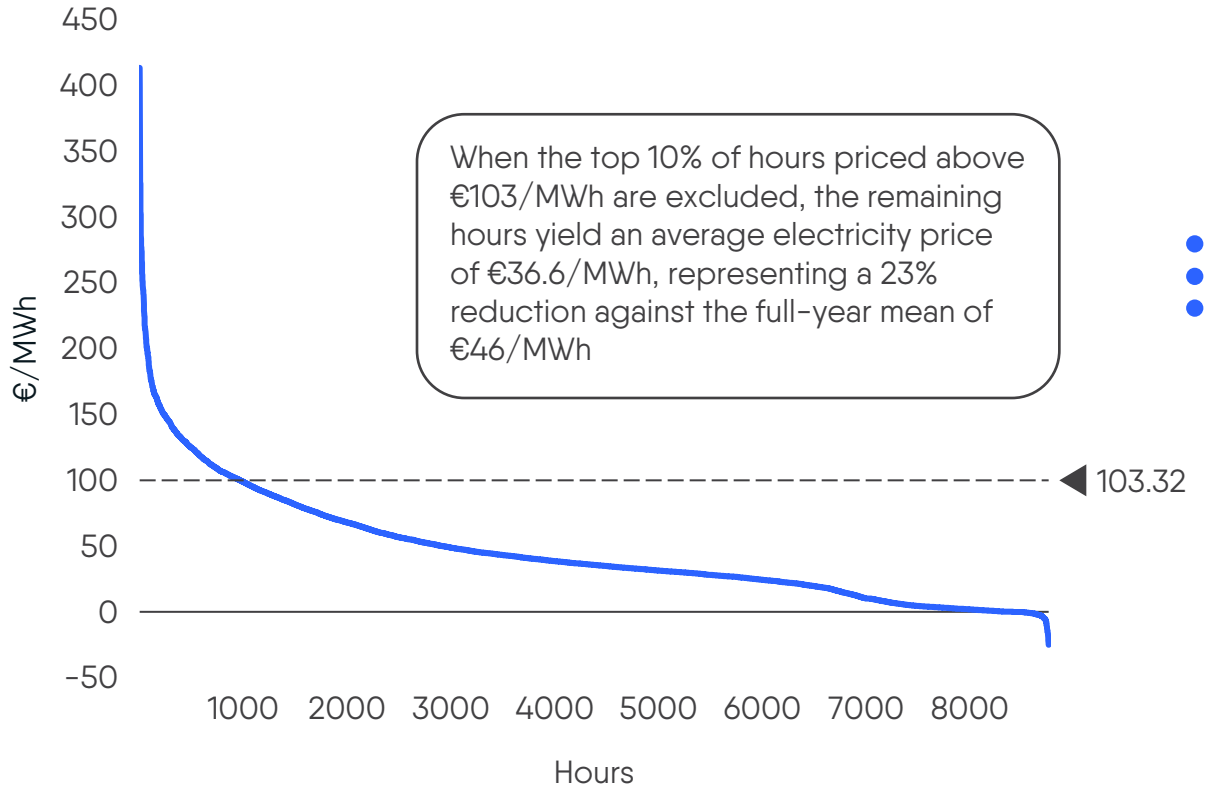
Share of EU industrial consumption hours by price band, 2040

- Eurelectric modelling[1] with a highly electrified 2040 scenario shows that flexible industrial demand can shift consumption to lower-priced hours, increasing it when prices fall below €50/MWh and reducing it when they rise above that level. This flexibility can unlock €939 million in annual arbitrage savings and creates €2.9 million in value per 100 MW of flexible industrial load.



Electricity price, Sweden 2025[2]

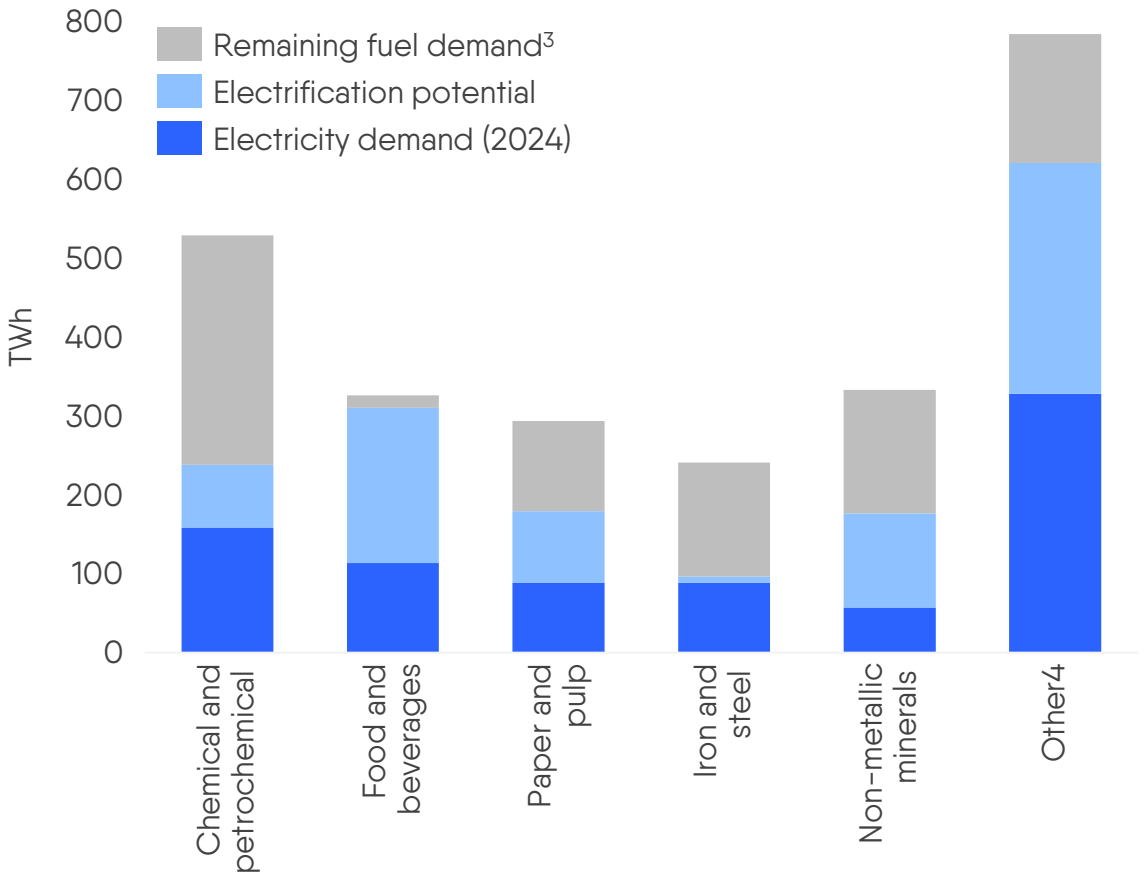
- Strategic load flexibility is a powerful cost lever: a Swedish industrial plant avoiding high-price hours for as little as 10% of annual operating time could cut its average electricity price by almost a quarter, from €46 to €35/MWh.



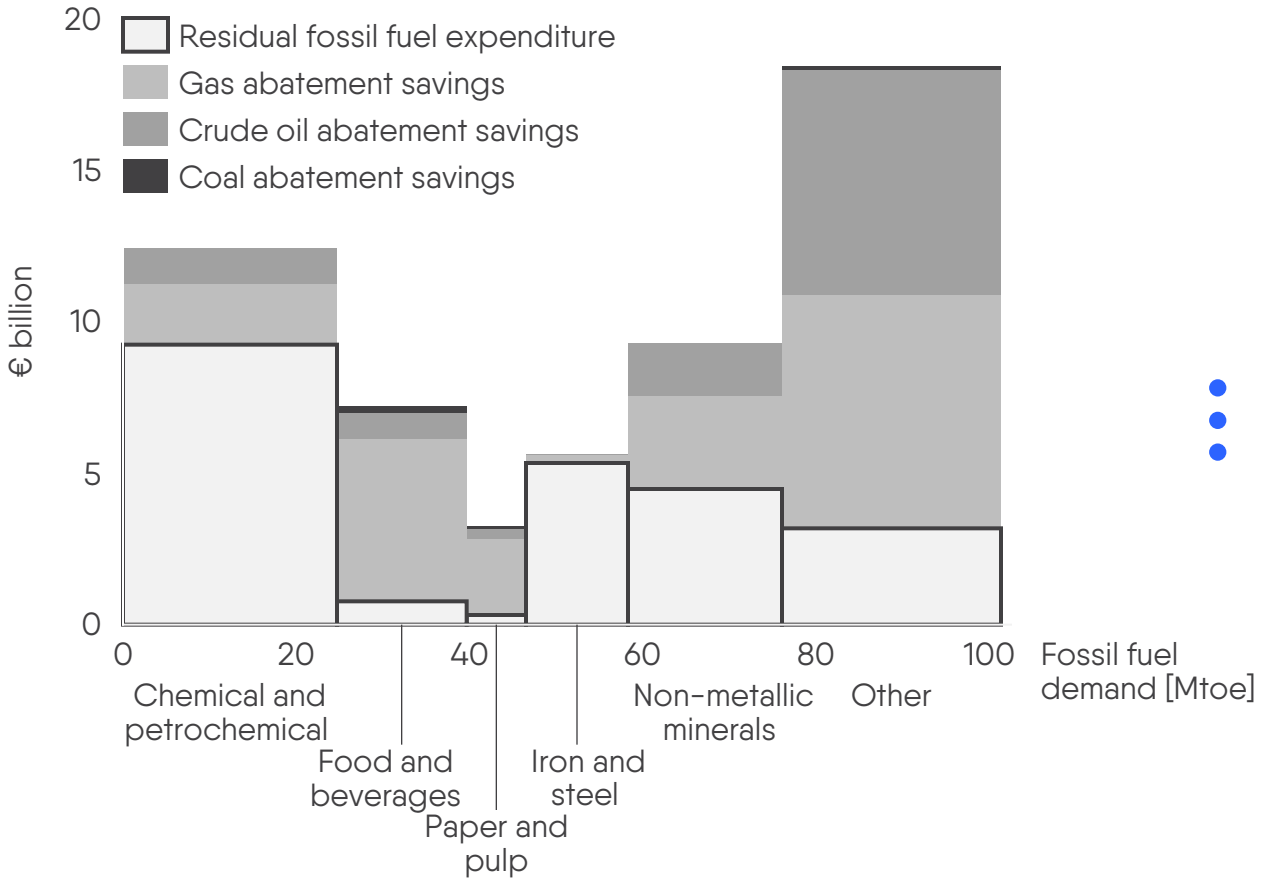
Notes: 1) Eurelectric modelled two 2040 scenarios (low demand flexibility and high demand flexibility) each allowing a different share of industrial load to operate flexibly, with the flexible load percentage varying across industry sectors. 2) Figures sourced from Elda. Data refers to SE3 bidding zone (central Sweden) which contains a high concentration of electricity consumption and industrial demand.
Sources: Eurelectric, Elda, ENTSO-E.

Electrifying EU industry with mature technologies could add 620 TWh to electricity demand and cut EU fossil fuel imports by more than €30 billion annually

Industrial energy consumption, EU[1,2]



Estimated EU industrial fossil fuel import costs, 2024[5]



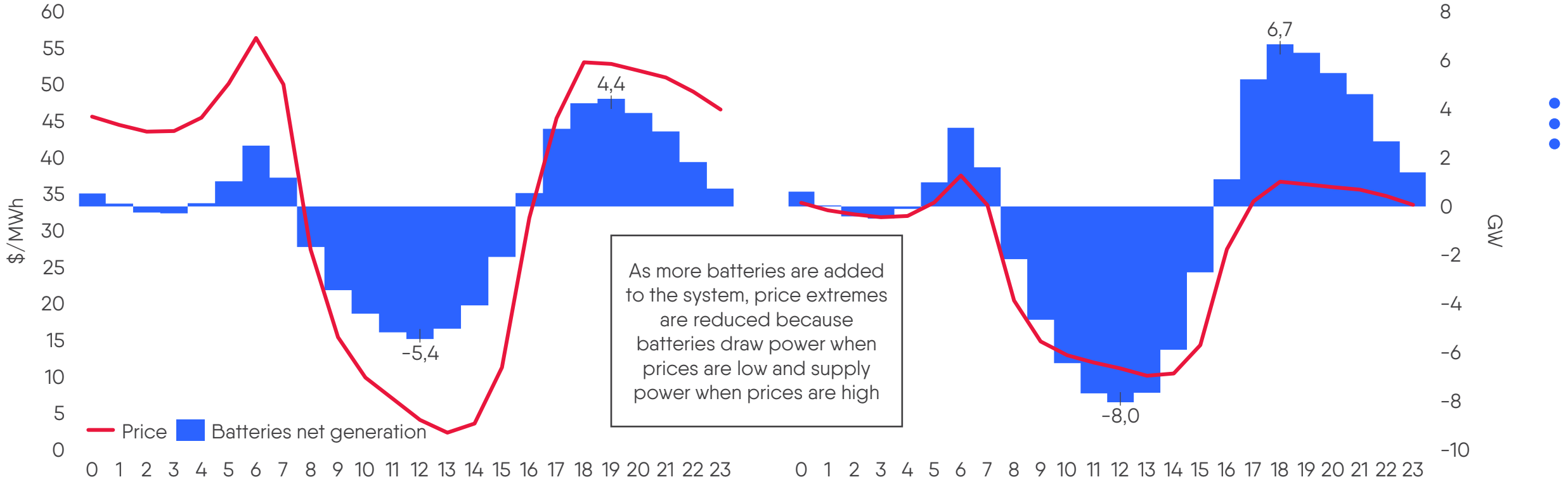
Notes: 1) Figures from Eurostat Energy Balance 2024. Exclude feedstock. 2) See assumptions in the appendix in the *Premium Deck*. Analysis builds upon the methodology of Fraunhofer ISI (2024) incorporating insights from ECCO, 2025, Eurelectric, 2025, Madeddu *et al*, 2020. The scope of potential electrification is restricted to mature technologies. 3) Includes renewables and biofuels. 4) Other sectors include mining, wood, non-ferrous metals, transport equipment, machinery, textile, construction and sectors unspecified in Eurostat Energy Balance. 5) Unit import prices (€ per tonne) calculated from Eurostat total import costs and volumes, converted to € per toe using standard conversion factors (crude oil: 1.0 toe/tonne; coal: 0.7 toe/tonne; LNG: 1.22 toe/tonne), then multiplied by industrial fossil fuel consumption. Estimated savings represent potential cost reductions from electrification. Sources: Eurostat, ECCO, Eurelectric, Agora Industry, Fraunhofer, Madeddu *et al.*

CAISO shows the dual value of storage: it lifts off-peak prices benefiting renewable suppliers, while reducing peak-hour prices for consumers

CAISO price curves, Q1 2025[1]

CAISO price curves, Q1 2026[1]

- Across CAISO, day-ahead midday prices increased by roughly 8 $/MWh on average, while peak-hour prices fell by about 16 $/MWh between Jan–Mar 2025 and the same period in 2026. Over the same window, average battery charging rose from 5.4 GW to 8.0 GW and discharging from 4.4 GW to 6.7 GW. In practice, more storage is absorbing low-priced energy in the middle of the day and releasing it when the system is tighter.
- As CAISO plans to increase its batteries[2], it shows something more encouraging than the mere batteries cannibalising themselves: solar producers can enhance the value of their assets as storage scales, while a flatter wholesale price profile will reduce pressure on retail customers.



Notes: 1) Average day-ahead hourly prices sourced from OASIS.CAISO. 2) See the appendix for a summary of both existing and planned battery systems within CAISO. Sources: CAISO, EIA.

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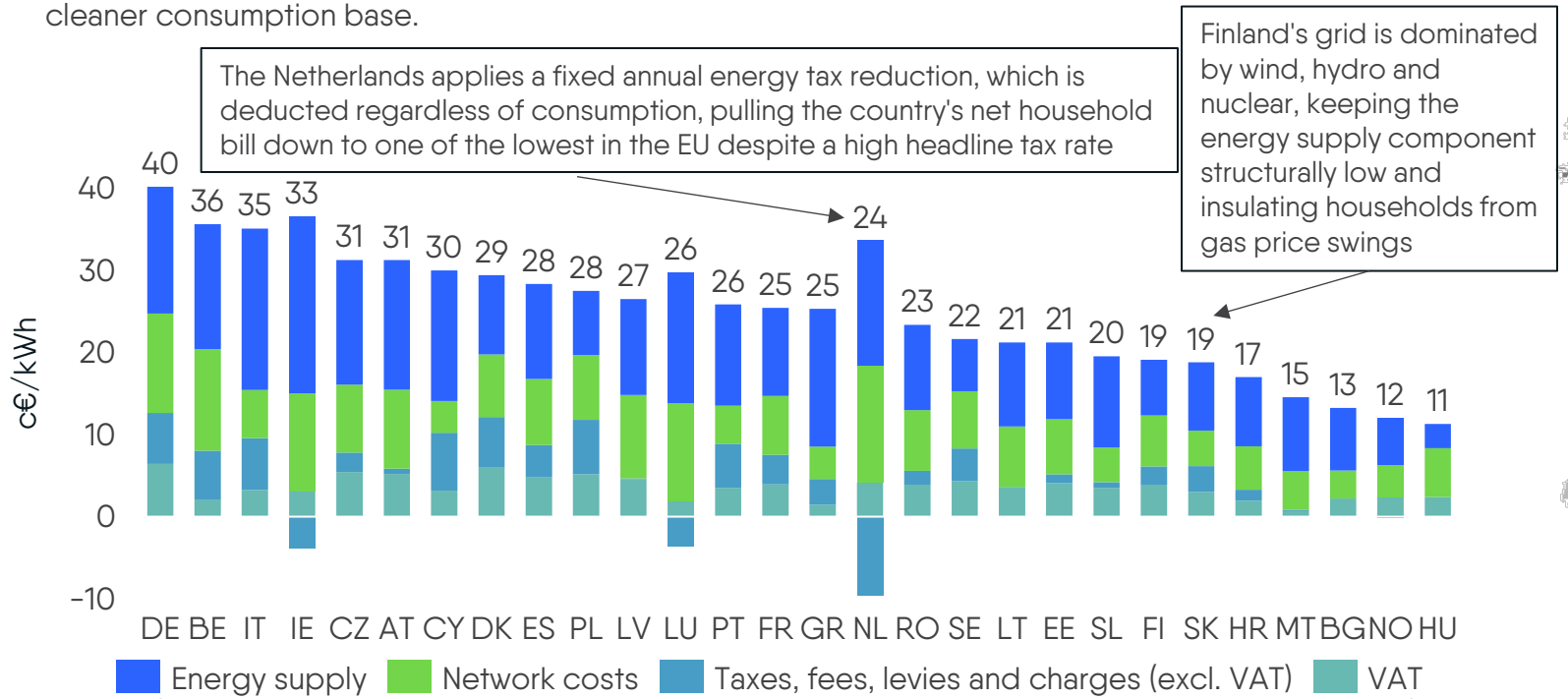
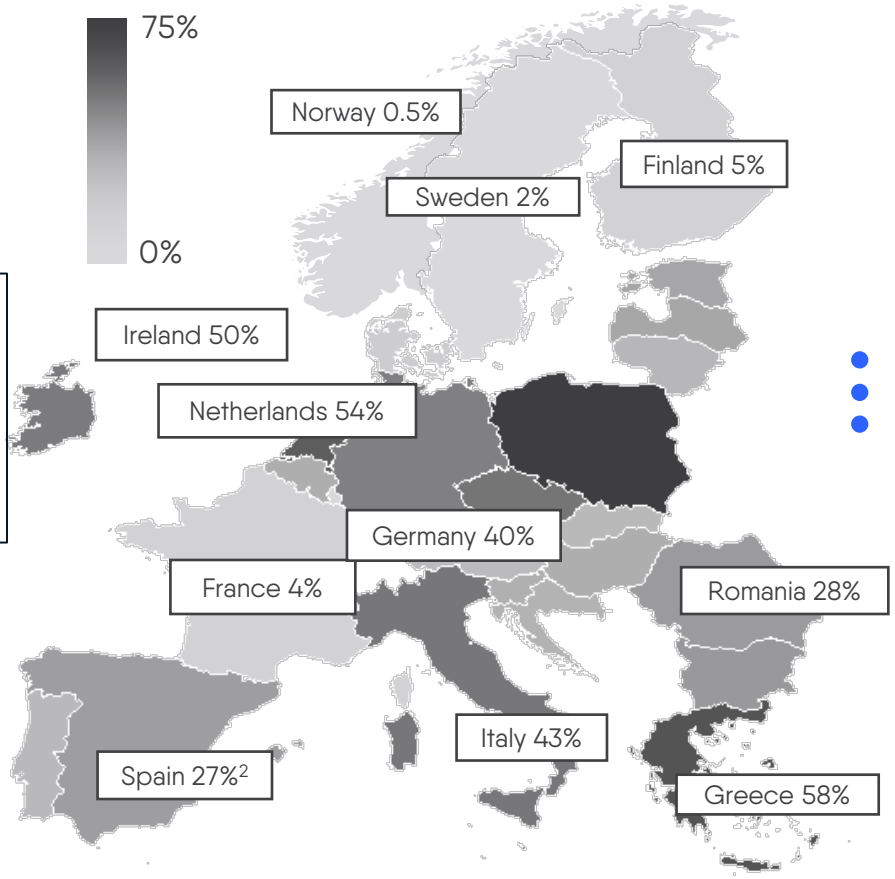
Cleaner grids mean cheaper bills meaning accelerating the shift away from fossil fuels is the most effective lever to close the electricity affordability gap across the EU

Electricity prices for household consumers, 2025[1]

- Fossil fuels are keeping electricity bills unnecessarily high: in countries where gas and coal still often set the marginal price the energy supply component alone pushes household bills well above c€30/kWh. The solution is clear: a faster transition to clean power, as demonstrated by France and the Nordics, who enjoy cheaper bills.
- Residual levies and grid tariffs are masking the true benefits of clean power: even as renewable generation drives energy costs down, taxes and network charges absorb much of the saving before it reaches households, making it more urgent to accelerate electrification and spread those fixed costs across a larger, cleaner consumption base.



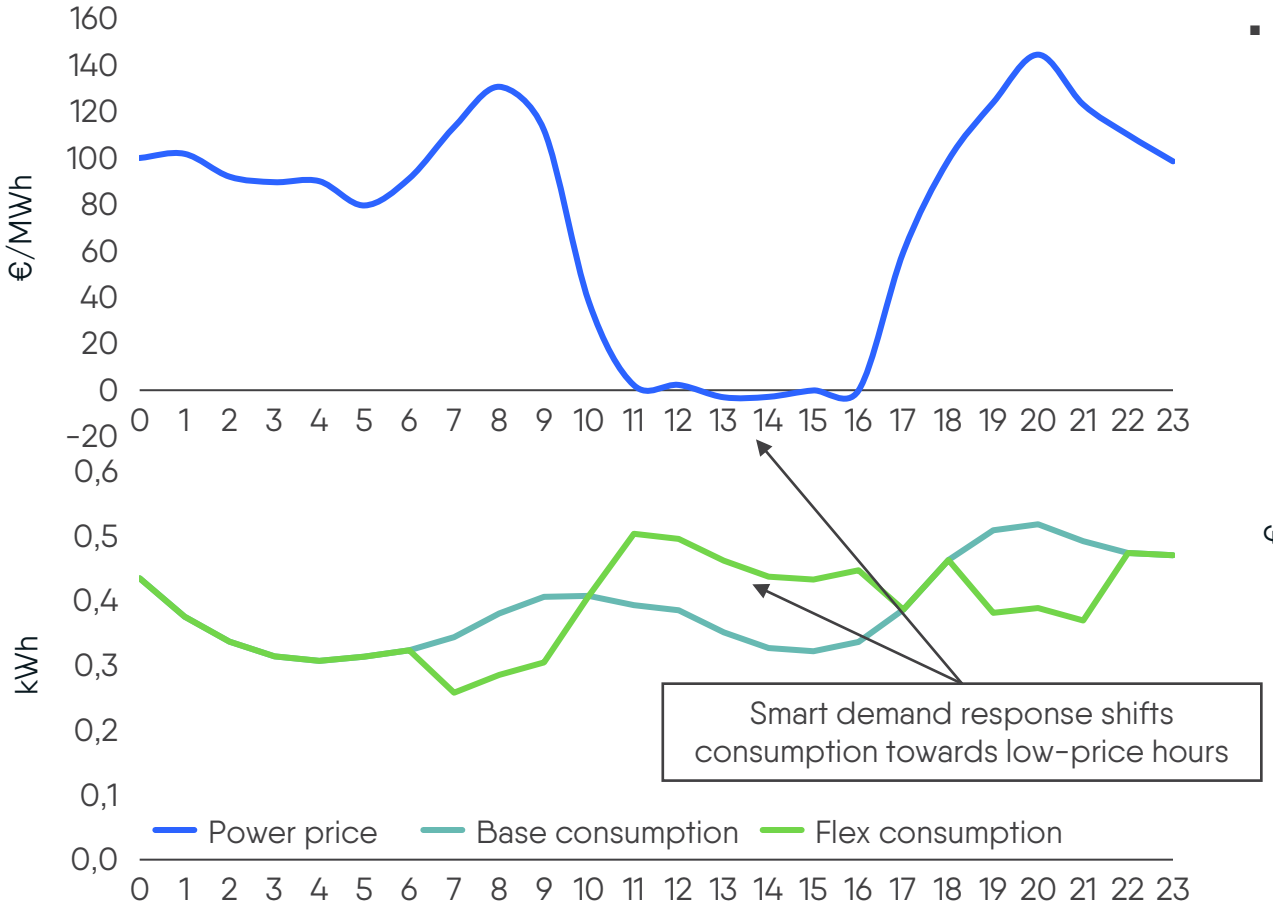
Annual fossil fuel share of load, 2025[3]



Notes: 1) Figures sourced from Eurostat. Data refers to a weighted average across households' consumption bands. 2) Spain's 2025 fossil fuel share reflects the temporary reinforced system operation measures introduced after the blackout, which increased the dispatch of gas-fired combined-cycle plants. 3) Figures sourced from Elda. Sources: Eurostat, Elda.

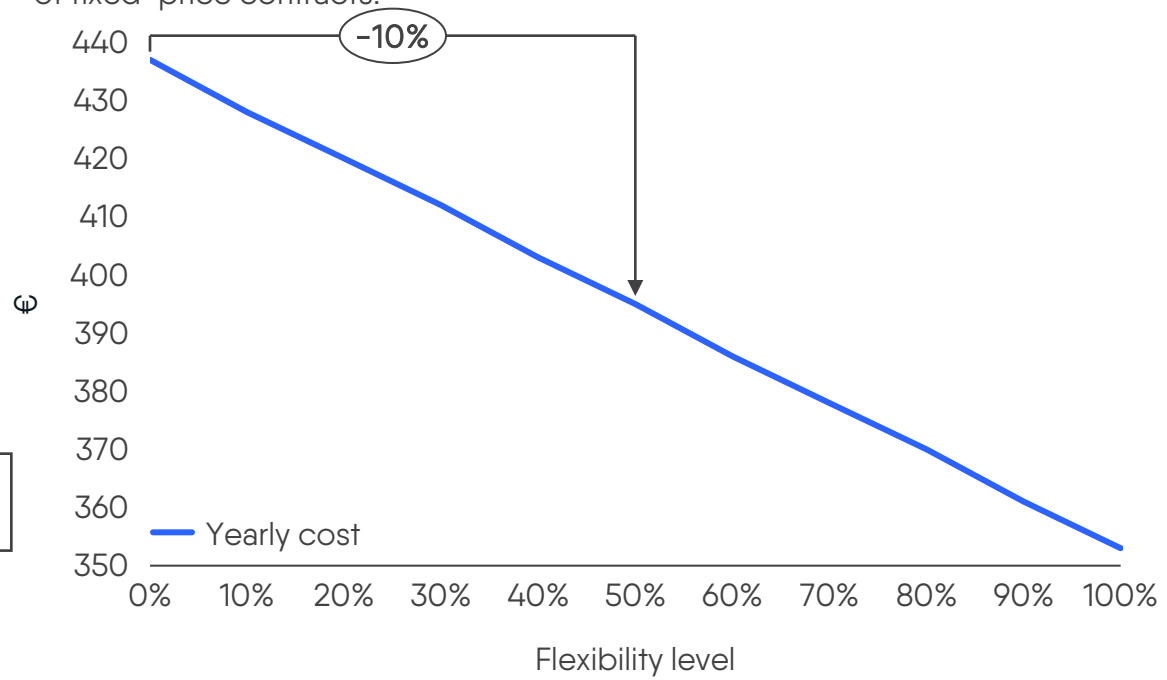
Flexibility is one way to turn price variation into household savings – through retail offers that reward flexibility and preserve consumer choice

Electricity price and demand profile in Belgium, April 11, 2025[1]



Illustrative savings from flexible consumption[2]

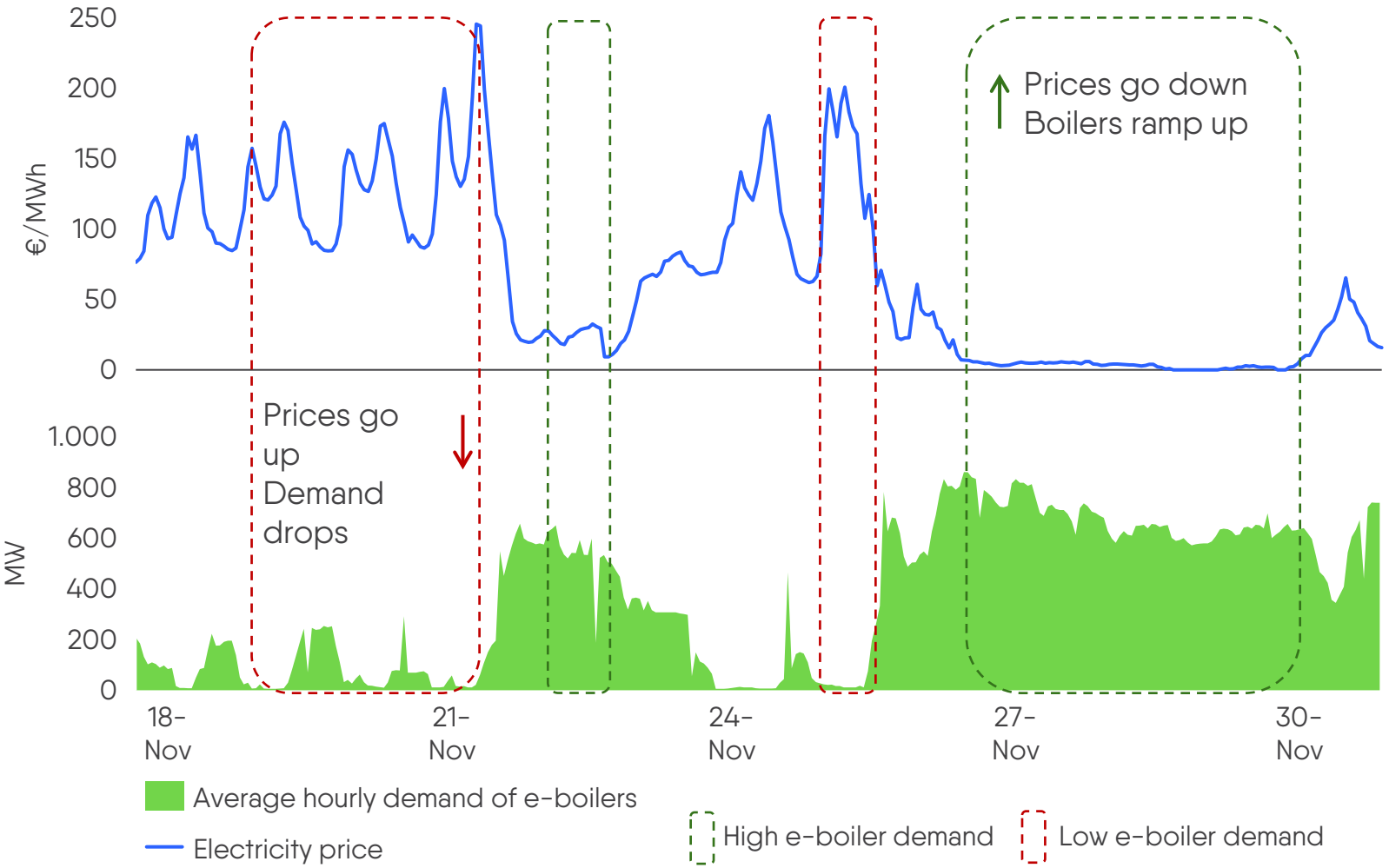
- Retail contracts can reward households for shifting flexible consumption to lower-price hours, while allowing consumers to choose their preferred level of price certainty. Flexibility can be encouraged through retail contracts (such as dynamic or time-of-use pricing), but consumers differ in risk profiles, knowledge and flexibility potential, and some may still favour the predictability of fixed-price contracts.



Notes: 1) Day-ahead prices sourced from Elda. Electricity consumption profile sourced from Synergrid. Consumption profile with flexibility based on Nico Schoutteet's code. Annual consumption is assumed to be 3,500 kWh. Flexibility is modelled as 25% of consumption shifted across 6 hours per day. 2) Assuming a dynamic price formula A × (Day-ahead price × B + C) is parameterised with a €70 subscription fee (A), a 1.05 pass-through multiplier (B), and a 1 c€/kWh fixed supplier margin (C). The calculation covers the energy supply component only and does not include network tariffs, taxes, levies, or VAT. Savings estimates assume consistent daily load-shifting behaviour. Sources: Eurelectric, Nico Schoutteet, Synergrid, Elda, ENTSO-E.

Finland shows that linking power and heat systems can turn renewable volatility into a source of flexibility

Finnish electricity price vs. consumption of electric boilers, 2025[1]



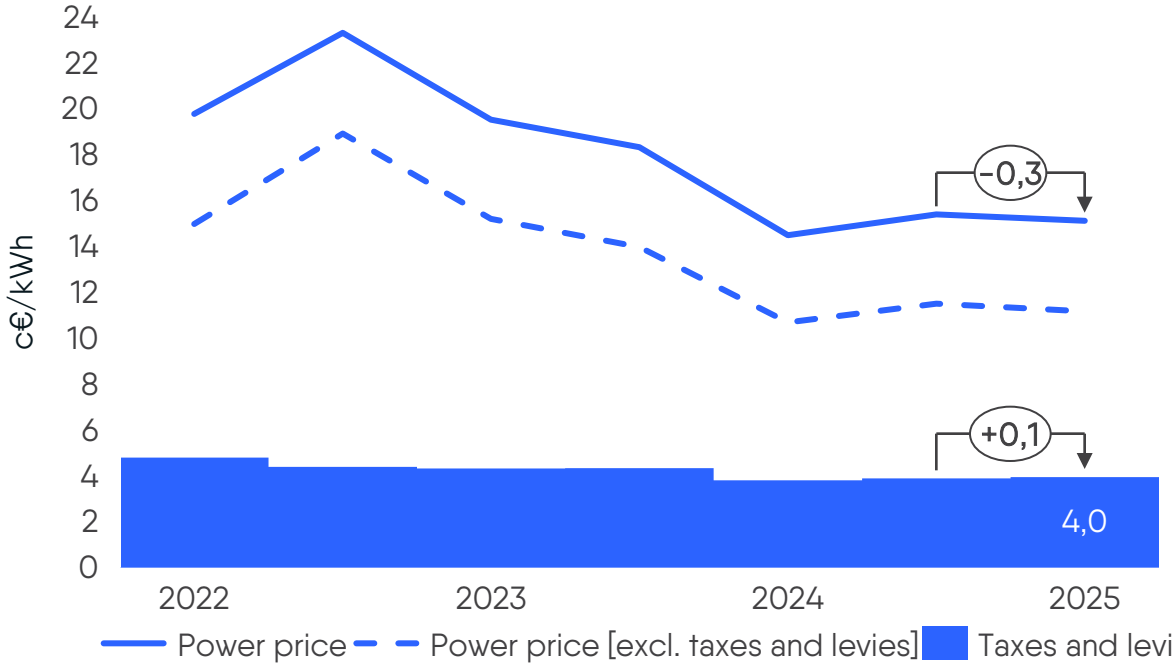
- Rapid wind expansion increased price volatility and lowered average wholesale prices, reducing the predictability of wind operators' returns.
- Finland's approach has emphasized market-driven flexibility rather than regulation or subsidies. Besides establishing new ancillary service markets to incentivize reserve capacity growth and investing in software to optimise dispatch decisions, the strategy has also relied on deploying electric boilers integrated with district heating networks.
- By end-2025, installed e-boiler capacity reached approximately 3 GW — equivalent to a quarter of Finland's peak load. E-boilers operate as price-responsive demand, consuming excess electricity during low-price periods and shutting down when prices rise, allowing gas and biomass boilers to resume working.
- This operating pattern creates natural demand-side flexibility without requiring complex control systems or subsidies. Importantly, it shows how e-boiler deployment provides a low-capital pathway to grid flexibility when combined with existing district heating infrastructure.

Notes: 1) Average day-ahead hourly prices sourced from Elda. Average hourly demand of e-boilers sourced from Fingrid. Sources: Elda, Fingrid.

The tax burden on electricity is at least twice that on gas in the EU, penalising electrification over continued fossil fuel use

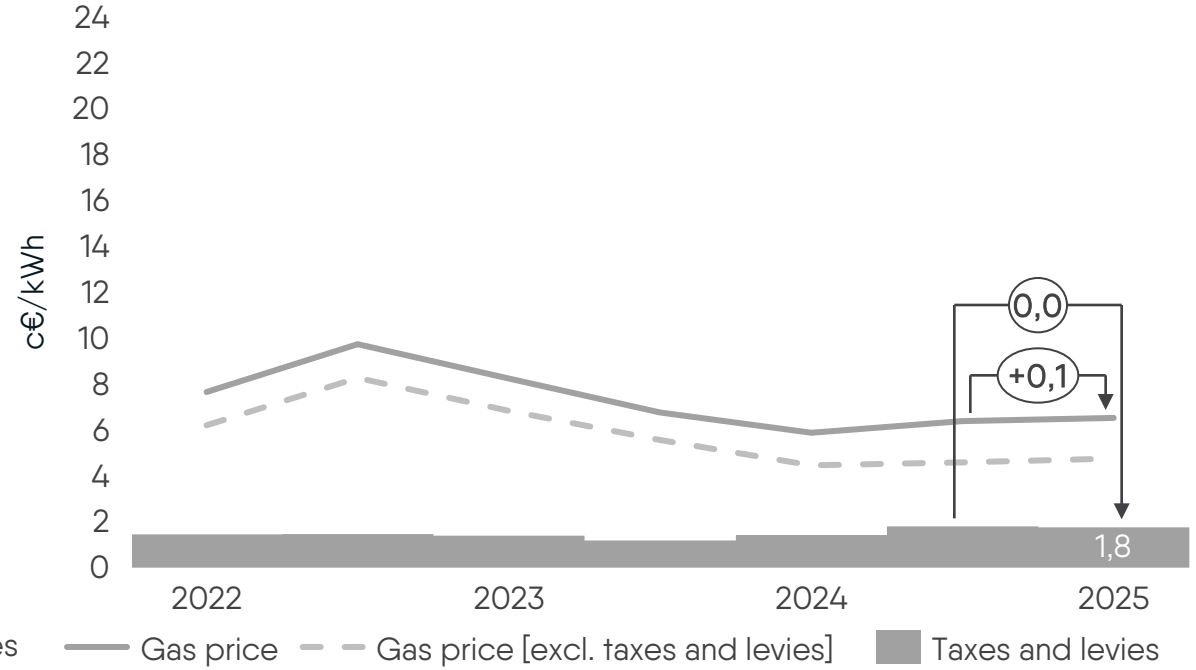
Electricity prices for large industrial consumers, EU[1]

- EU27 large industrial consumers face an average tax burden of more than 4 c€/kWh on top of the market price, ca. 35% of the pre-tax rate. Poland stands out, with consumers (including large industry) bearing one of the EU's highest mandatory levies (a burden rooted not in fiscal design but in a structural coal-dependency surcharge). Conversely, Ireland and the Netherlands have engineered relief schemes that keep effective net charges far below the EU norm. Such disparities distort the single market and raise questions of fairness for energy-intensive industries.



Gas prices for large industrial consumers, EU[1]

- Industrial gas consumers have consistently faced levies of only 1.4–1.8 c€/kWh across 2022–2025 (well below the 2 c€/kWh mark) regardless of the commodity price cycle. This structural advantage of gas over electricity in the tax treatment creates a persistent disincentive to electrify industrial processes: switching from gas to power does not just face a higher commodity cost, it also incurs a substantially higher tax wedge. Until levy asymmetries are corrected, the tax system actively works against decarbonisation of heavy industry.

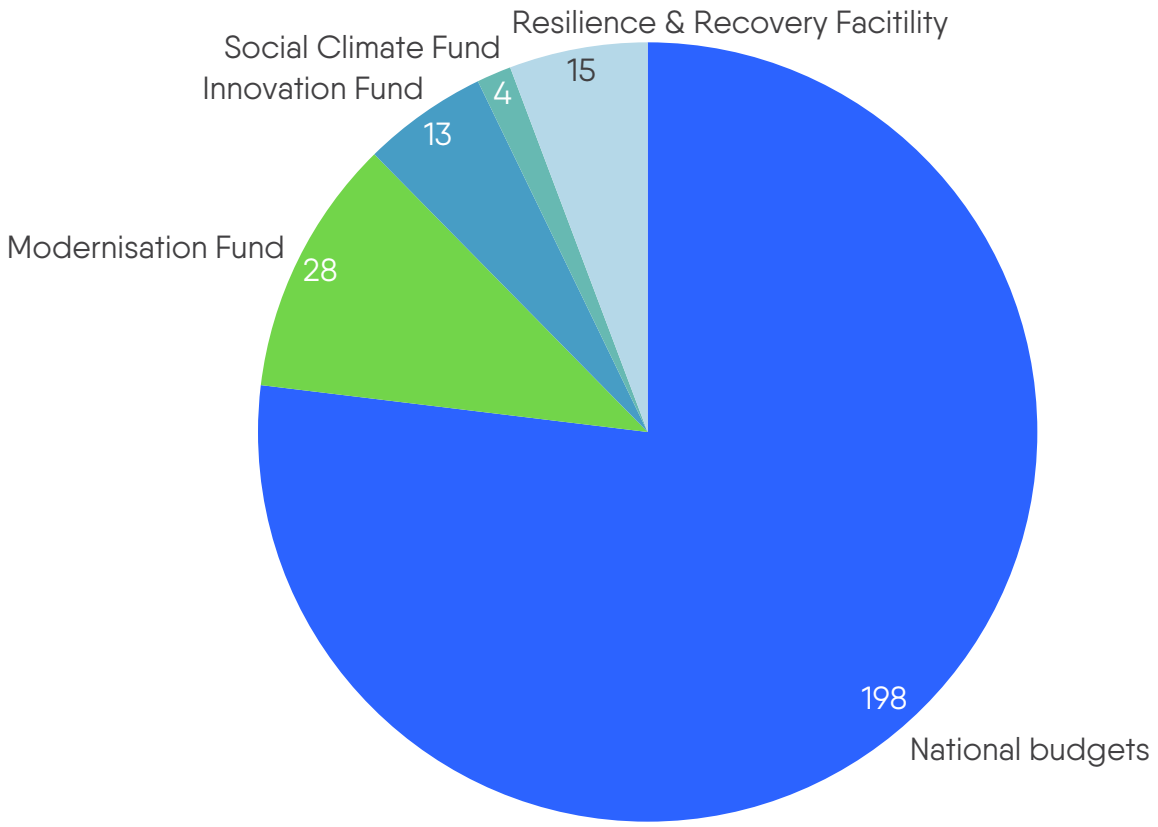


Notes: 1) Figures sourced from Eurostat. Data represents a weighted average across EU countries for electricity consumption band IF (70,000–149,999 MWh) and natural gas consumption band I4 (100,000–999,999 GJ). Source: Eurostat.

EU Emission Trading System is crucial for EU's energy transition as it remains a cost-effective policy to incentivise decarbonisation

Revenues raised by the EU ETS from 2013 to 2025

€ billion

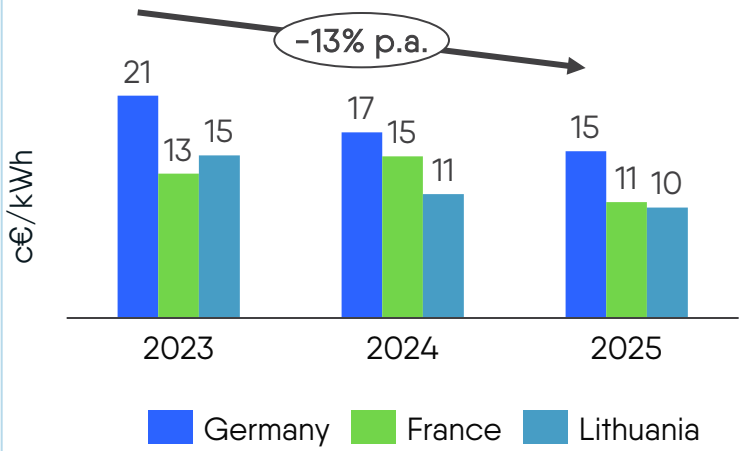


- Europe should stay the course on its Emissions Trading System (ETS) while updating it to **remain predictable, competitive and socially fair**.
- From 2013 to the end of 2025, **EU ETS auctions have raised over €258 billion in revenue.** In 2025, revenues totalled more than €43 billion, with some €24 billion directly benefiting EU Member States.
- Since 2005, emissions in ETS sectors have fallen by around 50%, while the EU economy grew by nearly 30%. This shows that the system is **effectively reducing emissions while supporting growth**.
- **On an average ETS accounts for around 9.6% of EU retail electricity prices for energy-intensive consumers.** However, exposure to ETS can be high in member states with less decarbonised electricity.
- A strong, market-based EU ETS remains key to cost-effective decarbonisation and investment in a net-zero power sector.

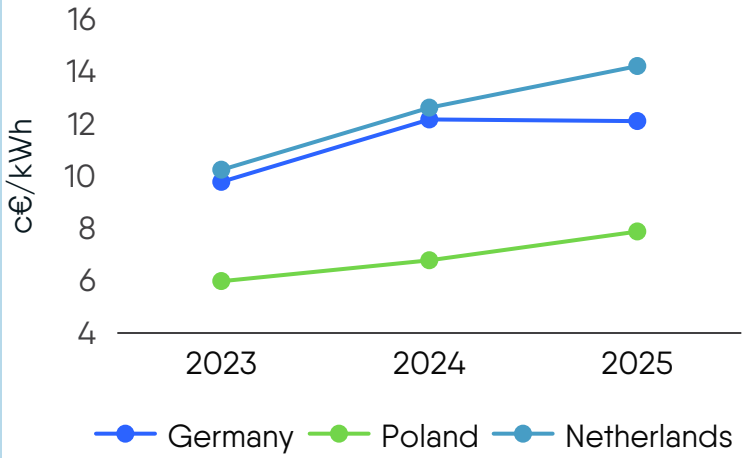
Notes: 1) Figures from European Commission. Sources: European Commission, Eurelectric.

Clean energy is cutting generation costs; accelerating grid modernisation and realigning electricity taxation must now complete the job for consumers

Energy and supply components[1]



Power network charges components[1]



Electricity vs. gas taxation, 2025[2]

Surge in clean power generation

Record expansion of renewables capacity, and the restoration of France's nuclear fleet have dramatically increased the share of low-cost electricity in the EU mix. As power gets cleaner, expensive gas-fired output is reduced and pushes wholesale prices down. The sustained growth of clean power means energy and supply costs for households are expected to keep falling across most member states.

Grid upgrading for the transition

The EU's aging electricity grid requires expansion to integrate renewables, DERs, EVs, heat pumps and electrify consumption – investments passed on to consumers through regulated network tariffs. But as electrification grows and flexibility reduces peak-hour stress, the same infrastructure serves greater volumes, spreading network costs across a larger base and gradually lowering per-kWh tariffs.

Unfair taxation on electricity

In seven member states, the tax share of final retail electricity prices remains between 1.3 and 4 times higher than of gas, for both households and energy-intensive industries. Fairer electricity taxation compared with other energy vectors supports electrification and lower bills.

Notes: 1) Figures sourced from Eurostat. Data refers to a weighted average across households' electricity consumption bands. 2) Figures sourced from Eurostat. The figures cover VAT along with all relevant taxes, fees, and levies for household electricity users (consumption: 2,500–4,999 kWh) and household gas users (consumption: 20–199 GJ). For Poland, weighted average consumption data was used.

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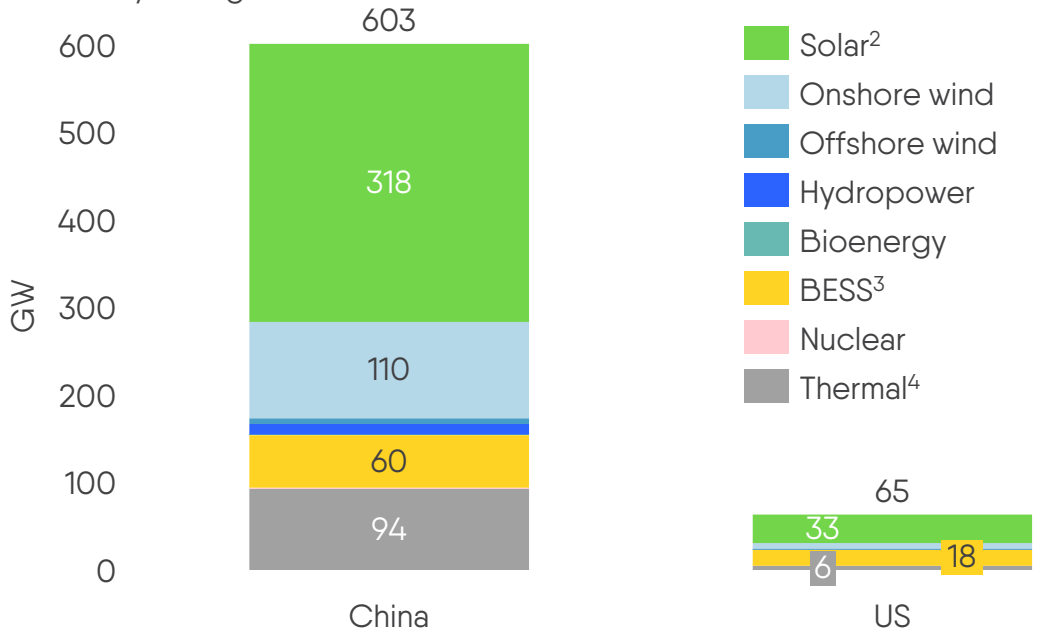
China added more than 600 GW of generation and storage in 2025 pushing annual additions above the entire installed capacity of major global countries

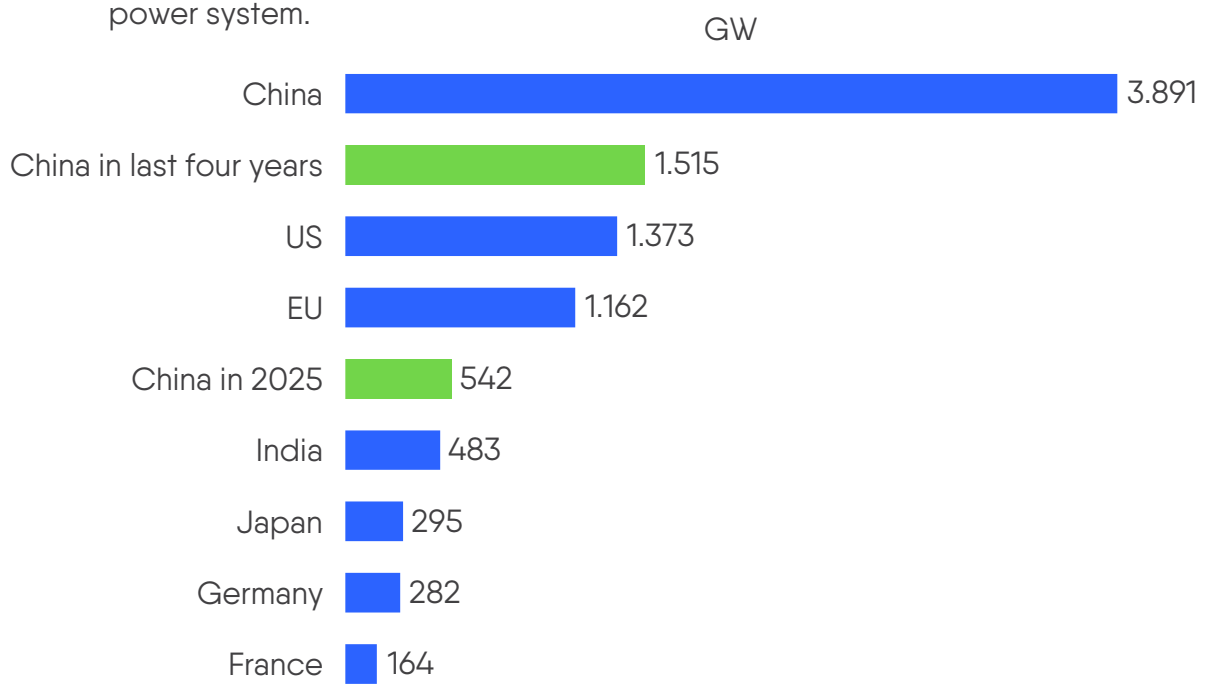
Electric generating capacity additions, 2025[1]

- China installed about 452 GW of new renewable power capacity in 2025, with solar alone above 300 GW, alongside continued investment in grid infrastructure.
- The scale of China's annual power-asset buildout is roughly 10 times that of the US grid. The latter, indeed, added around 65 GW of new grid-connected capacity in 2025, with nearly 90% coming from renewables and battery storage.



Current cumulative installed capacity[1,5]

- Chinese capacity additions in 2025 exceeded the entire installed power capacity of several major economies, including India, Japan, Germany, and France.
- Moreover, the capacity China added over the past four years (since end-2021) surpassed the total installed capacity of the United States' entire power system.



Notes: 1) Figures for China sourced from NEA. Figures for the US from EIA. 2) Solar figures for China include 153 GW of distributed solar PVs and 0.94 GW of solar thermal (CSP). 3) BESS figures for China as the difference between NEA's year-end totals (2025 minus 2024). Moreover, NEA notes that lithium-ion storage accounts for about 96% of "new-type energy storage". 4) Thermal figures for US do not include retirement of roughly 4 GW of coal plants. 5) Figures exclude BESS. India and Japan sourced from BNEF. EU figures sourced from Elda. Sources: NEA, EIA, Elda, BloombergNEF.

Europe's strength lies in clean power deployment and technological innovation, not fossil fuel endowment

Energy resource distribution and regional competitive strengths[1]

Notes: 1). Fossil fuels and critical minerals are measured per capita (production and mining capacity, respectively); hydro and geothermal by technical potential; nuclear by recoverable uranium reserves; solar by average global horizontal irradiation; wind by average speed at 80m; and innovation by energy patents filed over the past decade. Data sourced for the latest year available from IEA (multiple reports), World Bank, Our World in Data, Global Solar Atlas, Global Wind Atlas, Energy Institute, IHA, World Nuclear Association. 2) Eurasia covers Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan. Sources: IEA, IHA, EI, GSA, WB, WNA, GWA.

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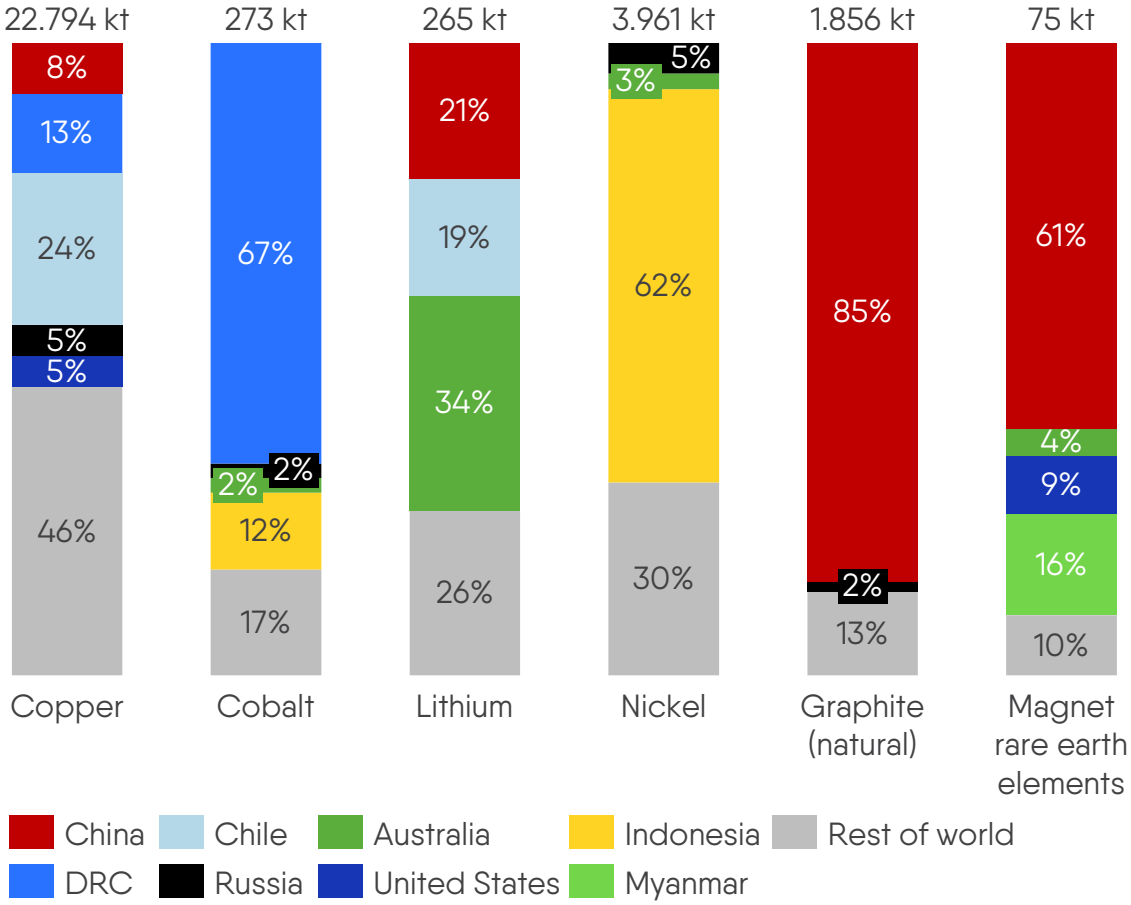
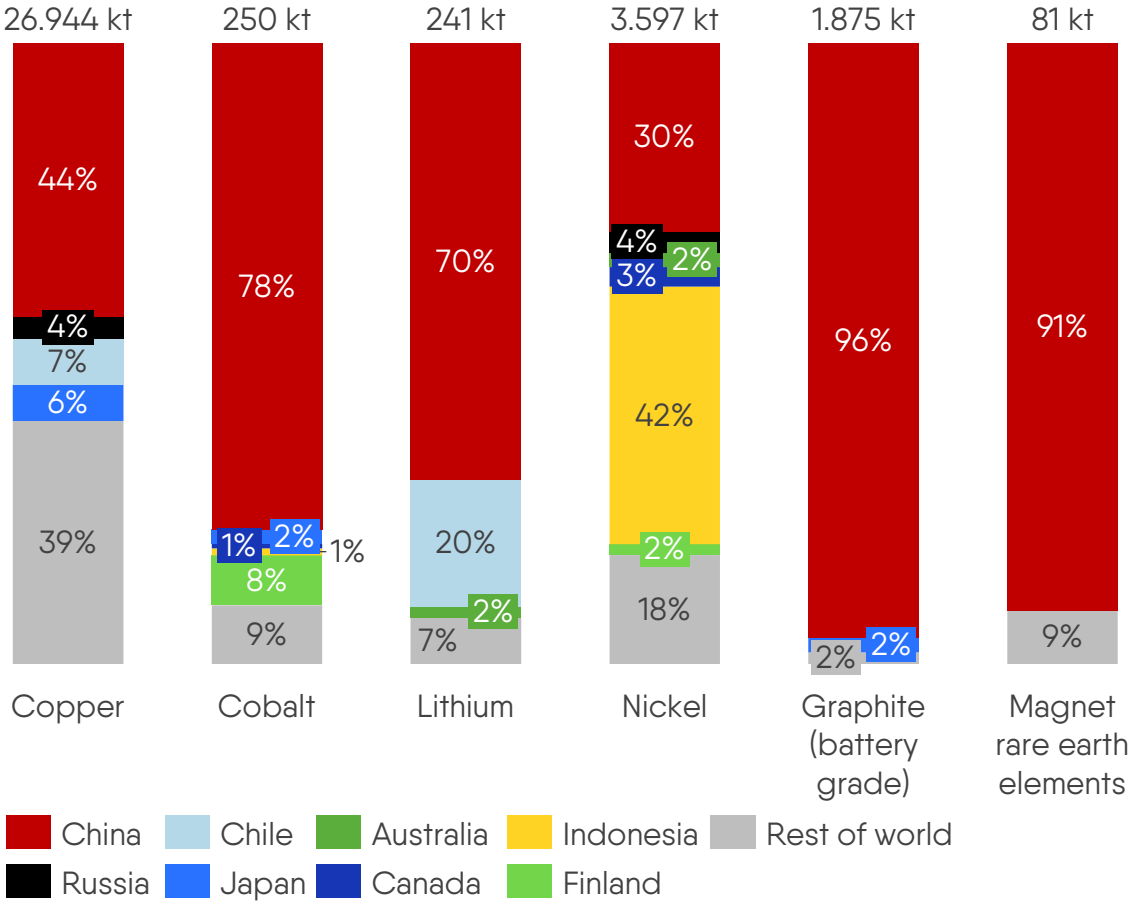
Scaling domestic and allied refining capacity is essential to securing a stable, independent supply of critical minerals for Europe's clean energy transition

Share of mining capacity in key energy transition minerals, 2024[1]



Share of refining capacity in key energy transition minerals, 2024[1]



Notes: 1) Figures sourced from IEA. Sources: IEA.

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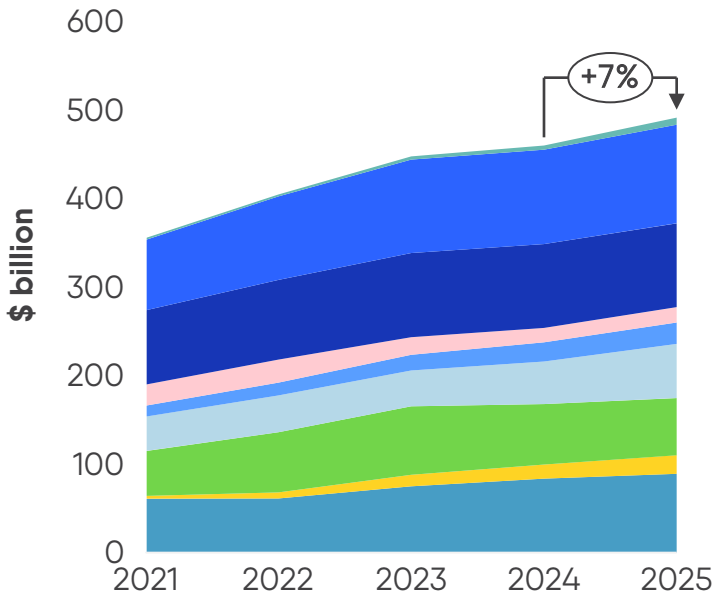
Record energy transition spending in 2025 driven by wind, grids, and electrification growth

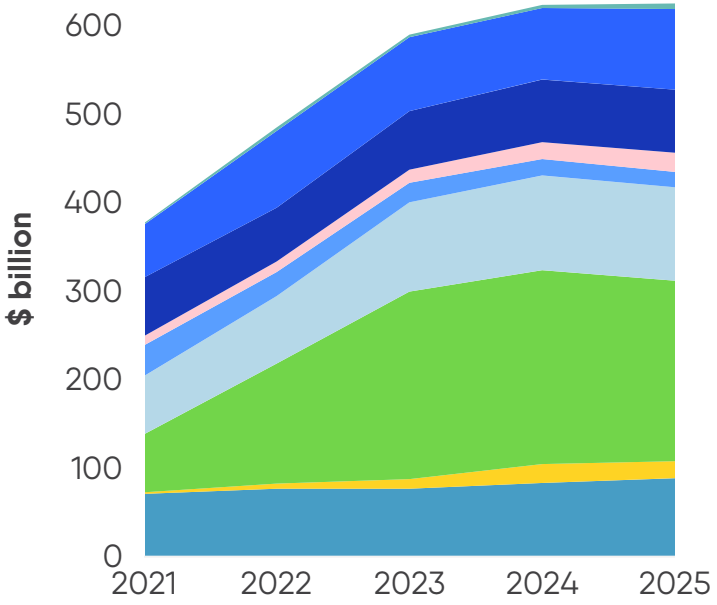
Energy transition investments, Europe[1,2]

- European clean energy investments increased 7% in 2025 compared to 2024, with wind, storage, electrification (excluding industry), and grids with the largest gains.



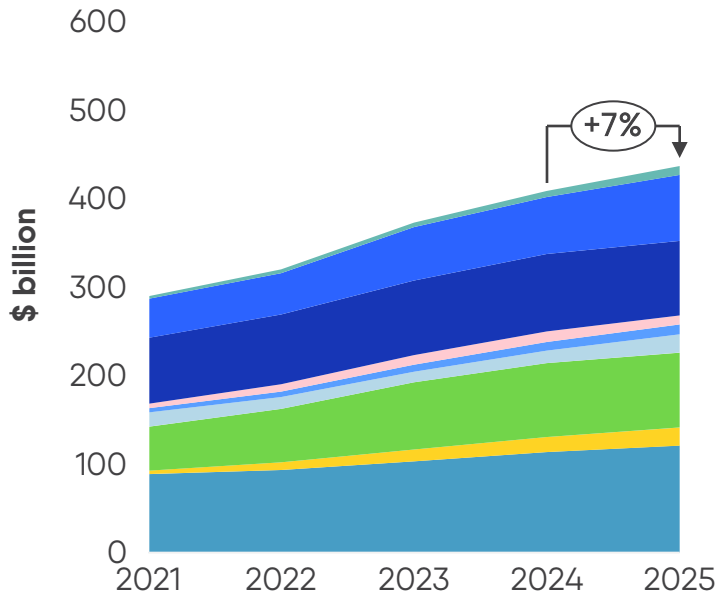
Energy transition investments, China[1]

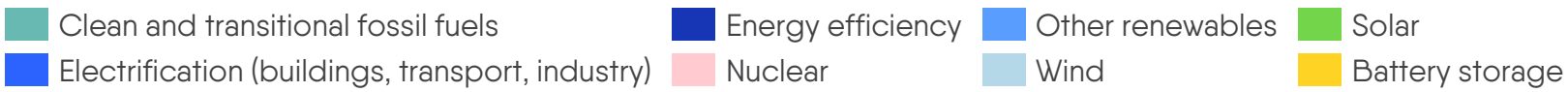
- China's clean energy investment remained stable at just over $625 billion despite solar's first decline in five years, though electrification investments grew 12%.



Energy transition investments, North America[1,3]

- North America saw 7% growth reaching $441 billion, driven by higher investments in electrification, wind, and grids. Nuclear and energy efficiency saw slight declines.





Notes: 1) Figures sourced from IEA. 2) European Union and Albania, Belarus, Bosnia and Herzegovina, North Macedonia, Gibraltar, Iceland, Israel, Kosovo, Montenegro, Norway, Serbia, Switzerland, Republic of Moldova, Turkey, Ukraine and United Kingdom. 3) Canada, Mexico and United States. Sources: IEA, BloombergNEF.

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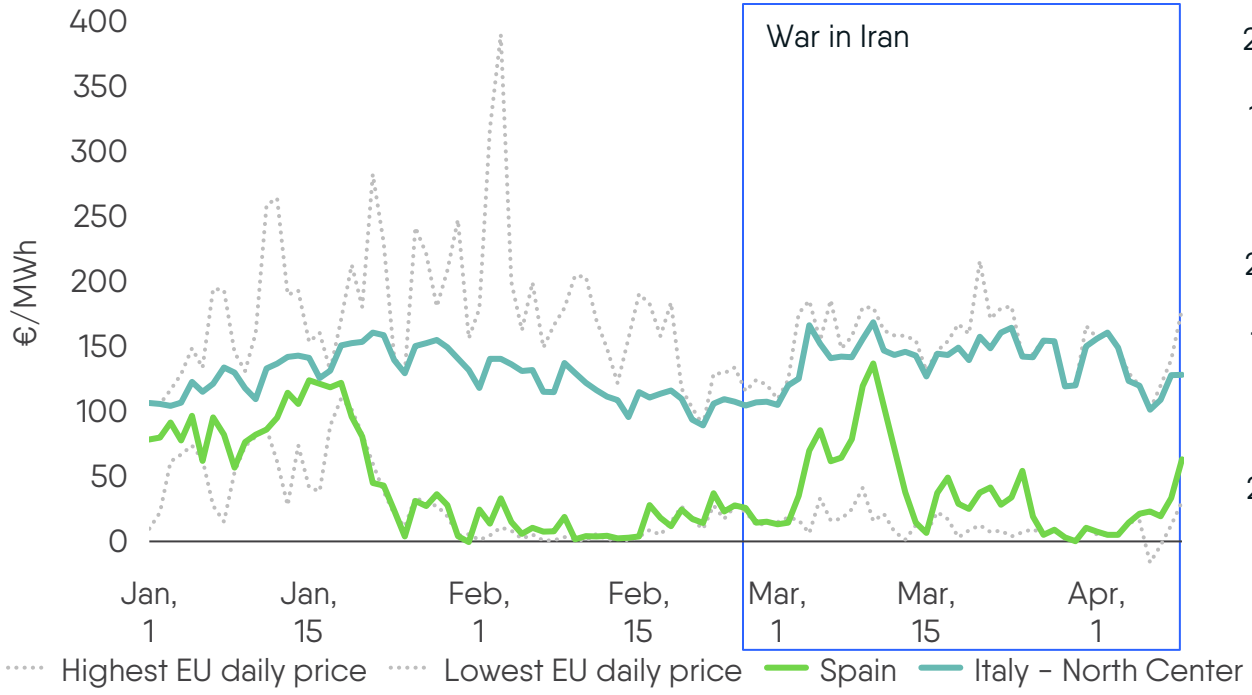
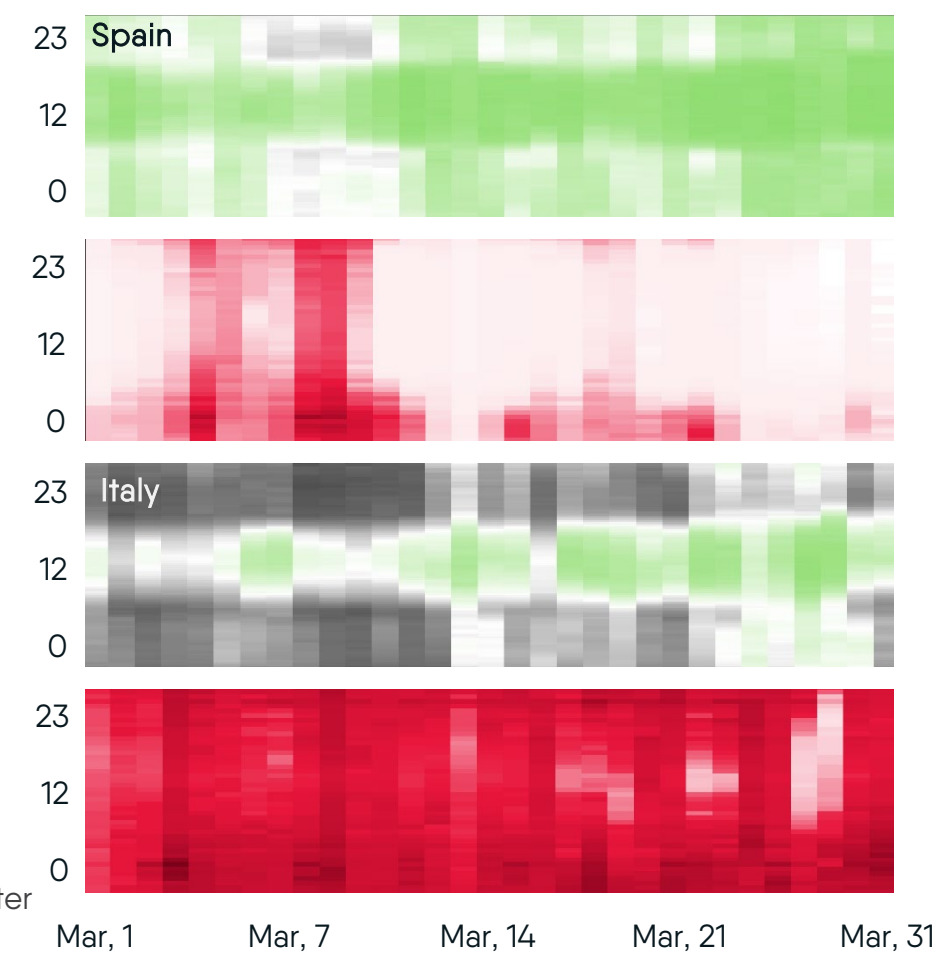
The lower the carbon content of a grid, the less a war can hurt electricity prices: March 2026 shows that decarbonisation is an energy security strategy

Daily average electricity prices, 2026[1]

- During March 2026, amid the outbreak of the Iran war, Spain's high share of VRE generation helped keep electricity prices remarkably low following the initial market shock, underscoring the stabilising role renewables play in insulating power markets from geopolitical disruptions. In contrast, countries such as Italy, where gas-fired generation accounts for a significant portion of the energy mix, sustained persistently high prices throughout the month.



Heatmaps of Spanish and Italian generation and prices, March 2026[1]

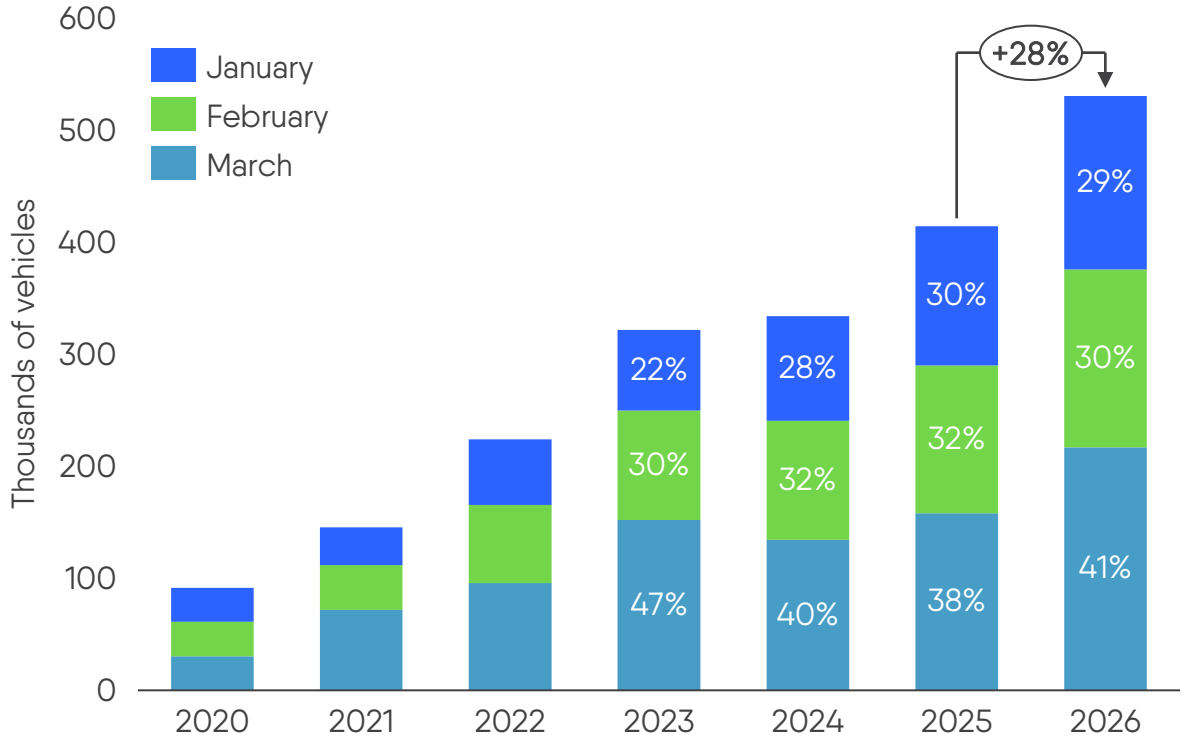


Notes: 1) Figures sourced from Elda. Power prices figure refer to simple daily average of day-ahead prices. Sources: Elda, ENTSO-E.

Oil crisis acted as accelerator in Q1 2026 as record BEV uptake exposes the true cost of Europe's petrol dependency

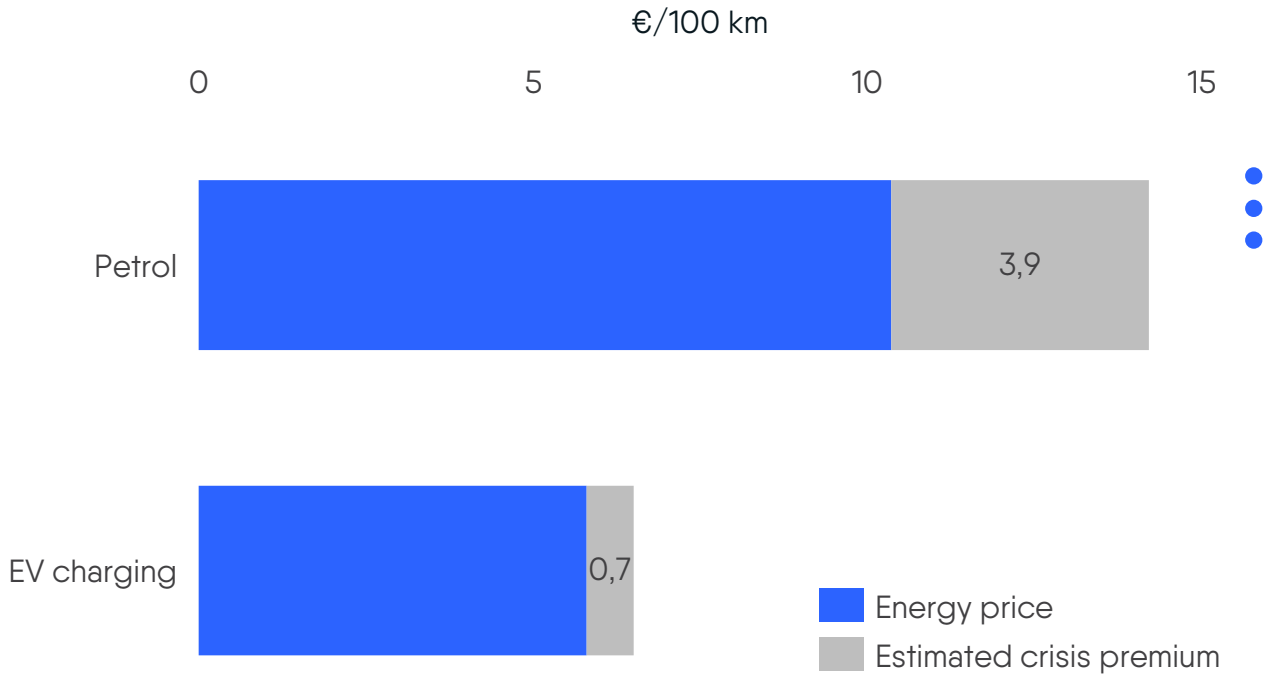
BEV registrations in the EU, Q1[1]

- Europe's energy transition accelerated in Q1 2026 against the backdrop of the Iran oil & gas crisis, with BEV registrations surpassing 500,000 units for the quarter and 200,000 in March alone (a new monthly record); Italy led the charge with +66% YoY growth, followed by France (+51%) and Finland (+44%).



Cost of EU petrol cars vs EV, March 2026[2]

- T&E estimates that at March 2026 oil prices, the Iran conflict added a €3.9/100 km crisis premium to petrol costs, versus just €0.7/100 km for EVs. Petrol drivers were five times more exposed to this oil shock than EV drivers, who are shielded by power prices' weak correlation with crude.



Notes: 1) Figures sourced from EAFO. 2) Figures from Transport and Environment. Sources: EAFO, T&E.

Stay the course to power proof our economy

MARKETS

- **Let the market deliver** efficient price signals
- **Encourage flexibility** on demand and supply
- **Avoid harmful market interventions**, distorting prices & discouraging investments

GRIDS

- **Facilitate permitting**
- **Allow anticipatory investment** & cost-effective measures
- **Ensure pragmatic solutions on tariff design**

ELECTRIFICATION

- **Electrify demand** through dedicated KPIs & enabling policies
- **Stop tax penalisation of power** vs gas
- **Support industrial electrification** with new funding tools

2040

- **Support the GHG target**, backed by a meaningful ETS/ ETS2
- **Balance climate & cost efficiency** to preserve competitiveness
- **Ensure investor predictability** for all decarbonised technologies