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European Battery Market Outlook 2026-2030

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Foreword

Welcome to our European Battery Market Outlook 2026-2030

For years, battery storage was seen as the missing piece of Europe's energy transition. Today, it is becoming one of the defining technologies of its next phase.

Across Europe, battery storage is helping integrate growing volumes of renewable energy, strengthen energy security and improve power system resilience. As the continent seeks to reduce its dependence on costly fossil fuel imports, accelerate electrification and meet its climate goals, storage can no longer be viewed as a supporting technology. It is becoming a strategic asset, instrumental to strengthening Europe's resilience, competitiveness and energy sovereignty.

This growing importance is reflected in the market's performance. In 2025, Europe installed 36 GWh of new battery energy storage systems, bringing total operational capacity beyond 100 GWh for the first time. Utility-scale batteries became the largest market segment, accounting for more than half of annual installations and marking the beginning of a new phase in Europe's battery storage journey.

This momentum comes at an important moment for Europe's power sector. Over recent years, SolarPower Europe has consistently called for a dedicated energy storage target to complement EU renewable energy ambitions. We therefore welcome the European Commission's decision, under AccelerateEU, to establish a 200 GW energy storage target by 2030

Battery storage is becoming a strategic asset for Europe's resilience, competitiveness and energy sovereignty

The target provides a much-needed silver lining on the horizon. Parts of Europe's solar market have recently experienced slower growth as power systems struggle to absorb increasing volumes of variable renewable generation. Rising curtailment, declining solar capture prices, grid congestion and insufficient flexibility all underline the growing need for storage as a core component of the energy transition.

Yet targets alone do not deliver flexibility. Under our Medium Scenario, annual battery installations are expected to exceed 50 GWh in 2026 and nearly quadruple to 138 GWh by 2030 in Europe. Total installed capacity is projected to grow more than sixfold, from just over 100 GWh today to around 580 GWh (EU-27: 470 GWh) by the end of the decade. Even so, Europe remains below the trajectory required to fully support a highly renewable and electrified energy system.

A positive development highlighted in this outlook is the increasing geographic diversification of Europe's battery market. Germany, the UK and Italy remain the largest markets, but their dominance is gradually declining as deployment accelerates elsewhere. Ukraine and Bulgaria entered the top five, each adding almost 3 GWh of battery capacity. This demonstrates that the value of storage is increasingly being recognised across very different European energy systems and market designs.

Ukraine's emergence on the European battery storage map is particularly significant. Following extensive damage to its power infrastructure caused by Russian attacks, battery storage has rapidly evolved from an investment opportunity into a critical energy security asset. The Ukrainian experience demonstrates that batteries are not only enabling the clean energy transition; they are also essential for safeguarding democratic societies.

The report also highlights an important shift within the market itself. Utility-scale batteries continue their remarkable growth trajectory, supported by growing flexibility needs, improving policy frameworks and increasingly attractive business cases. At the same time, residential storage has slowed in several mature markets following the exceptional growth triggered by the 2022 energy crisis. Greater attention will therefore be needed to ensure that households and businesses can continue to benefit from affordable, resilient and locally generated solar power.

While these developments underline the growing maturity of Europe's battery market, they also reveal the scale of the challenge ahead. Under our most likely scenario, the EU is set to fall short of its new storage target despite the remarkable growth expected over the coming years. Closing this flexibility gap will require a stronger policy response.

That is why a dedicated EU Battery Storage Action Plan is urgently needed. As outlined in SolarPower Europe's policy recommendations, three actions are particularly important: unlocking flexibility through appropriate network tariff structures; ensuring full market access for battery storage; and guaranteeing long-term policy consistency and transparency for investors.

For years, battery storage was seen as the missing piece of Europe's energy transition. Today, that piece is finally starting to fall into place. It is now up to policymakers, regulators and market participants to ensure low-cost battery storage can deliver its full flexibility value for Europe's energy security, competitiveness and climate ambitions.

Enjoy reading our report,

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Scurf Dyke Solar Farm, Driffield, East Riding of Yorkshire, UK — 80 MWp solar PV and 8 MW / 16 MWh battery storage. © BayWa r.e

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Methodology:
SolarPower Europe's five-year forecast consists of Low, Medium and High Scenarios. The Medium Scenario anticipates the most likely development given the current state of play of the market. The Low Scenario forecast is based on the assumption that policymakers halt solar and storage support and other issues arise, including negative policy changes, crisis situations. Conversely, the High Scenario forecasts the best optimal case in which policy support, financial conditions and other factors are enhanced.

Segmentation for BESS: Residential (<20 kWh); Commercial and Industrial (20 kWh to 1,000 kWh); Utility-scale (>1,000 kWh). Residential, commercial and industrial battery storage segmentation is based on the type of PV system coupled with the storage device. Industrial and utility-scale BESS can be either stand-alone or hybridised with industrial and large-scale power plants. SolarPower Europe's methodology includes only grid-connected battery storage systems.

Segmentation for solar PV: Residential (<10 kW), except for Austria, Germany and Switzerland where the segmentation is extended to < 20 kW; Commercial (<250 kW); Industrial (<1,000 kW); Utility-scale (>1,000 kW, ground-mounted). SolarPower Europe's methodology includes only grid-connected solar PV systems.

Installed PV capacity is always expressed in DC. All figures are based on SolarPower Europe's best knowledge at the time of publication.

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European battery storage market gains speed in 2025, driven by utility-scale systems

36 GWh	48%	580 GWh
36 GWh of batteries installed in Europe in 2025: 12th consecutive record-breaking year	48% of annual European battery storage growth: strong acceleration toward the next growth phase	580 GWh of total European battery capacity outlook by 2030: more than sixfold expansion, with the High Scenario reaching 735 GWh

In 2025, Europe installed 36 GWh of battery energy storage system (BESS) capacity, marking the twelfth consecutive year of record-breaking annual additions since our data series began in 2013. These new installations brought the total operational battery capacity in Europe above the 100 GWh milestone by year-end. The annual growth rate rose to 48% in 2025, following a slowdown in 2024 due to decreasing residential installations (see Fig. 1.). The contraction in the residential market was offset by strong growth in the utility-scale segment in 2024, which was a turning point for the battery market, with shifts in power price dynamics, support frameworks and financing conditions in favour of utility-scale battery deployment.

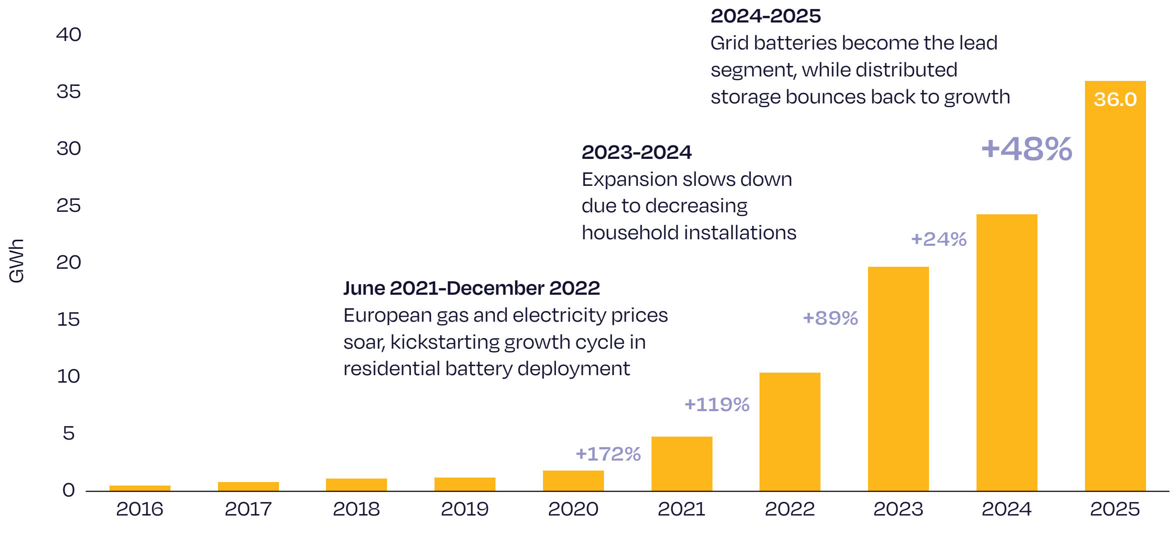
In 2025, these underlying dynamics had a material impact and utility-scale batteries delivered more than half of the annual deployment. Their expansion reflects increasing system flexibility needs, stronger revenue stacking opportunities, falling technology costs, hybrid solar-plus-battery storage expansion, and growing investor confidence.

Zooming in on the EU-27 market, 27 GWh of BESS were installed across the bloc in 2025, which means 34% year-on-year growth, accounting for 75% of total additions in Europe. As a result, cumulative operational battery capacity in the EU reached almost 80 GWh by the end of the year.

Figure 1

Battery storage deployment in Europe climbs to new heights in 2025

Europe annual BESS capacity 2016-2025



Europe's battery market broadens, but Germany, UK and Italy remain as leaders; Ukraine and Bulgaria soar to around 3 GWh of additions

In 2025, Europe's three leading battery storage markets, Germany, UK, and Italy, consolidated their predominance, while Ukraine and Bulgaria emerged to complete the top 5 markets (see Fig. 2). Notably, 2025 was the first year when reaching GWh scale was not sufficient to enter the top 5. Germany retained its leading position despite registering just a 2% annual expansion. The United Kingdom (UK), after a 14% market decline in 2024 due to decreased grid-scale BESS revenues, bounced back to growth claiming the second position. In Italy, the distributed segment contracted again, and the utility-scale segment remained stagnant, as investors waited for the first round of the Italian auction scheme (MACSE), resulting in the overall market shrinking by 18%.

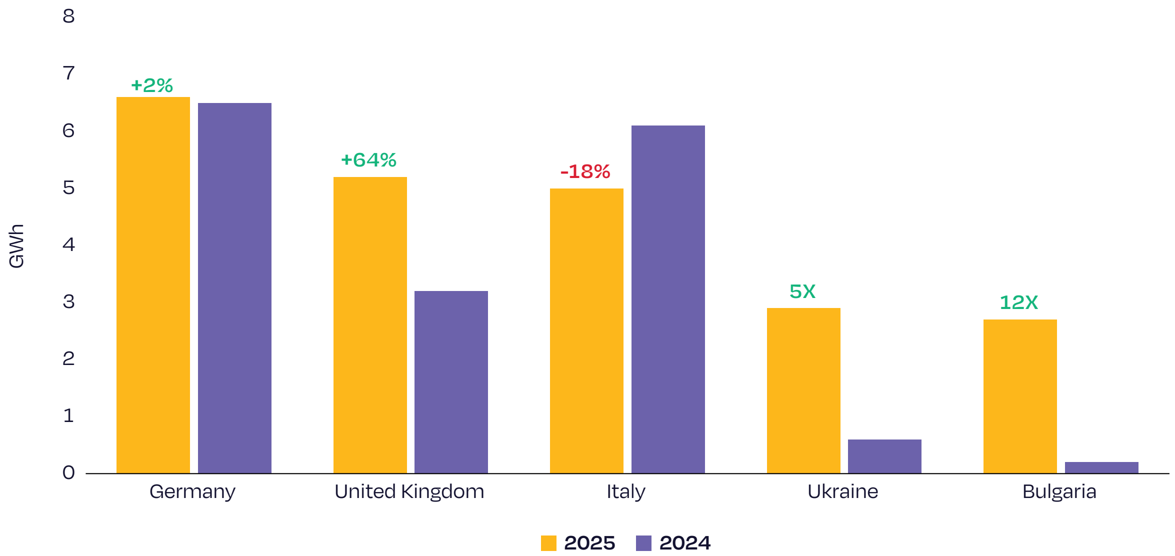
Closing the top 5, Ukraine and Bulgaria significantly increased their annual installations, with each adding almost 3 GWh in 2025. Four years into Russia's invasion, Ukraine has quickly learned the strategic role of solar and battery storage for energy security and is delivering both at scale. Bulgaria, after very successful utility-scale funding rounds, registered the largest growth rate in Europe, and is poised to deploy much more BESS capacity in the coming years to 2027.

Overall, the top 5 markets accounted for 62% of all installations in Europe in 2025, while in 2024, top-tier markets delivered almost 80% of yearly deployment. This underlines that that Europe's battery storage expansion is diversifying, with a larger contribution from smaller markets.

Figure 2

Germany, the UK and Italy remain in the lead in 2025, with strong emergence of Ukraine and Bulgaria

Europe top 5 BESS markets 2024-2025



Europe's battery fleet surpasses 100 GWh as utility-scale storage gains ground

Europe's cumulative battery storage fleet surpassed 100 GWh in 2025, marking a major milestone for the sector and underlining the speed of market expansion (see Fig. 3). Total installed capacity grew by 55% year on year, continuing a decade of exceptional growth that has taken Europe from just 1 GWh in 2016 to over 100 GWh today. Since 2021, the continent's battery fleet has increased tenfold, confirming that the market remains in a strong acceleration phase.

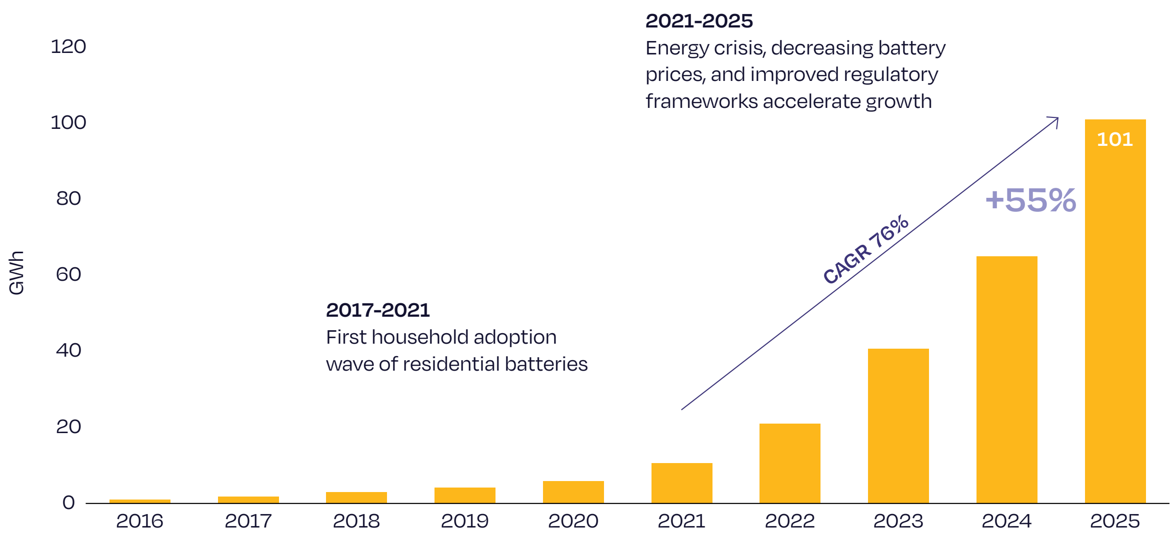
Residential storage still represents the largest share of installed capacity, but its predominance is fading. After two consecutive years of decline in market share, residential batteries now account for just under half of Europe's total battery fleet. At the same time, utility-scale storage has risen rapidly to become the second-largest segment, putting it on track to overtake residential storage in 2026. The commercial and industrial (C&I) segment remains comparatively small and stable, representing 11% of cumulative capacity.

Despite this strong progress, Europe still faces a major flexibility gap. By the end of 2025, the EU's solar PV-to-battery ratio stood at 8:1, improving from 10:1 in 2024 but still indicating insufficient storage relative to solar generation. While utility-scale and C&I ratios improved significantly, faster battery deployment will be essential to support Europe's expanding solar fleet.

Figure 3

European battery storage fleet crosses 100 GWh capacity milestone

Europe cumulative BESS capacity 2016-2025



Europe's annual battery market is set to grow fourfold to 138 GWh by 2030

Europe's BESS market is poised to enter a new phase of rapid expansion from 2026 onwards. Under the Medium Scenario, annual battery storage installations are expected to exceed 50 GWh in 2026 for the first time, a 44% increase compared with 2025 (see Fig. 4). This growth is primarily driven once again by the utility-scale segment, which will increase its share of annual installations to almost two-thirds of the total.

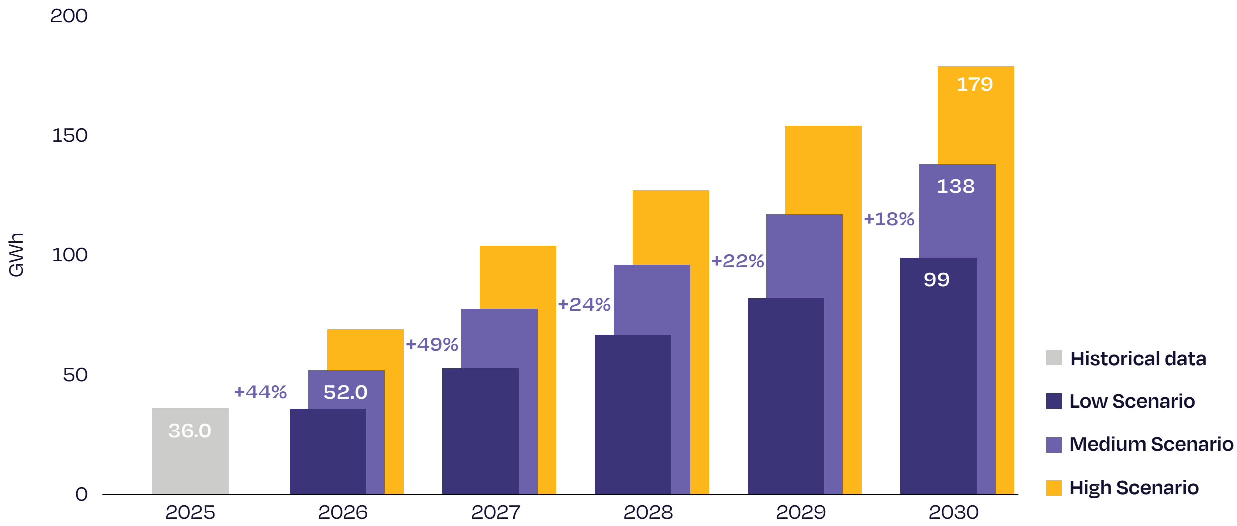
Distributed storage will also continue to grow, though at a slower pace. Residential installations are projected to recover momentum and reach 13.2 GWh in 2026, slightly above their 2023 peak, supported by the increased availability of dynamic tariffs, lower export remuneration for solar electricity, grid congestion, and rising consumer interest in more self-sufficiency. Meanwhile, the C&I segment is expected to add nearly 6 GWh, with a strong 26% annual growth rate.

Beyond 2026, the market is expected to maintain a steep upward trajectory. Annual installations are projected to rise to 138 GWh in 2030, with a compound annual growth rate (CAGR) of 28% in the period 2026-2030. By the end of the decade, annual additions would be about four times higher than in 2025.

Figure 4

Battery capacity additions in Europe will surge to 138 GWh by 2030, four times as large as 2025

Europe annual BESS market scenarios 2026-2030



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Europe's installed battery fleet to edge towards 600 GWh by 2030

Europe's cumulative battery storage fleet is projected to expand rapidly through the rest of the decade. Under the Medium Scenario, total installed BESS capacity is expected to rise by 51% in 2026, surpassing 150 GWh, and then continue growing at a 42% CAGR to reach 582 GWh by 2030 (see Fig. 5). This means Europe's battery fleet would grow sixfold in just 5 years.

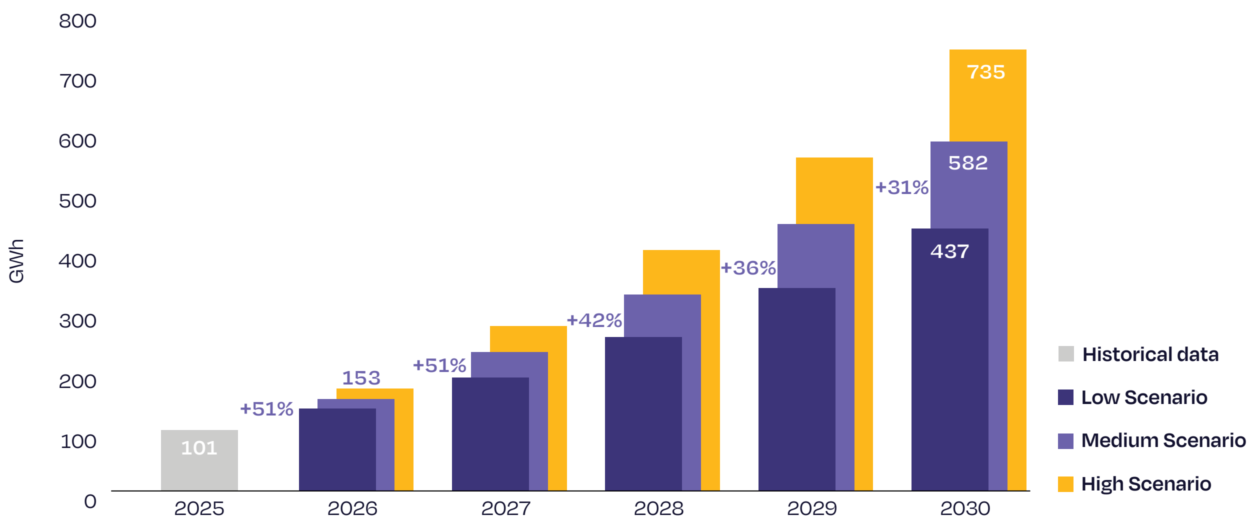
Within the EU-27, cumulative installed capacity is projected under the Medium Scenario to reach 470 GWh by 2030, up from 77 GWh in 2025. While this also represents a sixfold increase, it falls significantly short of the 600 GWh modelled by Rystad Energy under the Solar+ scenario to align with EU climate and energy targets and ensure improved energy security and affordability.[1] Only the High Scenario comes close to that benchmark, reaching 593 GWh by 2030.

The composition of Europe's battery fleet is also expected to shift considerably. In 2026, utility-scale batteries are projected to become the largest segment, accounting for almost half of total installed capacity. By 2030, their predominance will strengthen further, with 392 GWh deployed and a 67% share of the total fleet. Residential storage, while still growing in absolute terms, is expected to lose nearly half of its 2026 market share, reaching 121 GWh and 21% of total capacity at the end of the decade, C&I batteries are projected to reach 68.7 GWh and more or less keep this year's share, negligibly increasing to 12%

Figure 5

European battery storage fleet set to grow 6X, towards 600 GWh by 2030

Europe cumulative BESS market scenarios 2026-2030



1 SolarPower Europe (2026): Solar+ An EU pathway to achieve renewable targets, price affordability, and energy security

Delivering AccelerateEU means delivering 200 GW of storage across EU by 2030

In response to the Middle East crisis and resulting energy market disruptions, the EU adopted its emergency package "AccelerateEU" on 22 April, alongside the temporary State aid framework (METSAF) on 29 April, to address price spikes and fossil fuel dependency. AccelerateEU highlighted the need to accelerate electrification, expand domestic clean energy, and strengthen energy security. Notably, it set for the first time a 200 GW storage objective for 2030, up from today's 55 GW, highlighting that battery storage will be playing an important role in this growth. Although this falls short of the estimated flexibility needs of a renewables-based system, it represents a significant scale-up and underscores the urgency of action, implying a tripling of installed battery storage power within a four-year period.

That means there is a clear need for a targeted Battery Storage Action Plan at EU level, akin to the 2022 Solar Strategy, to drive the deployment and provide a coherent framework for policy, investment, and supply chain diversification. At the same time, SolarPower Europe fully recognises the important role of all storage technologies needed for rapid electrification of Europe's economy. The Battery Storage Action Plan would address measures specifically targeting battery storage and ensure that this key flexibility technology can be deployed at the scale and pace required to meet Europe's energy and climate objectives, while also lowering renewable energy curtailments, and dependence on fossil fuels.

Translating this ambition into concrete delivery requires a number of actions as set out in SolarPower Europe's proposed Battery Storage Action Plan (see Box 1). The following three actions – unlocking flexibility and accelerating battery storage deployment with network tariffs; ensuring full market access for battery storage; ensuring policy consistency and transparency – are the key basic requirements.

Ånge Energy Storage, Ånge, Sweden — 70 MW / 160 MWh battery energy storage system

Box 1

Battery Storage Action Plan

The Battery Storage Action Plan should include the following elements to further promote BESS deployment:

I. Removing barriers to permitting and grid access

a. Streamline permitting and grid connections, including for retrofitting battery storage to existing renewable assets, in particular in congested grid areas.

b. Promote hybridisation of battery storage with renewable generation to maximise system efficiency and reduce infrastructure costs.

II. Ensuring markets and system incentives reward battery storage

a. Establish markets for system services, including grid stability and grid-forming capabilities provided by battery storage.

b. Ensure full, non-discriminatory market access for battery storage across all electricity markets.

III. Providing clear, stable and bankable investment conditions

a. Ensure fair grid tariff treatment, eliminating double charging and fully recognising the system value of battery storage.

b. Provide stable, transparent and predictable regulatory frameworks to enable bankable business cases.

c. Harmonise technical standards, market rules and access conditions across Member States.

IV. I. Scaling deployment through targeted EU instruments

a. Support European industrial capacity, innovation and value chains in battery technologies.

b. Focus on the investability of BESS across Europe, including EU-level instruments that can provide long-term revenue stability and de-risks utility-scale BESS investment.

These recommendations are set out in SolarPower Europe's position paper A Flexibility Strategy for the EU: Strengthening the grid with batteries and demand response, published in Nov. 2025.

1 Unlocking flexibility and accelerating battery storage deployment with network tariffs

A key barrier to scaling battery storage systems across Europe remains the inconsistent and often discriminatory treatment of battery storage within network tariffs. In several Member States, these assets continue to face double charging, paying network fees both when charging electricity from the grid and when discharging it back into the system. These practices distort investment signals, weaken the business case for battery storage, and undermine the deployment of flexibility needed for a decarbonised and electrified energy system.

The European Union should therefore adopt a harmonised regulatory framework for grid connection charges and use-of-system tariffs, ensuring that these mechanisms actively support electrification, system flexibility, and the efficient deployment of battery storage. This framework should guarantee that grid tariffs are cost-reflective, predictable, and non-discriminatory fully recognising the system value that battery storage provides – such as reducing congestion, lowering peak demand, and avoiding costly grid reinforcements. A flexibility-based system design can significantly reduce overall system costs and limit price volatility, showing that battery storage delivers value well beyond what it can earn through market revenues alone.

At the core of this framework, **battery storage must be formally recognised as a distinct asset class, rather than being treated simultaneously as generation and consumption.** This requires the avoidance of introducing double charging and injection tariffs and the removal of discriminatory or unjustified fees, where such costs would ultimately be passed on to consumers. Clear and harmonised rules across Member States are essential to enable a level playing field and a functioning Single Market for BESS.

To ensure efficient system integration the framework should consider the use of locational and time of use signals to steer investment and system friendly behaviour. Following the EU guidance on network tariffs, national regulators should reduce grid connection fees for battery storage in areas with a higher level of congestion to be able to support the grid. Added to this, introducing local flexibility markets should also be taken into account as addressing congestion cannot be done solely through battery storage. Local flexibility markets are needed to ensure grid-friendly dispatch of assets like battery storage, enabling effective congestion management while maintaining consistent, market-based signals for generation.

The European Union should establish a coherent and flexibility-oriented framework for network tariffs and grid connection charges reflecting the increasing role of battery storage in the system. While implementation should remain under the responsibility of national regulatory authorities, EU legislation and guidance should provide clearer principles to ensure consistent treatment of battery storage assets across Member States and to reduce regulatory fragmentation within the internal energy market.

Finally, regulatory stability and predictability remain essential to mobilising investment at scale. **Changes to tariff regimes should therefore include adequate transition periods or grandfathering provisions to avoid undermining existing investments.** Continued efforts to improve transparency and harmonisation across Member States would strengthen investor confidence and accelerate the deployment of battery storage across the European Union.

2 Ensure full market access and revenue stacking for battery storage

Battery storage systems are still confronted with restrictive participation rules, fragmented regulatory frameworks, and insufficient revenue visibility. At the same time, the growing incidence of negative price events and system inefficiencies highlights a broader structural issue: flexibility, both storage and demand-side, is not yet fully implemented into market design.

The European Union should therefore ask for the complete implementation of the existing framework ensuring that battery storage and demand-side flexibility can access all electricity markets on a fair, transparent, and non-discriminatory basis, with clear visibility on short- and long-term revenue streams.

This means:

- **Full and non-discriminatory market access:** battery storage should have access to the day-ahead and intraday markets, balancing and ancillary service markets, other ancillary service markets such as black start, inertia, voltage control, and local congestion management and capacity markets,
- **Revenue stacking across services and technologies** for both standalone and hybrid assets (e.g. solar PV + BESS). These assets can stack revenues from multiple markets and services, including, energy arbitrage, ancillary services and balancing markets, capacity mechanisms, co-location with renewable generation,
- **Revenue visibility through market design and support schemes** ensuring that the Member States are fully in compliance with the implementation of flexibility-related provisions in EU electricity market design, including: provision of annual flexibility needs assessments, implementing market oriented support schemes for non-fossil flexibility on Member State level plus designing capacity mechanisms that fairly value storage duration while eliminating measures that disfavour storage,
- **Hybrid assets into support schemes** as hybrid projects (solar PV + BESS) should participate in renewable auctions as well as non-fossil flexibility support schemes on equal terms with stand-alone assets, and
- **Implementing the Guarantees of Origin (GOs) and market frameworks,** enabling tracking and certification of renewable electricity stored in batteries but also adapting the Guarantees of Origin frameworks to include stored energy.

3

Regulatory stability and predictability for safeguarding BESS deployment at scale

The successful deployment of BESS depends equally on the existence of a stable, predictable, and coherent regulatory framework. However, an increasing number of national and EU-level initiatives such as restrictions on key components, and broader industrial policy measures could potentially introduce fragmentation and uncertainty into the market. While these interventions pursue legitimate objectives, such as strengthening domestic manufacturing and resilience of the supply chains, their uncoordinated implementation risks slowing down of both behind the meter and in front the meter battery storage deployment at a critical moment for Europe's electrification.

Uncertainty around availability of BESS components, compliance with pending regulation, and access to financing can have immediate consequences on project development as battery storage is capital sensitive technology and any risk and uncertainty is priced-in the development making the projects bankability less certain, and the costs more expensive.

To address this challenge, **the European Union should ensure that all regulatory measures affecting BESS follow a coordinated, proportionate, and risk-based approach.** Regulations concerning critical system components must be designed in a way that avoids unintended constraints on technology choice and supply availability. Assessments on bottlenecks should be regularly preformed based on feedback from all Member States as well as the full supply chain before and after certain regulation is enforced. Implications of such policies should be regularly monitored and adjustments and amendments in those policies should be swift if it is showcased that BESS deployment is constrained or downward due to such regulation.

In parallel, **any new requirements in this regard should include robust transition arrangements and grandfathering provisions, ensuring that projects already in development or contracted are not exposed to sudden regulatory changes that could delay or cancel deployment.** This is essential to preserve investment certainty and maintain the pace of project delivery. The EU should prevent the emergence of a fragmented regulatory landscape by harmonising rules across Member States and aligning new requirements with existing European legislation, including grid codes, cybersecurity frameworks, and internal market rules. A consistent regulatory environment is essential to enable increased investment, reduce project complexity and delays and support the development of a Single Market for BESS.

Industrial policy objectives must be carefully aligned with deployment targets and not distort energy policy. While strengthening European manufacturing capacity in critical technologies is essential, this must be pursued in a manner that avoids creating short-term constraints on supply.

Finally, **all regulatory measures affecting battery storage should ultimately be assessed against their impact on the EU's ability to deliver towards the 200 GW of storage capacity by 2030.** Embedding a systematic consideration of deployment impacts into policy design will ensure that Europe achieves the right balance between security, resilience, competitiveness, and the urgent need to accelerate clean energy infrastructure.

European battery storage markets 2025

Europe's battery storage market accelerated strongly in 2025, with annual installations rising 48% to 36 GWh, driven mainly by utility-scale projects. The EU alone accounted for 27 GWh, while yearly investments reached 17 billion EUR. Utility-scale batteries led deployment with 19 GWh, supported by growing renewable penetration, price volatility, revenue stacking opportunities, support schemes, and lower technology costs. Distributed storage also recovered, with residential installations rebounding modestly and C&I deployments surging 77%, though both lost market share to utility-scale. Europe's cumulative battery fleet surpassed 100 GWh in 2025, marking a 55% year-on-year increase and highlighting batteries' critical role in addressing flexibility needs. Germany, the UK, and Italy remained the three largest markets, but deployment became more geographically diversified, with Ukraine and Bulgaria entering the top five. Still, the top three countries operate 61% of Europe's total installed battery capacity.

European battery storage market picks up speed in 2025, increasing by 48% to 36 GWh, boosted by utility-scale expansion

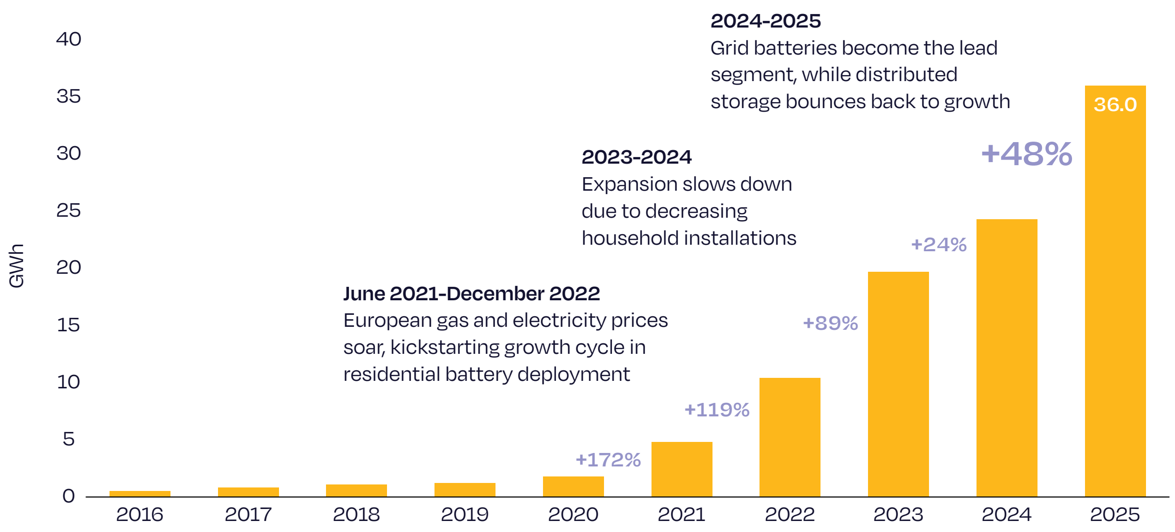
In 2025, Europe installed 36 GWh of batteries, representing a substantial acceleration compared to the previous year (see Fig. 6). This corresponds to an increase of 11.7 GWh (+48%) compared to 2024 and marks the largest year on year capacity increase to date, surpassing the previous record set in 2023 (9.2 GWh). Since 2022, the annual market has more than tripled, and despite the slowdown observed in 2024(+24%), battery storage has regained strong momentum. Batteries are the fastest growing power technology globally, and Europe is no exception.[2]

Looking at the EU, 27 GWh of BESS capacity was deployed in 2025, accounting for 75% of all installations across the wider European market. Despite continued policy uncertainty in Europe, batteries continue to outperform even the most ambitious growth scenarios. This has translated into a sustained increase in battery storage investments in 2020-2024, at an average annual increase rate of around 90%.[3] In 2025, European investments in BESS reached 17 billion EUR, with a 20% increase relative to 2024.

Figure 6

Battery storage deployment in Europe climbs to new heights in 2025

Europe annual BESS capacity 2016-2025



2 For the first time, the report includes in its European scope Turkey and Ukraine. This extension makes a material difference: growth in 2025 is 9 percentage points higher than under the previous scope (EU 27, Switzerland, and the United Kingdom). When referring to the EU, the scope narrows down to the 27 Member States of the European Union.

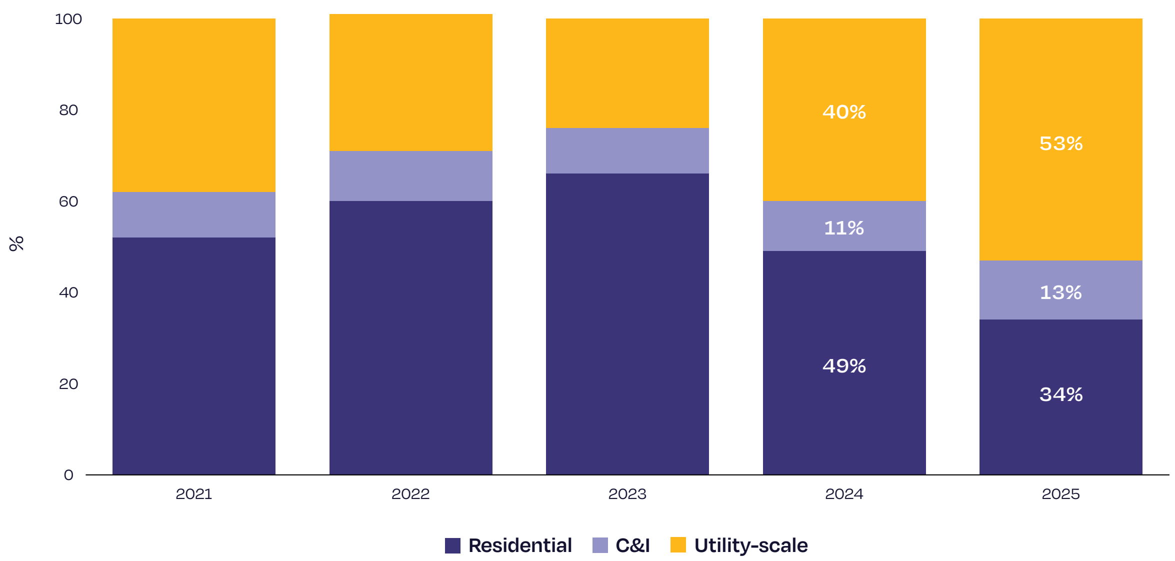
3 Institute for Climate Economics (2026): The State of Europe's Climate Investments

In 2025, **utility-scale** batteries led the market with 19 GWh installed, up from the 9.7 GWh in 2024 (see Fig. 7). This marks the second consecutive year of doubling in annual installations. The segment now accounts for over half of yearly capacity additions (see Fig. 7). This exponential growth trajectory is remarkable. Europe is now connecting ten times more utility scale batteries to the grid than in 2021, just before the war in Ukraine, and about 40 times more than in 2019, prior to the outbreak of the COVID 19 pandemic. This rapid expansion comes at a critical moment for Europe. Batteries, in combination with solar power, can displace fossil fuel imports, strengthen energy independence, enhance competitiveness through low-cost and reliable power for households and industry, while accelerating the shift towards a decarbonised energy system.

Figure 7

Utility-scale batteries deliver more than half of Europe's battery capacity; distributed storage bounces back to growth but loses market share

Europe annual BESS segmentation 2021-2025



Several factors are driving the rapid growth of utility scale batteries. With the expansion in renewables deployment experienced in recent years, the lack of system flexibility has become more apparent in the EU. This has increased price volatility, grid congestion, and curtailment, particularly during periods of high solar output and low demand. Batteries are the fastest-to-deploy solution to address this challenge.

Revenue stacking has become increasingly attractive as batteries can capture value across multiple market streams, while EU support schemes backed nearly 70 GWh of large-scale battery projects last year. Falling technology costs now particularly favour large projects, due to lower unit capital costs, higher utilisation rates, and increasingly sophisticated optimisation engines. As a result, financial institutions, infrastructure funds, and utilities are increasingly viewing large scale batteries as an investable asset class with scalable and repeatable risk profiles.

In addition, hybrid solar-plus-storage projects are scaling rapidly. Hybrid projects are gaining significant traction in the EU, with around 20% of new BESS capacity paired with solar PV, up from 6% in 2024 (see p. 71 for a more detailed description of the evolution of the hybrid market).[4]

Positive developments also continued in distributed storage, with both households and businesses deploying 16% more battery storage capacity in 2025 than in 2024. This marks a watershed moment, as distributed BESS had marginally declined in 2024 (-2%), following more than a doubling in 2023.

Within the distributed storage segment, the **residential** battery segment rebounded back to growth in 2025 (+3% relative to 2024), after the significant decrease experienced in 2024 (-8%). Last year, Europe added 12.3 GWh of residential capacity, representing more than 1.5 million battery storage units. In total, since 2020, nearly 5.4 million European households have installed solar-powered battery systems, achieving greater energy independence and contributing to decarbonisation efforts through solar powered battery systems.

One notable caveat tempers this rebound: when narrowing the scope to the EU 27, household installations continued to decline, with capacity falling by 11% in 2024 and a further 7% in 2025. The persistent lack of support schemes, pushback from grid operators in many Member States, and lower retail electricity prices continue to hinder the roll out of solar-plus-storage solutions in the residential segment.

Despite the absolute overall year-on-year growth in 2025, and delivering roughly the same volume as in its peak year in 2023 (13 GWh), it means a 22 percentage point drop in market shares. Residential storage now represents 34% of annual battery storage installations, down from 49% in 2024, and about two-thirds of installed capacity in 2023. This shift illustrates the rapid expansion of the battery storage market predominantly through utility-scale battery systems.

Also within distributed storage, **C&I** installations surged in 2025, with 4.7 GWh deployed, representing an 77% annual increase. Despite limited support for corporate adoption of storage and persistent administrative hurdles, European businesses are increasingly leveraging on site solar generation combined with battery storage.

While the potential is huge, the C&I BESS use cases remain rather narrow. Deployments are still largely concentrated on boosting PV self-consumption and reducing peak demand charges. Additional applications are largely limited to specific use cases, such as the electrification of industrial processes or vehicle fleets, the management of grid connection constraints, or niche agricultural applications. As system designs vary significantly depending on the underlying economic activity, market development remains gradual, and final investment decisions often involve lengthy and complex negotiations. Although some countries, including Hungary and Greece, have introduced dedicated funding programmes for businesses, support schemes across Europe are fragmented and, in many cases, insufficient (see p. 42 for a more detailed overview of support schemes in the distributed segment). Moreover, the provision of flexibility services by C&I batteries is still not feasible in most EU Member States, limiting opportunities for revenue stacking.

In spite of these limitations, the segment continues to move in the right direction. In 2025, C&I batteries increased their share of annual deployments to 13%, marking a historic high for the segment, which had hovered at around 10% since the onset of battery installations in Europe.

4 Source: Rystad Energy's Energy Storage Solution

Box 2

Türkiye joins the European battery storage map

Türkiye enters the European Battery Outlook this year with the largest pre-licensed battery storage pipeline of any country reporting to SolarPower Europe: 33.1 GW across 678 projects approved by the Energy Market Regulatory Authority (EPDK).

That pipeline is the result of one decisive policy move. In late 2022, EPDK opened grid capacity to new wind and solar without auction, on one condition: every project had to include battery capacity at least equal to its installed power. Within months, 4,369 applications totalling 221 GW had been submitted. Of those, 33 GW were approved – exceeding the pipelines of most European countries individually, and rivalling the combined pipelines of several leading markets.

At the end of 2025, commissioned battery energy storage capacity stood at 390 MWh. By February 2026, 300 MWh of storage-integrated wind and solar projects had been commissioned. The Ministry of Energy and Natural Resources has publicly indicated that 2-3 GW of battery energy storage will come online from 2026 onward. EDEDER's (Turkish Energy Storage Industries Association) base case places the 2026 commissioning wave at approximately 2.2 GWh, and cumulative capacity at approximately 8.7 GWh by 2030.

Ege RES, Kemalpaşa, İzmir, Türkiye — 12.8 MWe / 15.17 MWh battery energy storage system

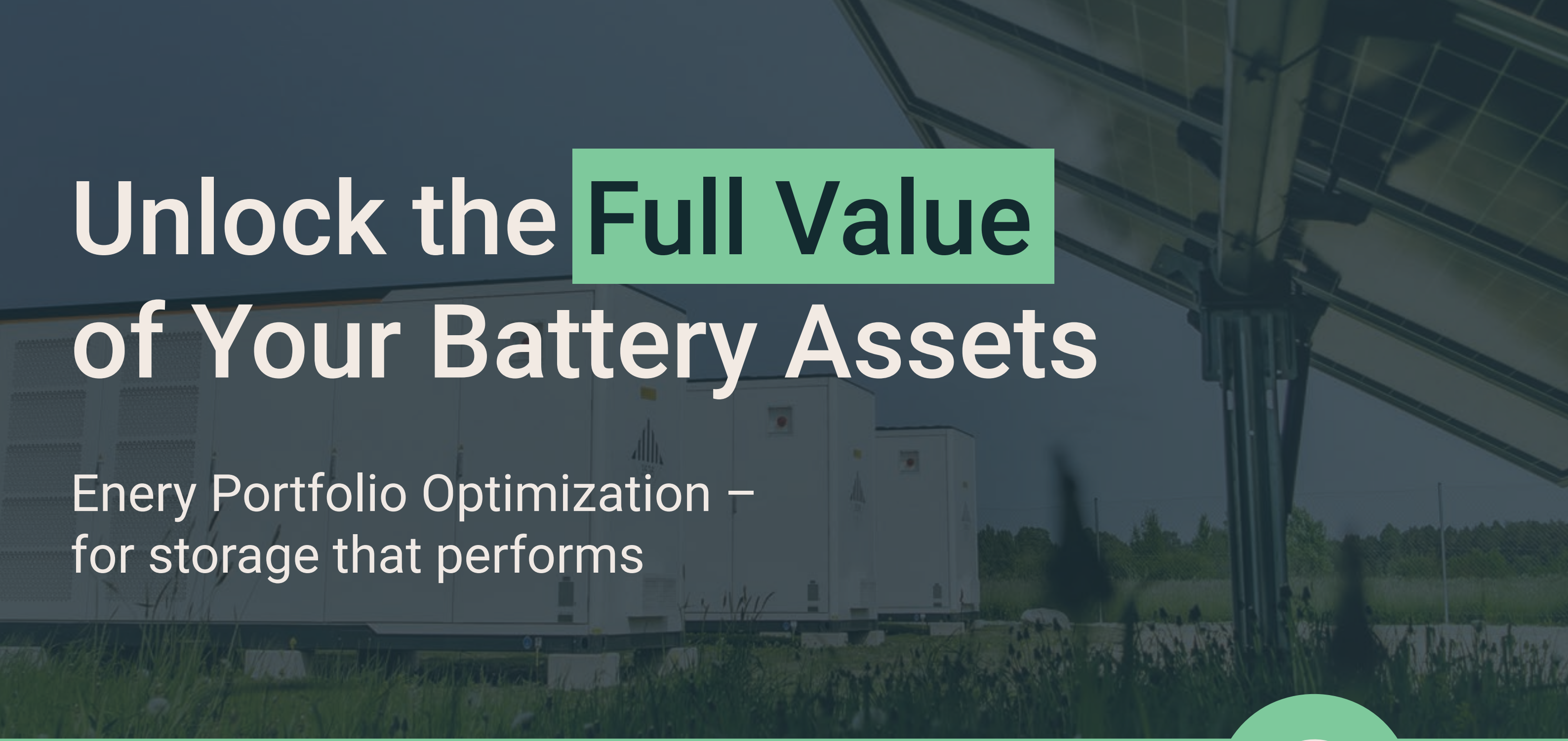
The expansion is anchored in a broader system transition. Türkiye raised its 2035 renewable target by 45% to 120 GW of wind and solar. Solar capacity has grown 625-fold since 2014, reaching 25 GW. A 30 billion USD Transmission 2.0 grid programme, 6 billion USD in World Bank energy financing, and a TRY 1 trillion distribution network programme support the build-out.

Every gigawatt-hour of dispatchable storage that shifts midday solar into evening peak directly displaces imported gas. For a country that still meets roughly two-thirds of its energy needs from imports, this matters at the macro level: a lower energy import bill, a narrower trade deficit, and structural relief on the current account. Avoided gas and coal imports add measurable improvement on top of this trajectory. Synchronously connected to ENTSO-E since 2010, Türkiye is also positioning to triple interconnection capacity to 6.8 GW by 2035.

This trajectory arrives at a moment of unusual visibility. From 9 to 20 November 2026, Türkiye will host COP31 in Antalya, the first time the country will preside over a UN climate conference. The Antalya presidency places Mediterranean climate ambition, Pacific resilience, and accelerated clean-energy investment at the centre of the global agenda. Türkiye's storage build-out is no longer a domestic story. It is a tangible demonstration of what the host of COP31 can deliver.

That Türkiye is now part of the scope of the European Battery Outlook is the right framing at the right time.

Battery Energy Storage System (BESS) installed alongside solar farm, Aliağa, Türkiye



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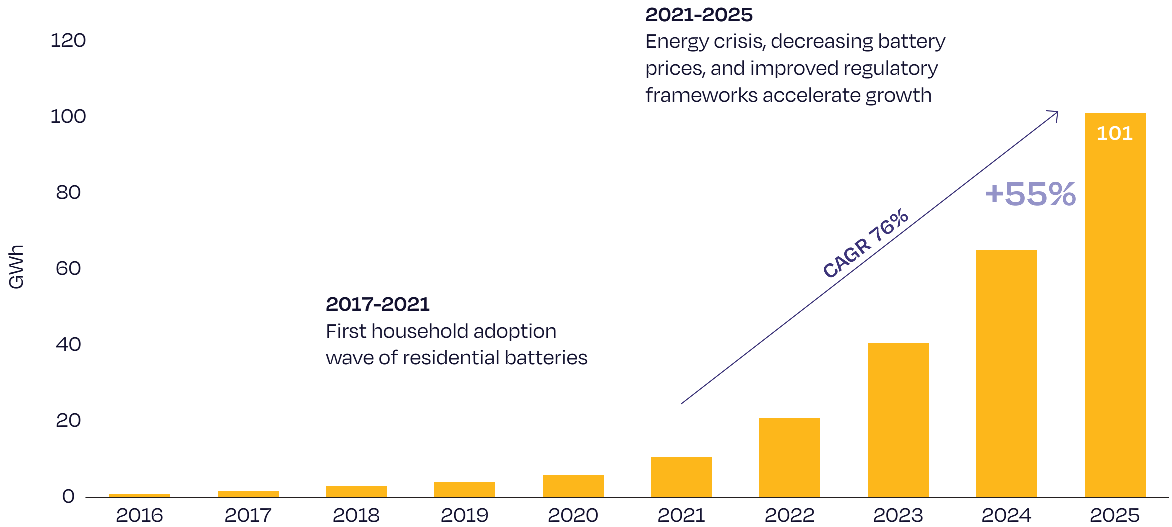
The European battery storage fleet crosses the 100 GWh mark; share of residential storage falls just under 50%

In 2025, the European battery storage fleet surpassed the 100 GWh mark, expanding by 55% year on year. (see Fig. 8). Over the past decade, Europe's BESS fleet has grown rapidly, achieving a compound annual growth rate (CAGR) of 70%, rising to 77% over the 2021-2025 period. This sustained acceleration has led to a tenfold increase in operational capacity in just four years, from around 10 GWh at the end of 2021. By comparison, back in 2016, Europe had installed 1 GWh of battery storage, meaning today's fleet is 100 times larger. Even at over 100 GWh of installed capacity, the cumulative market is still experiencing a strong acceleration phase (see Chapter 3 for more details on the expected 5-year deployment outlook).

Figure 8

European battery storage fleet crosses 100 GWh capacity milestone

Europe cumulative BESS capacity 2016-2025



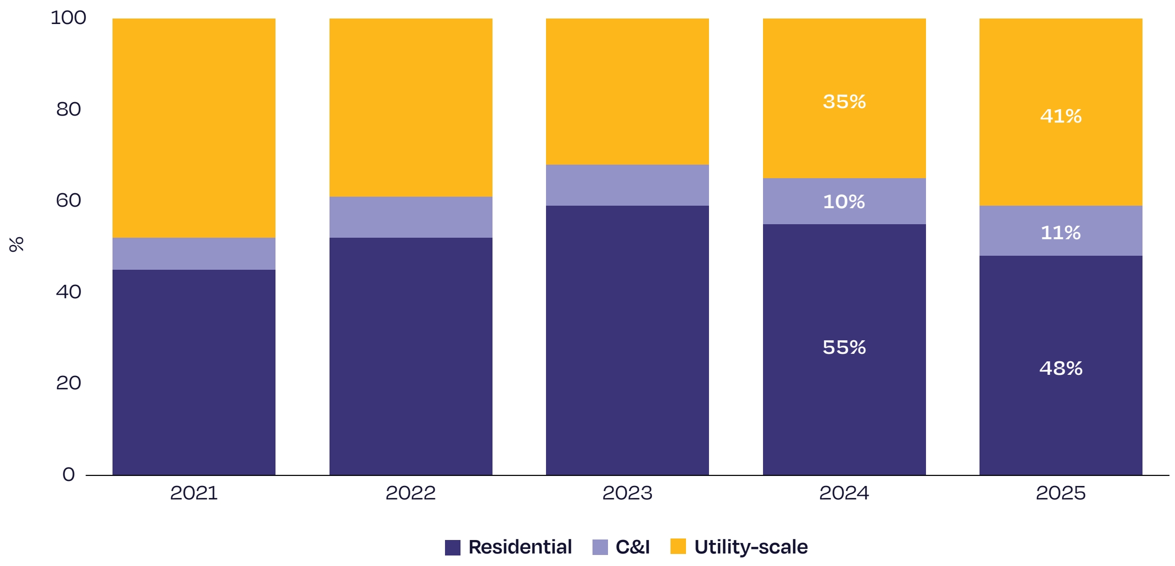
While residential storage still accounts for the largest share of cumulative installed capacity, its share has now fallen just below 50% after two consecutive years of decline (see Fig. 9). This trend is expected to continue, as utility scale batteries have become the second largest segment in 2025, and are set to overtake the residential segment in 2026.

Europe now displays a cumulative capacity breakdown similar to that of 2022, when the 2022 energy crisis led to a flurry of home battery installations. This time, however, residential installations are expected to grow only marginally, while utility scale installations are projected to accelerate faster than ever. The C&I segment, meanwhile, remains broadly in line with its position five years ago, accounting for 11% of cumulative capacity.

Figure 9

Distributed BESS continues to lead in 2025 while utility-scale accounts for 40%

Europe cumulative BESS shares per segment 2021-2025



Importantly, and despite the substantial growth in BESS capacity in recent years, the EU continues to face a flexibility challenge. By the end of 2025, the EU had an overall solar PV-to-battery storage ratio of 8:1, reflecting the large size of the solar PV fleet relative to the installed battery storage capacity. Although this represents a significant improvement from 10:1 in 2024, this ratio needs to decrease faster so as to alleviate pressing flexibility issues.

At segment level, the residential ratio stands at 3:1, unchanged year-on-year. In the C&I segment, solar capacity exceeds storage by 30:1, down from 40:1 in 2024. At the utility scale, the ratio has fallen to 12:1, improving from 17:1 the previous year.

More detailed information on segment-specific trends is available in SolarPower Europe's member-exclusive Market and Policy Navigator.

Annual deployment diversification continues, but Germany, Italy, and the UK still operate 60% of battery capacity

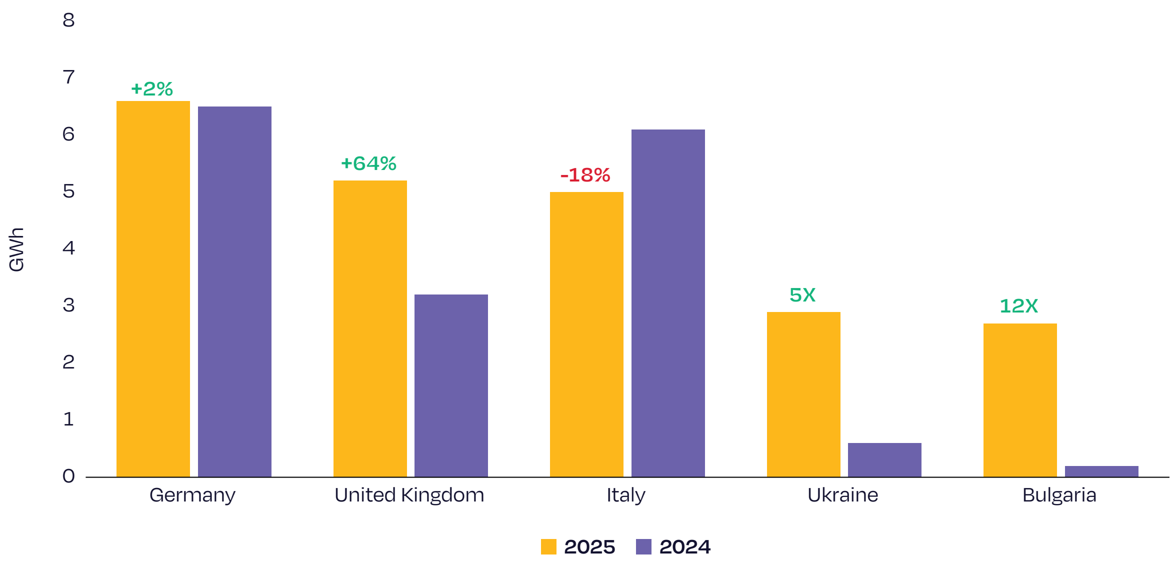
In 2025, Germany retained its leading position as Europe's largest BESS market (see Fig. 10), adding 6.6 GWh representing a 2% increase compared to 2024. The United Kingdom reclaimed second place, boosting its annual additions by 64% to 5.2 GWh. As expected, Italy slipped to third position due to an 18% decline in annual deployment, following the exceptional installation volumes of 2024. Nevertheless, the country still rolled out 5 GWh of battery storage, only narrowly losing its second place. Finally, two newcomers – Ukraine and Bulgaria – have emerged as key markets in 2025 - respectively replacing Austria and Sweden as the fourth and the fifth largest markets.

Europe's 2025 top 5 BESS markets illustrate three important dynamics. First, reaching the gigawatt-hour scale is no longer sufficient to secure a top 5 position. Second, the battery revolution is spreading across an increasing number of European countries: while only three installed 1 GWh or more in 2023, this rose to 10 in 2025. Third, countries without a strong utility-scale battery market can no longer rank among the top 5. While earlier rankings were largely driven by residential installations, today, amid stagnant household demand and sluggish C&I growth, top tier positions increasingly depend on deploying large volumes of utility-scale storage.

Figure 10

Germany, the UK and Italy solidify their dominance, as Ukraine and Bulgaria emerge very strongly in 2025

Europe top 5 BESS markets 2024-2025



Germany set a new deployment record last year, installing 6.6 GWh and exceeding 6 GWh of annual additions for the third consecutive year. The pace of expansion has stabilised, with growth rates of 2% in 2025 and 6% in 2024, reflecting a 17% downturn in household installations last year and the somewhat limited contribution from the C&I segment. The fall in new battery installations would have been even steeper if it was not because of plug-in battery systems, which grew in capacity by 21% in 2025. Importantly, the long anticipated expansion of Germany's utility scale battery market has begun to materialise. Despite lingering political uncertainty, the segment delivered two times more capacity in 2025 compared to the previous year, reaching 25% of annual additions.

The **United Kingdom** remains one of Europe's most dynamic BESS markets, underpinned by strong policy support and favourable market conditions. After a temporary slowdown in 2024, when annual installations fell 14% to 3.2 GWh, deployment rebounded sharply in 2025, reaching a new record of 5.2 GWh. As a result, the UK ranks as Europe's second largest market in 2025 and continues to operate the continent's largest utility scale battery fleet. At the distributed level, VAT exemptions for small scale BESS, streamlined permitting procedures, and targeted financial support for low income households are driving the expansion of residential and C&I storage. Together, these rooftop segments contributed nearly 20% in 2025.

After almost overtaking Germany in 2024, **Italy** recorded its first market contraction in 2025, connecting 18% less capacity year-on-year. The utility scale segment registered its first decline in annual installations (-11%), driven by the exhaustion of the project pipeline contracted under previous national auctions and the delayed launch of the first MACSE round. Despite this, the segment still performed solidly in 2025, deploying 3.1 GWh. Overall installations declined, however, due to the sharp downturn in the residential market, which shrank by 33% year-on-year. Meanwhile, the C&I segment remained subdued, with annual installations contributing 8% following its peak and 17% share in 2023

In its first year within the geographical scope of this report, **Ukraine** has catapulted to fourth place in the European ranking. Four years into Russia's invasion, the country has quickly recognised the strategic role that solar plus storage systems can play. In an extraordinary effort to reduce dependence on large thermal power plants and enhance power system resilience, Ukraine installed 2.9 GWh of BESS in 2025. More than 60% of this capacity comes from the distributed segment, as Ukrainian households, businesses, schools, hospitals, water treatment plants, and other critical facilities increasingly rely on solar plus storage systems to secure a stable and reliable power supply. The utility segment contributed nearly one-third of capacity to address the acute need for flexibility and reserve services in the power system.

Uusnivala battery project, Nivala, Finland - 55 MW / 110 MWh battery storage project

Box 3

Ukraine joins the European battery storage map

The Ukrainian BESS market has undergone a fundamental transformation – not only in terms of deployment volumes, but also in its regulatory architecture, market structure, and strategic role within the country's energy system.

The war has fundamentally changed Ukraine's energy landscape. Following the loss or damage of up to 50% of the country's generation capacity, BESS has evolved from an investment option into a critical component of energy resilience. Across all market segments, the solar + BESS model now dominates new projects, as solar generation alone cannot provide the flexibility and stability required by the power system.

Key legislative changes have become major drivers of market growth. Since 2024, BESS installations can be commissioned without construction permits and can be deployed on land designated for any purpose. In addition, energy storage facilities with a capacity of up to 5 MW do not require an energy storage license, significantly accelerating the development of the commercial and industrial segments.

VAT and import duty exemptions for renewable energy equipment, including BESS, have also been extended until 2028. For households, Cabinet of Ministers Resolution No. 673/2024 introduced preferential financing programs for the installation of solar PV systems and energy storage systems.

The Ukrainian market has effectively developed several implementation models for solar PV and BESS projects, ranging from self-consumption to full participation in the wholesale electricity market.

For commercial and industrial investors, electricity sales on Ukraine's segmented electricity markets are becoming increasingly popular, including the day-ahead market, intraday market, balancing market, and ancillary services market. BESS facilities can already participate in these markets, providing energy arbitrage, balancing services, and additional asset monetisation opportunities. At the same time, electricity stored in BESS can be sold on the open market without a separate energy storage license for installations of up to 5 MW.

Another important investment incentive is the updated Feed-in-Premium (FiP) green auction mechanism. Ukrainian legislation provides a dedicated quota for solar + BESS projects – 10% of auction volumes – with premium support of up to 0.12 EUR/kWh for a period of 12 years. Traditional solar PV projects receive a 5% quota with support of up to 0.08 EUR/kWh. This represents a clear policy signal from the government regarding the priority of solar + BESS development.

Ukraine's synchronization with ENTSO-E in 2022 created real demand for large-scale energy storage systems. Special auctions conducted by NPC Ukrenergo for FCR and aFRR reserves, offering five-year contracts denominated in euros, became the first stable market signal for utility-scale BESS investments.

In addition to backup power supply, BESS now performs essential functions in balancing the power system, managing peak loads, and facilitating the integration of renewable energy sources.

Despite these positive developments, the market continues to face several systemic challenges. Key barriers include outstanding debts in the balancing market, grid connection constraints, price caps imposed by the energy regulator (NEURC), and the absence of comprehensive war-risk insurance mechanisms.

Nevertheless, SEAU forecasts the deployment of more than 3 GWh of new BESS capacity by the end of 2026. Ukraine has already established the core regulatory framework required for the rapid development of the energy storage market. The next critical stage will be reducing financial risks and ensuring macroeconomic stability.

Battery energy storage system installation by Cetus Ukraine Ltd, Cherkasy, Ukraine

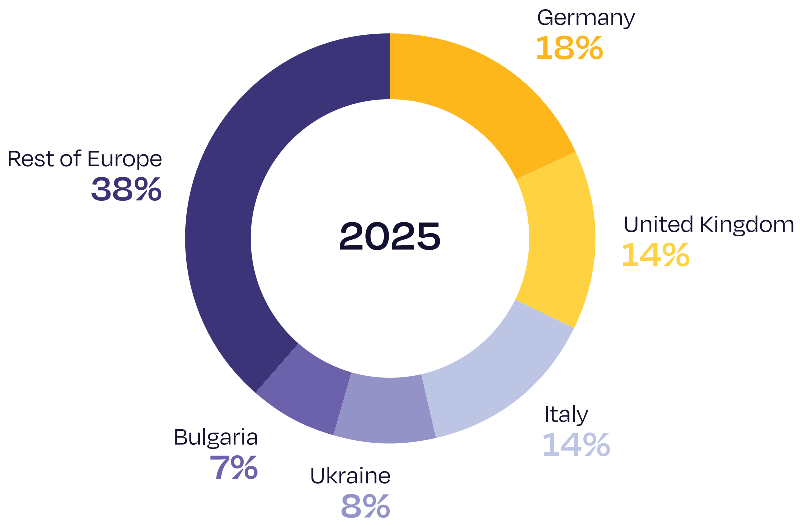
Closing the top 5, **Bulgaria** also emerged as a key market in 2025, with 2.7 GWh of connected capacity and the highest growth rate in Europe (+1,061% year-on-year). EU funding rounds have triggered substantial capital mobilisation for utility scale battery deployment, marking the country's first breakthrough year for grid scale storage. By contrast, the distributed segment remains largely underdeveloped, constrained by a highly regulated electricity market.

Taken together, Europe's top 5 BESS markets accounted for 62% of new battery installations across the continent in 2025 (see Fig. 11). Despite their still substantial share in annual additions, market concentration has declined noticeably in recent years. In 2023 and 2024, the top 5 countries accounted for nearly 80% of total added battery capacity.

Figure 11

For the first time, the top 3 markets delivered less than half of annual installations, as deployment diversification unfolds

Europe top 5 BESS market shares vs Rest of Europe 2025



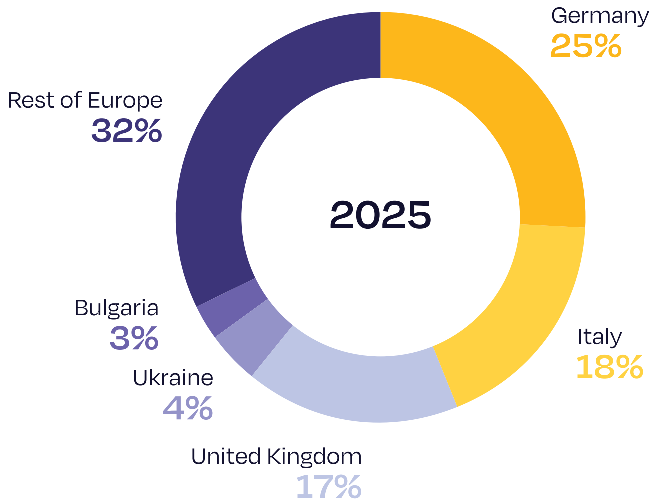
For the first time, the top 3 markets (DE, UK, IT) accounted for less than half of annual deployment, delivering just 47% of total installations. As expected, an increasing number of countries are now deploying batteries at scale, translating into a more geographically diversified deployment landscape. In 2025, 5 additional countries surpassed the 1 GWh threshold (BE, NL, RO, SE, AT).

Despite the growing importance of the rest of Europe, an analysis of the cumulative fleet highlights how concentrated deployment has been in recent years. The three leading markets still account for 61% of Europe's total battery storage fleet, with the remainder distributed across all other European countries (see Fig. 12).

Figure 12

Top 3 markets still account for 61% of the installed storage capacity, but their share decreases year on year

Europe top 5 cumulative BESS market shares vs Rest of Europe 2025



Box 4

Solar plus BESS in global emerging markets

In 2025, global BESS deployments reached roughly 106 GW, up 43% compared to 2024, bringing total installed capacity to about 270 GW/630 GWh.[5] Under IRENA's 1.5°C Scenario, tripling renewable electricity generation will need to be matched by a two- to fivefold expansion in battery storage by 2030, reaching up to 900 GW by 2030.[6] One of the main factors supporting BESS development around the globe is price. Average battery pack costs for stationary storage plunged 45% year-on-year in 2025, despite higher costs for key battery metals.[7] Recent reductions have been mainly driven by technology improvements and materials efficiency, allowing for growing economies of scale.

By the end of 2025, at least 30 countries had adopted or announced national measures to support energy storage. Around half of these countries have set explicit storage targets, but fiscal and financial incentives remain the most common policy lever. Most frameworks focus on battery storage, using incentives to expand capacity for grid operation and to stimulate domestic battery manufacturing. These measures typically address both utility-scale projects and residential batteries. In some cases, such as the Dominican Republic, policies require for new solar or wind installations to be paired with battery storage.

To ground these global trends in real-world examples, the next section will present four markets where solar growth, grid constraints and policy reforms are creating entry points for BESS deployment.

Case studies: BESS in Thailand, Brazil, Pakistan, and Bangladesh

In 2025, **Thailand** published its Revised Power Development Plan (RPDP), targeting 36 GW of solar and 10.5 GW of battery storage capacity by 2037. In addition to renewables, Thailand is positioning batteries in particular as part of a broader industrial development strategy. Under a resolution by the National Energy Policy Council (NEPC) and the Energy Policy and Planning Office (EPPO), an action plan to promote the battery energy storage industry (2023-2032) has been adopted. The document sets out multiple demand-driven approaches, including:

- Promoting BESS installation alongside renewables to enhancing system flexibility and reliability;
- Using BESS to defer transmission and distribution investments where cost-effective;
- Developing battery ancillary services to support system security.

Another goal of the action plan is to enhance Thailand's industrial competitiveness and local value creation. Deployment of energy storage is explicitly linked to building domestic capability and strengthening the country's battery ecosystem (including standards, skills, and production competitiveness).

5 Global energy storage market surpasses 100 GW annual installation milestone in 2025 | Wood Mackenzie
6 World Energy Transitions Outlook 2024: 1.5°C pathway
7 Lithium-Ion Battery Pack Prices Hit Record Low at $108/kWh - Battery-Tech Network

Brazil has a cumulative installed solar PV capacity of around 68 GW, as of February 2026, according to the National Agency of Electrical Energy (ANEEL). Rapid growth in solar (and renewables more broadly) is now colliding with grid constraints and rising curtailment, particularly in high-renewables regions. Curtailment losses have become material and are driving regulatory and operational responses, with storage increasingly considered as part of the solution (alongside grid access reforms), both by policymakers and the industry. A key milestone is Law No. 15.269 (24 November 2025), which modernises some aspects of the electricity sector framework and establishes guidelines for regulating electricity storage, including incentives for BESS.

However, in April 2026, ANEEL postponed the approval of a long-awaited specific regulatory framework for energy storage systems. This policy has been under discussion since 2019 and formalised through a draft proposal in public consultation in 2023. Despite this delayed regulation, Brazil has begun to see concrete project precedents. In 2026, ANEEL authorised a first co-located solar + BESS project (5 MWh). Back in 2023, the first large-scale BESS project (pilot with 30 MW power and 60 MWh for 2 hours) was inaugurated in the State of São Paulo by the Companhia de Transmissão de Energia Elétrica Paulista (ISA CTEEP).

Pakistan has an estimated total installed solar PV capacity of approximately 27-33 GW, as of end 2025 (this statistic might not fully capture behind-the-meter and off-grid installations).[8] The country's recent solar expansion has been underpinned by the National Electric Power Regulatory Authority (NEPRA)'s net metering regulations (2015), which established a framework for distributed generation (including solar) interconnected to distribution networks.

BESS deployment is still early-stage but is growing quickly behind-the-meter, as it is increasingly central for grid flexibility, particularly in the context of distributed solar uptake and system stability needs. Pakistan imported around 1.25 GWh of BESS in 2024 and a further 400 MWh monthly in early 2025, signalling rapid market acceleration (notably in decentralised applications). With unprecedented annual growth, the national BESS capacity could reach 8.75 GWh by 2030, significantly impacting peak demand management (GIZ, 2025).[9] However, a consistent theme is the lack of a specific regulatory category for BESS. The current Grid Code and Integrated Generation Capacity Expansion Plan (IGCEP) mention BESS requirements significantly, but still lack detailed provisions for performance standards, interconnection, and market participation.

Bangladesh is still dominated by thermal generation and imported power, while renewables contribute only a small share of installed capacity. As of April 2026, grid-connected installed capacity reached 29 GW, with solar contributing only around 767 MW.[10] System operations often face demand peaks, fuel constraints and grid bottlenecks. Bangladesh has adopted a Renewable Energy Policy 2025, setting higher ambition for renewables and explicitly including provisions that can ease costs for imported renewables equipment (with BESS included in scope, subject to conditions). However, energy storage deployment is still at an early stage, concentrated in either off-grid/mini-grid applications or early grid-connected pilots and preparatory work. While the Government of Bangladesh has promoted several programmes that have introduced solar PV combined with batteries, no utility-scale BESS project has been developed yet. This gap becomes increasingly relevant as Bangladesh plans a rapid expansion of solar (and renewables more broadly), while simultaneously facing high costs associated with maintaining thermal capacity and fossil-fuel dependency.

8 Pakistan's installed PV capacity estimated above 27 GW – pv magazine International
9 GIZ (2025), BESS: Applications and Impact on Demand Defection in the Power Sector of Pakistan
10 Bangladesh Power Development Board (2026): Installed power generation capacity

Drivers of battery storage deployment

Battery storage deployment in Europe is being driven by a combination of economic, technological, and policy factors across both distributed and utility-scale segments. In the residential market, persistently high retail electricity prices, the growing coupling of batteries with rooftop solar, declining battery costs, support schemes, and the rollout of smart meters and dynamic tariffs are strengthening the case for self-consumption and energy bill optimisation. In the commercial and industrial segment, uptake is increasing more slowly, although attachment rates are beginning to rise. At the same time, falling lithium-ion battery costs, especially for LFP technologies, have been a fundamental enabler of growth, despite some renewed price pressure in 2026 linked to raw material volatility. For utility-scale storage, widening wholesale price spreads, growing flexibility needs, better revenue stacking opportunities, and stronger policy support are improving project economics. Still, important barriers remain, including limited remuneration for grid services, unfavourable network tariff structures, and the absence of ambitious storage targets in many countries.

Structurally high retail electricity prices, dynamic tariffs, low battery prices and supportive frameworks remain the key drivers of distributed batteries

Retail electricity prices and attachment rates

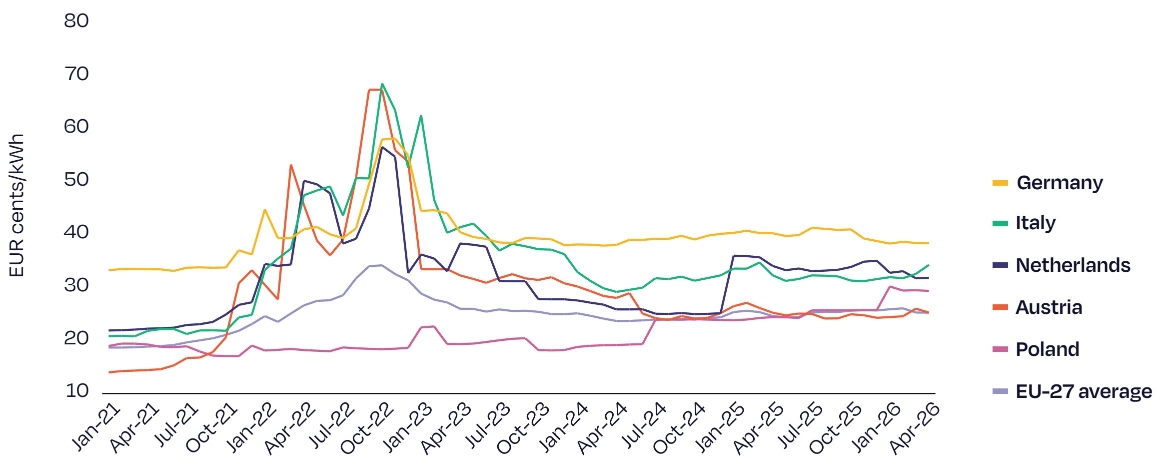
Retail electricity prices for households and small and medium-sized enterprises (SMEs) have historically shown a strong correlation with the development of rooftop solar installations. As electricity costs rise, both consumers and businesses tend to seek ways to reduce their exposure to retail prices and increase their energy independence. The growing availability of more affordable battery storage solutions, particularly in the residential segment, has further strengthened this trend, enabling self-consumption levels of 70% or above. This significantly enhances the economic attractiveness of rooftop solar as a hedge against high and volatile energy prices.

The post-pandemic economic recovery in 2021 led to a sharp increase in global energy demand, which resulted in structurally higher electricity prices across Europe. This situation was further exacerbated by Russia's invasion of Ukraine in 2022, which increased market volatility, fuelled inflation, and disrupted industrial activity amid unprecedented price fluctuations. While retail power prices have decreased since the 2022 peak, they remain on average 35% higher than 2021 levels, continuing to boost demand for residential solar and storage (see Fig. 13).

Figure 13

EU household electricity prices have declined substantially since 2022, but remain 35% higher than 2021 levels

EU-27 average household electricity prices Jan 2020 - April 2026



Data shows household electricity prices for each country's capital.
Source: Household Energy Price Index (2025).

Europe's strong dependence on Russian natural gas exposed a critical vulnerability, as gas-fired generation often sets the marginal electricity price in most European power markets. As gas prices surged, wholesale electricity prices rose accordingly, significantly impacting consumers. Household electricity bills increased sharply, particularly in gas-dependent markets such as Germany, Italy, and the Netherlands, with Italy recording price increases of up to 214% between October 2021 and the 2022 peak.

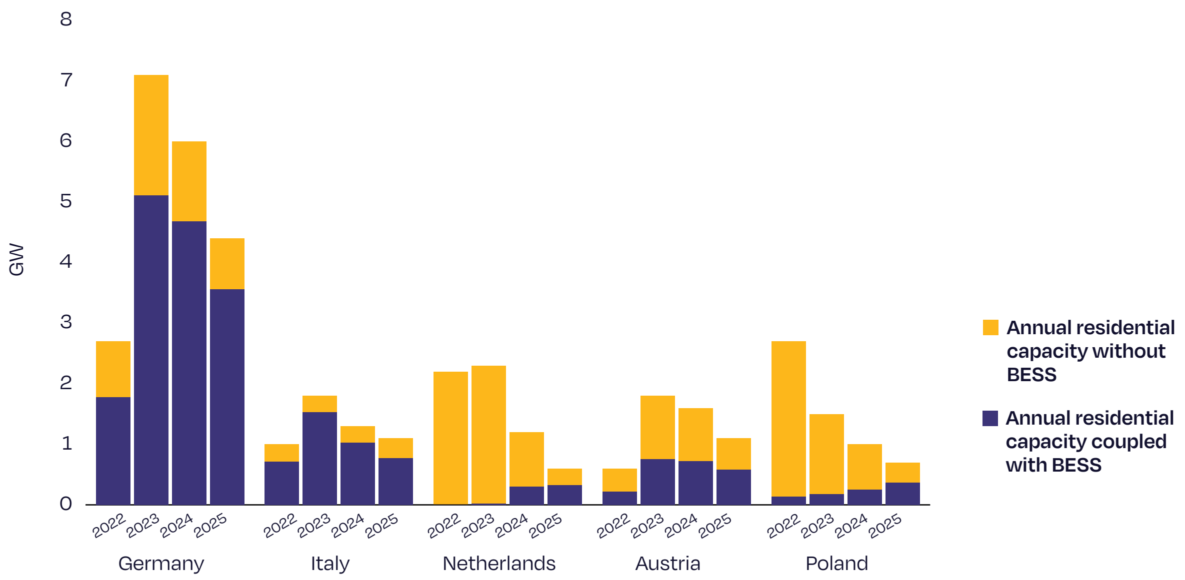
During the energy price crisis, several European markets recorded unprecedented levels of residential battery deployment, largely driven by the increasing trend of coupling batteries with rooftop solar systems. This is reflected in rising attachment rates across key countries, which reached 72% in Germany and 85% in Italy in 2023, supported by high electricity prices and strong policy incentives.

In 2024 and 2025, with less attractive policy and electricity price conditions, residential solar markets across Europe experienced a decline. However, attachment have continued to increase in most of the mature markets, and has almost reached 40% in 2025. This indicates that the coupling of solar and storage is becoming the new standard (see Fig. 14).

Figure 14

Attachment rates continue to rise despite declining residential solar installations

New annual residential solar PV installations coupled with BESS 2022-2025



In the case of the Netherlands and Poland, the availability of net-metering schemes combined with the absence of targeted incentives for battery storage led to rapid growth in residential solar without a corresponding increase in storage deployment. As regulatory frameworks have evolved – most notably through the gradual phase-out of net metering and the introduction of dedicated support measures for BESS – attachment rates have started to rise rapidly in both markets, crossing the 50% threshold in 2025.

The rapid expansion of residential solar-plus-storage during the energy price crisis was not mirrored in the C&I segment, which grew at a considerably slower pace. While high electricity prices encouraged SMEs and large industrial players to invest in solar PV to reduce costs and decarbonise operations, most projects were not coupled with battery storage. Between 2022 and 2025, more than 80 GW of solar PV capacity was deployed in the C&I segment in Europe, bringing the total installed capacity to nearly 160 GW by the end of the period. However, battery attachment rates remained relatively low over the same period – generally below 5–10% across the continent – resulting in a C&I solar fleet approximately 27 times larger than the installed battery capacity.

In 2026, coupling rates have increased, reaching around 20% in the commercial segment and approximately 10% in the industrial segment, indicating a growing but still limited integration of storage alongside solar in the C&I market.

Athens International Airport, Athens, Greece — 51.5 MW solar PV with 82 MWh battery storage

Box 5

Carbon footprint assessment

The carbon footprint debate: why electricity assumptions matter for batteries

The EU Batteries Regulation (EU) 2023/1542 establishes the carbon footprint of batteries as a central sustainability metric. For battery manufacturers, the way this footprint is calculated directly affects product competitiveness in the EU market, including in public procurement. While the methodology applies only to batteries placed on the market, excluding the operational phase, its design carries far reaching implications. At stake is not only methodological consistency, but also whether the Regulation supports or unintentionally undermines private sector investment in renewable energy.

Carbon footprint under the Batteries Regulation: where things stand

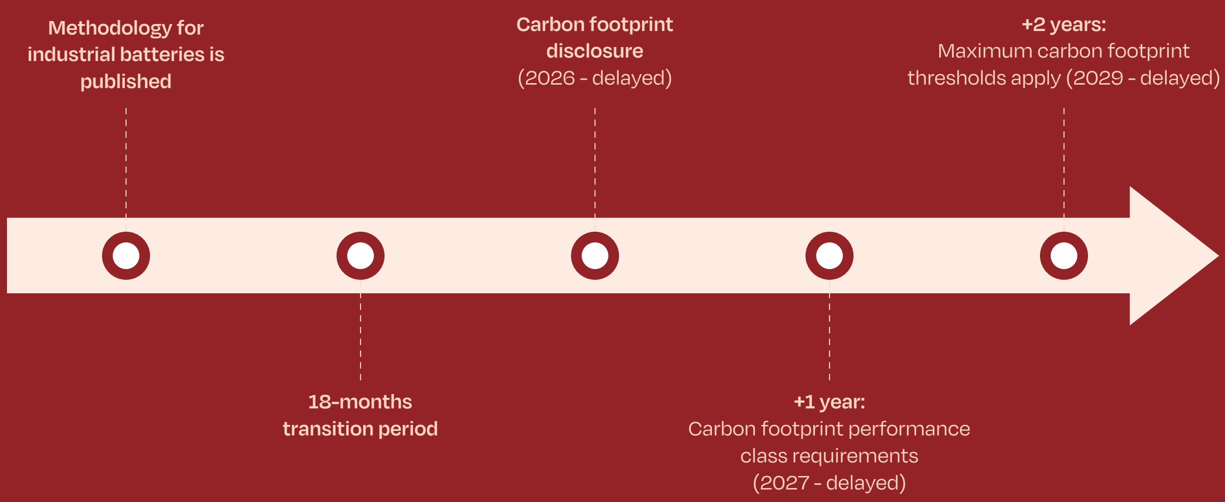
The Batteries Regulation entered into force in 2023, with additional requirements phasing in over time through delegated acts. A core element is the mandatory disclosure of the carbon footprint for different battery categories. This is intended to improve transparency, enable differentiation of low carbon products and shape market access through future maximum carbon footprint thresholds.

In 2024, the Commission published a draft delegated act on the carbon footprint methodology for EV batteries. Although not adopted to date, the draft set out a controversial approach: companies' investments in renewable electricity – such as power purchase agreements (PPAs) or renewable energy certificates – would not be reflected in the carbon footprint of batteries.

This choice triggered wide-reaching industry concern and pushback, as it directly affects how upstream manufacturing emissions are assessed. It has also delayed the entry into force for carbon footprint disclosure requirements, including also for BESS, initially scheduled for February 2026.

Figure 15

Timeline for carbon footprint requirements for industrial batteries



The key methodological question: how to treat electricity

The debate centres on how electricity, one of the largest contributors to upstream emissions in battery manufacturing, should be accounted for.

Two approaches are under discussion:

Approach 1: Default electricity factors	Approach 2: Accounting for real electricity emissions
Electricity-related emissions are calculated using predefined emission factors, such as national or EU average grid values. This approach favours simplicity and harmonisation but largely ignores differences in manufacturing pathways and energy sourcing.	Electricity-related emissions reflect the electricity actually contracted by companies, including renewable electricity secured through long term PPAs. This approach better captures differences between production strategies but requires robust safeguards to ensure credibility and comparability.

A debate that extends far beyond batteries

Carbon footprint disclosure is set to become a horizontal tool in EU product policy. Similar approaches are being introduced under the Ecodesign for Sustainable Products Regulation (ESPR) and are linked to preferential treatment for low carbon products under initiatives such as the Net Zero Industry Act. Comparable discussions are also emerging for energy intensive materials, such as steel and cement, within the scope of the Industrial Accelerator Act.

The way electricity is treated in battery carbon footprint methodologies may therefore set a precedent across multiple sectors. The choice made will influence whether carbon footprint rules encourage or dampen private investment in decarbonisation.

Why recognising renewable electricity matters

Private sector investment in renewable energy often takes the form of long term corporate PPAs. Companies sign these contracts for two interlinked reasons:

- First, energy security and price stability. Long term renewable procurement protects against fossil fuel price volatility and improves resilience.
- Second, emissions reduction. Using renewable electricity lowers the carbon footprint of operations and products, an increasingly important factor for customers, investors, and regulators.

These motivations reinforce each other. If renewable electricity cannot be reflected in product carbon footprints, a key incentive for signing PPAs is removed. This risks slowing private investment at a time when Europe urgently needs capital to scale renewables and strengthen energy independence. Furthermore, the use of national averages could disadvantage European BESS manufacturers located in countries with carbon-intensive grids, such as Poland, Bulgaria or Hungary.

While energy policy encourages companies to invest in renewables and strongly supports instruments like PPAs, carbon footprint methodologies that do not account for such investments may undermine these efforts. Industry stakeholders have consistently stressed that recognising renewable electricity does not imply lower integrity. With clear rules and safeguards, methodologies can remain robust while rewarding genuine decarbonisation efforts. Ensuring alignment between energy and environmental policy will be essential to support both energy security and decarbonisation objectives.

Support schemes

Support schemes play a key role in enabling battery storage deployment across Europe by reducing upfront investment costs. These schemes are characterised by the financial instrument used, the market segment targeted, and the level at which they are implemented. The two main mechanisms are capital expenditure (CAPEX) grants and tax-based incentives.

In the **residential segment**, **CAPEX grants** can be differentiated into national and regional/local programmes, depending on how funding is managed and allocated. By May 2025, just seven countries had launched national CAPEX support schemes for battery storage, while one year later, the number of countries has nearly doubled to 13. These schemes promote the adoption of home batteries, whether retrofitted, standalone, or in new PV installations, through upfront capital investment support (see Fig. 16).

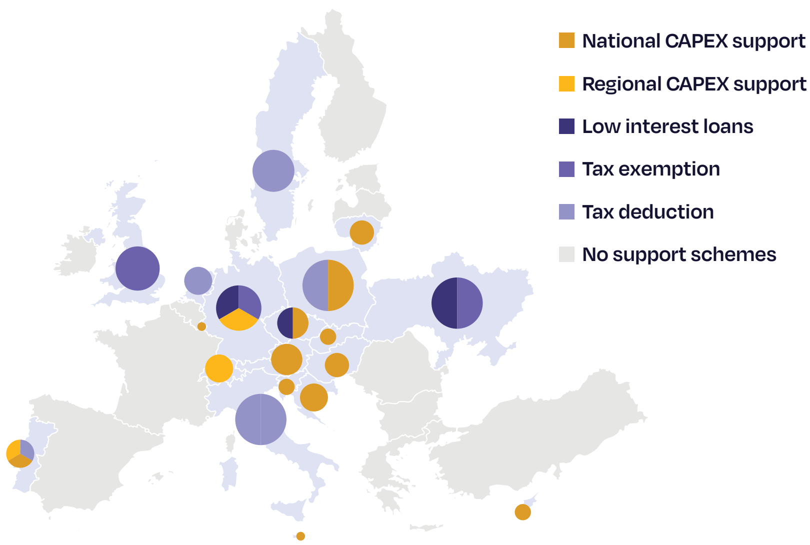
Such programmes are typically temporary and subject to budget restrictions, leading to immediate and sharp increases in installations until the funds are quickly exhausted. Once the funding round closes, households tend to delay purchases until the next programme becomes available, causing a sudden drop in battery system purchases. Nevertheless, CAPEX funding mechanisms are important for setting up the demand foundation in countries were household battery roll-out is still negligible.

Countries that have introduced CAPEX-only grant programmes in 2026 include Croatia, Lithuania, and Slovakia. In Croatia, the government covers up to 70% of eligible investment costs, increasing to 80% for lower-income households. Slovakia's scheme provides support for up to 50% of costs, rising to as much as 90% for low-income households. In Lithuania, the grant covers a more modest 30% of eligible costs; however, it has proven effective in stimulating market growth, supporting the installation of approximately 200 MWh of residential battery capacity over the 2025–2026 period.

Figure 16

More countries support residential battery adoption, but funding programmes remain limited

Mapping of tax incentives and direct/indirect support schemes for residential batteries in Europe 2026



Support schemes available as of the start of 2026.

Regional and local CAPEX support schemes can complement national programmes by accelerating residential battery uptake. Examples include state-level initiatives in Germany (e.g. Bavaria and Berlin), alongside support from the Federal Office for Economic Affairs and Export Control (BAFA), and municipal incentives such as Lisbon's grant of 300 EUR/kWh, capped at 3,000 EUR. These targeted measures can significantly boost deployment, particularly when aligned with broader national policies.

Tax incentives – primarily VAT exemptions, deductions, and rebates – play an important role in accelerating residential battery deployment by lowering upfront costs. In markets such as Germany and the UK, VAT exemptions have proven particularly effective, offering immediate benefits at the point of purchase and avoiding the administrative complexity associated with subsidy schemes. However, their impact can be uneven, as illustrated by the Netherlands, where complex eligibility requirements have limited uptake.

By contrast, CAPEX subsidies typically provide higher levels of financial support and can be more targeted toward specific groups or regions, making them especially effective in lower-income markets. Nevertheless, as mentioned, these schemes often rely on limited budgets and involve more burdensome application processes, which can result in stop-and-go deployment dynamics.

In 2025, only three countries – Denmark, the Netherlands, and the UK – had applied VAT exemptions or deductions. As of 2026, two more countries have introduced VAT waivers. Portugal has reduced the VAT on solar and storage products from 23% to 6%, and Ukraine has abolished VAT and import duties on PV modules and BESS until 2028.

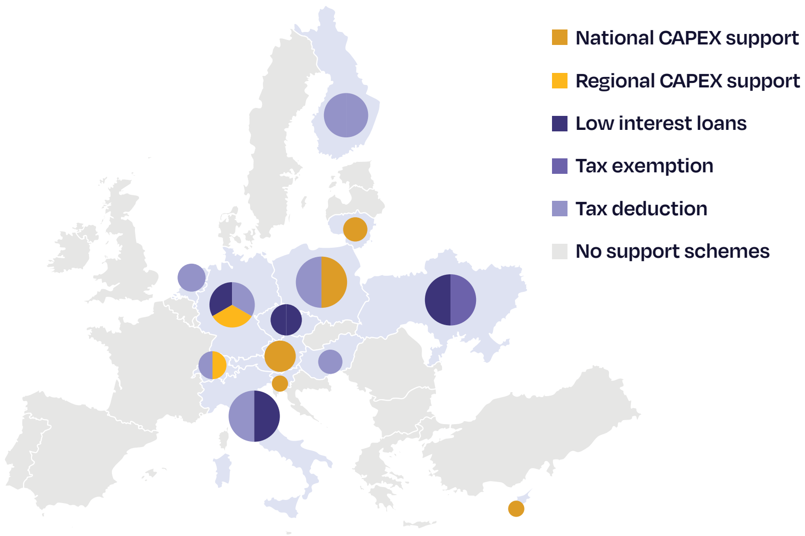
Tax deductions have also been implemented in countries such as Italy, Sweden, and Poland. Italy transitioned from the Superbonus scheme to the "Battery Installation Credit", allowing households to deduct 36% to 50% of installation costs, while Sweden's Green Tax Deduction provides deductions of 20% for solar PV and 50% for residential batteries.

Ånge Energy Storage, Ånge, Sweden — 70 MW / 160 MWh battery energy storage system

Figure 17

Financial support for C&I batteries remains insufficient across Europe

Mapping of tax incentives and direct/indirect support schemes for C&I batteries in Europe 2026



Support schemes available as of the start of 2026.

Beyond direct support mechanisms, several countries have introduced indirect financial tools, such as **zero- or low-interest loans**, to improve accessibility for households unable to cover high upfront costs. For instance, the Czech Republic has restructured its New Green Savings Programme to prioritise interest-free loans, while still offering full CAPEX subsidies for low-income households. Similar financing options are available in Ukraine and Germany, further supporting the uptake of residential solar and battery systems.

In the **C&I battery** segment, the same taxonomy can be applied to map the existing support schemes in Europe (see Fig. 17). National C&I eligible **CAPEX grants** are in place in 2026 in 5 countries – Austria, Cyprus, Lithuania, Poland and Slovenia – two fewer than in 2025.

Three noteworthy examples are Lithuania, Poland and Romania. In Lithuania, a CAPEX support scheme is available for companies and energy communities deploying BESS with capacities of up to 1 MWh, providing a 30% investment grant. The programme aims to deliver 110 MWh of storage capacity over the 2024–2026 period.

In Poland, the My Electricity 7.0 scheme supports farmers (and households) installing battery systems, offering up to 16,000 PLN (approximately 3,600 EUR) for storage systems above 2 kWh. Additional financing mechanisms are also available for farmers and companies investing in BESS.

In Romania, the solar PV grant scheme *Casa Verde Fotovoltaice* is being adapted into *Casa Verde Baterii*, a grant scheme targeting both residential and commercial battery installations. A proposed budget of 76 million EUR has been allocated to support the hybridisation of existing rooftop solar systems, although detailed eligibility criteria and implementation rules are still under development.

Tax incentives are increasingly being used to support commercial and industrial adoption of storage. Finland, under the EU State aid framework, offers tax credits for investments in local solar generation and battery storage, with eligibility extended to most sectors. In Germany, businesses benefit from accelerated depreciation for BESS investments, alongside an additional 10% corporate tax reduction for projects meeting specific certification requirements. Hungary allows companies to claim up to 30% of eligible costs, with higher rates available for SMEs. In Italy, support continues through low-interest loans and tax deductions, particularly in Southern regions, while in the Netherlands the Energy Investment Allowance provides a tax deduction of up to 45% of eligible CAPEX for entrepreneurs subject to income or corporate tax. Overall, seven European countries currently provide tax benefits to companies adopting battery storage, an increase from just three countries in the previous year.

In parallel, governments and financial institutions are expanding access to soft loan schemes. For example, Ukraine has introduced a pilot programme offering preferential loans to SMEs at around 10% interest, with the state covering the difference between market and concessional rates. In the Czech Republic, zero-interest loans are available for companies of all sizes investing in solar and battery storage across commercial buildings, warehouses, garages, and carports. As of 2026, four countries offer active soft loan programmes – up from three in the previous year – further improving financing conditions for storage deployment in the commercial and industrial segment.

More detailed information on battery storage support schemes is available in SolarPower Europe's member-exclusive Market and Policy Navigator.

Smart devices and time-of-use tariffs

A strong business case for distributed battery storage requires not only financial incentives, but also a supportive regulatory framework that removes technical barriers, streamlines permitting, and reduces administrative burdens. This includes enabling complementary technologies, such as solar PV, EVs, and heat pumps, that enhance system flexibility.

Smart meters are a key enabler, providing real-time data that supports demand response, time-of-use pricing, and optimised energy use. By allowing consumers and grid operators to better manage distributed resources, they help reduce peak demand, lower costs, and strengthen overall system resilience.

As of end 2025 smart meter deployment in households had advanced considerably across the EU.[11] Out of 22 Member States within the scope of the analysis, 15 have reached rollout rates above 80%. Belgium, Croatia, Poland, and Lithuania have achieved intermediate rollout levels of 30-80%, while progress remains limited in Romania and also in Hungary at around 10%. Cyprus and Germany are the only Member States with a smart meter penetration below 10%.

Without access to smart meters, consumers in these markets face significant limitations in the range of offers available from energy suppliers and have few opportunities to participate in flexibility initiatives. Additionally, the slow adoption of smart meters restricts suppliers and third parties from providing flexibility services.

The lack of **time-of-use** and dynamic pricing contracts further weakens price signals for consumers, limiting their ability to adjust energy consumption in response to changing production costs. According to the Agency for the Cooperation of Energy Regulators (ACER), a large share of EU households, 59% on average and 100% in several Member States, remain on regulated or flat-price contracts. While these provide protection from price volatility, they also prevent consumers from benefitting when wholesale prices fall and can dampen the price signal effect. Among non-household consumers, only about one third in a sample of 12 European countries have access to dynamic pricing contracts. These 12 countries are the only ones that provide data regarding non-household contracts, showing that most European countries are not monitoring the uptake of dynamic tariffs for non-household consumers. The most advanced countries are Belgium, Sweden and Italy with dynamic contract uptake rates higher than 60%. Countries like Spain, Latvia, and Lithuania present adoption rates in between 20-50%, while France, the Netherlands or Austria have integration rates of less than 10%.

11 ACER & CEER (2025): Rewarding Flexibility: How retail contract choice can help unlock consumer flexibility

Battery costs and prices

A fundamental driver of battery storage deployment, across both distributed and utility-scale applications, is the steep decline in the production costs and selling prices of lithium-ion batteries, which today account for over 90% of the global stationary storage market. Two key factors underpin the dominance of lithium-ion technologies: rapidly decreasing costs and strong performance in terms of durability. In both respects, lithium-based batteries maintain a clear advantage over alternative storage technologies.

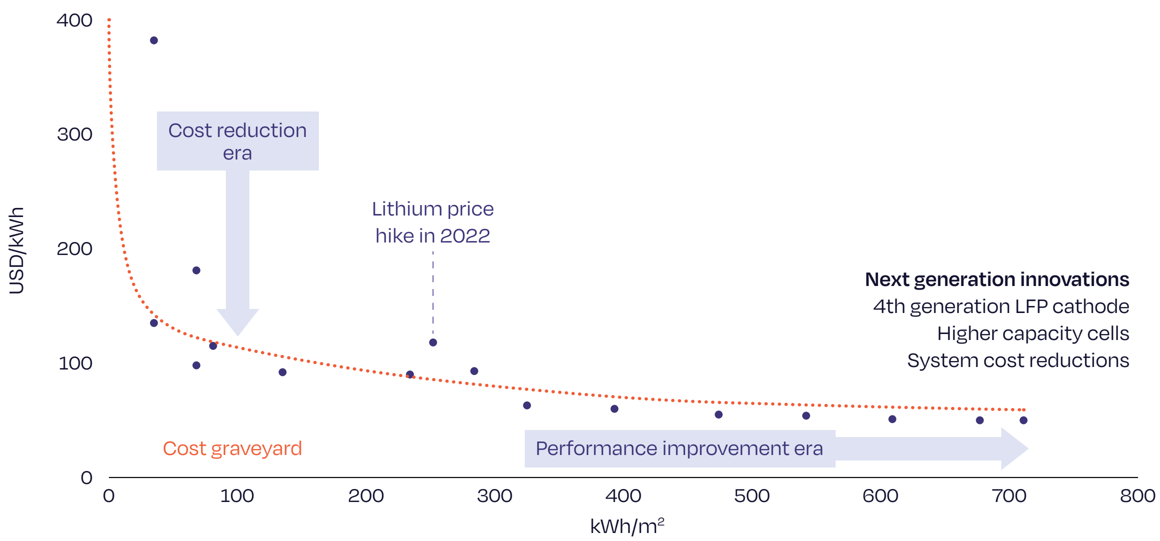
Within the broader lithium-ion segment, lithium iron phosphate (LFP) has emerged as the leading chemistry, capturing more than 85% of the market. This is primarily due to its strong safety profile, longer lifecycle, and greater cost-effectiveness compared to other chemistries such as the earlier dominating nickel manganese cobalt (NMC) and nickel cobalt aluminium (NCA). LFP, and increasingly lithium iron manganese phosphate (LFMP), also reduces dependence on expensive and supply-constrained critical raw materials such as nickel and cobalt. In addition, these chemistries offer enhanced thermal stability, improving overall system safety, and longer operational lifetimes. Although LFP batteries have a lower energy density compared to nickel-based alternatives, this is not a limiting factor for stationary storage applications, where space and weight constraints are less critical than in the electric mobility sector.

Lithium-ion battery systems, particularly those based on LFP chemistry, have undergone two distinct development phases: an initial period of rapid cost reduction followed by a phase of continuous performance improvement (see Fig. 18). Since their commercial introduction in the 1990s, lithium-ion batteries have experienced substantial cost declines, largely driven by increasing production volumes and resulting economies of scale. This expansion has been supported by the upscaling of upstream mining and material supply chains, enabling the industry to meet growing demand while progressively lowering manufacturing costs.

Figure 18

As battery costs fall and production volume increases, areal energy density rises

Cost reduction versus performance improvement forecast for LFP BESS 2015-2030



Historical energy storage system costs are produced from industry averages prepared by CRUs analyst team.
Source: CRU Energy Storage Service.

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Used for **30+ years** in over **5 million** transformers globally, and validated through hundreds of field and laboratory tests, **FR3™ fluid** is proven for use in distribution and power generation transformers.

Fire safety you can trust

- **Fire-resistant** K-class fluid
- **2X** higher flash and fire point*
- **Zero reported** fires in 30+ years

Performance that scales

- **Up to 20% more** load capacity*
- **Supports top fluid** temperatures up to 140 °C
- **Reduced maintenance needed** under normal operating conditions*

Sustainability benefits

- **100% biodegradable** in as little as 10 days (OPPTS 835.3100)
- **Non-hazardous** per GHS
- **Reduce dependency** on fossil-based materials

*Compared to mineral oil

FR3™ a Cargill brand

Discover how **FR3™ fluid** elevates **BESS performance**

FR3fluid.com

According to CRU, between 2010 and 2020, the production cost of LFP batteries declined sharply by around 80%, falling from 470 USD to 92 USD per kWh (404 EUR to 79 EUR per kWh). This substantial cost reduction enabled manufacturers to decrease average selling prices by nearly 70% over the same period. At the same time, energy density per unit area increased significantly, with areal energy density rising from 33 kWh/m² in 2010 to 135 kWh/m² in 2020.

As production volumes continued to expand, leading to significant overcapacities, manufacturers entered a new phase in which further cost reductions increasingly depended on performance improvements and higher energy density. Between 2020 and 2025, LFP cell and system production costs declined by a further 35%, reaching approximately 60 USD per kWh (52 EUR per kWh). Over the same period, areal energy density nearly tripled again, approaching 400 kWh/m². Looking ahead, this figure is expected to continue rising, with projections suggesting a near doubling to over 700 kWh/m² by 2030.

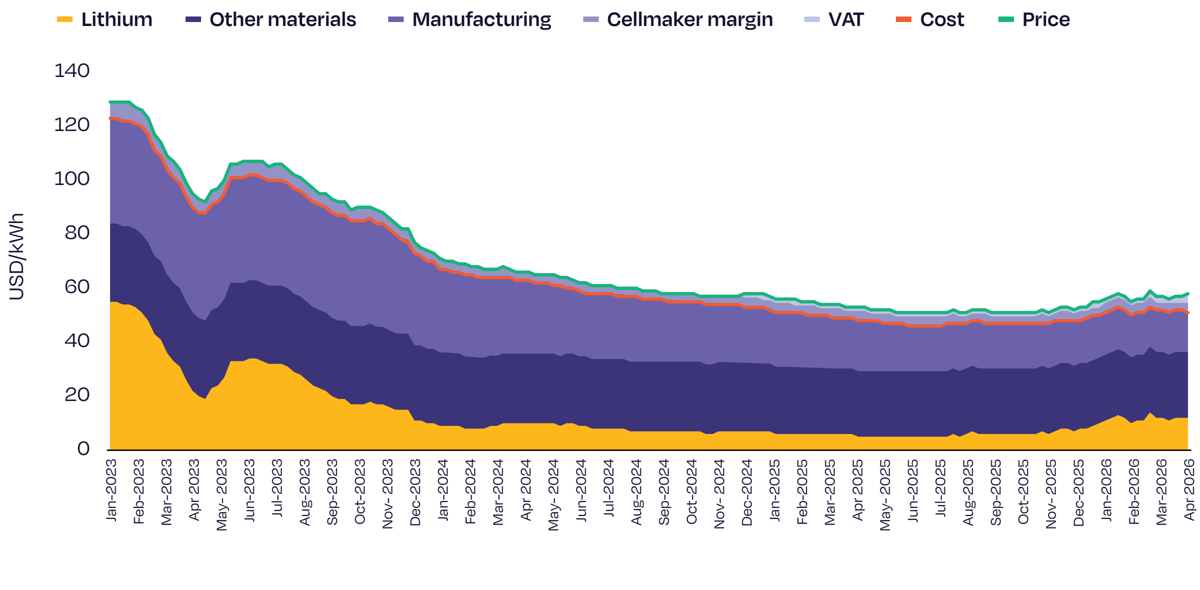
At the same time, the cost structure of battery manufacturing has evolved. An analysis of a typical mainstream Chinese 314 Ah battery cell shows that raw materials now account for the majority share of production costs (see Fig. 19). As manufacturing processes have become more efficient, the relative share of material costs has increased, making battery prices more sensitive to fluctuations in commodity markets. By early 2023, raw materials represented close to 70% of total production costs, while manufacturing accounted for just over 30%. In 2026, these rates have stayed at similar levels, with raw materials making up more than two-thirds of total production costs.

This growing dependence on raw material prices has contributed to increased cost volatility in recent years. Following a sharp increase in lithium and other critical mineral prices in 2022, battery production costs rose by approximately 30% compared to 2021 levels. Costs then fell rapidly at the beginning of 2023, declining by around 40% within four months, before increasing again by approximately 16% due to surging demand from the electric vehicle sector and tightening supply of key battery materials.

Figure 19

Battery metal prices constitute over 70% of total production costs of LFP cells, reducing the share of manufacturing costs

Tier 1 Chinese 314 Ah BESS weekly cell production cost and price, nominal $/kWh



Source: CRU Battery Technology and Cost Service.

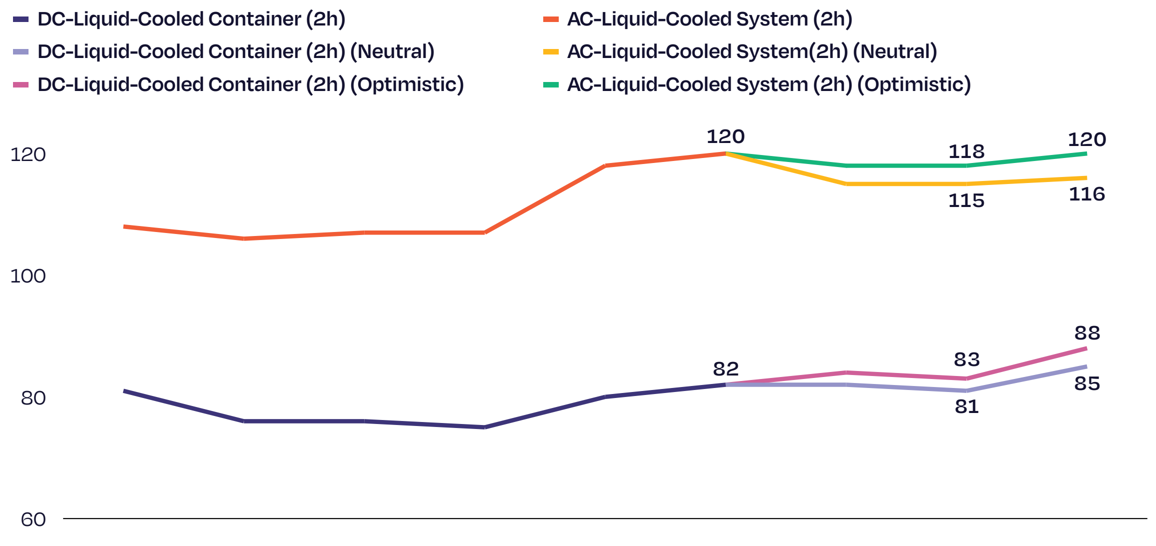
Since then, BESS production costs have fallen sharply, declining by more than 50% by the end of 2025 and reaching record lows faster than initially expected. In 2026, however, costs have begun to edge upwards again, driven by a combination of commodity price fluctuations, strong demand, and broader structural market dynamics. In particular, speculation around the near-term availability of lithium has pushed up spot prices, feeding through into higher cell manufacturing costs. As a result, BESS cell prices increased 9% from 47 USD/kWh (41 EUR/kWh) at the end of 2025 to around 51 USD/kWh (44 EUR/kWh) by April 2026, increasing the average shipping costs from China to Europe by 9% (see Fig. 20).

In the second quarter of 2026, the average price range for 2h DC-side battery storage containers exported from Chinese suppliers to Europe stood at 74–90 USD/kWh (64-77 EUR/kWh), while the price range for 2h AC-side systems reached 105–138 USD/kWh (90-110 EUR/kWh).

Figure 20

Prices for Chinese batteries shipped to Europe register a mild increase in 2026

Prices and forecast for Chinese battery storage products exported to Europe 2025-2027



Source: Infolink.

Since the fourth quarter of 2025, BESS prices in Europe have started to increase, driven by three main factors. First, from early 2026 onward, some component prices have grown by more than 50%, driving an increase of over 15% in mainstream residential storage cell prices. Second, utility-scale storage demand in emerging markets such as Australia, Latin America, and the Middle East has accelerated. Third, China's export VAT rebate for battery products was reduced from April 2026 and is set to be phased out in 2027, narrowing exporters' pricing margins and pushing up prices for the European market.

Box 6

State of Global and European battery manufacturing

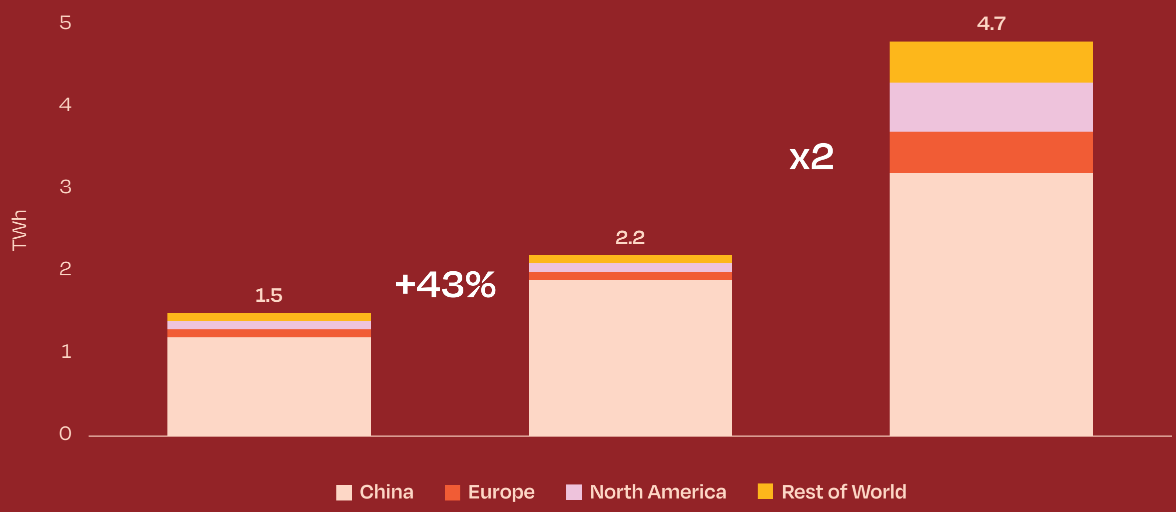
In 2025, global battery cell production reached about 2.2 TWh, up 43% from 2024. This significant growth was largely driven by China, which increased its output by 700 GWh. China continues to dominate global battery manufacturing, accounting for 86% of global cell production. Europe ranks second, with around 5% of global output (110 GWh), slightly ahead of North America (105 GWh), and the rest of the world (99 GWh).[12]

Currently, 80% of existing cell production capacity – both in Europe and globally – serves the EV market. However, demand for stationary batteries is gaining traction, prompting an increasing number of European battery assemblers to expand into the BESS segment.

Figure 21

Global battery cell production set to reach 4.7 TWh by 2030

Global lithium-ion battery cell production by region 2024-2025, and forecast 2030



Note: Production here refers to actual produced volumes, i.e. utilisation of production capacities.
This is dependent on how long inventories can be kept (i.e. varies with different chemistries).
Source: CRU Group.

Although European battery cell production has grown significantly in recent years, the EU still meets around 50% of its demand through imports, with a net import balance of 17 billion EUR in 2024.[13]

Despite some setbacks in 2025, lithium-ion battery production capacity in Europe continues to expand in response to rising demand. SolarPower Europe's latest analysis[14] estimates around 250 GWh/year of nominal lithium-ion battery cell production capacity in Europe by the end of 2025.[15]

12 Different from nameplate production capacities, "production" here estimates actual production i.e. utilisation of capacities. This is dependent on how long inventories can be kept (i.e. varies with different chemistries)
13 Bruegel Clean Tech Tracker
14 SolarPower Europe (2026), *EU Battery Storage Market Review 2025*
15 Europe includes the EU-27, UK, Norway and Switzerland

Battery value chains

The battery industry value chain extends beyond cell production, comprising three main segments: upstream (raw material extraction and processing), midstream (materials transformation and cell and pack manufacturing), and downstream (deployment, use, re-use, recycling and end-of-life).

While mining and extraction of battery materials are lacking in the EU, Europe has been developing its midstream capabilities, particularly in the production of **cell components, battery cells** (Fig. 22) **and battery modules and packs**, primarily for the EV sector. At least 11 companies with BESS in their product portfolio have opened new battery assembly lines in the EU over the past two years.

Battery cells contain four major components: cathodes, anodes, electrolytes, and separators. Electrolytes enable the transport of lithium ions between the anode and the cathode, while the separator prevents short circuits by keeping anodes and cathodes physically separated.

Europe hosts cathode active material (CAM) manufacturing capacity of 52 GWh/year – reflecting the battery cell capacity these components can support – along with 3 GWh/year of anode active material (AAM) capacity, 345 GWh/year of electrolyte capacity, and 220 GWh/year of separator capacity.

Further along along the value chain, components are then assembled into a battery cell. Europe hosted **267 GWh/year** of battery cell production capacity in 2025 (Fig. 22), around 80% of which serves EV applications, with around 19% dedicated to BESS.

This distribution is reflected in battery chemistry choices, with around 70% of European battery production being nickel-based (NMC and NCA). This share is expected to decline in favour of LFP, driven by accelerated BESS deployment and the integration of LFP into the portfolios of nearly all major global automakers to reduce costs.

The bulk of cell production in Europe is held by three South Korean companies – LG Energy Solution, Samsung SDI and SK On – which together account for 164 GWh/year of capacity across their sites in Poland and Hungary. Chinese manufacturer CATL also operates a 14 GWh EV battery cell factory in Germany, opened in 2023. Meanwhile, European players such as ACC (FR), Verkor/Renaud (FR), and PowerCo (DE) are increasingly contributing to domestic battery production capacity.

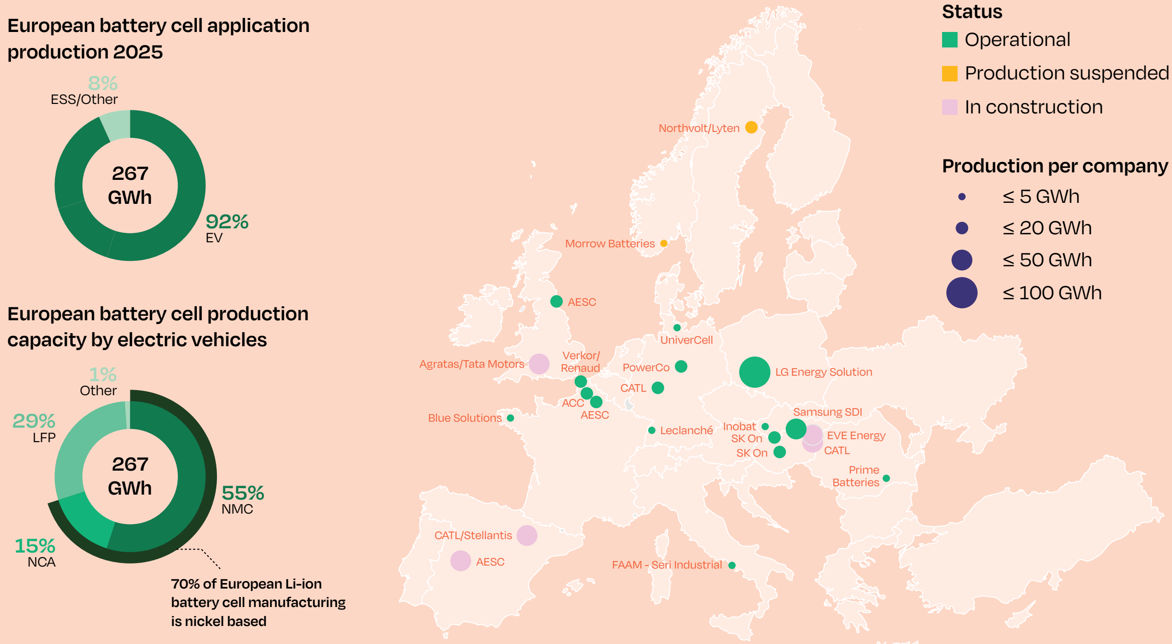
Battery cell manufacturing capacity in Europe has increased from just 1 GWh in 2017 to over 250 GWh today, reflecting investments of around 33 billion EUR in battery factories by 2025.[16] However, many battery producers in Europe are postponing or cancelling expansion plans due to uncertainty over future profitability. Production costs in the region are about 350% higher than in China,[17] while the battery supply chain ecosystem remains comparatively underdeveloped.

Recent developments highlight these structural challenges. When Sweden's Northvolt, Europe's largest investment in a homegrown battery producer, declared bankruptcy in late 2024, it underscored the challenges of competing with Asian producers, particularly as smaller manufacturers still struggle to scale production and achieve sufficient yields. Most recently, in May 2026, Norwegian battery cell developer and manufacturer Morrow Batteries also filed for bankruptcy and announced the closure of its factory in Arendal, Norway. Despite efforts to ramp up production, the company never fully scaled beyond 1 GWh capacity.

16 BloombergNEF
17 IEA (2024), *Energy Technology Perspectives 2024*

Figure 22

Battery cell manufacturing map, EU-27, Norway, Switzerland, UK



Up to date as of May 2026. Production capacities are based on company announcements. Missing providers and updates canbe notified to the report authors. NMC= nickel-manganese-cobalt; LFP= lithium-ion phosphate; NCA= nickel-cobalt-aluminium; Other= SSB, LMP, VRFB, Lead-acid, LMO.
Source: SolarPower Europe, IPCEI Batteries, Volta Foundation

Even so, some larger players continue to expand cautiously: Tesla recently increased the target for production capacity at their planned cell factory in Grünheide, Germany, from 8 GWh to 18 GWh. In total, an estimated 190 GWh worth of additional battery cell production capacity is currently under construction in Europe, including projects by CATL, AESC, Agratas/Tata Motors, EVE Energy.

Finally, cells are then assembled into modules and battery packs for use in on-road mobility, battery storage, or other applications (e.g. off-road mobility for agriculture and industry applications, defence, construction, maritime, etc).

Currently, 81 companies assemble batteries in Europe, the majority (68%) serving the EV sector, developing solutions for electric cars or heavy-duty mobility (buses, trucks). While certain assemblers source their cells in Europe, either through their own production (e.g. CATL) or through partnerships with other manufacturers, most still import from Asia and perform only final assembly in Europe.

Beyond LFP, metal-ion batteries based on alternative chemistries, such as sodium-ion (Na-ion), present significant market potential for stationary storage applications. Similar to LFP and LFMP, sodium-ion technologies reduce reliance on critical raw materials, avoiding the use of cobalt, nickel, and lithium altogether. Their key advantages include high power capability, long lifecycle, and strong safety performance, making them suitable for both mobility and stationary use cases. In addition, sodium-ion batteries can be manufactured using existing lithium-ion production infrastructure, enabling relatively rapid industrial scaling.

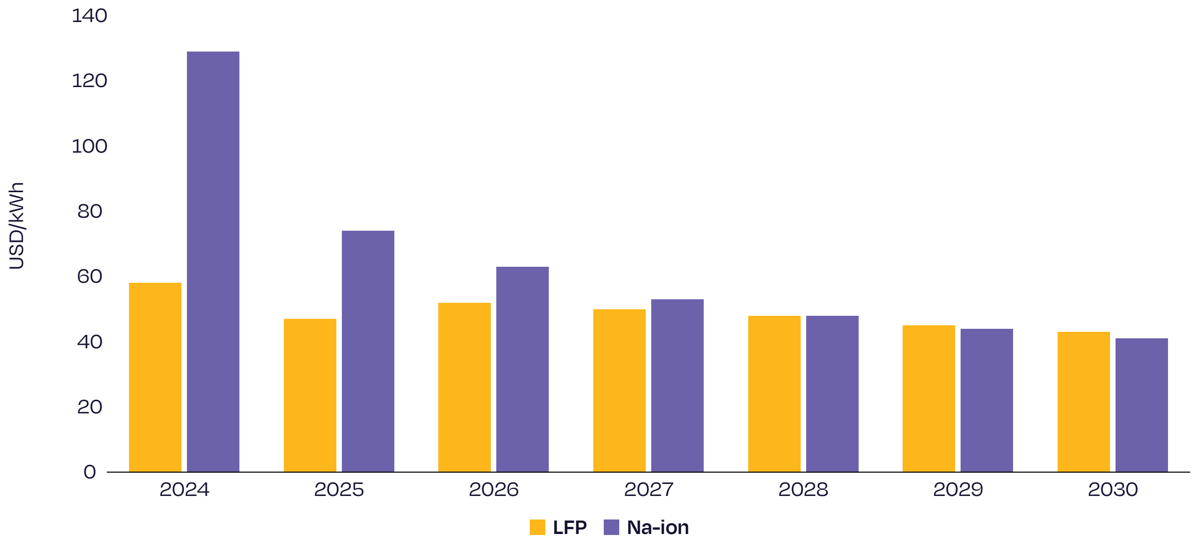
Among these emerging chemistries, sodium iron phosphate pyrophosphate (NFPP) stands out for its potential to deliver lower costs, enhanced safety, longer lifecycle, and independence from critical minerals, while maintaining an adequate energy density for stationary storage. Recent volatility in lithium markets has further strengthened interest in sodium-ion technologies, as cell manufacturers seek to diversify supply chains and reduce exposure to raw material price fluctuations.

In 2024, sodium-ion BESS cell costs were still significantly higher than LFP, at almost 130 USD/kWh (110 EUR/kWh), approximately double the cost of LFP cells (see Fig. 23). However, following a rapid cost reduction, sodium-ion prices fell by more than 40% in 2025 alone. As a result, the cost gap has narrowed substantially, with the sodium-ion cells being 57% more expensive than LFP cells in 2025.

Figure 23

Sodium-ion batteries expected to reach cost parity with LFP by 2028

LFP and NFPP cell cost forecast, real 2026 USD/kWh 2024-2030



Source: CRU Battery Technology and Cost Service.

Looking ahead, further cost reductions are expected as manufacturers increasingly retool production lines to accommodate sodium-ion technologies and capture a growing share of the market. By 2028, sodium-ion cell costs are projected to decline by an additional 35%, while LFP costs are expected to remain stable, decreasing by only around 1% over the same period. This trajectory should bring sodium-ion batteries to cost parity with LFP by 2028, driven by continued technological improvements, scaling effects, and persistently high lithium prices. By 2030, sodium-ion cells are expected to become slightly more cost-competitive, with costs projected to fall approximately 4% below those of LFP.

Box 7

Manufacturing battery storage systems in the EU, a way forward with the Industrial Accelerator Act

On 4 March 2026, the European Commission published its proposal for the Industrial Accelerator Act (IAA), classifying battery energy storage as a strategic net-zero technology and introducing phased "Made in EU" requirements to accelerate localisation of the battery value chain in Europe.

The IAA establishes a comprehensive policy framework to strengthen Europe's industrial base and accelerate the deployment of strategic net-zero technologies, including battery energy storage systems. More broadly, it signals a shift in EU industrial policy towards greater strategic autonomy and supply chain resilience with a focus on nearshoring and expanding domestic manufacturing capacity in key sectors for economic development and the clean energy transition.

Under the proposed framework, BESS projects benefiting from public procurement schemes, auctions, or other forms of public support would increasingly be required to demonstrate European industrial content (the "Made in EU" requirement for system components). The objective is to ensure that public funding supports the development of domestic manufacturing capabilities and reinforces European technological leadership in the battery sector.

For large-scale BESS projects, the proposal introduces phased localisation requirements. One year after the Act enters into force, supported projects would be required to integrate EU-manufactured battery management systems (BMS). Three years after entry into force, additional obligations would apply to battery cells and other strategic components manufactured within the European Union. These provisions aim to progressively anchor the battery value chain in Europe while giving industry a transition period to adjust to the current concentration of BESS component manufacturing – especially battery cells – in Asia.

At the same time, the IAA seeks to stimulate market demand for European-made storage technologies by directly linking access to public incentives and procurement mechanisms with compliance with Made in EU criteria. This creates a significant market pull effect for domestically manufactured battery systems and components, while incentivising investment in European production capacity.

Another central pillar of the IAA is its strengthened approach to foreign direct investment (FDI). The proposal introduces stricter screening mechanisms and conditionality requirements intended to ensure that external investments contribute directly to European value creation, industrial development, and technological capability building. The IAA's aim is to prevent the EU from becoming solely a deployment market, while production, intellectual property, and strategic control remain concentrated outside the Union.

To obtain approval under the proposed framework, foreign direct investments would need to comply with at least four out of six strategic conditions:

- a cap limiting foreign ownership to 49%;
- requirements to establish joint ventures with one or more EU entities;
- obligations concerning intellectual property licensing, know-how transfer, and joint ownership of newly developed IP;
- commitments to reinvest in EU-based research and development activities;

- workforce localisation requirements, including minimum EU employment shares and training obligations; and
- commitments to strengthen European value chains through local sourcing targets for manufacturing inputs.

Taken together, these provisions represent one of the EU's most ambitious attempts to combine industrial policy, the clean energy transition, and security objectives within a single legislative framework. The IAA seeks to reshape the clean tech market, including BESS, by strengthening investment structures that support know-how transfer and job creation in order to expand domestic manufacturing, thereby enhancing local value creation and strategic industrial autonomy. Ultimately, the success of the IAA will depend on achieving an effective balance between the push for reindustrialisation and the urgent need to scale clean technology deployment, including battery storage. While the proposal's strategic rationale aligns strongly with the EU's long-term competitiveness and resilience objectives, uncoordinated and fractured implementation should be avoided. Otherwise, it could lead to supply shortages, price volatility, higher project costs, investment uncertainty, and delays – at a time when Europe urgently needs rapid renewables deployment and electrification.

Ånge Energy Storage, Ånge, Sweden — 70 MW / 160 MWh battery energy storage system

Increasing wholesale volatility, improving project economics, and rising flexibility and stability needs drive utility-scale battery deployment

Wholesale price volatility

Wide and frequent price differentials in the wholesale electricity market are key drivers of utility-scale battery deployment. Volatility in prices creates energy arbitrage opportunities, enhances ancillary service revenues, and enables merchant business models. These business models are key for bankability of grid batteries, as they can directly monetise their core capabilities: fast charging, quick discharging, and system balancing.

The most direct revenue stream is energy arbitrage, based on capturing the spread between low and high prices over short time intervals. Wider spreads increase margins per cycle, while more frequent spreads enable higher utilisation rates and more daily cycling.

Wholesale price volatility is also a symptom of system flexibility needs driven by high generation shares of renewables, grid congestion, and sudden supply-demand fluctuations. These are exactly the conditions where flexibility is valuable, and BESS can respond within milliseconds to capture short price spikes, provide balancing energy and participate in energy markets.

Capu di Padula, Porto-Vecchio, Corsica, France — 5.08 MW solar PV with 16.1–16.3 MWh battery storage

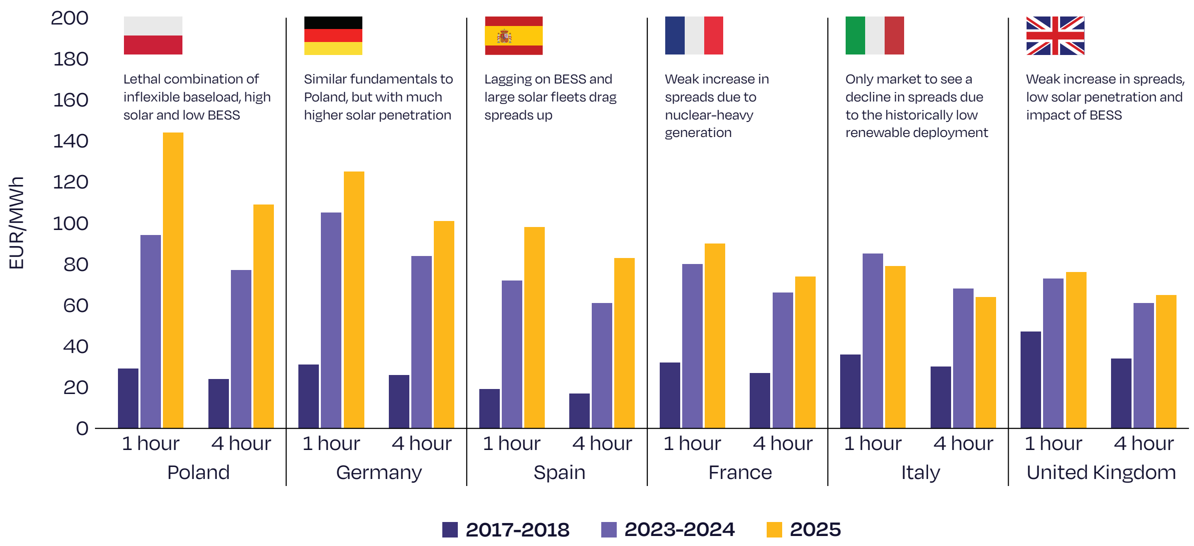
High solar generation during midday hours, combined with subdued electricity demand, drives wholesale power prices down to zero or even negative levels. Until 2022, negative electricity prices in Europe occurred for less than 0.5% of the year – equivalent to roughly two full days.[18] This share rose sharply to nearly 2% in 2023 and 3% in 2024, reaching a new peak of 3.4% in 2025. In absolute terms, this corresponds to around 310 hours of below-zero prices – almost two consecutive weeks.

This lack of flexibility and resulting price volatility are clearly reflected in the 1-hour and 4-hour intraday spreads, which indicate the share of the price curve that batteries can capture and how this aligns with different battery durations (see Fig. 24). The 1-hour intraday spread captures real price volatility and reflects the maximum daily arbitrage opportunity between the lowest- and highest-priced hours of the day. In contrast, the 4-hour spread represents the average price difference between the cheapest and the most expensive 4-hour blocks, capturing more sustained price differentials. The latter provides a more realistic arbitrage opportunity for typical utility-scale batteries (2-4 hours), reflecting the structural imbalance between midday solar generation and evening peak demand.

Figure 24

Wholesale intraday spreads widen as more renewables are deployed without sufficient storage capacity

1-hour and 4-hour intraday spread for selected European countries in the period 2017-2018, 2023-2024, and 2025



Source: Rystad Energy Europe Renewable & Power Analysis Dashboard.

Price spreads across Europe have widened significantly since 2017-2018, driven primarily by increasing renewable generation and limited system flexibility. The strongest growth is observed in markets with rising solar capacity, inflexible baseload and low battery storage deployment, such as Poland, Germany and Spain, where both 1-hour and 4-hour spreads have expanded markedly. For instance, in Germany, intraday spreads have nearly tripled on average since 2017-2018, exceeding 110 EUR/MWh. In contrast, spreads have increased more moderately in France, where nuclear-heavy generation dampens volatility. The UK provides a contrasting example, with spreads showing more limited increases due to lower solar deployment and relatively high BESS capacity, which already contributes to smoothing price volatility.

18 SolarPower Europe (2026): EU Battery Storage Market Review 2025

Grid stability services

Batteries are the most effective solution for firming renewable generation. By coupling renewables with battery storage, variable output can be converted into firm, dispatchable supply. By managing variability, batteries also reduce stress on network infrastructure and can defer the need for costly grid expansions. When properly integrated into market mechanisms, they can deliver a wide range of critical system services.

Grid stability services can be broadly divided into 4 categories:

- Frequency containment reserves (FCR) provide instantaneous response to stabilise system frequency within seconds following imbalances;

- Balancing services, including automatic (aFRR) and manual reserves (mFRR), subsequently restore the system to equilibrium by correcting ongoing deviations over minutes. Restoration reserves, often referred to as secondary and tertiary reserves, ensure longer-term system recovery and rebuild reserve margins after major disturbances;

- Ancillary services, such as black start capability, voltage control, inertia, and congestion management, support overall grid operability;

- Capacity markets provide remuneration for firm capacity, ensuring system adequacy during peak demand periods.

The availability of these distinct market streams shapes the scope for revenue stacking, underpins the economic viability of battery projects, and ultimately enables the delivery of essential grid services that support system stability, efficiency, and resilience.

In 2026, 23 of the 31 countries covered in the report have established some form of fast frequency regulation market, while 20 have opened balancing and restoration services, and only 6 have developed additional ancillary service markets (see Fig. 25). To safeguard security of supply, remuneration mechanisms such as capacity markets can also be introduced. However, to date, batteries are eligible to access such schemes in only 7 European countries.

Spain has been the last country to implement a capacity market, after receiving approval from the European Commission in June. The mechanism will run for 10 years at 900 million EUR per year. Under the mechanism, Red Eléctrica will remunerate new and existing projects that can provide energy during periods of scarcity, including electricity generation, demand-side response and energy storage. Importantly, winning projects will be selected through transparent and non-discriminatory bidding processes.

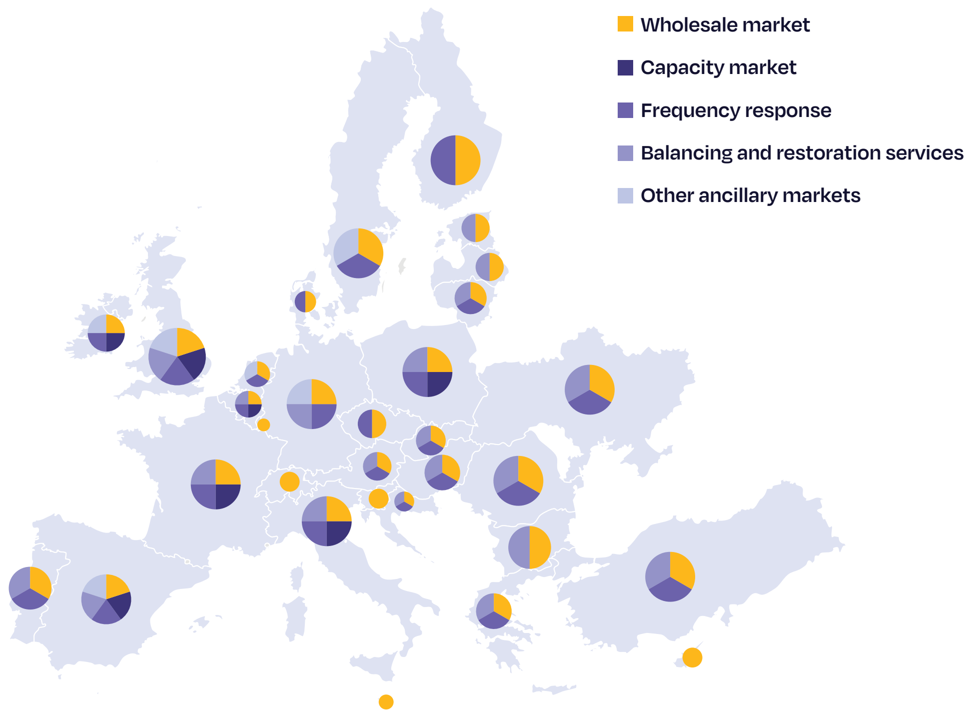
Overall, all three core revenue streams – frequency response, balancing and restoration, and other ancillary services – are available in just three countries, Germany, Spain, and the United Kingdom, with Spain and the UK being the only markets where these are combined with a capacity market.

Compared to 2025, only frequency response (four countries more) and balancing and restoration services (6 countries more) show progress in the number of countries with markets for these capabilities. However, despite some progress, many of these essential services remain insufficiently remunerated across European markets, highlighting the need for fair compensation through well-designed ancillary and capacity market frameworks.

Figure 25

Additional battery revenue streams emerged in 2025-2026, but the majority of grid services remain unremunerated

Mapping of key revenue streams for grid-scale batteries in Europe 2026



Revenue streams available as of the start of 2026.

Network tariffs

Another critical and often underestimated component of the business case for standalone utility-scale BESS is transmission-level **network tariffs** (see Fig. 26). These are network costs paid by electricity users, and are designed to recover the cost of building, operating, and maintaining the electricity system. Network tariffs directly affect the cost of charging and discharging operations, and therefore the net value of all revenue streams, from energy arbitrage to ancillary services. In particular, the risk of double charging (paying both charging and discharging fees) can significantly erode margins and discourage investments. Beyond project economics, tariff design also influences system efficiency and asset location. Poorly designed frameworks can penalise batteries despite their contribution to reducing congestion and enhancing flexibility.

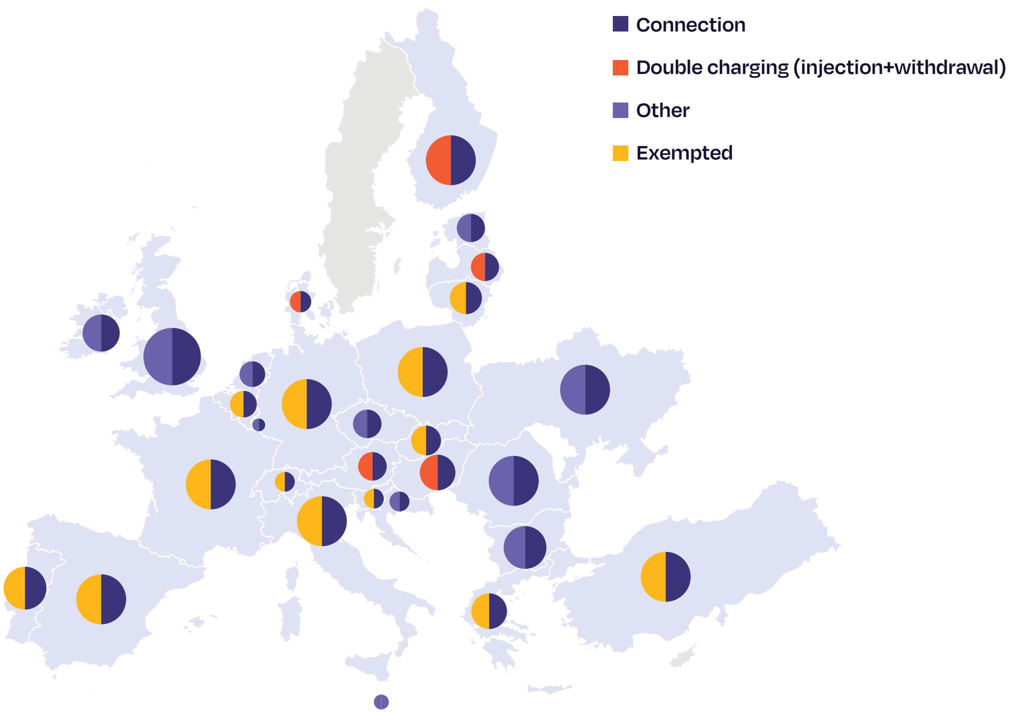
Many countries have largely removed double charging through either exemptions for BESS or other adjustments. For example, Belgium, Germany[19], Greece, Italy, the Netherlands, Portugal and Spain provide full or partial exemptions from network charges for BESS operators. In some cases, such as Italy, Spain and Portugal, battery storage is fully exempted from use-of-network charges when energy is injected back into the grid, but charges still apply to own consumption (auxiliary services, cooling, etc). Poland and Lithuania apply capacity charges that account for the balance between withdrawal and injection, effectively reducing or eliminating double charging.

19 After months of discussion and uncertainty, the German grid fee reform for storage is on the verge of finding a final outcome. It appears that grid fee exemptions for projects commissioned before August 2029 will remain, as long as final investment is reached before the publication of the reform act in early 2027. The future grid fees will be based on connected capacity, and grid fees for generators, which are capped under EU law. The introduction of dynamic grid fees has been postponed, and are expected to be introduced between 2030 and 2033.

Figure 26

Double charging has been removed in several European countries, but unfavourable grid tariff structures are often still present

Mapping of transmission network tariffs for grid-scale batteries in Europe 2026



Grid tariff structures as of April 2026.

A second group of countries employ network tariff methodologies that still formally involve double charging, but with certain adjustments to reduce the financial burden on BESS. For instance, France has introduced two types of grid zones: withdrawal zones, where the grid is primarily for consumption, and injection zones, where the grid must accommodate significant electricity input. This solution effectively incentivises BESS plants to either inject or withdraw, depending on their zone. On the other hand, Ukraine, Bulgaria and Estonia use network tariffs that are paid on the difference between the withdrawn and injected electricity (i.e. net consumption).

A third group of countries continue to apply traditional network tariff structures that limit BESS expansion. Austria, Denmark, Hungary, Latvia and Croatia still apply double charging without any significant discount mechanisms. However, even within this group, reforms are under way: in Austria, exemptions for grid-friendly assets are starting on 1 January 2027, although the details remain unclear.

Finally, many governments implement highly conditional or specific structures. In Ireland and the United Kingdom, storage is classified as generation, paying only for the energy injected at the transmission level. Slovakia provides a use-of-network tariff exemption to storage facilities that deliver ancillary services to the TSO. Malta and Cyprus, did not yet create a comprehensive network tariff framework, since storage deployment is still limited or not yet available on the transmission level.

Box 8

Getting BESS network tariffs right: Eliminating double charging and unlocking flexibility

Well designed network charges for BESS, avoiding double charging and reflecting actual system use, are essential to unlock flexibility, lower system costs, and scale storage deployment across Europe.

With the European Commission expected to present an EU framework for network charges this year to incentivise more efficient use of the electricity system, SolarPower Europe and the Battery Storage European Platform set out recommendations to guide tariff design, promote efficient grid utilisation, and support greater harmonisation across Member States, while avoiding hindering the deployment of renewable generation and storage and respecting national competences.

This framework should build on the **Commission's July 2025 guidance** on renewables, grids infrastructure and network tariffs, which aims to reduce electricity costs by improving the use of existing infrastructure, accelerating the rollout of grids and storage, and introducing future proof tariff design. The guidance underlines the need for cost reflective methodologies that incentivise flexibility, manage peak demand, and steer investments to where they provide the greatest system value, while recognising the key role of storage in lowering system costs.

In parallel, every two years, **ACER provides recommendations to national regulatory authorities** (NRA) on how to design network tariffs in a more decentralised and flexibility-driven system. It emphasises the need to ensure non-discriminatory treatment of all network users, including bidirectional assets such as BESS, by properly accounting for both injections and withdrawals and applying cost-offsetting where needed to avoid double charging. ACER further highlights that tariff structures should provide strong cost-reflective signals, notably through greater use of time-differentiated and power-based charges linked to network peak usage, while improving transparency and comparability across Member States.

Building on these principles and our latest Solar Power Europe and the Battery Storage European Platform **EU Flexibility Strategy proposa**l, NRAs should ensure that tariff methodologies fully reflect the system value of BESS, avoid double charging, and provide clear, predictable signals that incentivise flexibility and efficient grid use.

The EU should ensure that grid connection charges and use of system tariffs are cost reflective, non discriminatory, and designed to incentivise flexibility without distorting system behaviour. BESS currently face inconsistent treatment across Member States, particularly where they are treated as both consumers and generators, leading to double charging and inefficient price signals (see Fig. 26 in p.62). Injection tariffs for BESS should also be avoided, as they are reflected in market bids, increasing wholesale electricity prices and weakening efficient dispatch signals. More broadly, grid connection charges should follow a shallow connection approach, with BESS paying only for direct connection costs, while wider grid reinforcement is appropriately socialised. Storage assets operating under flexible connection agreements (FCAs) should benefit from lower charges reflecting their reduced network impact.

Getting BESS network tariffs right: Eliminating double charging and unlocking flexibility

Emerging national practices illustrate how tariff design can support efficient deployment. In Finland, Fingrid has introduced connection signals for BESS above 30 MW, encouraging siting in production dominated areas to support renewable integration. In Poland, frameworks allowing multiple assets to share a single grid connection point demonstrate how hybridisation can optimise grid capacity and reduce infrastructure costs. More broadly, EU guidance supports the use of locational and time of use signals to steer investment and system friendly behaviour.

Tariff frameworks should also support the operational role of BESS by avoiding penalisation of charging during periods of high renewable generation or low grid utilisation. This should be complemented by predictable time of use signals and well functioning flexibility markets. Without mechanisms that value and remunerate storage services, key system benefits, such as congestion management, peak shaving, and renewable integration, cannot be fully realised.

Finally, predictable and stable regulatory frameworks remain essential. Changes to tariff regimes should include appropriate grandfathering or sufficient lead times, while transparent network planning and early engagement with developers can better align grid investment with storage deployment.

BESS Vilvoorde, Vilvoorde, Belgium — ENGIE's 200 MW / 800 MWh battery park, among the largest in Europe

Governmental support

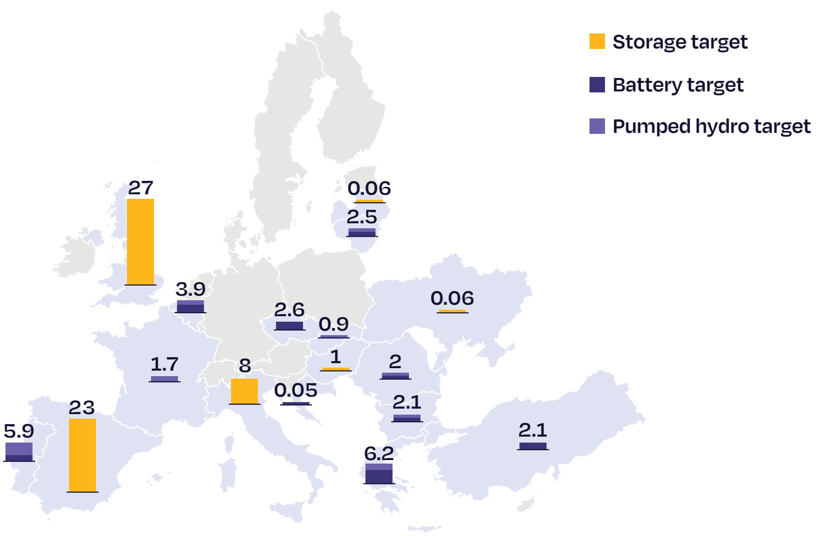
Energy storage targets are another crucial policy element for BESS deployment. An analysis of the EU National Energy and Climate Plans (NECPs) and energy strategies in non-EU countries shows significant differences in how storage targets are defined and implemented. Clear, time-bound targets not only foster innovation and provide certainty for investors, but can also help support future grid expansion planning.

As of 2026, 17 countries have set storage targets measured in MW/MWh or EUR, while in the previous edition of this report, only 14 had done so (see Fig. 27).[20] The latest countries to define such targets are Ukraine and Turkey, which explicitly referenced storage targets in their national strategies, while Latvia has also introduced measurable targets.

Figure 27

Most European countries do not have a national energy storage target

Mapping of national energy storage targets in Europe 2026



However, most of the existing targets remain unambitious. Only 10 countries have set dedicated battery storage targets (Belgium, Bulgaria, Croatia, Czechia, Greece, Lithuania, Portugal, Romania, Turkey and the United Kingdom), which range between less than 1 GW and 27 GW by 2030. Overall, the most ambitious 2030 targets are in the United Kingdom (27 GW) and Spain (23 GW), while Italy (8 GW) and Greece (6.2 GW) also set comparatively high benchmarks for energy storage. Several countries include energy storage in their NECPs, but do not provide detailed breakdowns by technology. For instance, Austria, Finland and Poland mention storage but without specific targets.

Within national strategies, one effective instrument to quickly mobilise capital investments into battery projects is providing **financial support**. Across Europe, support typically takes three main forms: upfront CAPEX grants, a range of price support mechanisms, and fixed-price tolling agreements provided to asset owners.

20 In the 2025 edition, Switzerland, Ukraine and Turkey were not yet included in the scope.

As outlined in our January published EU Battery Storage Market Review 2025, last year, EU Member States contracted a record 70 GWh of grid-scale battery storage, about as much as the total capacity already operating in the bloc. Most of this volume, around 50 GWh, was supported through CAPEX-based schemes funded by EU instruments, such as the Modernisation Fund and the Recovery and Resilience Facility, with major programmes in countries like Poland and Spain.

Alongside CAPEX support, price-based mechanisms also played a significant role, including Germany's innovation tenders for hybrid solar-plus-storage projects and Greece's CfD-backed auctions. A major turning point came with Italy's first MACSE auction, where the entire 10 GWh on offer was awarded under 15-year tolling contracts at very competitive prices. The results underscored a strong developer preference for long-term revenue certainty, with longer-duration batteries dominating the results.

More detailed information on revenue streams, network tariffs and energy storage targets is available in SolarPower Europe's member-exclusive Market and Policy Navigator.

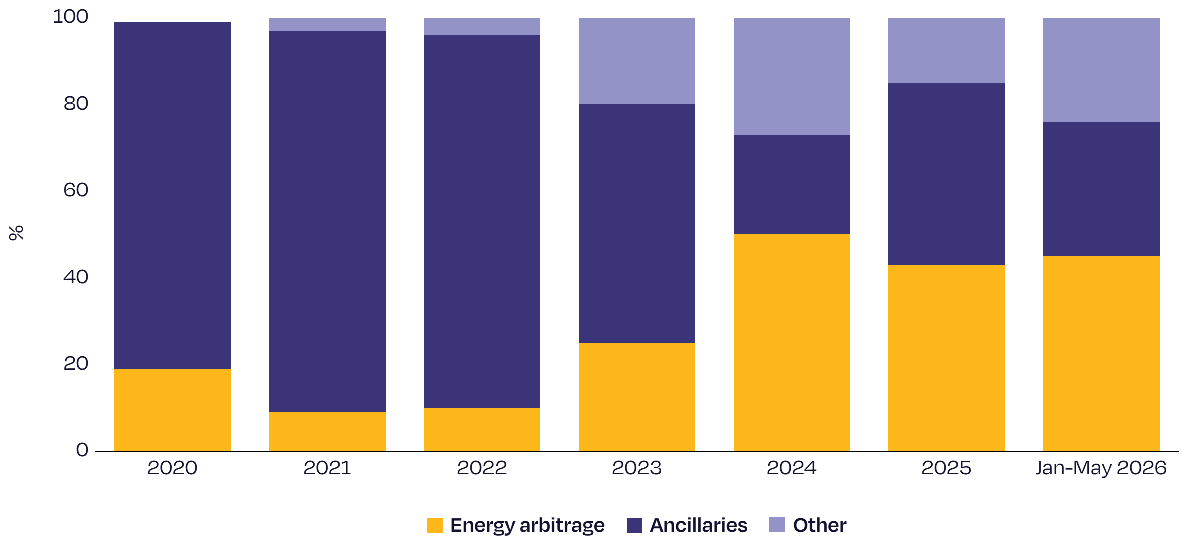
Project revenues

Price volatility, the availability of revenue streams, grid tariff structures, energy storage targets, and support schemes are key factors determining **project revenues** and **bankability**. Within Europe, the United Kingdom stands out as the leading grid-scale storage market, with nearly 15 GWh of operating battery capacity by the end of 2025, twice as much as Italy, the second-largest market. As the fastest-growing market in recent years and home to the largest utility-scale battery fleet in Europe, the UK provides valuable insights into the evolution of storage revenues. Between 2020 and 2026, the UK battery market has shifted from a highly profitable, ancillary service-driven model to a more mature and competitive landscape characterised by diversified and stacked revenue streams (see Fig. 28).

Figure 28

Energy arbitrage takes a predominant role in BESS revenue models as ancillary markets saturate in the UK

Evolution of utility-scale BESS revenue in the UK, 2020-May 2026



Average monthly data consolidated in annual averages.
Source: Modo Energy.

Early UK battery projects relied heavily on frequency response services, delivering strong and stable returns. But, rapid capacity growth led to market saturation and a 60% revenue drop in 2023, exposing the risks of relying on limited revenue streams.

While 86% of revenues came from ancillary services in 2023, generating around 184,000 EUR/MW/year in total, continued declines in ancillary revenues reduced average returns down by over two thirds to approximately 59,000 EUR/MW/year in 2024, despite initial diversification.

A structural shift emerged in 2025, as operators increasingly adopted merchant strategies combining balancing, wholesale arbitrage, and capacity markets. New products such as Quick Reserve supported a partial recovery, with revenues rising to around 80,000 EUR/MW/year. By 2026, the UK market had evolved into a multi-market environment, where profitability depends on effectively stacking and optimising multiple revenue streams.

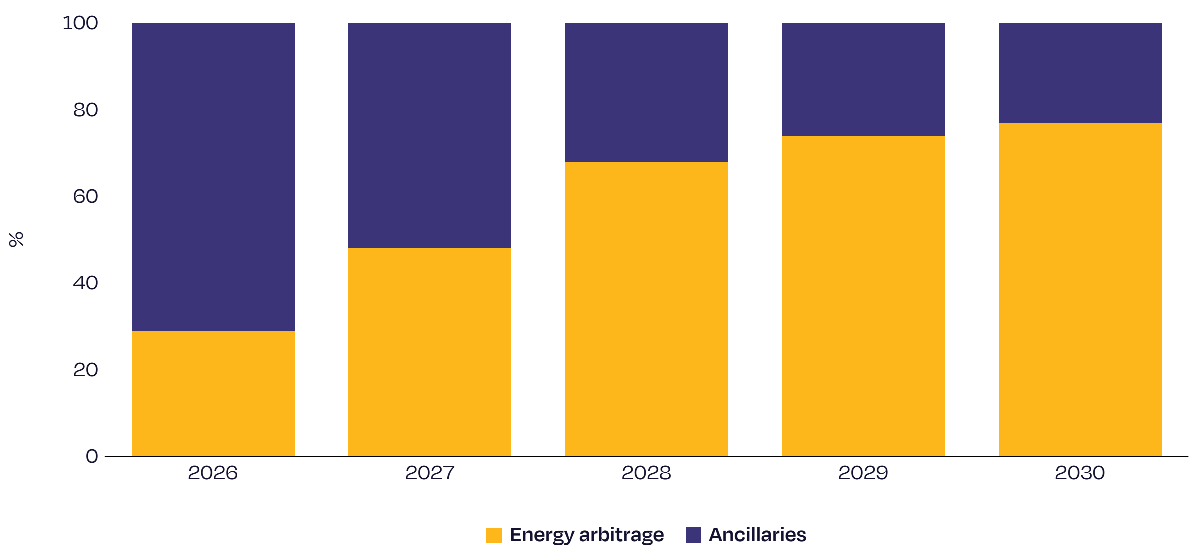
This transition from ancillary service-led revenues to diversified revenue stacking was broadly expected, but the speed of market saturation caught many investors and price modellers off guard. Looking ahead, energy arbitrage is expected to play an increasingly central role, as growing shares of renewable generation drive greater wholesale price volatility. While this creates higher upside potential, it also introduces greater uncertainty and revenue risk. New grid stability markets may offer additional revenue streams, but these are typically very shallow and tend to saturate quickly, often within one to two years.

A similar evolution is expected across other European markets. Germany provides a clear example: currently, more than 70% of battery revenues still originate from ancillary services (see Fig. 29). But, this share is projected to decline quickly as renewable deployment, electrification, and grid constraints increase wholesale price volatility, making energy arbitrage a more dominant component of the revenue stack. As in the UK, newly introduced grid service markets are likely to provide only temporary revenue opportunities before becoming saturated.

Figure 29

German grid BESS revenue models are anticipated to follow a similar trajectory to the UK over the coming years

Utility-scale BESS revenues outlook in Germany 2026-2030



Source: Modo Energy.

Flexibility and adequacy needs

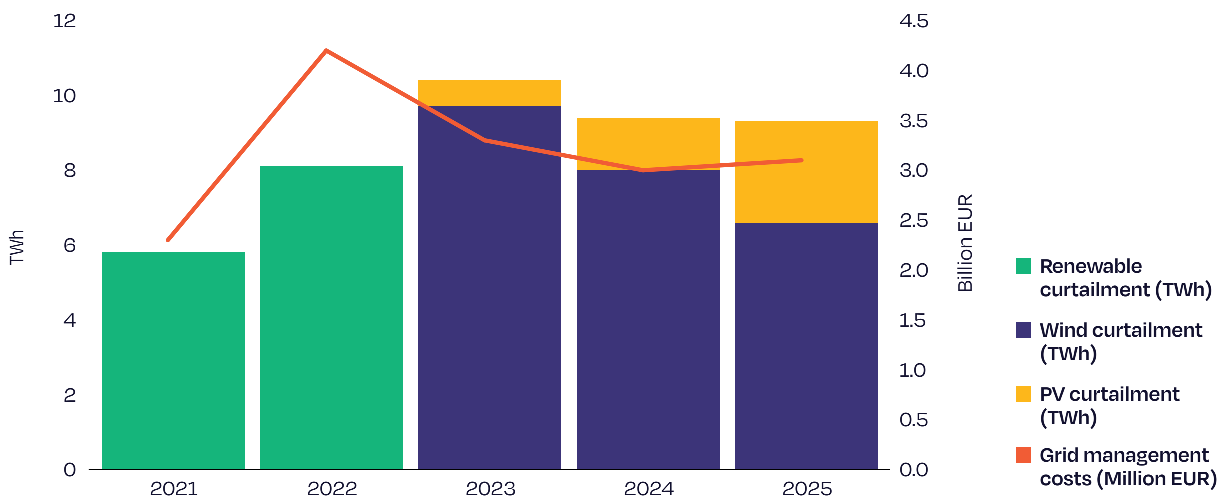
The challenges of renewable integration can be illustrated by two key indicators: the level of curtailment of renewable power generation and grid management costs. Currently, in times of low demand, renewable energy producers are compensated for halting electricity production, while fossil fuel power plants are paid to ramp up generation during periods of low renewable output.

In 2025, Germany curtailed 9.3 TWh of renewable generation and paid 3.1 billion EUR in grid management costs, about the same level as the previous year. After grid management costs peaked at 4.2 billion EUR during the energy price crisis in 2022, they declined and stabilised at 35% above pre-crisis levels, indicating that grid management costs closely follow wholesale electricity prices. Out of the German renewable generation curtailed in 2025, solar PV accounted for about 2.7 TWh, representing a 29% share, nearly quadrupling compared to 2023.

Figure 30

German grid management costs remain stable in 2025, while solar curtailment almost doubles to 2.7 TWh

Evolution of renewables curtailment and grid management costs in Germany 2021-2025



Breakdown of curtailment of renewables for the period 2020-2022 not available.
Source: Bundesnetzagentur.

Breaking down the costs of congestion management, redispatch remains the main component, with grid reserves and countertrading also contributing to overall expenditure. Persistently high levels of curtailment and redispatch costs point to a grid system that is currently unable to keep pace with renewable deployment. The rapid increase in solar PV curtailment indicates that the grid cannot absorb daytime solar generation. While curtailment has historically been associated with wind generation during the winter, the recent increase in solar PV deployment points to increasing overproduction during the summer as well.

The growing frequency of negative electricity prices has also accelerated the decline in the market value of solar power, as reflected in falling **solar capture rates**, which compare solar revenues to average wholesale prices. During periods of high solar generation, particularly in spring and summer, wholesale prices tend to drop significantly, reducing the earnings of solar assets. While this dynamic decreases electricity costs for consumers, it undermines the economic viability of standalone solar projects.

In three of the EU's leading solar markets, data from 2020 to 2025 shows a clear relationship between increasing solar generation and declining capture rates (see Fig. 31). Average PV capture rates fell in May 2025 to 57% in Spain, 32% in Germany, and just 18% in the Netherlands. In May 2024, solar capture rates in the three markets were still between 45-55%. In May 2026, solar capture rates have partially recovered to 66% in Spain, 39% in Germany, and 31% in the Netherlands. However, the downward trend is clear and is likely to worsen unless demand for electrification and storage deployment accelerate in tandem with PV rollout.

Figure 31

Solar capture rates slightly improved in 2026, but the downward trend continues to deepen in key solar markets

Monthly capture price relative % for solar PV Jan 2022-May 2026

May data is till May 15th.
Source: Rystad Energy Europe Renewables and Power solution.

Under appropriate regulatory and market conditions, integrating batteries with renewable assets enhances their investment appeal and supports viable business models. **Hybrid solar-plus-storage** systems significantly improve the value of solar electricity. In markets such as Germany, Spain, Hungary, and the Netherlands, where integration challenges are already apparent, pairing storage with solar generation significantly boosts capture rates.

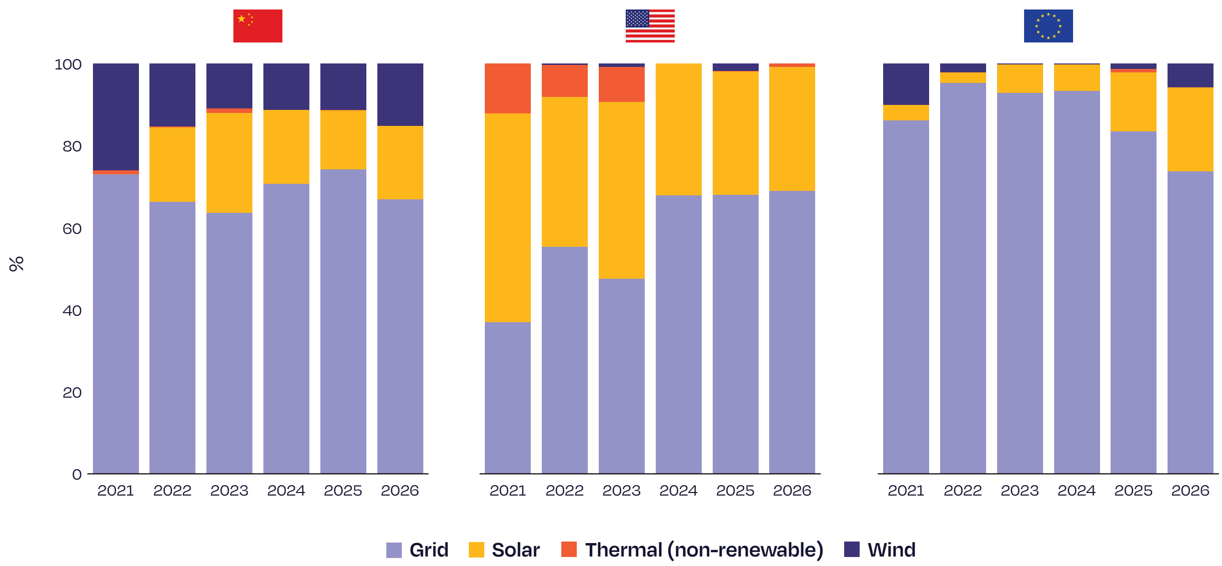
Despite the clear benefits of hybridisation, this trend has remained somewhat limited in the EU compared to other regions (see Fig. 32). In China, hybrid renewable-plus-storage systems have provided around 30% of annual installed battery capacity since 2021. The country shows the most diversified supply mix, with meaningful contributions from both solar and wind. This has been unleashed through strong renewable hybridisation policies, and the use of storage as a renewable integration technology, rather than pure merchant assets. In the US, strong incentives to pair solar with storage led to investors deploying large volumes of hybrid assets, especially in the 2021-2023 period. The growth of standalone batteries reflected a need for system flexibility and grid services. Still, last year, 30% of grid-scale batteries were installed in combination with solar.

In the EU, standalone batteries have consistently dominated deployment, as until recently, about 90% of annual installations came from standalone systems. Batteries have been predominantly deployed for frequency response, balancing markets and arbitrage. However, hybridisation with renewables, particularly with solar, is rising rapidly in 2026.

Figure 32

Hybrid solar and storage systems emerge in the EU but remain behind China and the US

Power supply source for utility-scale BESS projects in each region, % added capacity (GW) 2021-2026



Based on BESS project list as of April 2026.
Source: Rystad Energy's Energy Storage Solution.

European battery storage markets 2026-2030

Europe's battery storage market is set for rapid expansion between 2026 and 2030, driven by energy security concerns, electrification, and rising renewable deployment. Under the medium scenario, annual battery installations are expected to exceed 50 GWh in 2026 and reach 138 GWh by 2030, while total installed capacity grows from just over 100 GWh in 2025 to nearly 600 GWh by the end of the decade. Utility-scale batteries will lead this growth, increasing their share of annual additions from 63% in 2026 to 75% in 2030, supported by falling costs, stronger revenue opportunities, hybridisation with solar, and public support schemes. Residential and commercial segments will also expand, though more gradually. However, deployment remains constrained by regulatory uncertainty, inadequate remuneration frameworks, grid bottlenecks, and permitting delays. Geographically, Europe's battery market is becoming more diversified: while Germany, the UK, and Italy remain dominant, smaller markets such as Bulgaria, Ukraine, Spain, and the Netherlands are expected to gain significance by 2030.

European battery storage market expected to edge towards 140 GWh of annual installations and around 600 GWh of total capacity by 2030

Europe is navigating treacherous waters in 2026, amid intensifying global geopolitical tensions and a renewed fossil fuel crisis. The ongoing war in Ukraine, along with the recent escalation in Iran, including the disruption of trade flows through the Strait of Hormuz, have amplified fossil energy price volatility and heightened supply security risks.

These developments have reignited concerns over energy security and industrial competitiveness, forcing Europe to once again confront its long-standing Achilles' heel: structural dependence on fossil fuel imports, on which much of its economic and social model has historically relied.

Against this backdrop, the EU has launched the AccelerateEU strategy, seeking to tackle this structural dependence on imported fossil fuels at its root. It focuses on two core pillars: accelerating renewable deployment, and an accelerating electrification across industry, transport, and heating.

Arzberg Battery Storage Project, Arzberg, Bavaria, Germany — 100 MW / 200 MWh battery energy storage system

At the heart of this structural shift toward domestically sourced clean energy lies a critical new objective: As part of AccelerateEU, the European Commission has for the first time set an energy storage goal – achieving 200 GW of capacity by 2030. This sends a powerful signal to markets, that the EU will require at least this level of energy storage deployment to continue rolling out the energy transition.

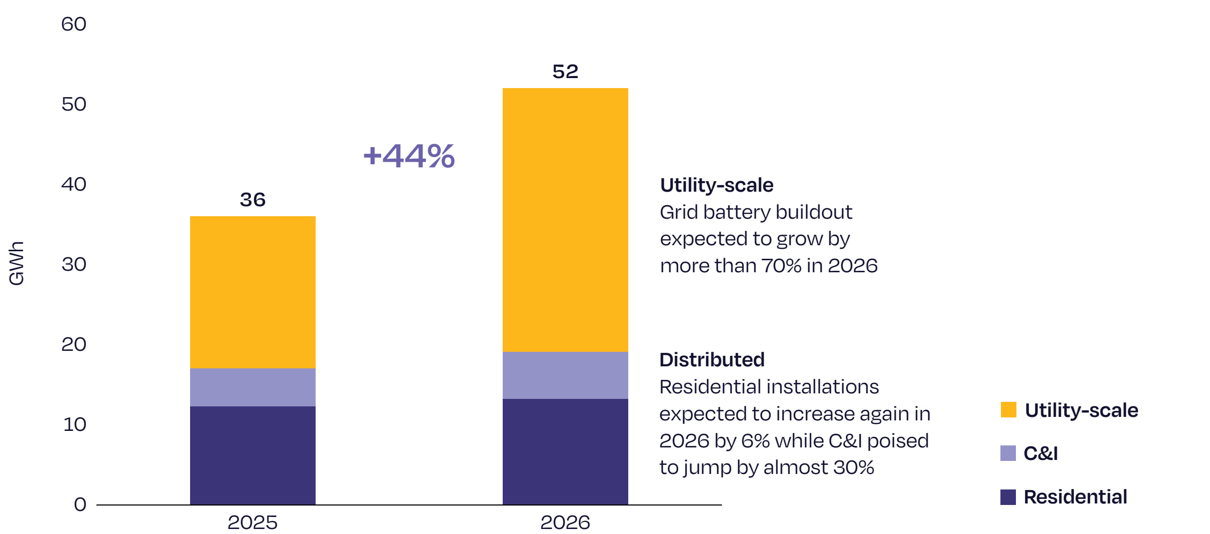
In the race to deploy storage, batteries are evolving beyond their traditional role as market-driven flexibility assets, increasingly becoming strategic infrastructure. As the fastest-growing power technology, supported by rapidly declining system and installation costs, short deployment timelines, and improving project economics, batteries are expected to deliver the majority of new storage capacity by the end of the decade. However, significant challenges remain. These include renewed policy support in some countries for fossil-based flexibility, persistent grid bottlenecks, lengthy and complex permitting procedures, inadequate legislation, and limited or uneven access to revenue streams and grid services (read more about our Battery Storage Action Plan in p. 15).

After recovering momentum in 2025, the European battery storage market is set to reach a new milestone in 2026. Under our most-likely Medium Scenario, annual BESS installations are expected to exceed 50 GWh for the first time (see Fig. 33). This represents a 44% increase – or 16 GWh – compared with 2025 (36.0 GWh), corresponding to half of the total BESS capacity in Europe by the end of 2025 (101 GWh).

Figure 33

European annual battery capacity additions to accelerate in 2026 and cross 50 GWh, driven by a surge in utility-scale

Europe annual BESS installed capacity 2025-2026



The **utility-scale** segment underpins overall BESS market growth in 2026 and is anticipated to increase its share from 53% in 2025 to 63% in 2026. This expansion is driven by increasing system needs, robust revenue potential, declining costs, growing hybridisation with solar PV, and sustained appetite from institutional and corporate investors.

In parallel, distributed storage will continue to expand, albeit at a more moderate pace. At the **household** level, batteries are expected to regain momentum, with installations reaching 13.2 GWh in 2026, representing 7% annual growth. These volumes would exceed the historical peak in 2023, when 13.0 GWh were delivered. Decreasing solar export remuneration, grid congestion, dynamic tariffs, funding programmes, decreasing technology prices, and citizens' willingness to become more self-sufficient are factors that are turning solar+BESS into the industry standard for new home installations. Additionally, retrofitting rates in key residential solar markets are growing very rapidly, as households with existing solar PV systems now increasingly look to batteries as a necessary add-on.

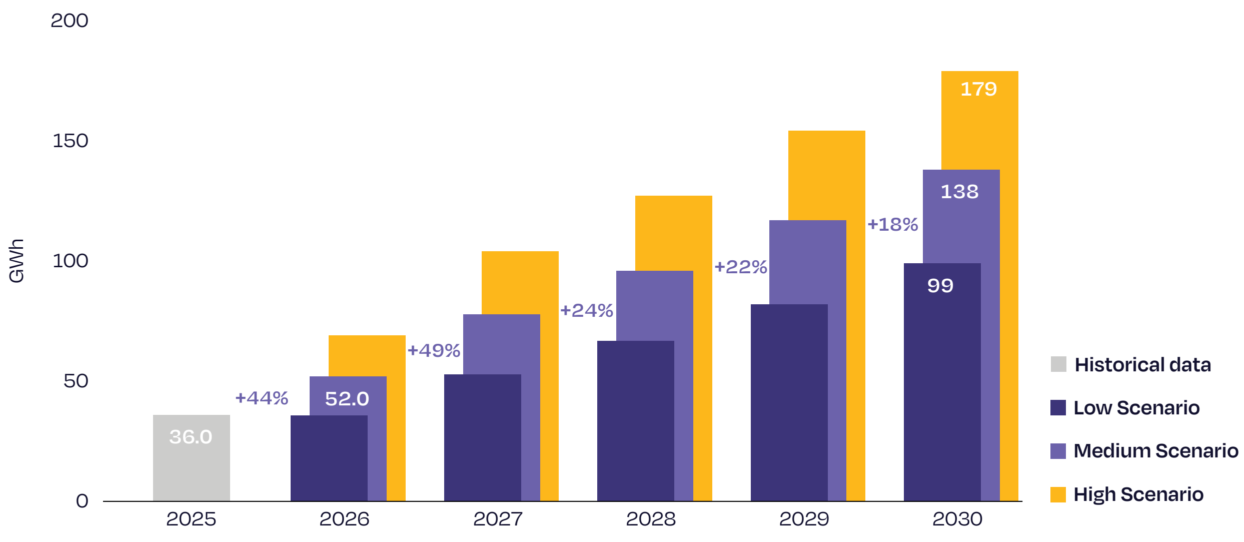
While still smaller in absolute terms, the **C&I** segment is expected to again outpace residential expansion, with 5.9 GWh of new capacity in 2026 and a 26% growth rate. Despite continued challenges – including limited funding support, complex investment structures, restricted access to revenue streams, and burdensome administrative processes – the segment continues to demonstrate strong underlying demand. Businesses are increasingly turning to solar-plus-storage to enhance energy independence, reduce electricity costs, manage peak demand, and ensure operational continuity through back-up capacity.

Beyond 2026, and in line with prevailing market and regulatory conditions, our Medium Scenario points to a strong expansion trajectory (Fig. 34). Annual installations are expected to surge by a further 49% and reach 77.7 GWh in 2027, before entering a more mature growth phase. Deployment is projected to increase 24% to 95.9 GWh by 2028, 22% to 117 GWh in 2029, and 18% to 138 GWh in 2030. By the end of the decade and with a compound annual growth rate (CAGR) of 28% for the period 2026-2030, annual BESS additions are expected to be nearly four times higher than in 2025, reflecting battery storage's cornerstone role in Europe's energy transition.

Figure 34

Battery capacity additions in Europe will surge to 138 GWh in 2030, four times as large as 2025

Europe annual BESS market scenarios 2026-2030



Box 9

Unlocking Flexibility and accelerating BESS deployment under the Grids Package

Presented in December 2025, the European Commission's **Grids Package** aims to modernise Europe's electricity infrastructure, improve cross border coordination, and enable more efficient use of the electricity system in support of electrification and renewable integration. The Package consists of two main components: binding legislative proposals and complementary non legislative guidance, each addressing different aspects of grid development and system flexibility.

Legislative proposals

The legislative component of the Grid Package introduces binding rules that shape how battery storage is planned, permitted, and integrated into the electricity system.

It includes two key proposals:

The **revision of the TEN E Regulation** seeks to strengthen EU level coordination of grid planning and requires system operators to consider non-fossil flexibility solutions, including storage, alongside traditional infrastructure investments.

The proposed **Directive on accelerating permit granting procedures** (amending the Renewable Energy Directive and the Electricity Directive) aims to accelerate approval procedures for grids, renewables, and storage, including hybrid projects. It does so through shorter timelines, digitalized processes, and streamlined requirements.

Through these legislative files, battery storage is embedded in scenario planning and permitting frameworks as a key tool to optimise infrastructure and reduce system costs.

Non legislative guidance

Complementing the legislative proposals, the Commission has issued non binding guidance to support implementation and provide immediate direction to Member States and regulators.

This guidance focuses on two main areas:

1. The **Grid Connection Guidance** promotes best practices for grid access, including hosting capacity maps, queue management reform, prioritisation of grid supportive projects, and the use of flexible connection agreements to enable earlier connection of storage in constrained grids.

2. The **CfD Design Guidance** supports investment frameworks that recognize hybrid renewable plus storage projects as a means to improve system efficiency and investment stability. Contracts for Difference (CfDs) can provide predictable revenues while incentivising system friendly operation.

Across these instruments, battery storage is positioned as a flexibility resource that enables more efficient grid use and supports renewable integration.

Implications for BESS deployment

The Grid Package has significant implications for BESS deployment across Europe.

Together, these measures support a shift towards a flexibility first system in which storage helps reducegrid congestion, improve system reliability, and enable higher shares of renewable energy. Faster permitting, improved grid access, and the recognition of flexible assets in planning frameworks create a more enabling environment for BESS deployment.

However, key gaps remain. The system value of storage is not consistently recognised across legislative provisions or grid levels, creating uncertainty for investors. Distribution system operators remain underemphasised, despite their central role in integrating storage. Rules for hybrid and co located projects lack clarity, particularly regarding shared connection points. Some instruments, including locational signals and auctioning mechanisms, may increase complexity if not carefully designed.

Addressing these gaps will be essential in the ongoing legislative negotiations and in national implementation.

Next steps and policy priorities

The legislative proposals will be negotiated by the European Parliament and the Council and are expected to be adopted by the end of 2026. The guidance documents are non binding and intended to support implementation by Member States and regulators.

To fully support BESS deployment, EU co legislators should ensure that the final framework:

- recognises non fossil flexibility, including BESS, as a core system resource,
- ensures consistent treatment of storage across transmission and distribution levels,
- provides clear rules for hybrid and co located projects;
- aligns planning, connection, and market design with a flexibility first approach; and
- remains fully complementary to existing legislative frameworks, notably the Electricity Market Design and the Renewable Energy Directive, reinforcing their implementation and avoiding overlap or disruption.

At national level, Member States and national regulatory authorities should:

- build on Commission guidance to integrate storage systematically into grid planning and congestion management;
- implement connection frameworks that prioritise grid supportive assets, including BESS and hybrids;
- ensure transparent and efficient queue management and the use of hosting capacity maps;
- align tariff and market signals with system needs to incentivise flexibility; and
- provide clear, stable and predictable regulatory frameworks to support storage deployment.

Coherent and timely action at both the EU and national level will be critical to unlocking the full value of battery storage and delivering a cost efficient, resilient, and decarbonised European power system.

Even under less favourable conditions reflected in our Low Scenario, annual installations are still expected to reach 36 GWh, matching the deployment levels seen in 2025. This underscores the significant progress made in regulatory frameworks across European countries, which are increasingly capable of unlocking capital and driving investment into battery storage across segments. Even with a pessimistic outlook, annual installations are projected to remain stagnant in 2026 before increasing steadily to 98.6 GWh in 2030.

The urgency of energy, economic and climate security requires a significantly accelerated rollout of battery storage, in parallel with solar PV expansion. Yet, the full potential of batteries continues to be constrained by persistent regulatory and investment barriers. Under our High Scenario, deployment could reach around 70 GWh in 2026, illustrating the scale of additional growth if these barriers are effectively addressed.

The lack of clear and harmonised asset classification, where storage is still inconsistently treated as generation, consumption, or both, creates regulatory uncertainty. Fragmented and unstable market access rules, alongside unfavourable or unclear grid tariff structures, further limit revenue visibility. In addition, ancillary service markets remain underdeveloped in several countries, while trade restrictions and weak investment signals associated with national storage targets continue to reduce investor confidence.

Grid infrastructure continues to be a major bottleneck. Lengthy interconnection queues – with delays often exceeding 5 to 10 years – constrained grid capacity, and intense competition for connection points significantly slow down project realisation. Permitting and administrative barriers also persist, driven by non-harmonised requirements on fire safety, land use, and environmental assessments, coupled with understaffed local authorities struggling to process an increasing pipeline of projects.

Murellu, Pieve, Corsica, France — 1.7 MW solar PV with 5.2 MWh battery storage

In essence, while battery storage is now deemed system-critical infrastructure, it is not yet fully remunerated for the value it provides, sufficiently de-risked, or adequately integrated into national regulatory frameworks.

By contrast, under a more optimistic outlook in which energy security and decarbonisation efforts accelerate, the High Scenario projects a strong surge in deployment. After nearly doubling to 69.1 GWh in 2026, annual installations would approach the 100 GWh threshold as early as 2027 and reach approximately 180 GWh by 2030. This would represent a 30% increase compared to the Medium Scenario and a fivefold expansion relative to 2025 levels.

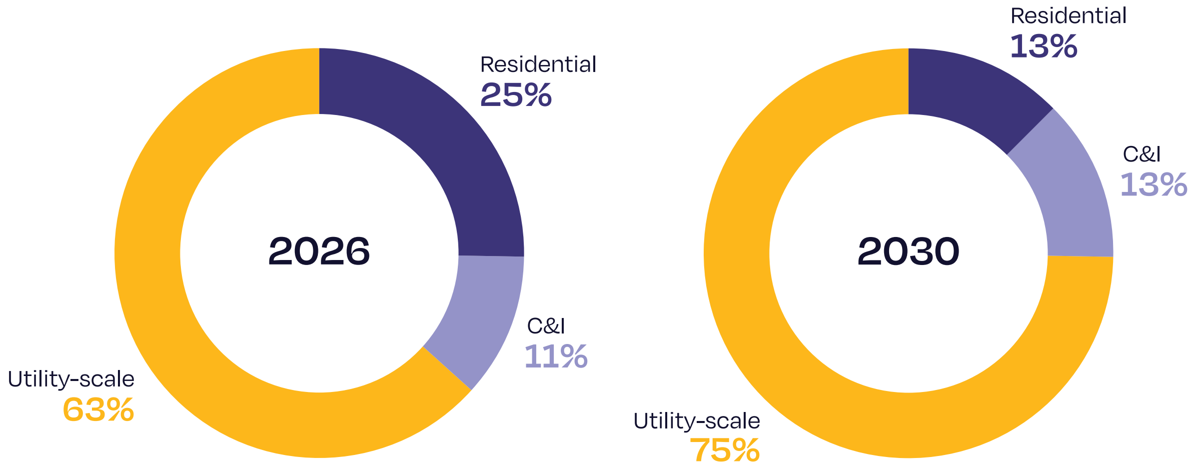
Narrowing the scope to the EU-27, our Medium Scenario anticipates 41 GWh of installations in 2026, representing a 50% increase compared with 2024. By 2030, annual additions are expected to climb to 114 GWh, resulting in a market that is four times larger than in 2025.

Examining the segment breakdown of installations through 2030, our Medium Scenario highlights an even more pronounced dominance of utility-scale batteries (see Fig. 35). The segment's share of annual additions is set to rise from 63% in 2025 to 75% by 2030. By then, utility-scale deployments are expected to exceed 100 GWh per year – roughly 10 times the volume added in 2024.

Figure 35

Utility-scale batteries are expected to further increase their share to 75% of the annual market in 2030

Europe annual BESS segmentation 2026-2030



Utility-scale developments

The development towards utility-scale projects marks a fundamental shift in the energy transition and the way battery deployment materialises, which can be traced to various reasons:

Standalone renewable projects are increasingly giving way to fully integrated renewable-plus-storage solutions. The hybridisation of batteries with solar PV and wind assets, alongside the retrofitting of existing plants with storage, is set to become standard industry practice. This evolution is expected to be particularly pronounced in European markets with high solar PV generation. It is also becoming more prevalent in countries with large connection queues, where access to the grid has become a physical limitation for standalone battery projects. In such cases, investors are increasingly leveraging existing connection points of renewable assets, even when standalone batteries may offer higher theoretical returns.

The need to balance energy supply and demand has also spurred a level of funding support unseen before. Only last year, EU Member States procured an unprecedented 70 GWh of large-scale battery storage (see Chapter 2, p. 67) Through various EU development programmes, countries like Poland, Bulgaria and Spain have each funded more than 10 GWh of utility-scale battery projects. With the exception of Bulgaria, where delivery deadlines fall in the near term, most projects are scheduled to come online between 2028 and 2029, providing a strong pipeline and a solid foundation for market growth over the coming years. Additional support has also emerged in countries such as Lithuania (4.3 GWh), Romania (3.1 GWh), and the Czech Republic (1.5 GWh), further accelerating deployment.

However, the realisation of this pipeline remains uncertain. Many projects were awarded under tight delivery timelines and with limited clarity on future market access and revenue frameworks. In some markets, this unprecedented level of support also raises the risk of boom-and-bust cycles. To mitigate these risks, countries must move beyond one-off funding schemes and establish stable, long-term regulatory frameworks that adequately remunerate flexibility and system services. Such frameworks are essential to unlocking the full value of battery storage and enabling bankable, scalable investment models.

Waldkappel Battery Park, Waldkappel, Hesse, Germany — 16 MW / over 33 MWh stand-alone battery energy storage system

One clear example of tying renewable support to flexibility is Italy. The country is expected to launch the new FER-Z tenders, which represents a paradigm shift from asset-based renewable support to a profile-based, system-integrated mechanism. Through long-term CfDs awarded via competitive bidding rounds, the scheme incentivises aggregators to deliver stable renewable generation profiles, making BESS essential for ensuring compliance and managing risk. The programme will run until 2029.

A further structural shift is underway in the design of utility-scale battery projects, with average durations steadily increasing. Early revenue models in leading markets such as the UK were largely based on ancillary service provision, typically requiring 1–2 hours of storage. Today, longer durations are becoming more attractive, enabling participation in energy arbitrage and the capture of wholesale price spreads, particularly during evening peak demand periods. While grid stability services remain a key revenue component, energy shifting is expected to become a dominant value driver across Europe. As a result, average project durations are projected to increase from around 2 hours today to 4 hours and beyond. Recent procurement rounds, such as the first MACSE auction in Italy, demonstrate the economic viability of this shift, with average project durations of approximately 6.5 hours achieved at very competitive cost levels.

Behind-the-meter developments

While utility-scale batteries continue to expand rapidly, distributed storage , but at a slower pace. Under the Medium Scenario, the potential of residential and C&I storage remains largely untapped in several markets, including the possibility to aggregate distributed storage systems and use them as a single flexibility asset. Large-scale optimisation of battery fleets could enhance system efficiency, improve project economics, and provide valuable grid services. However, this level of operational integration has not yet been hardly realised by developers, aggregators, grid operators, and regulators.

One fundamental difference still limits the growth potential of the C&I segment – **a lack of standardised business models due to the heterogeneity of installation types**. Businesses differ widely in their commercial activity, energy consumption profiles, grid connection types, physical location, the presence of dedicated energy managers, and so on. This complexity translates into bespoke solutions and higher transaction costs for developers, installers, and financiers throughout project development and execution. In contrast, both residential and utility-scale segments benefit from more standardised and replicable models, enabling economies of scale and faster cost reductions.

In addition, **the ongoing effects of the Middle East war will, in time, drive up distributed solar and storage installations**. Despite not currently having a large direct impact on electricity prices, this new fossil fuel crisis is already affecting the perception of energy security among European households and businesses. Unlike at the onset of the war in Ukraine, when electricity prices skyrocketed, this energy crisis is expected to have more gradual but sustained impact on battery storage installations in the longer term. Energy shocks triggered by geopolitical tensions continue to strengthen the case for energy independence through distributed solar and storage.

Overall, behind-the-meter storage is projected to account for 26% of annual BESS additions by 2030, representing a 10 percentage point decline in market share. Both residential and C&I segments are expected to contribute around 17.5 GWh each by the end of the decade. Over this period, the C&I segment is set to triple in size compared to 2026, while residential storage will expand more moderately, growing by approximately 34%.

Box 10

Looking back and forth

A review of our Medium Scenario projections across the past two editions of the European Battery Market Outlook (EBO) shows that actual market developments have consistently outperformed expectations. Based on now consolidated historical data for 2025,, it appears that our Medium Scenario underestimated deployment by 14% in the 2024 edition and by 10% in the 2025 edition. This deviation is primarily explained by stronger-than-anticipated growth in the utility-scale segment, with countries such as Bulgaria and Belgium emerging as leading utility-scale battery markets in 2025.

Our Medium Scenario has progressively adjusted to reflect improving market visibility and accelerating growth dynamics. The rollout of support schemes enhanced regulatory frameworks, the introduction of national storage targets, and continued cost reductions have all contributed to successive upward revisions to our outlook. For 2026, projections were increased by 7% in last year's edition and have now been further revised upward by 13%. These adjustments are mainly driven by greater visibility on project pipelines and shorter delivery timelines in the utility-scale segment, alongside a slightly improved outlook for residential storage.

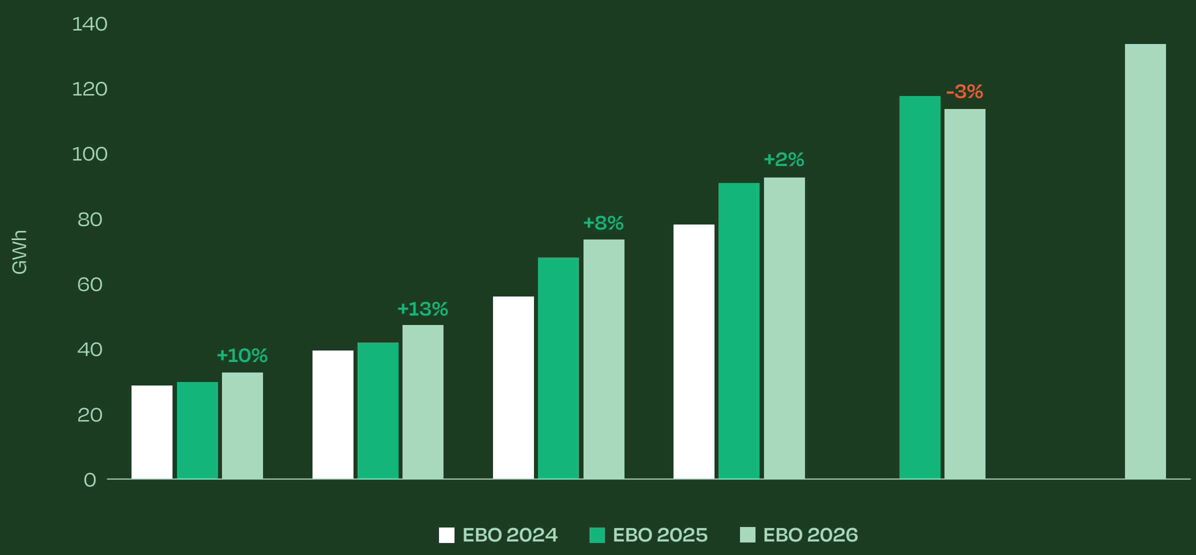
Looking further ahead, the divergence between this and last year's outlook narrows progressively over the 2027-2029 period compared to the EBO 2025, and turns slightly negative by 2029. This reflects the expected completion of a large share of utility-scale projects secured through recent EU-funded procurement rounds, which frontload deployment into earlier years of the period.

In terms of cumulative capacity, the EBO 2026 projects significantly higher volumes than previous editions. By 2028, total installed capacity is expected to be 25% higher than projected in the EBO 2024 and 11% above the EBO 2025 estimate. By 2029, the projected battery storage fleet is 11% larger than in the previous edition.

Figure 36

European annual battery market outlook increases again compared to previous editions

Comparison Medium Scenario EBO 2024 vs 2025 vs 2026

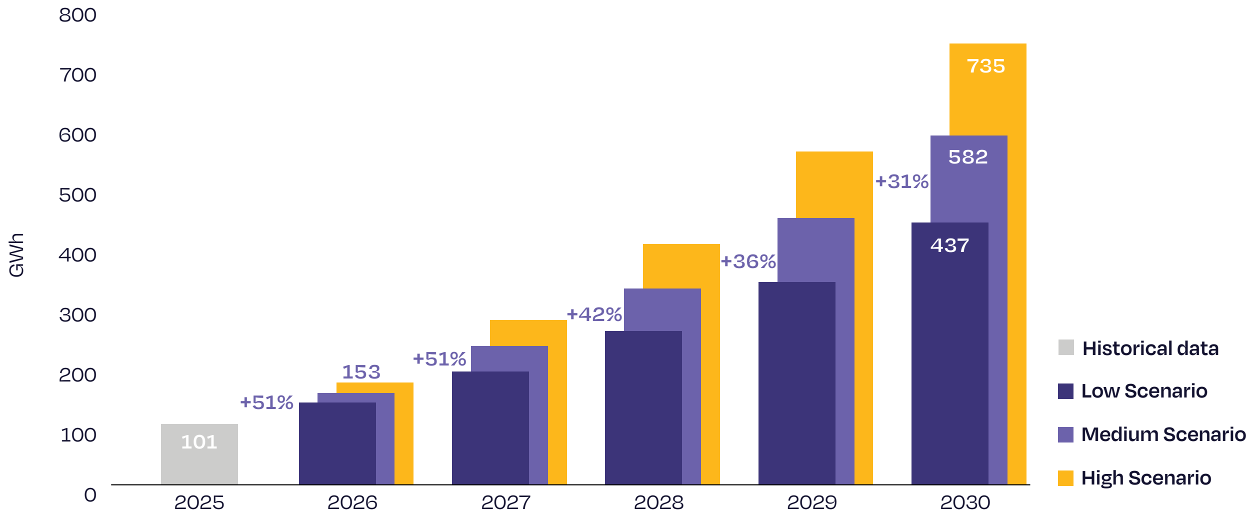


Examining the evolution of Europe's BESS total fleet, the Medium Scenario projects sustained and robust growth through 2030. By 2026, cumulative installed capacity is expected to rise by 51%, exceeding 150 GWh (see Fig. 37). Looking ahead, current market and policy dynamics point to a 42% CAGR in operational battery capacity, reaching over 580 GWh by 2030. This trajectory implies that Europe's BESS fleet will expand sixfold over five years under the Medium Scenario.

Figure 37

European battery storage fleet set to grow 6X, towards 600 GWh by 2030

Europe cumulative BESS market scenarios 2026-2030



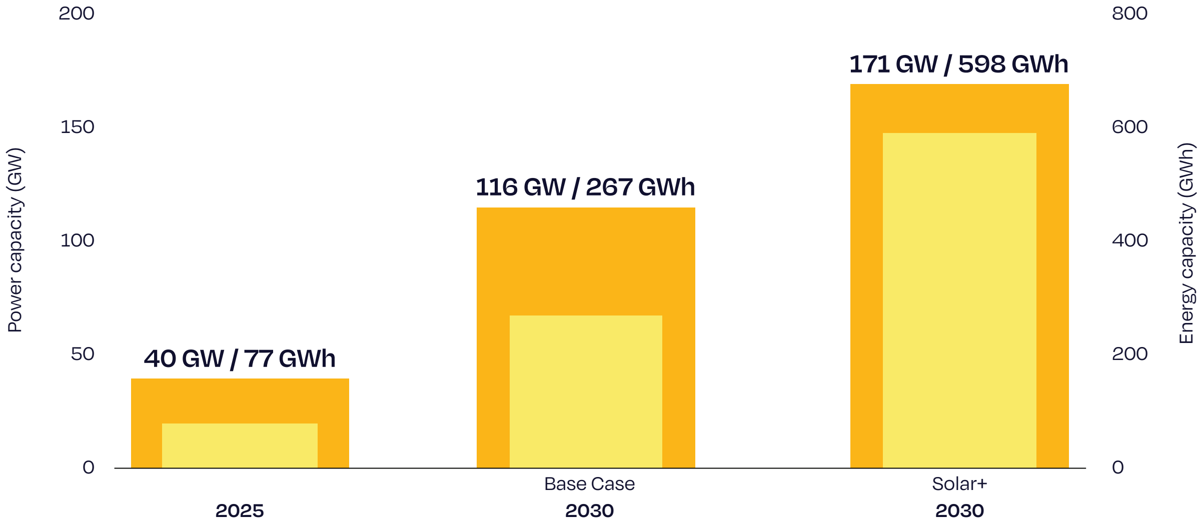
Narrowing the scope to the EU-27, the Medium Scenario projects total deployed BESS capacity to reach 470 GWh by 2030. While this volume also represents a sixfold increase from the 77 GWh in operation in 2025, it remains significantly below the level required to support a highly renewable-based power system and an increasingly electrified energy system. According to SolarPower Europe and Rystad Energy's recently published Solar+ report, at least 600 GWh of battery storage capacity would be needed to meet future flexibility requirements (see Fig. 38).[21] Under current assumptions, only the High Scenario approaches this trajectory, with the EU-27 expected to reach 593 GWh by 2030.

21 SolarPower Europe (2026): Solar+ An EU pathway to achieve renewable targets, price affordability, and energy security

Figure 38

With more ambition, EU batteries could reach 600 GWh by 2030, optimising a renewable-based power system

EU BESS installed power and energy capacity 2025 and 2030, Base Case and Solar+ scenarios

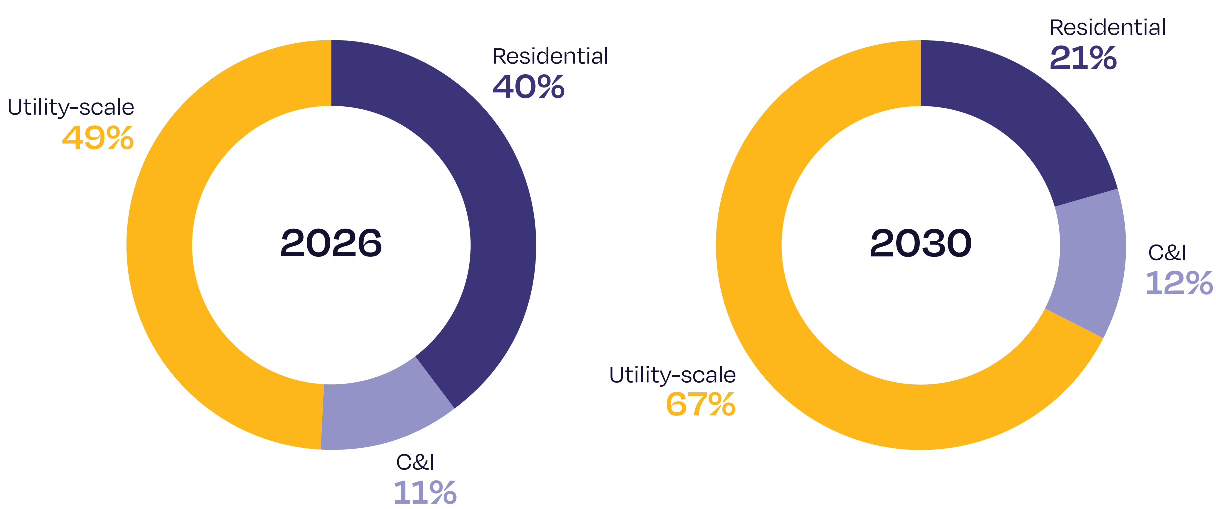


The distribution of operational BESS capacity in 2026 and 2030 as per the Medium Scenario closely mirrors the pattern of annual battery additions (see Fig. 39). This year, the utility-scale segment is expected to become the largest segment, accounting for almost half of the total installed capacity. Going forward, the segment will continue to increase its share, reaching a 67% share by 2030. The residential segment is expected to represent 40% of the operating capacity in 2026; however, it will lose 19 percentage points by 2030, bringing its total capacity down to a 21% share. C&I batteries are poised to quadruple their installed capacity by 2030, but their share will increase only marginally by 1 percentage point to 12% of the total.

Figure 39

By 2030, utility-scale batteries will strengthen their role as the backbone ofEurope's fleet

Europe cumulative BESS segmentation 2026-2030



Ongoing market diversification enables more deployed capacity outside the largest markets in 2026, but leading countries will regain share by 2030

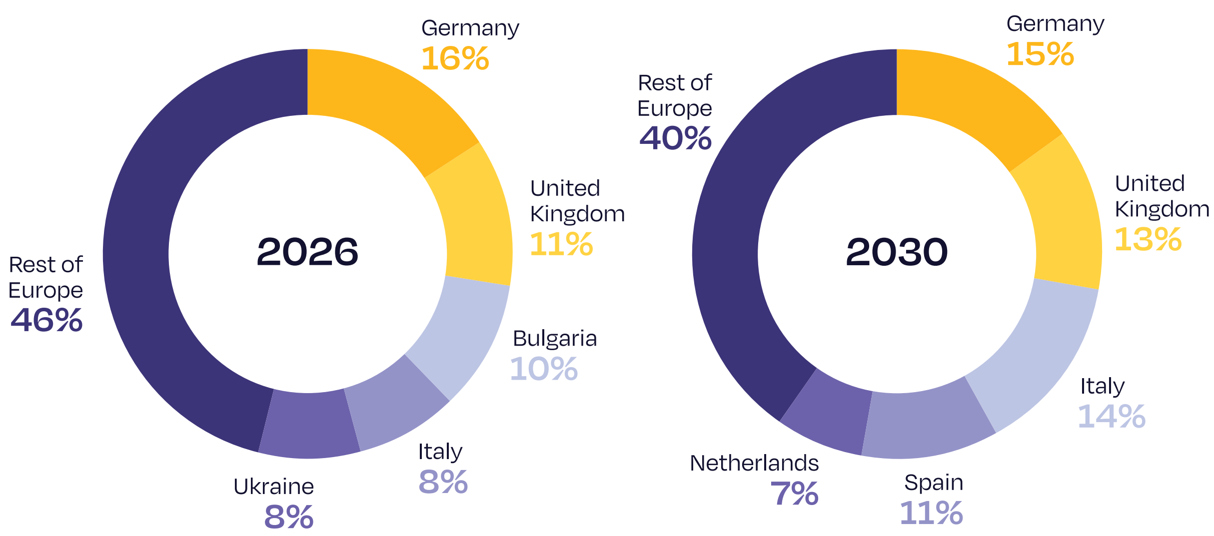
An analysis of the geographical distribution of installations across the continent to 2030 reveals several substantial changes in the composition of the top 5 markets. Despite an increasing contribution of smaller markets across Europe, in 2025, the top 5 markets (DE, UK, IT, UA, BG) still captured 62% of annual additions. In 2026, this trend will accelerate, with smaller markets outside the top 5 providing 46% of Europe's annual BESS capacity, which is 8 percentage points more than in 2025 (see Fig. 40). Most of the markets that are experiencing strong activity, such as the Netherlands, Spain, Austria, Belgium, Greece, Poland, and Romania, have taken very decisive steps in improving framework conditions for the deployment of battery storage. In our Medium Scenario, 29 out of 31 European markets in the scope of this report are expected to expand in 2026.

More detailed information on country-specific trends is available in SolarPower Europe's member-exclusive Market and Policy Navigator.

Figure 40

Top 5 battery markets' share expected to reach a historic low of 54% in 2026 asdiversification accelerates across Europe, ahead of a partial rebound by 2030

Europe top 5 BESS markets 2026-2030



Several markets illustrate these trends. Greece has conducted three storage auctions, granted grid connection permits for around 4.5 GWh of grid batteries, and launched support programmes for distributed storage. In Romania, a combination of support programmes for both prosumers and large-scale batteries, together with important regulatory improvements such as accelerating permitting procedures, is expected to double the market size for the second consecutive year. These developments, alongside progress in other countries are supporting an accelerated and diversified deployment of storage in Europe, a key condition for delivering flexibility across time and geography.

The top 5 countries in our ranking are expected to account for 54% of 2026 additions, as Germany, the UK and Italy are growing at a slower pace than the rest of Europe. In turn, Bulgaria and Ukraine will remain part of the top 5 European markets in 2026, with Bulgaria even surpassing Italy.

Looking at the European top 5 annual markets in 2030, the Medium Scenario anticipates that the share of the main contributors will recover share and account for 60% of total installations. By that point, mature solar markets such as Spain and the Netherlands will increase their BESS deployment and join the current top 3 markets Germany, Italy and UK in the top 5 ranking.

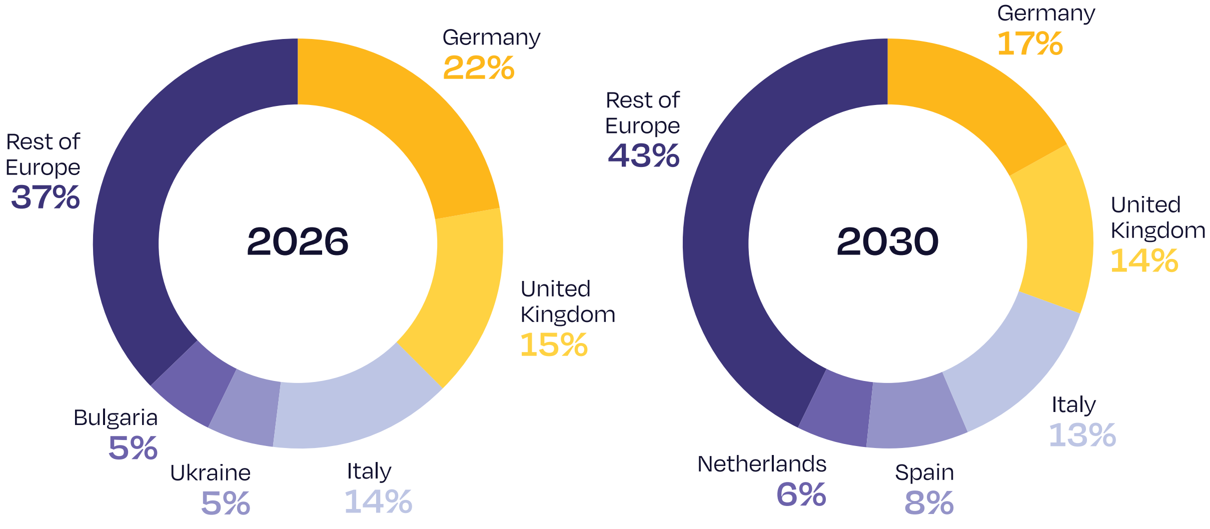
The same top three markets by annual installations in both 2026 and 2030 will also be the largest 5 BESS fleets in Europe in the corresponding years (see Fig. 41). Germany, the UK, and Italy will retain their dominance, with more than half of Europe's total BESS capacity at the end of 2026. Closing the 2026 ranking, Ukraine and Bulgaria are anticipated to add 10% of Europe's total, 5% each.

In 2030, Spain and the Netherlands will reach the top 5 cumulative ranking, jointly representing almost 80 GWh. The top 3 markets will see their share decline, as the rest of European countries are expected to deploy significant battery storage volumes by 2030. Overall, the top 5 markets will lose some share of the European battery fleet, declining by around 5 percentage points to 57%, as other European markets gain share by 2030.

Figure 41

Top 5 markets set to preserve its weight in the cumulative fleet, but top 3 will lose market share

Europe top 5 BESS cumulative markets 2026-2030



Box 11

Scaling battery storage with quality

Battery storage systems are entering a phase of rapid scale-up, evolving into an increasingly central pillar of the energy system. The growth brings a critical new reality: quality risks are scaling alongside deployment. Compared to earlier expansion of solar PV, today's battery projects involve significantly higher complexity due to three key factors:

- Batteries are highly integrated electrochemical, electrical, and digital systems with complex interdependencies. Modern BESS rely on the seamless coordination of battery cells, power conversion systems, energy management system (EMS) and battery management system (BMS) software, and grid interfaces. As a result, integration weaknesses can lead to project-wide underperformance, with system-level issues often proving more consequential than failures of individual component.

  Industry evidence supports this: while global utility-scale BESS deployment has accelerated rapidly, failure rates fell by 97% between 2018 and 2023 as a result of lessons learned, stronger codes and standards, and improved industry practices. When failures did occur, they most frequently arose during construction, commissioning, or the first years of operation and were primarily linked to integration, assembly, and balance-of-system (BOS) components – such as HVAC systems, fire suppression systems, electrical infrastructure, and operational controls – rather than battery cells themselves.

- Unlike PV plants, utility-scale batteries typically rely on multiple stacked revenue streams, such as energy arbitrage, frequency regulation, capacity markets, etc. These market-dependent income streams are volatile and complex to model. A BESS's profitability relies on participation in various energy markets, which adds financial and operational complexity. As a result, shortcomings in design or operation can compromise a battery's ability to deliver all contracted services, directly undermining its business case.

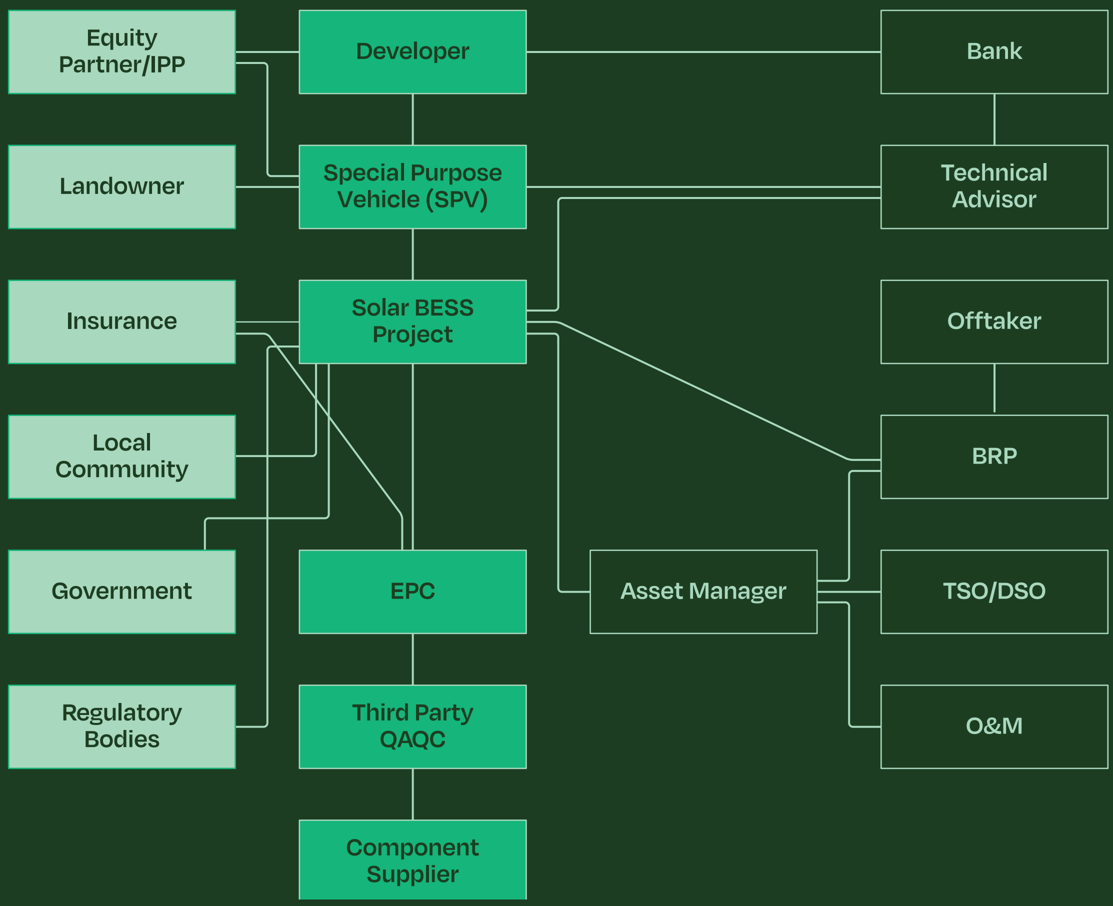
- Large batteries must meet strict safety standards (e.g. to prevent fire and thermal runaway incidents), comply with evolving regulatory requirements, such as battery safety and sustainability rules, and protect their digital control systems against cybersecurity threats. As BESS deployments scale, these requirements become more demanding, making rigorous quality management essential to avoid accidents, regulatory non-compliance, or cyber incidents.

In this context, quality is no longer a secondary technical consideration; it is becoming a prerequisite for bankability, safety, and investor confidence. Projects with weak quality practices are more exposed to underperformance, financial losses, contractual disputes, and reduced stakeholder trust.

At the same time, scaling battery projects requires managing an increasingly complex ecosystem of stakeholders. As illustrated in the figure below, utility-scale BESS and hybrid PV+BESS projects involve a wide range of stakeholders. Every interface, responsibility split, and project handover introduces potential quality risk if roles and accountabilities are not clearly defined.

Figure 42

Stakeholder Overview



Source: Sunzest Solar, December 2025

To address these challenges, SolarPower Europe's Lifecycle Quality Workstream is developing industry best practices aimed at improving transparency, harmonising processes, and strengthening coordination across the project lifecycle.

These guidelines bring together expertise from across the value chain, including developers, asset owners, investors, EPC contractors, technology providers, independent engineers, insurers, and operational experts. This multi-stakeholder approach helps ensure that the recommendations reflect practical experience across different project stages and stakeholder perspectives.

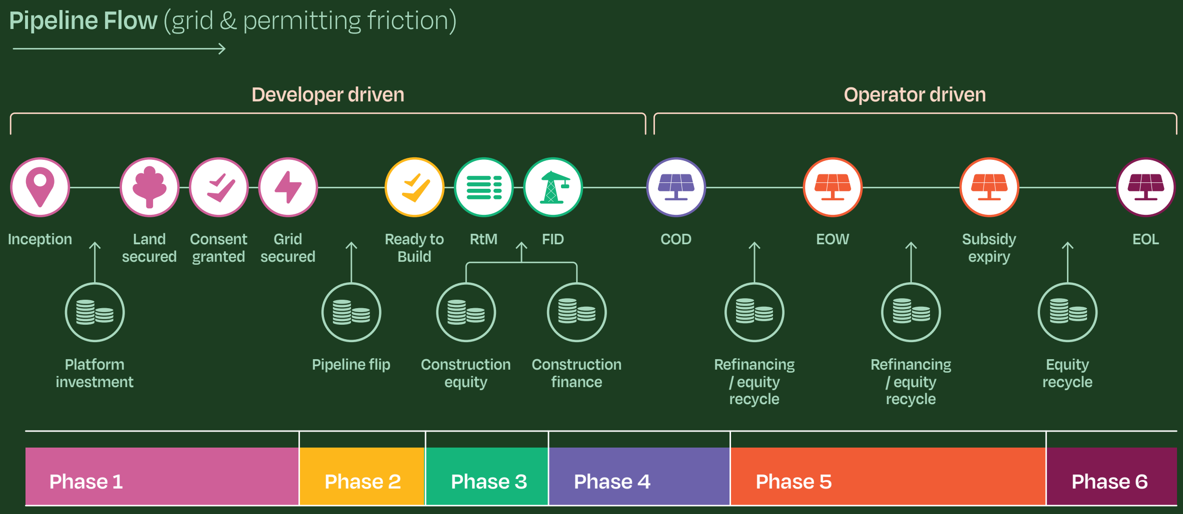
Given the rapid evolution of battery technologies, business models, and regulatory frameworks, these guidelines are designed as living documents that will continue to develop alongside the market. Ongoing dialogue, knowledge sharing, and continuous improvement are essential to raising quality standards and supporting the delivery of safe, reliable, and bankable battery storage at scale. The guidelines are freely available on SolarPower Europe's website.

A Lifecycle Approach to Quality

This work is grounded is the recognition that quality cannot be treated as a one-time verification exercise. Long-term battery performance is shaped by decisions made well before operations begin, from technology selection and supplier choice to project execution, commissioning, and operational handover. As illustrated in Figure 43, project risk, financing decisions, and ownership structures evolve throughout the asset lifecycle. Each project milestone introduces different technical, commercial, and operational considerations, making quality management a continuous process rather than a point-in-time assessment.

Figure 43

Project stage and financing points



Source: Everoze, Devember 2025

SolarPower Europe's Technical Due Diligence Best Practice Guidelines support this shift by moving technical due diligence beyond traditional project verification and positioning it as a proactive quality management tool. The guidelines provide a structured framework to assess technical quality, project readiness, and risk throughout the project lifecycle. This includes strengthening decision-making during early project development, improving supplier assessment and accountability, increasing transparency around technical assumptions, and integrating emerging considerations such as cybersecurity, sustainability, and evolving regulatory requirements.

Complementing this, SolarPower Europe's Engineering, Procurement and Construction (EPC) Best Practice Guidelines focus on translating quality principles into project execution. This is particularly important, as industry evidence shows that many battery project failures originate during construction, commissioning, and the first years of operation, often due to integration challenges and balance-of-system issues rather than battery cells themselves. The EPC guidelines therefore place strong emphasis on system integration, testing and commissioning, quality assurance processes, stakeholder coordination, and effective project handovers. Their objective is to ensure that quality is maintained not only in design, but throughout implementation and into operations.

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Best Practice Guidelines

Sustainable Solar
Environmental, social, and governance actions along the value chain

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