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EU Solar Market Outlook 2025-2030

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Foreword

Welcome to our EU Solar Market Outlook 2025-2030

Times for solar in the EU have changed – and unfortunately not for the better. In 2025, the EU solar market contracted for the first time in a decade.

Last year, we warned policymakers with a yellow card that Europe's solar momentum would fade without decisive action. Reality has now confirmed those concerns, as already indicated in our mid-year market assessment. With 65.1 GW installed in 2025, EU solar deployment fell by 0.7%.

One might argue that this contraction is merely a correction after the extraordinary solar heydays of the energy crisis, when annual growth reached unprecedented double-digit levels. Indeed, the EU met its 320 GW_{AC} (400 GW_{DC}) milestone for 2025. Solar also became the largest electricity source in June for the first time ever, and its annual share in EU power supply rose to over 13%, roughly doubling within just a few years. These achievements certainly deserve recognition.

But the negative market turn reflects much more than a typical correction. The rooftop segment has contracted sharply, despite consumers still facing high retail gas and electricity prices, as home solar support schemes were gradually phased out. Utility-scale installations continued to grow strongly, surpassing half of all new capacity in 2025, yet this was not sufficient to compensate for the weakening of the residential market. And conditions for large-scale solar are also becoming increasingly challenging. Long-anticipated structural bottlenecks have intensified: grid congestion, curtailment, falling capture prices, stagnating electrification, and unresolved flexibility and storage needs. Even permitting remains a substantial barrier in many Member States.

This year's outlook delivers a clear wake-up call to policymakers: solar is too important to fail. Action is needed now

With regulatory implementation and adjustments still coming too slowly and at insufficient scale, we have significantly revised our market outlook. The result is a much dimmer trajectory for the EU solar sector than expected only a year ago. We anticipate two further years of market decline. For 2030, the Medium Scenario has been revised down by 12% in just twelve months, removing nearly 100 GW from Europe's expected solar fleet – more than 1.5 times the total annual installations of 2024. Under current trends, the EU is now projected to reach only 718 GW of installed solar by 2030, falling short of the 750 GW target. Our Low Scenario foresees only 664 GW, below the already modest 701 GW indicated in Member States' National Energy and Climate Plans.

Flexibility is the key to further success. Without rapid deployment of battery storage, demand response, grid digitalisation and expansion, solar's value will continue to be constrained just at a time that EU businesses and citizens are craving for affordable electricity. Negative prices and curtailment are eroding business cases, and investor confidence is weakening at a moment when Europe needs more clean energy investment for its energy security and competitiveness.

This year's outlook delivers a clear wake-up call to policymakers: solar is too important to fail. Action is needed now. The EU urgently needs a decisive push on flexibility with a dedicated **EU Flexibility Strategy** that unlocks the enormous potential of battery storage and demand-side flexibility. Without this, Europe will not only miss its 2030 solar targets. If solar – the EU's largest and fastest-growing clean technology – fails to pick up in the next years, the EU will certainly miss its 2030 renewables target of 42.5%.

It is time to course-correct. With decisive and coordinated action, Europe can still reverse the current negative trend, as solar and battery storage are incredibly swift to deploy. SolarPower Europe stands ready to work with policymakers to rebuild momentum and deliver the solar-powered energy system needed for security, competitiveness, and climate objectives.

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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 support and other issues arise, including interest rate hikes and severe financial crisis situations. Conversely, the High Scenario forecasts the best optimal case in which policy support, financial conditions and other factors are enhanced.

Segmentation is based on the following system size: Residential (<10 kW); Commercial (<250 kW); Industrial (<1,000 kW); Utility-scale (>1,000 kW, ground-mounted). SolarPower Europe's methodology includes only grid-connected systems. Installed capacity is always expressed in DC, unless otherwise stated. The EU average AC to DC conversion ratio is assumed to be 1.25; however, different ratios are at times used at individual Member State level, depending on country-specific market characteristics.

All figures are based on SolarPower Europe's best knowledge at the time of publication.

Contents

Contents

The EU's decade-long solar boom reaches its turning point as 2025 marks the first market contraction since the mid-2010s

65.1 GW

65.1 GW installed in 2025: a decrease compared to 65.6 GW in 2024

-0.7%

-0.7% annual market growth, down from 2.8% in 2024

718 GW

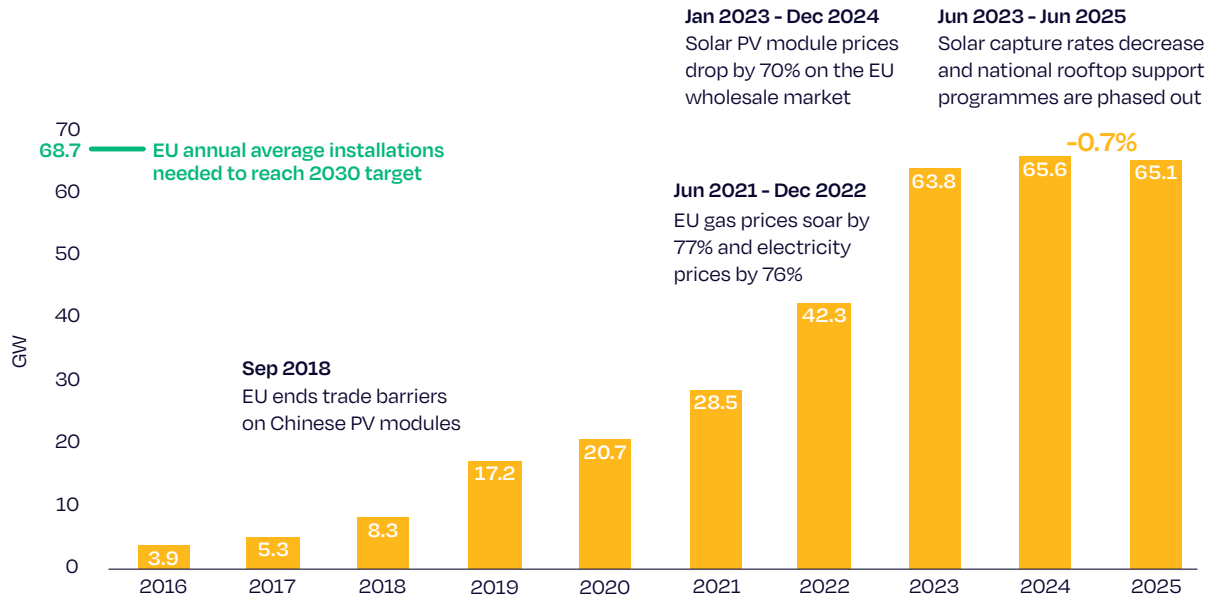
718 GW projected by 2030, falling short of the EU solar target

The EU's decade-long solar boom reaches a turning point as 2025 marks the first market contraction in nearly a decade. After several years of high expansion, the EU is expected to install 65.1 GW of new solar PV capacity in 2025 – a slight 0.7% decrease compared to 2024's 65.6 GW (Fig. 1). This follows the sharp cooling already visible last year, when annual growth fell from double-digit levels to just 2.8%. The mild contraction confirms that the extraordinary momentum of 2021-2023 has now receded.

Figure 1

For the first time in a decade, the EU solar market declines

EU annual solar PV installed capacity 2016-2025



The slowdown reflects the fading impact of the energy crisis that had previously accelerated rooftop deployment. Gas and electricity prices remain at elevated levels but the sense of urgency for households and businesses to invest in solar has diminished, as rooftop support schemes in several key markets have been phased out. On the utility-scale side, auctions, corporate PPAs and earlier merchant projects continue to support activity, but grid congestion, rising negative-price events and policy uncertainty weigh on bankability.

Compared to last year's expectation of a 70 GW market, the updated 2025 figure is 7% lower, driven primarily by a steeper-than-anticipated decline in residential and commercial rooftop demand. This downturn shows the reactiveness of households and businesses to changing market conditions and should serve as a warning for policymakers aiming to keep the EU on track for its 2030 solar ambitions.

By contrast, utility-scale solar emerges as the central engine of EU solar growth, exceeding 50% of total installations for the first time in 2025. On a cumulative level, solar capacity remains predominantly rooftop based, with a 61% share, while utility-scale captures the remaining 39%.

Agri-PV park in Pöchlarn, Germany.

Solar to supply an all-time high of over 13% of EU electricity in 2025

Solar is expected to supply 13.4% of the EU's electricity in 2025, up from 11.6% in 2024 and 9.7% in 2023 (Fig. 2). This marks a doubling of its share since 2021 and reflects how continued solar deployment is reshaping the EU power mix.

In a system where total electricity generation has remained broadly stable, rising solar and wind output has directly displaced fossil fuels. Between 2021 and 2024, the gas share fell from 19.0% to 15.3%, while coal declined from 14.7% to 9.9%. For the first time, solar became the EU's largest single generation technology in June 2025, providing 22% of total power output. Together, wind and solar are set to deliver over 30% of EU electricity in 2025, exceeding the combined output of all fossil fuels.

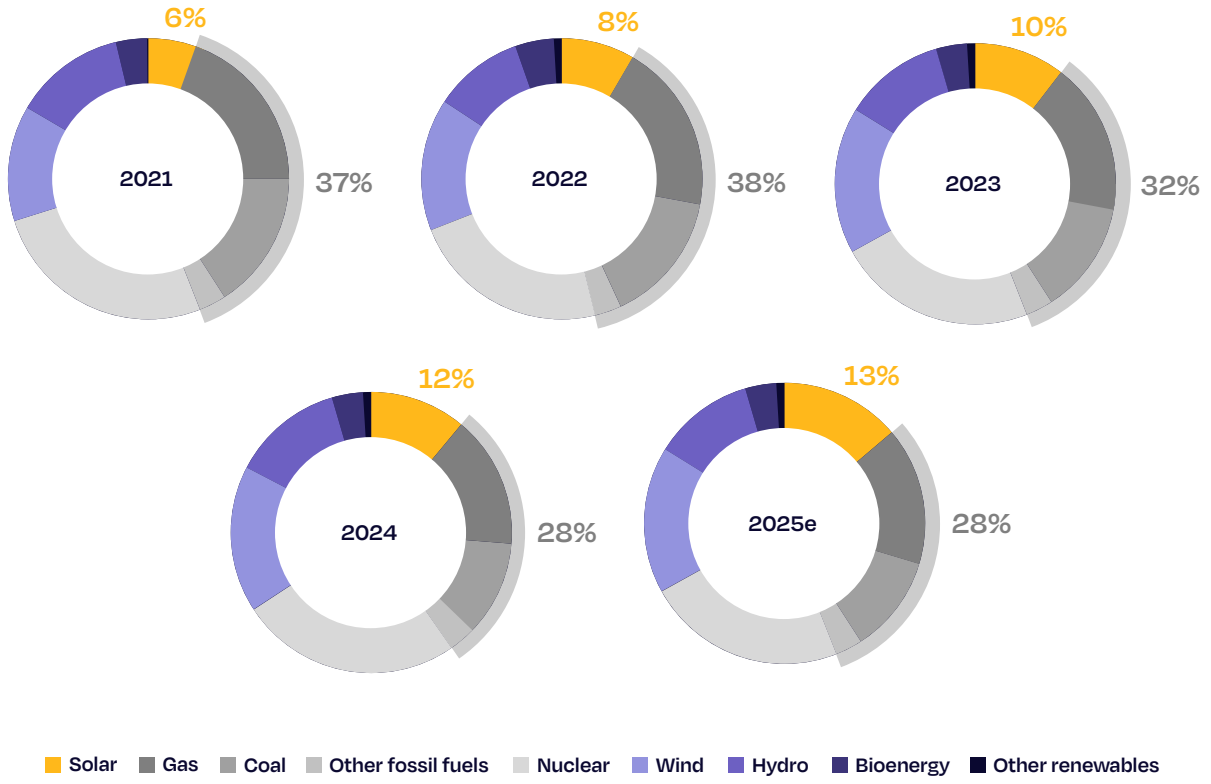
Solar generation is increasing across all seasons. Spring shows the strongest uplift, with March-May output now two to three times higher than five years ago. Summer months continue to set records despite growing grid constraints, while autumn production has nearly doubled since 2020. Even winter shows progress, with January solar covering more than 4.5% of demand in average across the entire EU.

By September 2025, solar had already generated more electricity than in all of 2024, reaching 312 TWh in nine months. The overall seasonal pattern remains familiar, but the entire curve continues to rise sharply as solar expands its contribution throughout the year.

Figure 2

Solar's EU electricity share doubled in the last 4 years, crossing 13% in 2025

EU-27 share of electricity generation per source 2021-2025



More and more EU rooftop markets decline, while utility-scale segments hold steady

The structure of the EU solar market shifts noticeably in 2025 as traditional rooftop activity cools and utility-scale installations take the lead. Residential solar sees the steepest decline: 19 markets record contraction this year, pushing the residential share of annual additions down to 14%, half the level of 2023 (Fig. 3). This reflects the phase-out of support schemes in several mature markets and the limited expansion of rooftop solar beyond early-adopter households. Interestingly, wherever legal in EU Member States, rather new plug-in / balcony solar is rapidly gaining popularity as the upfront investment is low, DIY installations possible, and grid-connection very simple, indicating continued interest from households in solar.

The commercial and industrial segment remains more stable but also begins to soften. With the number of declining C&I markets rising again, its share falls from 37% in 2023 to around 32% in 2025, with growth increasingly concentrated in only a few countries.

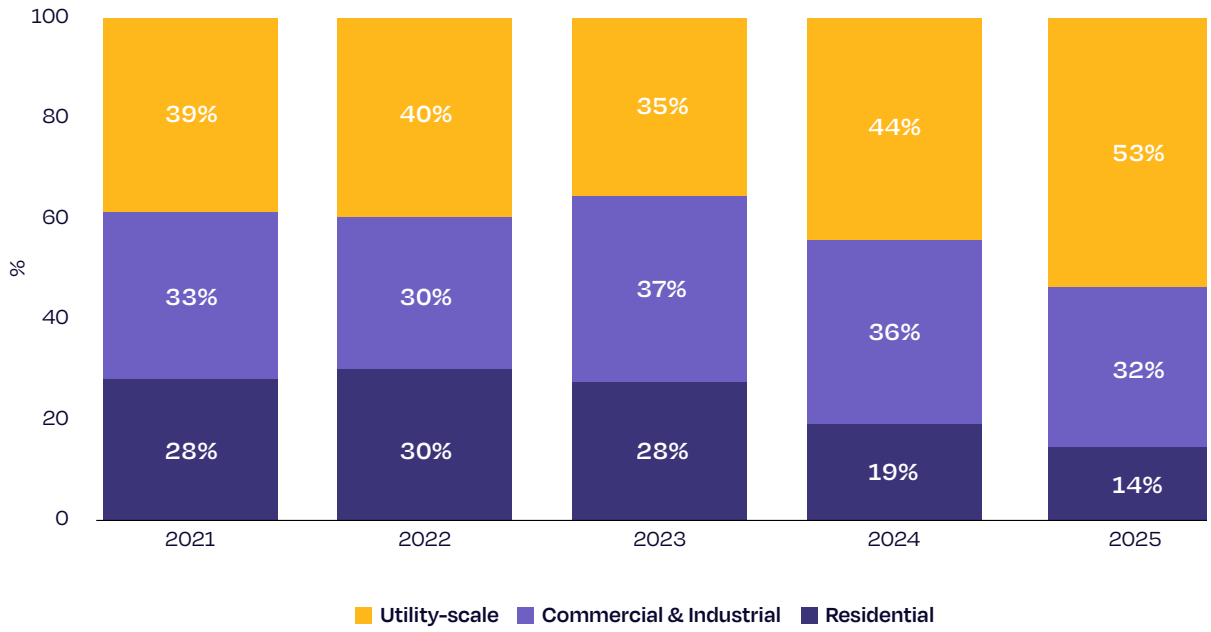
Utility-scale solar becomes the main engine of EU installations, exceeding 50% of annual capacity for the first time. Despite increasingly tougher project economics, it remains the most resilient solar segment, supported by public auctions and PPA commitments made during the strong 2022-2024 period that are now reaching completion.

On a cumulative basis, rooftop systems still account for the majority of installed EU capacity at the end of 2025, though utility-scale continues to gain ground, rising to 39% of the total. This gradual shift mirrors the slowdown in new residential and C&I additions and the sustained commissioning of large-scale projects.

Figure 3

Utility-scale drives half of all installed solar in 2025, as home solar continues to slump

EU-27 annual solar PV segmentation 2021-2025



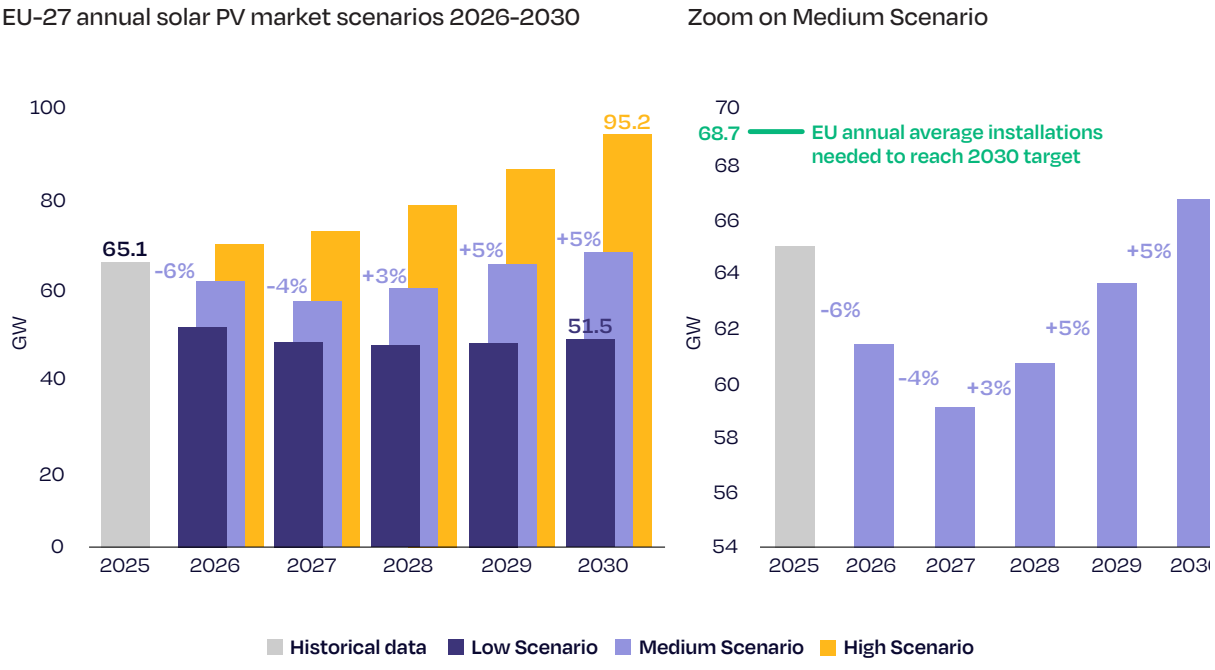
Two more years of solar market decline anticipated before growing again

After the decline in 2025, EU solar installations are expected to continue declining in 2026 and 2027 before slightly recovering toward the end of the decade. The Medium Scenario displays a U-shaped trajectory: two years of further single-digit contraction, followed by a slow rebound that brings annual additions back to growth territory, though at low one-digit levels, reaching around 67 GW by 2030, a volume already almost deployed in 2024 (Fig. 4). The Low Scenario sees installations settling near 50 GW, while the High Scenario shows continuous growth, with volumes rising steadily through 2030.

The downturn follows as the utility-scale segment is in a state of transformation. Standalone solar especially faces increasing challenges on profitability, as many projects aim for higher self-consumption and hybridisation with battery storage. Furthermore, the slowdown is shaped by rooftop demand continuing a downward path. Residential and small-commercial installations remain soft through 2026-2027 as support schemes phase out, self-consumption enablers develop slowly, and lower retail electricity prices reduce urgency. Stabilisation is expected from 2027 onward as electrification accelerates, energy-sharing frameworks expand, and new rooftop requirements begin to take effect.

Figure 4

After two years of further downturn, the EU solar market is not expected to return to 2025 levels until 2030



Grid constraints and limited flexibility also weigh on near-term growth. Congestion, negative-price periods and curtailment continue to affect project bankability, while storage deployment, smart-meter rollout and aggregator access remain insufficient to support higher solar integration. Today's state of the electricity system brings low capture rates for solar and high price volatility for consumers.

Slow electrification further dampens investment today, although rising electricity demand from EVs, heat pumps, industry and data centres will help strengthen the market from 2028 onward. Besides electrification, storage and flexibility there's a need for policy stability and improved land-use processes. These factors will influence how quickly the market moves from decline back into growth.

44 MW solar park in Las Rozas, Seville, Spain.

2030 EU solar target missed in the Medium Scenario and reached only in the High Scenario

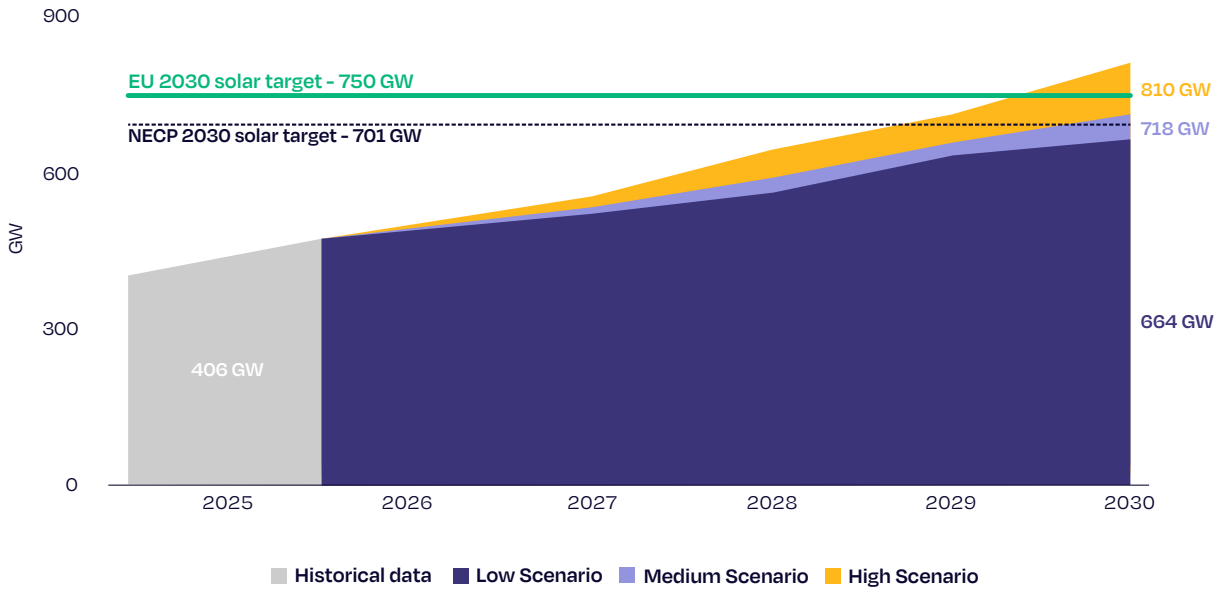
The cumulative outlook shows that today's conditions are not sufficient for the EU to reach its 750 GW (600 GW_{AC}) solar target by 2030 (Fig. 5). In the Low Scenario, total capacity rises to 664 GW, while the most-likely Medium Scenario reaches 718 GW, still more than 30 GW below the EU objective. Only the High Scenario, at 810 GW, is consistent with meeting the 2030 ambition. This gap reflects the combined impact of softer rooftop demand, insufficient flexibility, regulatory uncertainty, and ongoing land-use and permitting constraints, all of which limit the pace at which new capacity can be added throughout the second half of the decade.

Looking at how the market expands between 2026 and 2030, both rooftop and utility-scale capacity continue to grow on a cumulative basis, though at different speeds. Rooftop installations rise from 247 GW in 2025 to 397 GW in 2030, supported by their wide base of residential, commercial and industrial users. Utility-scale capacity grows more quickly, doubling from 159 GW to 321 GW, as large project pipelines awarded in recent auction and PPA cycles continue to materialise once grid conditions, flexibility solutions and permitting frameworks gradually improve. This structural difference results in utility-scale gaining further ground in the total EU solar fleet, even as rooftop remains the majority share.

Figure 5

The most likely scenario sees solar fall short of EU 2030 target

EU-27 cumulative solar PV market scenarios 2026-2030



Market concentration also remains high throughout the decade. Around 80% of all new additions between 2026 and 2030 are expected to come from just 10 Member States, with the top three alone contributing nearly half of total EU deployment. While emerging markets such as Romania, Portugal and Greece strengthen their roles, most new capacity still comes from a relatively small group of countries, underscoring the importance of broadening participation if EU-wide goals are to be met. As the number of annual GW-level EU markets declines by two to 14 in 2025, more Member State ambition is needed as updated National Energy and Climate Plans together imply an aggregate 701 GW of solar capacity by 2030 – higher than the previous targets but still below the EU's 750 GW target. Even with most national goals being unambitious, around a quarter of Member States are still expected to miss their own 2030 solar targets under current market and policy conditions.

In per-capita terms, 10 Member States already exceed 1 kW of solar per person in 2025, while the EU average stands just above 900 W. If all NECP targets were met, this would rise to roughly 1.6 kW per person by 2030, or over 3 average-sized rooftop PV modules per EU citizen. The EU has the potential to double today's installed capacity by 2030, but the need for stronger alignment between national ambition, market conditions and EU-wide objectives is high.

More detailed information on country-specific trends and segments across the EU is available in SolarPower Europe's brand-new, member-exclusive Market and Policy Database.

1.7 MW Agri-PV plant in Rodilhan, France.

How can EU policymakers help the solar sector achieve its targets

For the first time in a decade, the solar market in the European Union is not growing anymore. The implications of this slowdown are profound, jeopardising the bloc's 2030 renewable energy targets and its ambitions on energy security and competitiveness.

Solar energy serves Europe's citizens and businesses effectively but is now increasingly constrained within an outdated and inflexible electricity system. To unlock the full potential of solar, the EU must boost electrification and flexibility, maximising the versatility of solar to serve a broader range of European industries, SMEs, citizens and farmers with the clean and affordable energy they are looking for.

Solar energy is quick to deploy. With the right policy frameworks, the deployment figures can get back on track. But they can just as easily slip further behind if policymakers and regulators fail to act. The following recommendations are designed to address these challenges and allow solar and storage to do what it does best: serving its clients with clean, affordable and reliable energy.

1

Redefine EU energy security around renewable and flexible electrification

The EU's reliance on a constant flow of imported fossil fuels is a core security and economic vulnerability. It must, therefore, treat the energy transition as a security imperative and evolve into an 'electro-continent' which relies on domestically produced clean energy. As EU leaders decide on future defence spending, investments in renewables and electrification, backed up by a robust cyber- and data security architecture, must be eligible to such spending.

The upcoming revision of Europe's energy security legislation, too, is an opportunity to make EU regulation evolve with its energy system. Energy security policies shall no longer incentivise fossil fuel storage or imports. Instead, it should:

1. **Embed indicators for national electrification and flexibility in future Energy Security legislation and National Energy and Climate Plans (NECPs)**. Member States must plan for electrification in line with the EU's electrification goal of 32% of energy consumption by 2030, and consolidate national non-fossil flexibility objectives coming out of the national non-fossil Flexibility Needs Assessments. Unlock the full potential of renewables for grid stability and balancing. Ensuring that solar, batteries, and inverters are allowed to provide flexible power as well as balancing and grid stability services, thereby replacing fossil-powered plants in their traditional roles.

2. **Establish a robust EU cybersecurity framework to protect distributed energy systems**, including strong harmonised standards, strict remote-control limitations for inverters and EU data storage requirements.

3. **Build resilience against economic and climate shocks, by investing in a flexible**, decarbonised renewables-based system that shields citizens from volatile energy prices.

2 Adopt an EU Flexibility Strategy that particularly embraces the opportunity of battery storage

Getting flexibility right is the next frontier for the energy transition. Grid congestion is costing billions annually – 4.3 bn EUR in 2023 according to ACER – and has led to 7,149 hours of negative price hours across Europe in 2024, putting new solar investments at risk. Investment in electricity grids is, therefore, essential but must be complemented by a wider coordinated strategy on flexibility as network charges are already an important component of the electricity bill. Without a coordinated strategy for flexibility, upward pressure on network charges risk undermining the affordability and competitiveness benefits of the transition. The European Parliament shares this assessment and, in its June 2025 Clean Industrial Deal resolution, called on the European Commission to propose a dedicated EU Flexibility Strategy. Such a strategy should include action in three areas as outlined in our recent paper for an EU Flexibility Strategy[1]:

1. **Taking a flexibility-first approach to grid development**, including (a) improving the transparency and governance around grid planning and operations; (b) widely adopting benefit-based (TOTEX) remuneration frameworks for system operators; (c) digitalising grid connection processes including transparent grid hosting maps; and (d) prioritising flexible, system-friendly assets in grid connection queues.

2. **Unlocking the full potential of demand response**, including (a) giving demand side flexibility equal access in electricity markets such as balancing and capacity markets; (b) setting clear and enabling rules for aggregators; (c) empowering consumers to respond to price signals with smart meters and dynamic contracts; and (d) adopting clear and harmonised network codes.

3. **Embracing the opportunity of battery storage with an action plan on BESS deployment, safety, quality and supply chains**, including (a) clarifying permitting rules for standalone and hybrid BESS; (b) ensuring fair and cost-reflective tariffs, finally ending any double charging; (c) rewarding BESS for the full spectrum of services it provides in electricity markets and when providing grid-stability services like inertia, black start and grid-forming; and (d) ensuring non-fossil flexibility support schemes are available. This deployment push needs to be accompanied by a coherent approach to quality, sustainability and resilient supply chains, including: (1) industrial policies that support European production and strategic partnerships in an open trade environment; (2) safety and quality standards that are clear and harmonised across Europe; and (3) circularity policies and waste streams that make full use of the scale of the Single Market.

It is worth fully appreciating the opportunity of BESS for energy system economics and stability. In recent years, costs have fallen, and performance has improved dramatically. According to SolarPower Europe data, in 2024 the EU installed 18.5 GWh of battery storage, bringing the total fleet to 49.1 GWh. In 2025, battery storage installations are expected to grow by almost 40%, reaching 25.7 GWh[2]. By 2029, total capacity is forecast to reach 400 GWh, yet this remains well below the 780 GWh required by 2030 to meet flexibility needs in a renewables-based system[3]. We therefore urge the Commission to develop a dedicated BESS action plan or strategy, similar to the 2022 solar strategy, that spurs deployment of BESS by a factor 10 and provides a coherent approach to safety, quality and supply chain objectives.

1 SolarPower Europe (2025): A Flexibility Strategy for the EU
2 SolarPower Europe (2025): European Market Outlook for Battery Storage 2025-2029
3 SolarPower Europe (2024): Mission Solar 2040

3

Improve permitting procedures

Permitting remains one of the major barriers to solar deployment. According to SolarPower Europe's Permitting State of Play report[4], data shows that in several European countries, permitting delays for solar projects still exceed two years, and in some cases stretch up to four years. These timelines are double the maximum duration allowed under the Renewable Energy Directive (RED III) framework.

Two years into REDIII transposition, Member States are still lagging behind on progress and permitting remains slow. Instead of simplifying permitting processes, many governments have created new layers of complexity and legal uncertainty. Reforms are often poorly enforced, overinterpreted, or remain theoretical – resulting in limited impact on the ground. Meanwhile, the 2022 emergency regulation expired on 30 June 2025, risking legal uncertainty in countries where RED III has not been fully transposed (See Table 1).

Table 1

RED III permitting rules transposition across Member States

Overview of Member State transposition into law of EU permitting rules

	BE (FL)	BE (WA)	BG	CZ	FR	DE	EL	HR	HU	IE	IT	LT	LV	NL	PL	PT	RO	SI	SK	ES	SE	Transposition rate per dimension	Indicative plant scale concerned by the measure
Single contact point and digitalisation																						67%	small-scale + large scale
Deadlines for permit granting																						52%	small, medium + large scale
Acceleration areas																						14%	small-scale + large scale
Overriding public interest																						67%	small, medium + large scale
Simple rules for Repowering																						42%	large scale
Acceleration on artificial structures																						48%	mostly small scale
Positive silence																						43%	small-scale
Simple notification for small-scale PV (for grid)																						67%	small-scale
RES Mapping areas																						33%	small-scale + large scale
Transposition rate per Member State	67%	33%	56%	33%	22%	56%	44%	22%	56%	22%	78%	56%	13%	22%	75%	67%	78%	78%	22%	44%	67%		

Fully transposed | Fully transposed but not effective | Mostly transposed or to be transposed | Mostly not transposed

Not transposed | No information

4 SolarPower Europe (2025): EU Renewable Energy Permitting: State of Play

It is now urgent that:

1. National governments effectively implement RED provisions on the two-year deadlines for permit granting, the digitalization of processes, the establishment of one-stop-shops, and the principle of overriding public interest;

2. The European Commission proactively engages and guarantees proper implementation of Renewable Acceleration Areas (RAAs) by providing clear guidelines and spreading good practices, avoiding any further proliferation of no-go areas as we have seen in several places.

    a In Ireland for example – the designation of acceleration areas has resulted in no-go zones, limiting rather than enabling project development.

    b In France, RAAs were introduced in 2023. However, no concrete measures have been implemented to reduce permitting times or offer associated benefits within these designated areas.

3 The European Commission makes EU funding available for Member States to build up the necessary skilled staff and resources for national and local permitting authorities.

In addition, we call on the European Commission to support national governments in streamlining permitting for innovative solar technologies like agrisolar and floating solar. Agrisolar, a combination of agricultural activities with solar PV production, offers multiple benefits, including additional income for farmers, enhance crop resilience, enable dual use of land and improve water and soil efficiency. However, Member States have been too slow integrating such inter-disciplinary policy domains and developing dedicated policy frameworks. Therefore, it is the European Commission's role to support Member States in unlocking the full potential of agrisolar across the continent by:

1. Developing an EU-wide definition and supporting Member States in defining agrisolar at the national level.

2. Clarifying the definition of eligible agricultural areas to facilitate the development of agrisolar projects in the upcoming Common Agriculture Policy (CAP).

3. Introducing specific eco-schemes for agrisolar under the CAP and recognising the integration of agrisolar into nature restoration and carbon farming schemes.

4

Boost the rooftop solar market

Rooftop solar is a cornerstone for public acceptance for the energy transition, allowing citizens and SMEs to hedge against volatile energy prices and empowering local actors to maximise self-consumption while also relieving pressure on grids as more energy services electrify. Policymakers, therefore, need to urgently turn around the rooftop market's downward spiral, especially in the residential segment. In many cases – in Italy, Germany, the Netherlands, and Hungary – the sudden end of support policies that incentivise grid injection have left citizens in limbo and uncertainty. Member States should move to support schemes that incentivise self-consumption and include behind-the-meter storage assets to ensure proper grid integration.

At the EU level, the European Commission holds important levers to make sure the rooftop solar markets thrive again:

1. Actively support the implementation of the rooftop standard in the Energy Performance of Buildings Directive (EPBD) and the energy sharing provisions in the Electricity Market Design (EMD). Activating those two levers together can boost the market again by allowing public and commercial rooftop owners to share the electricity with nearby residential consumers that have complementary demand profiles.

2. The EU should advance with the implementation of ETS2. European countries must design price signals that incentivise citizens to replace fossil fuels with clean technologies for heating and mobility. The Social Climate Fund should be leveraged to support rooftop solar and flexibility measures in buildings, ensuring that the benefits of clean energy are accessible to all. The ETS2 should drive real behavioural change without eroding Europe's capacity to produce and recycle strategic homegrown raw materials important to solar such as aluminium.

3. Targeted Multiannual Financial Framework (MFF) budgets should be secured for the post-2028 period to sustain momentum and drive further adoption. It will be key to give further clarity on the possibility to leverage Cohesion and Competitiveness funds for making our buildings future-proof.

5 Make solar system supply chains more sustainable, resilient, and European

Parts of the solar PV supply chains are currently highly concentrated outside of Europe. The EU should step up and take a proactive approach to building resilient and sustainable solar module, equipment and inverter supply chains.

Diversification is essential for supply chain security. Global trends are moving in the right direction; in the last years, more than 400 GW of module manufacturing capacity have been announced outside of China to be operational by 2030 . This effort will be further strengthened as the Net-Zero Industry Act (NZIA) comes into effect at Member State level and as the EU advances with a broad portfolio of free trade agreements with global partners.

Complementing this with an EU preference or 'made-in-Europe' policy for solar components is important, but must be done in a measured and harmonised way, applied in Public Procurement frameworks as a bonus on top of diversification mandates. A clear, simple definition of EU preference based on the production location, and a clear verification scheme are essential to avoid bureaucratic complexities and a fragmented application across Europe.

In addition, the EU must complement the demand pull of the Net-Zero Industry Act with a dedicated financing push. We call for a Solar Manufacturing Facility , similar to the Battery Booster, with production-linked incentives based on CAPEX and OPEX. The EU cannot solely rely on a demand-pull strategy, supply-side financing measures are equally important.

Policymakers must avoid conflating sustainability policies like carbon footprint methodologies with industrial policy, as this can lead to unintended consequences in the private renewables procurement market and would disincentivise private companies' efforts to reduce scope 2 emissions. A targeted industrial approach will ensure that the EU remains competitive, resilient, and at the forefront of clean energy innovation.

Resilience is also about circularity. Policymakers should act to harmonise circularity and end-of-life management policies for solar PV and battery technologies across Member States. Creating a single European market for waste is necessary to ensure efficient and affordable recycling, enable the recovery of strategic and critical raw materials and provide the possibilities for secondary raw materials to be made available for European manufacturers.

5 SolarPower Europe (2025): Reshoring Solar Manufacturing to Europe
6 SolarPower Europe (2024): The EU Solar Manufacturing Facility

EU Solar Market 2025

For the first time in a decade, the EU solar market will experience a decline in 2025, with a 0.7% contraction in annual capacity additions. The decrease is caused by worsened conditions for the solar business case, including declining solar capture rates, lack of system flexibility, and a challenging price landscape. At the same time, solar PV generation in the EU reached new heights in 2025, with an expected 13% penetration share, while total solar capacity has crossed the 2025 EU target of 400 GW. In the Watt per capita dimension, 10 EU countries now operate more than 1 kW per inhabitant.

1.1 Annual solar PV market 2025

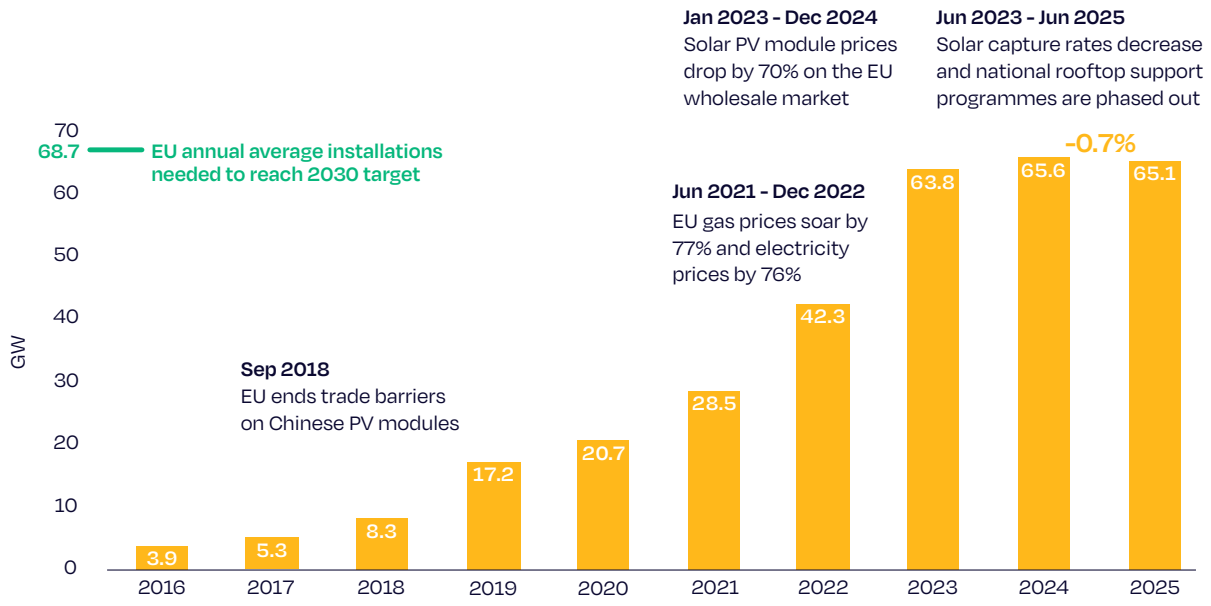
The EU's decade-long solar boom reaches its turning point as 2025 marks the first market contraction since the mid-2010s

After a period of unprecedented growth, the EU solar market is poised to take a small step back in 2025.[7] The bloc is set to install 65.1 GW of new solar PV capacity, marking the first annual decrease in market size in a decade (Fig. 6). Following years of extraordinary expansion, +38% in 2021, +48% in 2022, and +51% in 2023, growth had already slowed sharply in 2024, when installations rose only 2.8% to 65.6 GW. In 2025, the market is expected to shrink by 0.7%, confirming that the EU solar boom is under pressure.

Figure 6

For the first time in a decade, the EU solar market declines

EU annual solar PV installed capacity 2015-2025



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7 Throughout this report, 2025 figures are estimated based on latest available data at the time of publication.

Several factors underpin this slowdown. The effect of the energy price crisis that drove record deployment between 2021 and 2023 has somewhat faded – at least in the eyes of EU citizens. Between 2021 and 2022, natural gas prices (excluding taxes and levies) had surged by 77% and electricity prices by 76%[8]. By the first half of 2025 these prices dropped by 16% and 12% respectively, however, gas prices are still 80% higher today than they were in the first half of 2021. Additionally, higher taxes and levies on electricity, compared to fossil combustion, have watered down price signals. As the sense of urgency that had pushed citizens, companies and governments toward solar decreased, so did the national support schemes within key solar markets.

On the utility-scale side, the pipeline of renewable auctions, an expanding corporate PPA market, and the completion of pre-contracted merchant projects have, until now, partly offset the rooftop slump. However, growth in this segment remains constrained by grid congestion, a quickly growing number of negative power price events resulting in record-low solar capture prices, and lingering policy uncertainty, which together weigh on project bankability.

Compared to last year's report forecast of 70 GW, the realised 2025 outcome falls short by 7%, mainly due to a steeper-than-expected decline in residential and commercial rooftop demand across several leading markets. This underlines the high elasticity of distributed solar to shifts in economic and policy conditions. The contraction should be seen as a worrying warning sign for policymakers: failure to swiftly address the root causes of this market decline threatens to derail progress toward the EU 2030 solar target and seriously risks undermining EU decarbonisation, competitiveness, and energy security ambitions.

3 MW Agri-PV plant in Cruscades, France.

8 Eurostat (2025): Energy statistics – prices of natural gas and electricity

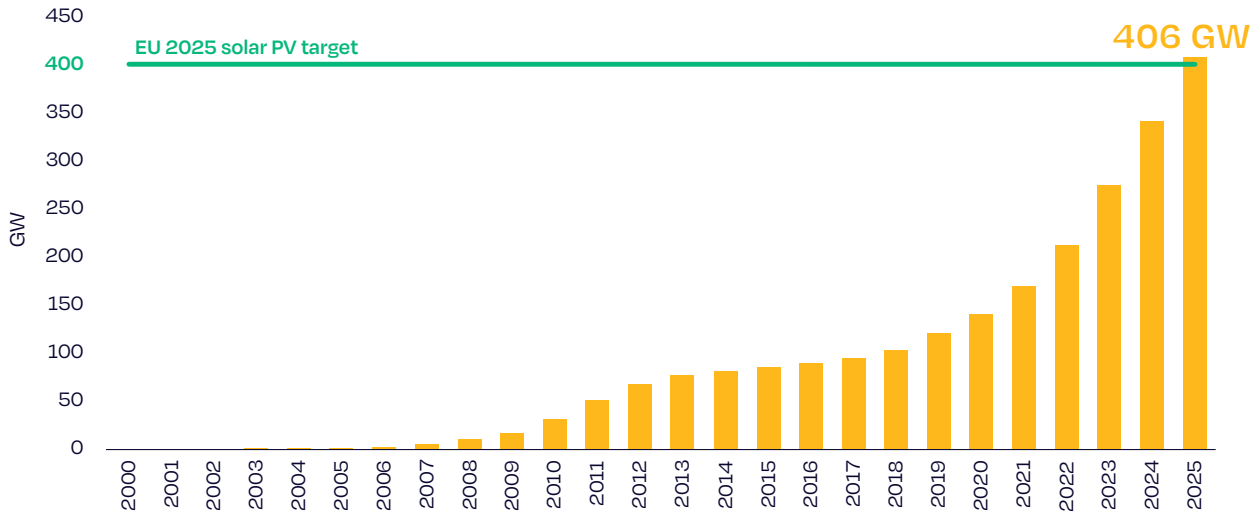
EU total solar capacity rises to 406 GW, hitting the EU 2025 benchmark

By the end of 2025, the EU is expected to reach 406 GW of installed solar PV capacity, placing the bloc 1.6% above its 400 GW solar milestone for 2025 (Fig. 7). This marks another significant step in EU solar expansion: cumulative capacity is now about five times higher than a decade ago, when only 86 GW was installed in 2015, and almost triple the 2020 level of 141 GW.

Figure 7

The EU reaches its 2025 solar target

EU-27 cumulative solar PV capacity 2000-2025



The distribution of installations continues to broaden across the continent. The top five markets, representing 66% of the EU population, are set to account for 68% of all solar capacity in 2025, or 278 GW. This share has steadily declined over the last decade, falling below 80% for the first time in 2021, reflecting the growing contribution of growing markets. In 2024, the share of the EU's top five markets stood at 69%, and in 2023 at 71%, confirming a clear though slowing diversification trend.

A similar pattern appears within the top ten markets, which together hold 86% of EU operating capacity in 2025, or 348 GW. Their dominance has gradually eased from the ~90% level seen in 2015-2017 to below 90% from 2023 onwards. The remaining 17 markets account for 58 GW at the end of 2025, less capacity than Germany alone (119 GW), but already exceeding the installations of the second-largest market, Spain (55 GW).

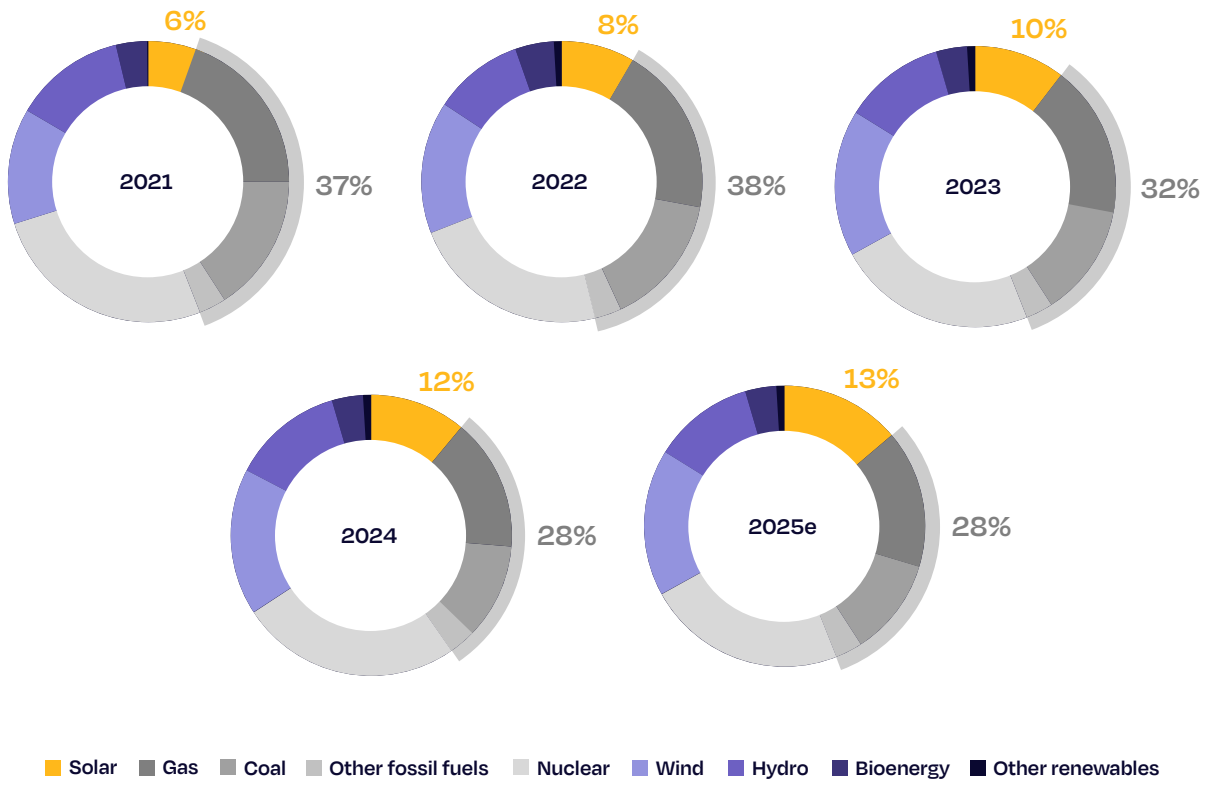
Solar to supply an all-time high of over 13% of EU electricity in 2025

Solar power is expected to supply 13.4% of the EU's electricity in 2025, up from 11.6% in 2024 and 9.7% in 2023[8] (Fig. 8). This marks a doubling of solar's electricity share since 2021, when it provided just 5.8%, reflecting sustained capacity additions and solar's strengthening position within the EU power system.

Figure 8

Solar's EU electricity share doubled in the last 4 years, crossing 13% in 2025

EU-27 share of electricity generation per source 2021-2025



© SolarPower Europe. Source: Ember data based on ENTSO-E, Eurostat, Energie-Control (E-Control), Energy-Charts, Agora Energiewende, Sustainable Energy Authority of Ireland (SEAI), Terna, Augstsprieguma Tikls AS (AST), Energie Opwek, NetAnders, Statistics Netherlands (CBS), Spanish System Operator Information System (eSIOS)

8 SolarPower Europe forecast based on data from Ember Electricity Data Explorer, built on data from ENTSO-E, Eurostat, Energie-Control (E-Control), Energy-Charts, Agora Energiewende, Sustainable Energy Authority of Ireland (SEAI), Terna, Augstsprieguma Tikls AS (AST), Statistics Netherlands (CBS), Nationaal Energie Dashboard (NED), Instrat, Spanish System Operator Information System (eSIOS).

This rise has taken place in an electricity system where total generation has remained broadly stable, fluctuating in a narrow range of 2,700-2,875 TWh annually between 2021 and 2024. Power generation in 2025 is expected to remain similar, with 2,157 TWh produced by end of October. In such a nearly flat-demand environment, the increase in renewable generation has translated directly into displacement of fossil fuels. Between 2021 and 2024, the share of gas fell from 19.0% to 15.3%, while coal declined sharply from 14.7% to 9.9%.

The principal drivers of this fossil phaseout are solar and wind. Together, these two technologies have supplied nearly all of the additional renewable electricity that has replaced coal and gas over the past decade. For the first time in June 2025, solar provided more EU power than any other technology for an entire month, though, when we look at the full year, wind remains largest EU renewable generator, rising from 13.9% in 2021 to above 18% expected in 2025. Solar continues to accelerate as the fastest-growing clean electricity source, rising from 5.8% to over 13% in 2025. Both wind and solar combined are projected to deliver over 30% of the EU's power generation this year, more than all fossil fuels combined at around 28%.

A longer-term view highlights the scale of the transformation. It took six years to cut 5 percentage points from coal and gas generation; from 39% in 2015 to 34% in 2021. Four years later, the level is expected to go 8 percentage points lower to below 26%, driven overwhelmingly by the expansion of wind and solar. This demonstrates the speed of renewables adoption, even in spite of stagnating electrification rates.

44 MW solar park in Las Rozas, Seville, Spain.

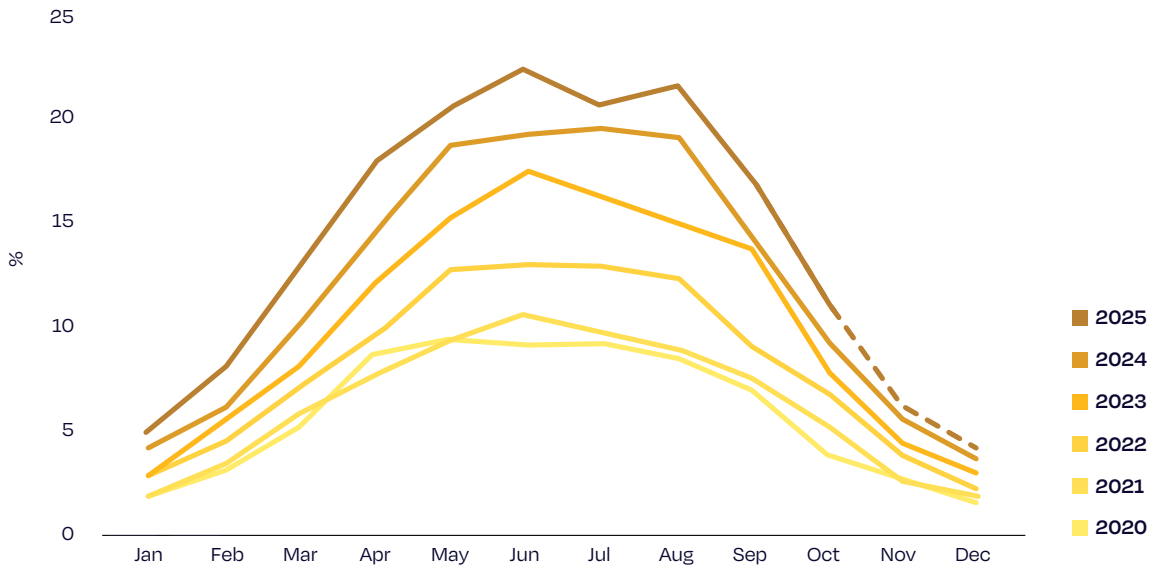
Solar faces an uphill battle when aiming at capturing higher shares of electricity generation in winter months. EU electricity demand is highest in winter, when solar irradiation is lowest. In December-January EU electricity demand typically ranges between 240 and 260 TWh, which is around 20-30% higher than mid-summer demand and 10-20% higher than spring and autumn levels. Monthly electricity demand, which has been generally stable over the last few years, has followed a highly similar path by October 2025. Electricity demand, as part of the overall energy demand, has remained stagnant at 23% over recent years. This means that the rise in solar's monthly shares primarily reflects capacity-driven growth rather than major shifts in demand so far.

Increasing the granularity to a monthly level, solar electricity generation is expected to have reached new highs in every single month of 2025 (Fig. 9). The strongest gains appear in the spring months, which remain the fastest-growing part of the curve. While solar's share is also growing in the winter even though the absolute share is still low at about 5%, as of March its contribution is set to grow significantly. Solar generation in March has more than doubled compared to five years ago, while both April and May have roughly tripled, marking a substantial uplift in the early-season profile. This means solar is pushing fossil generation out of the system earlier in the year than ever before.

Figure 9

2025 EU solar power generation reaches new heights

EU-27 solar PV monthly share of electricity generation 2020-2025



Oct-Dec extrapolation based on historical solar share.

 Source: Ember data based on ENTSO-E, Eurostat, Energie-Control (E-Control), Energy-Charts, Agora Energiewende, Sustainable Energy Authority of Ireland (SEAI), Terna, Augstsprieguma Tikls AS (AST), Energie Opwek, NetAnders, Statistics Netherlands (CBS), Spanish System Operator Information System (eSIOS)

During summer, when irradiance reaches its annual peak across Europe and grid congestion plays an increasingly important role, solar still manages to set new records. Even in this highly constrained period, June, July, and August 2025 have all generated more solar electricity than in 2024, with mid-summer output now two to three times higher than in 2020.

Solar output is also rising steadily in autumn, effectively extending the solar season. September has nearly doubled since 2020, while October has almost tripled, confirming that solar is now making a meaningful contribution well beyond the traditional summer window and reducing fossil reliance deeper into the year.

Even in the darkest winter months, where electricity demand sits at its peak, solar shows notable progress. In January, solar covered over 4.5% of all electricity demand, which is nearly three times higher than in 2020.

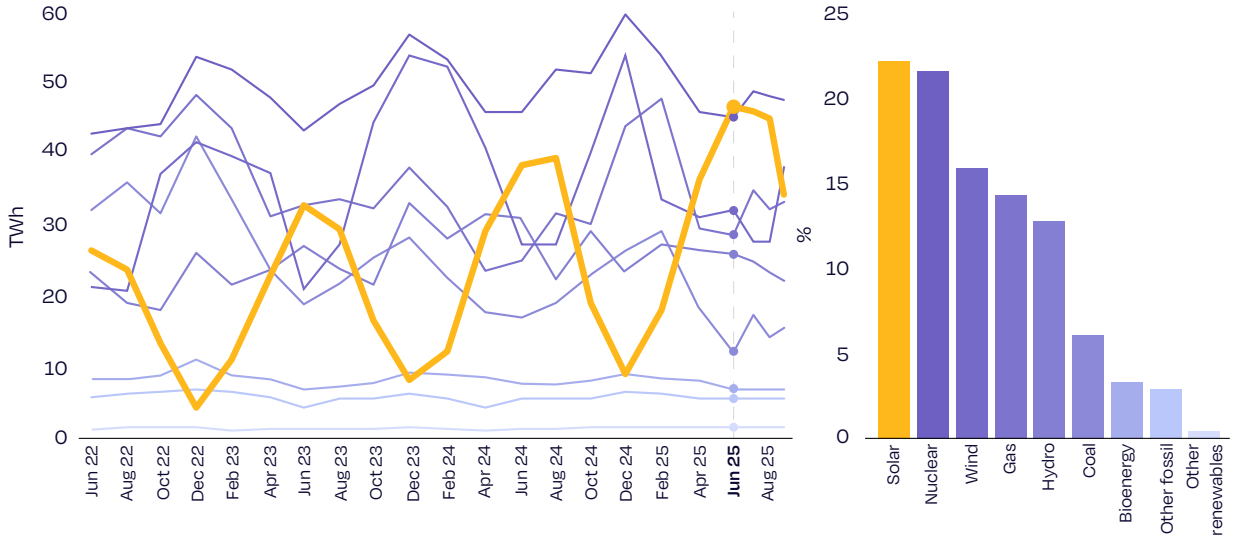
3 MW Agri-PV plant in Cruscades, France.

Overall, the seasonal shape of the solar generation curve remains familiar – but the entire curve is lifting sharply upward year after year. Figure 10 shows this behaviour over 2022-2025 compared to other electricity sources. Most notably, in June for the first time ever, solar outperformed all other generation sources in the EU, delivering over 47 TWh in one month (equal to a 22% market share), exceeding nuclear generation at 45 TWh (21.6%), and pushing gas and coal combined down to just 40 TWh. In Q2 2025, renewables reached a 54% share in the EU power generation mix, mostly due to solar contributing 19.9% of the total.

Figure 10

For the first time, solar outshined all other EU electricity sources in June 2025

EU-27 monthly electricity generation per source 2022-2025 (left) and snapshot of June 2025 (right)



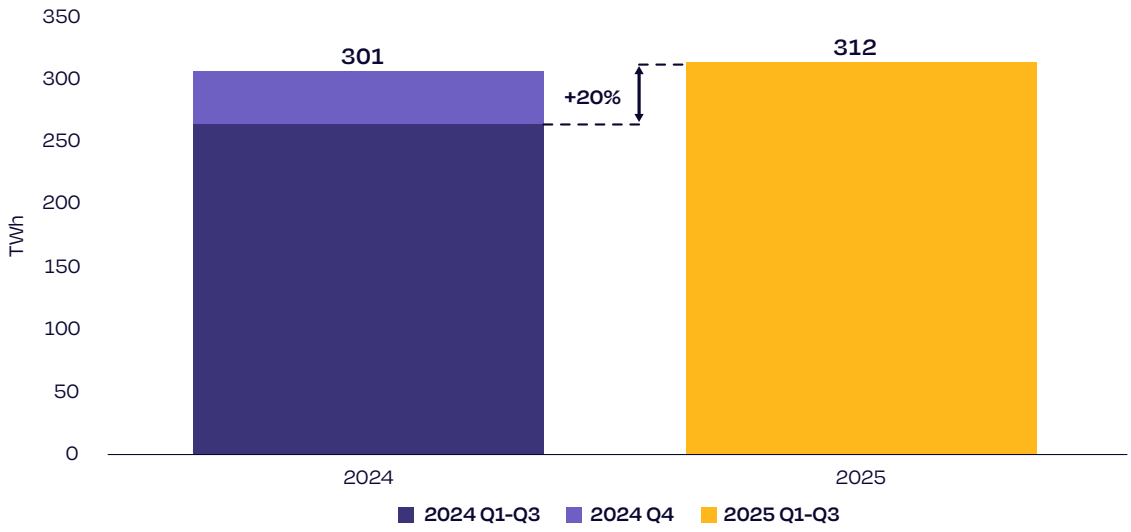
 Source: Ember data based on ENTSO-E, Eurostat, Energie-Control (E-Control), Energy-Charts, Agora Energiewende, Sustainable Energy Authority of Ireland (SEAI), Terna, Augstsprieguma Tikls AS (AST), Energie Opwek, NetAnders, Statistics Netherlands (CBS), Spanish System Operator Information System (eSIOS)

Looking at total solar power generation for 2025, the speed at which solar is taking a more prominent role is becoming more and more visible. Over the first 9 months of 2025, solar already generated more than in the entirety of 2024 (Fig. 11). In total, 312 TWh were generated by end of September 2025, compared to 259 TWh over the same period last year – that's 20% more zero-marginal cost solar electricity.

Figure 11

In the first nine months of 2025, solar generated more power than all of 2024 combined

EU-27 solar PV electricity generation 2024 - Sep 2025



© SolarPower Europe. Source: Ember data based on ENTSO-E, Eurostat, Energie-Control (E-Control), Energy-Charts, Agora Energiewende, Sustainable Energy Authority of Ireland (SEAI), Terna, Augstsprieguma Tikls AS (AST), Energie Opwek, NetAnders, Statistics Netherlands (CBS), Spanish System Operator Information System (eSIOS)

Declining solar capture rates, battery storage penetration, shift towards auctions and enduring low module prices among key factors affecting the solar business case in 2025

In this section, we assess the solar business case in 2025 through four factors that together bring a clear picture of today's market conditions: capture rates, battery storage deployment, PPAs and auctions, and solar module prices. Each of these influences project revenues and investment certainty in a different way, and together they offer a glimpse into the evolution of the economic environment for solar, particularly for utility-scale installations.

In contrast to the record solar market share in the EU's electricity mix, solar capture rates plummeted to record depths in 2025. The monthly capture rate shows the ratio to which solar electricity is compared to the average electricity price during that month. For example, in sunny months when solar electricity is available in abundance, the power price drops, reducing solar electricity's value. While this is a positive development for electricity consumers during that time, it reduces the business case for standalone solar installations.

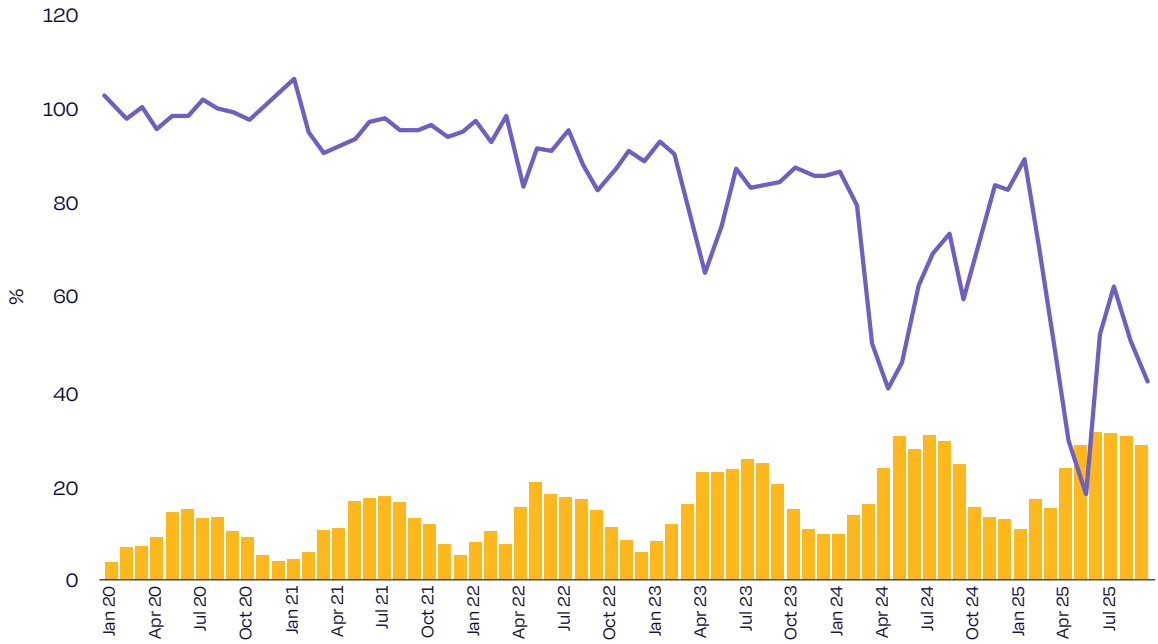
15 MW Agri-PV plant in Adorf, Germany, using Trinasolar PV modules.

Across both leading solar markets, Germany and Spain, the data from 2020 to 2025 shows a clear and accelerating relationship between rising solar penetration and declining capture rates, the so-called cannibalisation effect (Fig. 12). Between January and September 2025, solar reached an average monthly penetration share of 21% in Germany and 22% in Spain, each around two percentage points higher than the same period in 2024, according to Rystad Energy data.

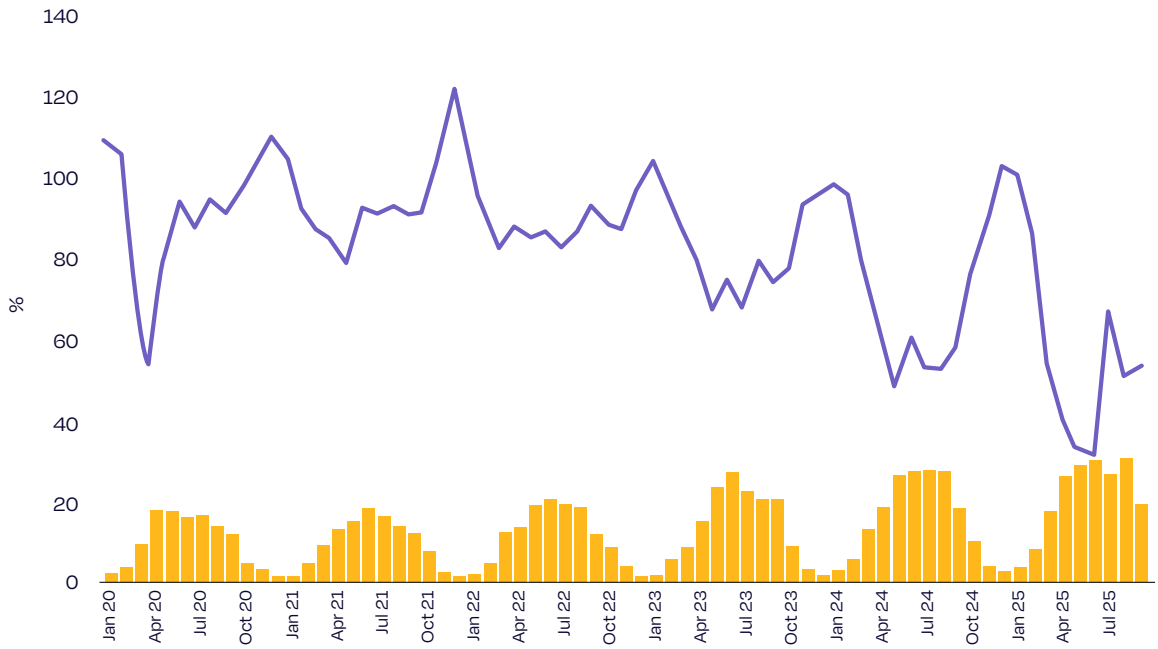
Figure 12

After record low capture rates in June, solar electricity value rebounded strongly in July

Monthly solar PV capture rates and generation share in **Spain** 2020 - Sep 2025



Monthly solar PV capture rates and generation share in **Germany** 2020 - Sep 2025



Solar capture rate: the weighted average price a solar plant receives for its electricity compared to the overall average electricity price.
 Source: Rystad Energy European Renewables & Power Solutions

Yet this relatively modest increase in share translated into a disproportionately large decline in value: average solar capture rates dropped to 58% in Germany and 52% in Spain, down from 67% and 63% respectively the year before. As solar increasingly becomes the dominant energy source during sunny hours in the spring and summer months, the wholesale prices are significantly lower during these times. The steeper decline over April and May shows this dynamic the clearest. In Germany, capture rates went from above 50% in March to nearly 33% in May. In Spain, the decline was even steeper, from 49% in March to 18% in May.

Both countries registered a sudden solar capture rate rebound in July, a pattern that is atypical when compared with historical seasonal behaviour. In Germany, the capture rate jumped from 33% in May to 68% in July, while in Spain it soared from 18% to 63% over the same period. This surge was driven by a phenomenon some in the industry have dubbed the 'Hitzeflaute' (a German blend of 'Hitze', heat, and 'Flaute', lull). In contrast to the well-known Dunkelflaute – a cold, windless winter period in which renewables struggle to meet demand without flexibility or storage – the Hitzeflaute describes a stretch of intense, windless summer heat. During this event, air conditioning demand rose sharply, the warming of cooling-water sources constrained nuclear output, and wind generation remained low. Solar stepped in during these conditions and delivered disproportionately high system value.

This episode underlines two key points. First, solar's growing importance not just in mitigating climate change, but in sustaining power-system resilience under increasingly extreme weather, especially in the summer months. Second, the potential for solar to capture significantly higher market value when demand and supply conditions shift – whether through flexibility, scarcity, or involuntary reductions in other generation such as wind and nuclear.

The Hitzeflaute event illustrates a broader point: flexibility is central to enhancing the solar business case. For rooftop solar, households and businesses can shift part of their electricity use to sunny hours, increasing self-consumption and substantially reducing their energy bills. A similar logic applies at the system level, where flexibility determines whether solar electricity retains its value as solar's share in the power mix increases.

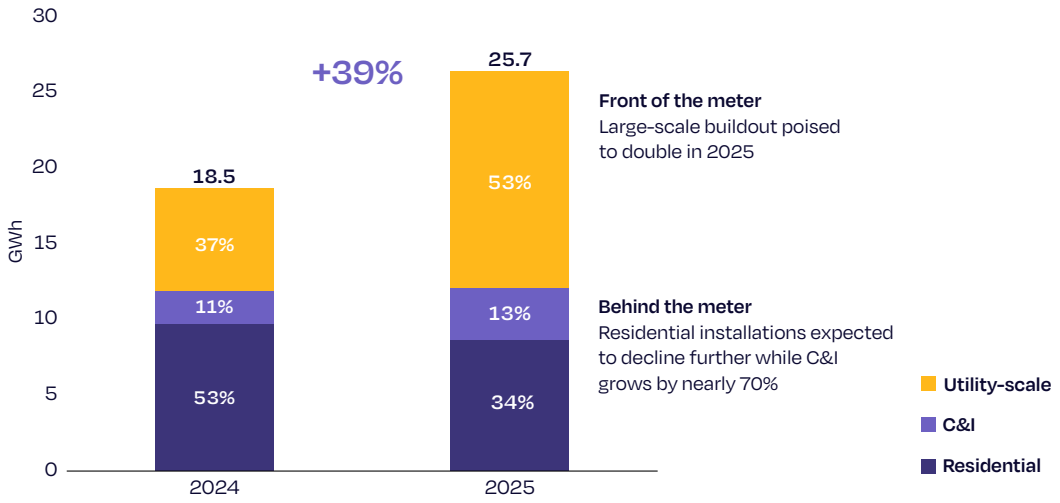
10 MW solar park in Chamorro, Spain.

One of the clearest signals of today's non-optimised solar business case in the EU is the rapid diffusion of solar-plus-storage configurations and, more broadly, the surge in standalone storage deployment. As merchant revenues for utility-scale PV have fallen with declining capture rates, developers across Europe are increasingly hybridising large solar parks with batteries to hedge their exposure and stabilise revenue streams if policy frameworks allow. At the same time, rooftop solar is increasingly installed in conjunction with battery storage systems – in the most mature EU markets battery attachment rates are above 70%. According to SolarPower Europe's modelling from the European Market Outlook for Battery Storage 2025-2029, BESS installations in the EU-27 are expected to increase 39% in 2025 (Fig. 13). However, there is a high upwards potential, with growth raising over 100% in the High Scenario (see more information on BESS and flexibility at p. 83 and 86).

Figure 13

EU annual battery market is expanding rapidly in 2025, driven by utility-scale installations

EU-27 annual BESS installed capacity per segment 2024-2025



Alongside storage, developers are increasingly looking at structured routes to market, namely power purchase agreements (PPAs) and auctions, to secure stable revenues for utility-scale projects. The decline in merchant solar value shown earlier has made predictable income streams far more important for bankability, and both auctions and PPAs continue to play a central role in providing that stability.

By the end of October 2025, solar capacity awarded through national auction schemes stood at 20 GW, already exceeding the 2024 full-year total. As more auctions are scheduled before year end, 2025 is on track to set a new record for awarded capacity (Fig. 14).

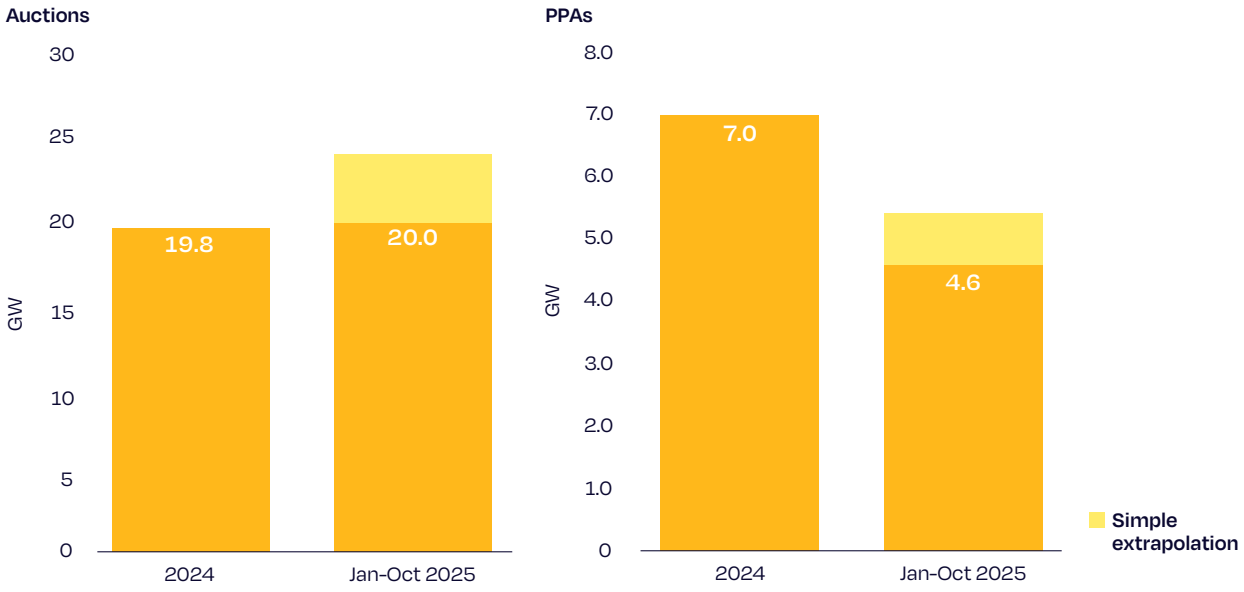
On the other hand, PPAs are being signed less often this year, mostly due to a mismatch between sellers' eagerness to lock in power prices for ensured future revenues and buyers' hesitancy to lock in prices in today's low and negative price environment. By October 2025, only 4.6 GW in contracts were signed. At this pace, 2025 PPA contracts would cover over 20% less solar capacity than last year.

Both routes to market, auctions and PPAs, are further discussed at p. 80.

Figure 14

Stronger reliance on solar auctions in 2025 as PPA solar contracted volumes shrink

EU-27 annual solar PV capacity awarded in auctions and contracted in PPAs 2024-2025



The record pace of solar PV deployment is closely linked to its improved product cost competitiveness. Over the past three years, a major shift in PV component prices – particularly for PV modules, inverters, and batteries – has cemented solar's role as the most cost-competitive and easily scalable source of electricity generation worldwide.

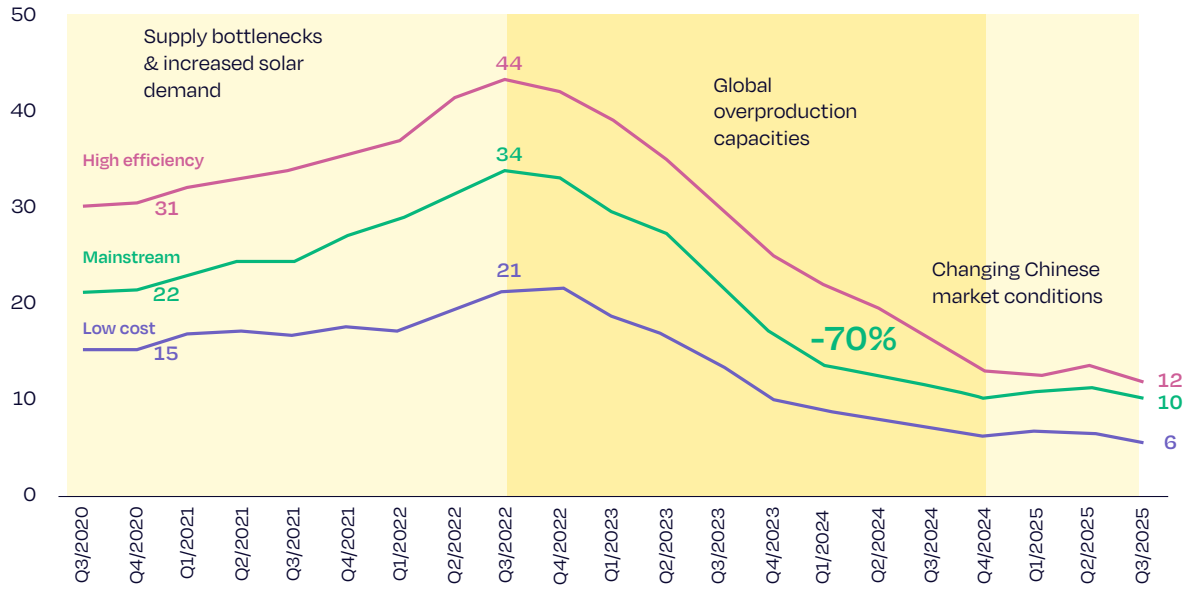
PV modules in particular have reached extremely competitive prices in recent times. After rising to a record peak of 34 EUR cents per Watt at the end of 2022 due to supply bottlenecks and an unprecedented surge in demand, mainstream PV module prices in the EU fell sharply in the last few years as new production capacities came online worldwide. The resulting supply glut – accentuated by rapid technological improvements and intense competition in China – pushed prices down by more than 70%, reaching around 10 EUR c/W for mainstream modules.

In 2025, despite continued overcapacities, prices for silicon and wafers increased notably following government interventions in China. This concerted effort in the upstream industry, however, has had no effect on module prices yet – both in China and Europe module prices have remained mostly stable at near record-low levels (see Fig. 15). A brief and insignificant module price increase in Europe in Q2, driven by a shift in solar market design in China that lead to a gigantic demand spike in the world's largest market – and resulting in over 120 GW of installations in May alone, has been followed by another price decrease. Module wholesale prices in Europe are again in the 10 EUR c/W range for mainstream modules in Q3 2025 after Chinese demand had dropped to monthly levels under 10 GW in the summer. While some analysts believe module prices won't go up anytime soon due to decreasing demand in China and continued overcapacity, some anticipate price increases due to consolidation effects and further government interventions in the coming months.

Figure 15

Solar module price stabilises in 2025 after two years of freefall

EU-27 average quarterly wholesale solar PV module prices 2020-2025



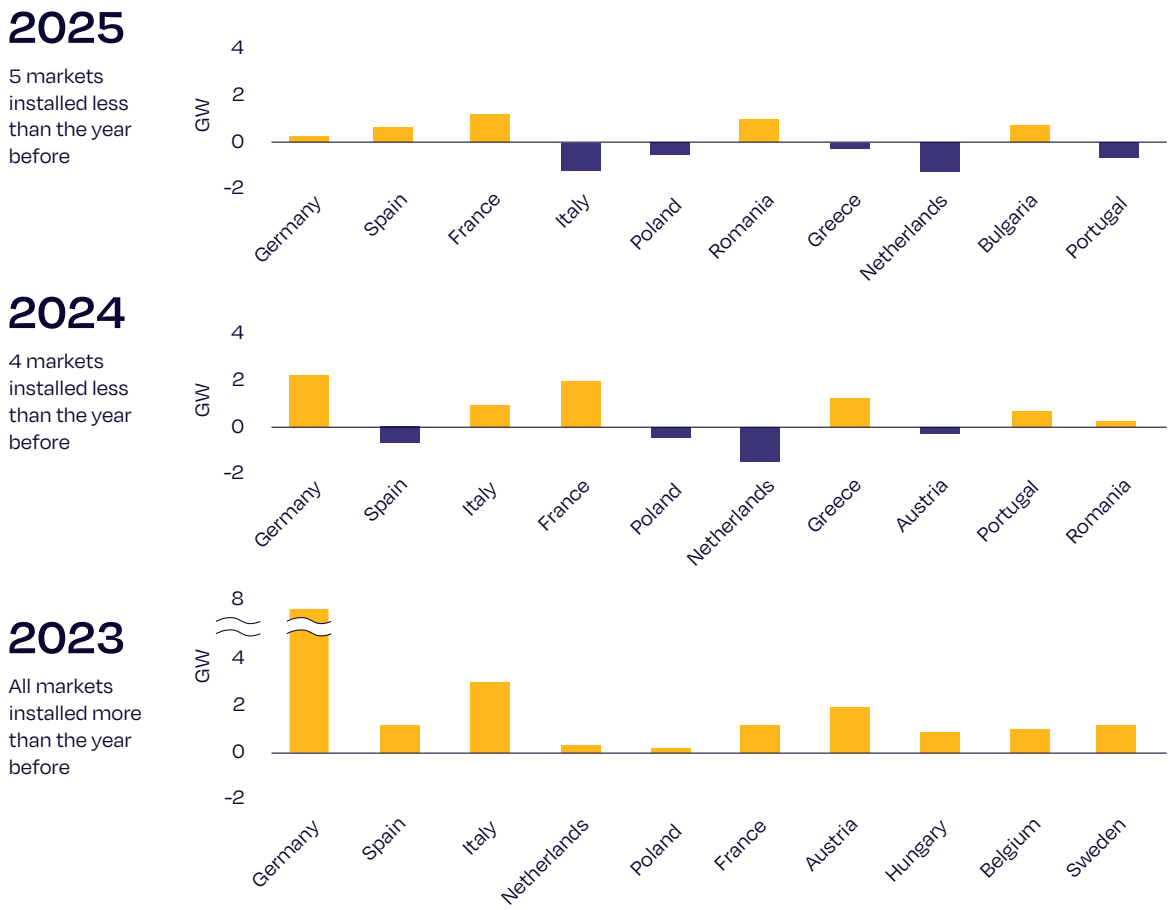
Five of the top 10 EU solar markets installed less in 2025 than 2024

Following the exceptional growth peak recorded in 2023, when all top 10 EU solar markets showed a net increase in installed capacity, the landscape in 2024 and 2025 shows a clear normalisation (Fig. 16). In 2024, four of the ten leading markets already posted lower additions than in the previous year, and this trend has intensified in 2025, with five of the top 10 countries installing less capacity than in 2024. Beyond the number of declining markets, the magnitude of changes has also progressively softened: the double-digit GW surges seen in 2023 give way to more moderate increases or outright contractions in both 2024 and 2025. Today, the EU market has, more than ever, shifted from expansion across all segments toward country- and segment-specific growth.

Figure 16

More and more top EU solar markets see slowdown

Net change in newly installed solar PV capacity, EU-27 top 10 markets 2023-2025



Germany remains Europe's largest solar market by a wide margin, but the drivers behind its growth have changed significantly over the past three years. The exceptional market increase in 2023 (7.8 GW more than the year before) was primarily driven by rapid expansion of the residential and commercial rooftop market. Since then, rooftop additions have slowed substantially (except for very small plug-in do-it-yourself installations that have boomed, see Box 2 p. 49). Instead, growth in both 2024 and 2025 has been carried by utility-scale solar, where Germany's strengthened auction framework and supportive policy environment have kept the deployment growing strong. In 2025, however, the declining rooftop segment nearly offsets the utility-scale gains, resulting in only marginal net growth compared to 2024.

In **Spain**, the slight contraction observed in 2024 (-0.9 GW) reflects a temporary cooling in the rooftop and industrial segments, which had been expanding rapidly in previous years. By 2025, these declines are partially reversed (+0.4 GW) driven by growth in the utility-scale segment.

A notable dynamic in 2025 is the reshuffling between **France** (+1.0 GW) and **Italy** (-1.0 GW), with France overtaking Italy as the third largest EU solar market. France's growth is supported above all by a strong expansion of the commercial segment, complemented by a steadily rising utility-scale pipeline that has boosted volumes in both 2024 and 2025. Italy, meanwhile, shows the opposite pattern: while its utility-scale market has more than doubled since 2023, rooftop additions have weakened sharply. The phaseout of the Superbonus support scheme has significantly reduced residential and commercial momentum, while the largest utility-scale projects have been struggling with grid congestion, administrative procedures and local opposition challenges in 2025.

In **Poland**, total additions have declined for a second consecutive year, driven mainly by a slowdown in the residential and small-commercial segments. The surge in household PV that characterised earlier years driven by the net-metering support scheme has normalised as the scheme was phased out. Today, the 'My Electricity' support scheme is backed by record funding, but the rooftop segment is stabilising at roughly half of its 2023 level. As a result, the overall market has edged down, even as the country remains solidly in the top 5.

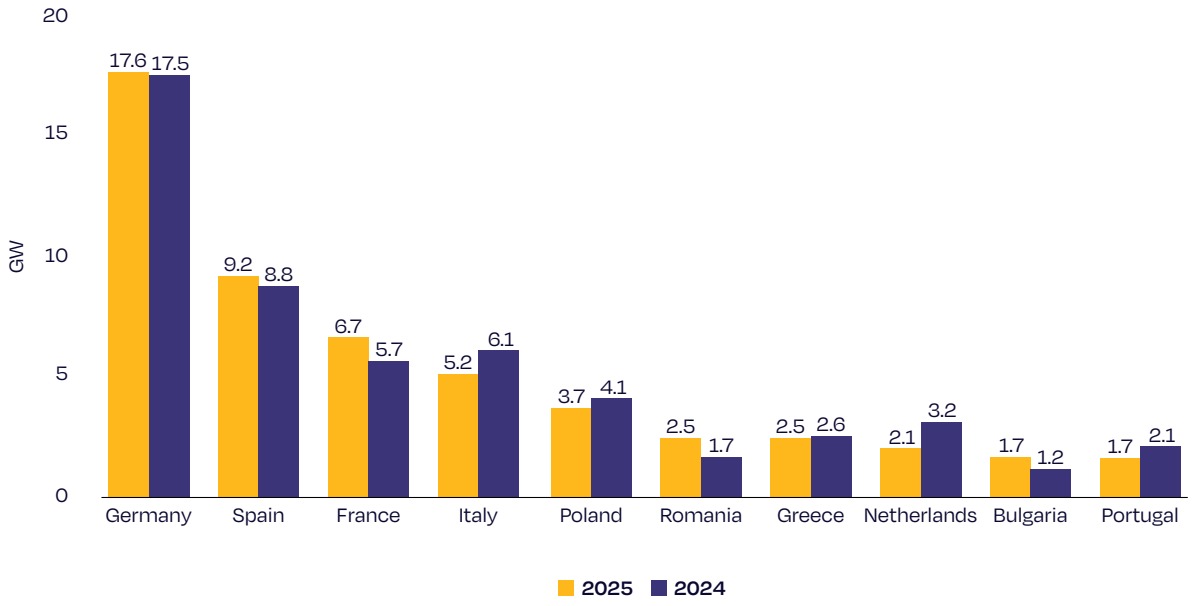
The steepest contraction among major markets occurs in the **Netherlands** (-1.1 GW), a rooftop-heavy market strongly exposed to the phase-out of the net-metering scheme. Residential additions in 2025 fall to less than one-third of their 2023 level, with policy uncertainty and a weaker business case already dampening demand well ahead of the scheme's official end in 2027. This decline moves the Netherlands from 4th place in 2023 to 8th in 2025, representing the largest ranking drop within the top 10.

Beyond the dynamics in the largest EU markets, the shifts occurring among the mid-sized markets also reshape the composition of the top 10 in 2025. Two developments stand out most clearly. First is the continued rise of **Romania**, which entered the top 10 for the first time in 2024 and consolidates its position this year with another strong expansion. The country adds 2.5 GW in 2025, up from 1.7 GW in 2024, marking a 45% year-on-year increase – the fastest growth rate among all of 2025's top 10 markets (Fig. 17). Romania's relatively stable rooftop and rapidly developing utility-scale market, driven by a strong policy framework, fast permitting times, soaring BESS deployment, an emerging PPA market and CfD tenders. This allowed the market to overtake **Greece**, which faces a decline in its rooftop segment as the net-metering scheme is phased out and the net-billing scheme faces implementation delays. In **Portugal**, the utility-scale market falls below the GW scale due to delays in developing pipeline projects. Both Greece and Portugal have a large project pipeline, though many of these projects could be considered speculative and are awaiting a better investment environment.

Figure 17

France enters the top 3 EU solar markets, switching places with Italy

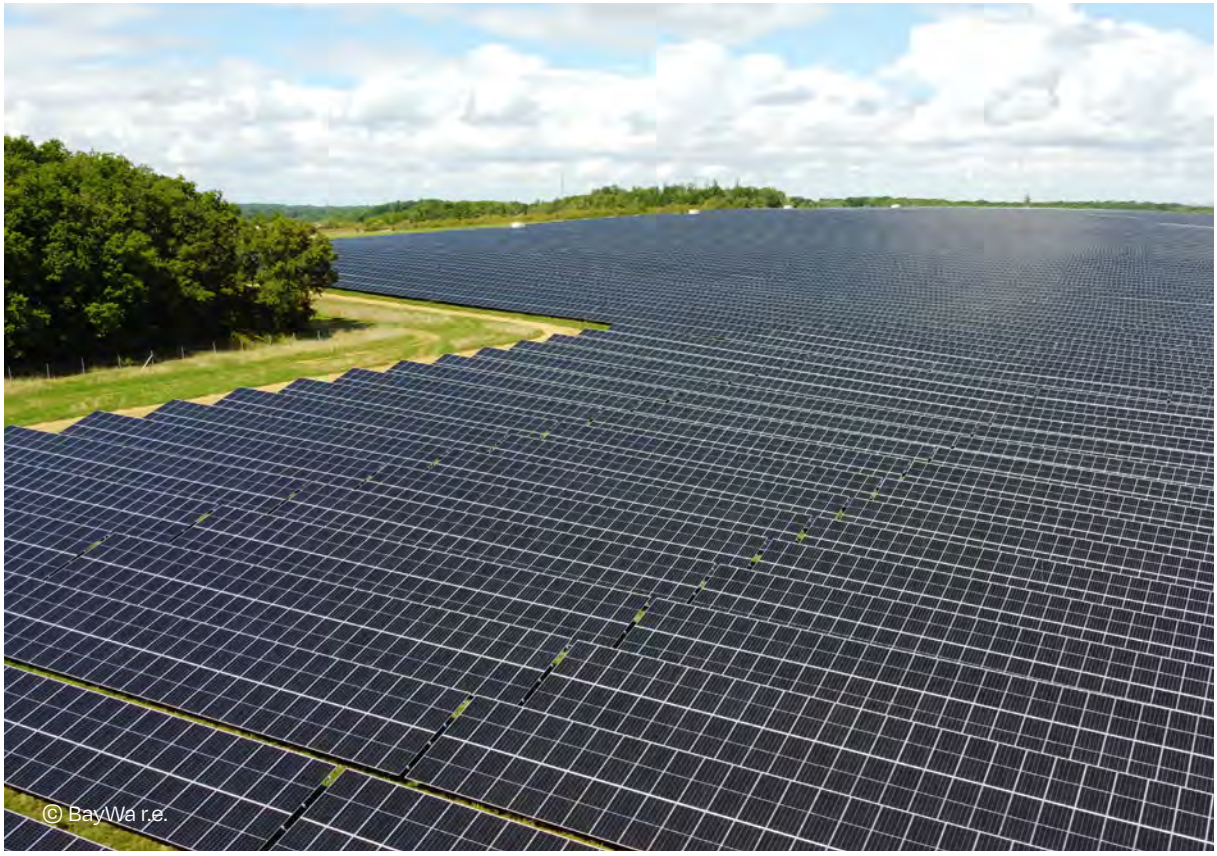
EU-27 top 10 annual solar PV additions 2024-2025



© SolarPower Europe. The graph displays the EU-27 top 10 markets by annual PV capacity additions in 2025.

The second change is the entrance of **Bulgaria** into the top 10 for the first time. With 1.7 GW of new capacity in 2025, Bulgaria grows by nearly 40% compared to 2024, replacing **Austria**, whose annual additions have steadily declined since the 2023 peak and no longer meet the threshold for the top 10 in 2025. Bulgaria's acceleration is driven by a sudden and temporary expansion in the utility-scale segment tied to deadlines under the National Recovery and Resilience Plan (NRRP), while Austria's decline is caused by a gradual slowdown in the rooftop segment. In 2025, the Austrian market faced a change in rooftop solar support mechanisms, before the budget for solar support schemes was cut across the board.

Taken together, the shifts observed across the 2025 ranking underline that the core of Europe's solar markets remains anchored in the same leading countries, even if their relative growth patterns differ from year to year, while the midsized markets are reshaping the edges of the top 10. Newer and previously smaller markets such as Romania and Bulgaria entering the list, reflecting broader diversification of solar growth across the EU. These developments are summarised in Box 1, which provides a compact overview of the top 10 markets in 2025. Detailed information on each EU solar market is available for SolarPower Europe's members in our Market and Policy Database.



47 MW solar park in Amance, France.

Box 1

EU-27 top 10 solar markets in 2025

1

The German market stagnated in 2025, with counterbalancing trends across its segments. While the utility-scale deployment grew, supported by strong auction volumes and improving grid-access procedures, rooftop installations showed a decrease following announced changes to the support framework. Political consensus around long-term renewable commitments weakened over the year, creating uncertainty that weighed on investor confidence.

Germany

2025 Annual market	17.6 GW +1% from 2024	49% Rooftop	51% Utility
2025 Cumulative capacity	119 GW #1 in EU	67% Rooftop	33% Utility

2

Utility-scale additions, the driving force in the Spanish PV market, stayed strong, driven by a large pipeline with many projects already in advanced permitting stages, while the smaller self-consumption declined further. High curtailment levels, low capture prices and a more challenging PPA environment weighed on investment decisions. Overall deployment remained solid, though increasingly shaped by grid and market-value constraints.

Spain

2025 Annual market	9.2 GW +5% from 2024	13% Rooftop	87% Utility
2025 Cumulative capacity	55.4 GW #2 in EU	21% Rooftop	79% Utility

3

Record installation levels were reached as earlier tender rounds translated into strong commissioning across the year. Troughout 2025, however, policy uncertainty intensified, with even brief discussions on moratoria for renewable projects. Lower auction volumes, weakened support schemes, and declining political prioritisation of solar reduce visibility for future projects. Despite a strong year in absolute terms, confidence heading into 2026 was noticeably lower.

France

2025 Annual market	6.7 GW +17% from 2024	71% Rooftop	29% Utility
2025 Cumulative capacity	33.9 GW #4 in EU	63% Rooftop	37% Utility

4

Rooftop deployment declined steadily, partially counteracted by utility-scale projects and supported by a growing storage pipeline that enhances system integration. Small rooftop installations stabilised at a much lower level than during the Superbonus-related boom, sustained in part by the continuation of the 50% tax deduction and new energy rules for buildings. Large auction volumes being awarded towards the end of the year improve the expectations of renewed momentum ahead.

Italy

2025 Annual market	5.2 GW -16% from 2024	54% Rooftop	46% Utility
2025 Cumulative capacity	41.1 GW #3 in EU	73% Rooftop	27% Utility

5

The Polish market settled at a lower but stable level as the prosumer segment, after the sharp decline from net-metering highs, maintained steady volumes under net billing, supported by grant schemes. Large-scale PV emerged as the main engine of growth, though increasing grid-access constraints, rising curtailment, and difficult bankability conditions continued to limit project realisation. Overall installations remained solid but increasingly shaped by system bottlenecks.

Poland

2025 Annual market	3.7 GW -9% from 2024	48% Rooftop		52% Utility
2025 Cumulative capacity	24.7 GW #6 in EU	68% Rooftop		32% Utility

6

Growth in the Romanian market reached the highest rate among its major EU peers, driven by rapid utility-scale expansion, strong public support and very short permitting timelines. Distributed PV and storage also saw strong uptake, reinforcing broad-based progress across segments. Some uncertainty emerged from upcoming changes to grid-allocation rules and limited PPA liquidity, but overall performance remained exceptionally strong.

Romania

2025 Annual market	2.5 GW +45% from 2024	44% Rooftop		56% Utility
2025 Cumulative capacity	7.6 GW #12 in EU	49% Rooftop		51% Utility

7

Total capacity additions remained high, supported by significant progress in utility-scale projects and early steps in a national storage programme. Rooftop and C&I segments declined sharply following the shift from net metering to net billing and associated administrative delays, while rising grid congestion and curtailment weighed on project economics. Utility-scale activity offset part of this decline, resulting in only a slight contraction for the year.

Greece

2025 Annual market	2.5 GW -4% from 2024	28% Rooftop		72% Utility
2025 Cumulative capacity	12.2 GW #7 in EU	55% Rooftop		45% Utility

8

Rooftop additions reached a low point following previous announcement of the net-metering stop from 2027 and continued uncertainty around remuneration, including retailer-imposed levies. At the same time, dynamic contract uptake and flexible consumer behaviour remained standout features in a market with the highest Watt per capita ratio in Europe, and late-year election results revived optimism for more supportive policies ahead. Overall deployment declined further, well below earlier peaks.

Netherlands

2025 Annual market	2.1 GW	-34% from 2024	63% Rooftop	37% Utility
2025 Cumulative capacity	28.9 GW	#5 in EU	75% Rooftop	25% Utility

9

Installations remained at the GW scale, driven by a short-term surge in utility-scale commissioning linked to NRRP funding deadlines. Rapid storage deployment helped ease midday price pressures and supported system flexibility, while C&I rooftop activity continued its gradual expansion. This acceleration was largely deadline-driven rather than structural, and long-term growth remains constrained by limited residential support, regulatory gaps and grid-capacity challenges.

Bulgaria

2025 Annual market	1.7GW	+39% from 2024	15% Rooftop	85% Utility
2025 Cumulative capacity	6.2 GW	#5 in EU	19% Rooftop	81% Utility

10

Overall solar deployment declined, with rooftop systems taking a larger share as utility-scale additions eased from 2024 levels. A sizeable project pipeline sustained momentum, but grid congestion, weaker PPA activity and declining capture prices increasingly limited large-scale project realisation. Solar growth is progressively shaped by system and market constraints.

Portugal

2025 Annual market	1.7 GW	-21% from 2024	52% Rooftop	48% Utility
2025 Cumulative capacity	8.2 GW	#11 in EU	44% Rooftop	56% Utility

New milestone reached as all top 10 EU countries in installed solar capacity per inhabitant operate over 1 kW solar

The EU reaches a new milestone in 2025, with exactly ten countries now surpassing the 1 kW level of installed solar capacity per inhabitant (Fig. 18). This represents a sudden shift from previous years, when only a handful of frontrunners had crossed this threshold. The rising cumulative Watt per capita values indicate how deeply solar is embedded in the electricity mix across diverse market types, from long-established leaders to newer, fast-growing entrants. On average, the EU has crossed over 900 W/c in 2025, and is on its way to break through the 1 kW per capita milestone in 2026.

Despite a declining market, the Netherlands retains its position at the top of the podium with nearly 1.6 kW/c, equivalent to a bit more than three average-sized rooftop PV modules per inhabitant. Germany remains in second place with 1.4 kW/c, up strongly from 2024, while Estonia climbs onto the podium for the first time, driven by one of the highest W/c growth rates among all Member States (+36%).

In the south of Europe, Greece rises from 6th to 4th place on the back of a 28% increase. Although growth is slowing, the Benelux region is now completely represented in the top 10, with Belgium climbing two spots and entering the top 10, while Luxembourg retains its 9th place.

While the ranking remains relatively stable at the top, reshuffling continues in the middle ranks. Austria, Spain, Denmark, and Hungary, Luxembourg all record solid double-digit W/c growth, creating a closely packed cluster between 1,050-1,200 W/c and showing how competition among EU solar markets for a spot in the top 10 is intensifying. While it needed 830 W to reach the top 10 in 2024, this year a Member State had to exceed the 1 kW level.

Figure 18

New milestone: 10 EU countries reach over 1 kW of solar per person

EU-27 top 10 countries cumulative solar capacity per capita 2025

For the first time, utility-scale solar drives more than half of all installed capacities in the EU

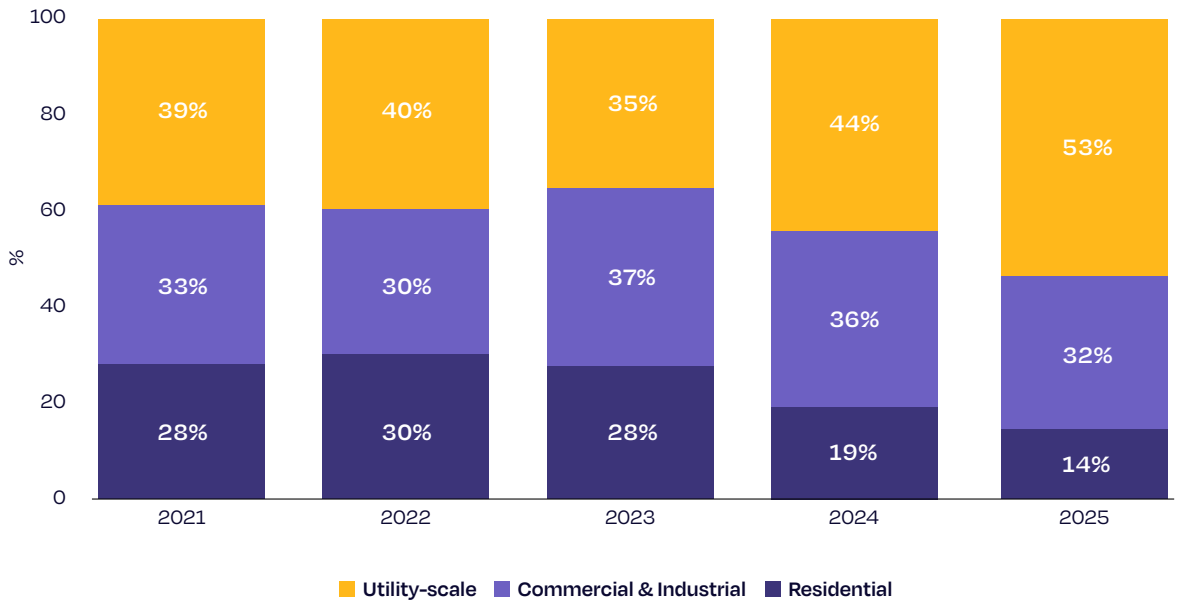
The composition of the EU solar market has shifted markedly in 2024 and 2025 as rooftop activity has declined and utility-scale installations have become the dominant growth driver. Residential solar has contracted sharply: 17 markets saw declining household installations in 2024, rising further to 19 in 2025, compared to only 6 in 2023 (See Fig. 20 on p. 47).[9] This downturn pushes the residential share of annual installations down to 14% in 2025 (Fig. 19), half the level seen just two years earlier. The slowdown reflects the phase-out of rooftop support schemes in several mature markets and the saturation of early-adopter households, while policy and electricity market settings in many countries remain insufficient to activate the broader mass-market segment. However, while residential solar capacity additions are declining, interest from EU households in solar continues, as demonstrated by the strong uptake of plug-in solar (see Box 2).

The C&I segment shows more stability, though it begins to exhibit signs of cooling as well. While business demand has been buoyed by self-consumption economics and corporate decarbonisation targets, the number of declining C&I markets continues to rise: three in 2023, 14 in 2024 and 16 in 2025. As a result, the C&I share slips from 37% in 2023 toward 32% in 2025, with growth increasingly concentrated in just a handful of stronger markets.

Figure 19

Utility-scale drives half of all installed solar in 2025, as home solar continues to slump

EU-27 annual solar PV segmentation 2021-2025

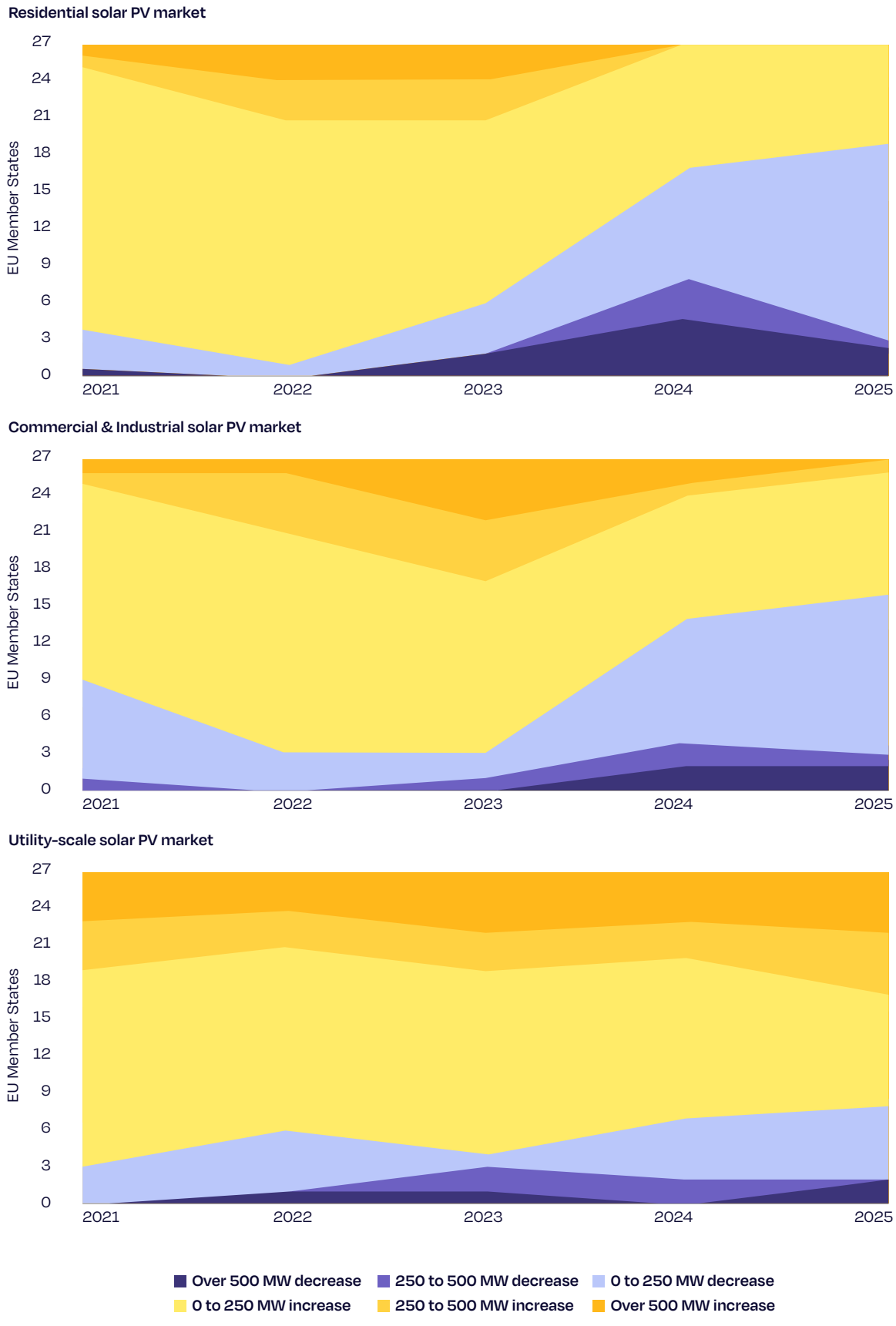


9 Our segmentation methodology considers residential solar all grid-connected PV systems below 10 kW. More information on our methodology is available at p. 4.

Figure 20

More and more EU rooftop markets decline, while utility-scale segments hold steady

Number of EU-27 markets increasing/decreasing compared to the year before by segment 2021-2025



By contrast, utility-scale solar emerges as the central engine of EU solar growth, exceeding 50% of total installations for the first time in 2025. It also remains the most resilient segment: only 8 markets record a decline compared to 2024, a modest growth in the category, up from 7 in 2024 and 4 in 2023. Today's high installation levels largely reflect the large volumes of capacity awarded in auctions and signed under PPAs during the strong 2022-2024 period, which continue to translate into grid-connected capacity even as new project economics have become more challenging.

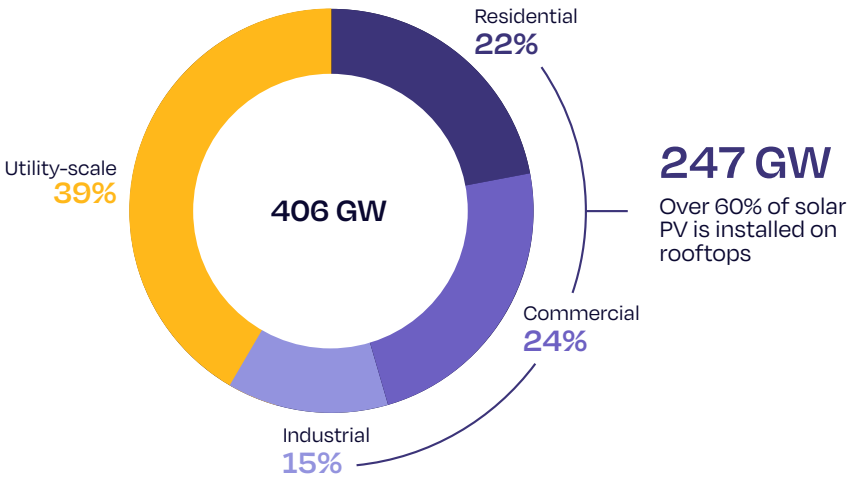
Overall, there's a rebalancing within the EU solar market. As residential PV activity scales back and C&I stabilises, utility-scale solar carries the bulk of growth, compensating for near-term contractions in the rooftop segment. This shift shows how previous policy and market momentum in large-scale procurement has a delayed effect, materialising in record installations now shaping the 2025 installation landscape.

In cumulative capacity terms, utility-scale continues to gain ground. It accounted for 35% in 2023, 36% in 2024, and now rises to 39% in 2025, reflecting the commissioning of projects awarded in recent auction and PPA cycles. Still, rooftop solar provides the majority of the EU's solar installed base (Fig. 21). Residential has decreased from 25% to 22% between 2023 and 2025, and C&I from 41% to 39%. These shifts mirror the slowdown in new rooftop additions visible in the annual data. More detailed information on segmentation across EU solar markets is available in SolarPower Europe's member-only Market and Policy Database.

Figure 21

Despite home solar market decline, over 60% of the EU solar fleet is on rooftops

Segmentation of cumulative EU solar PV installations 2025



Box 2

Plug-in solar PV in 2025

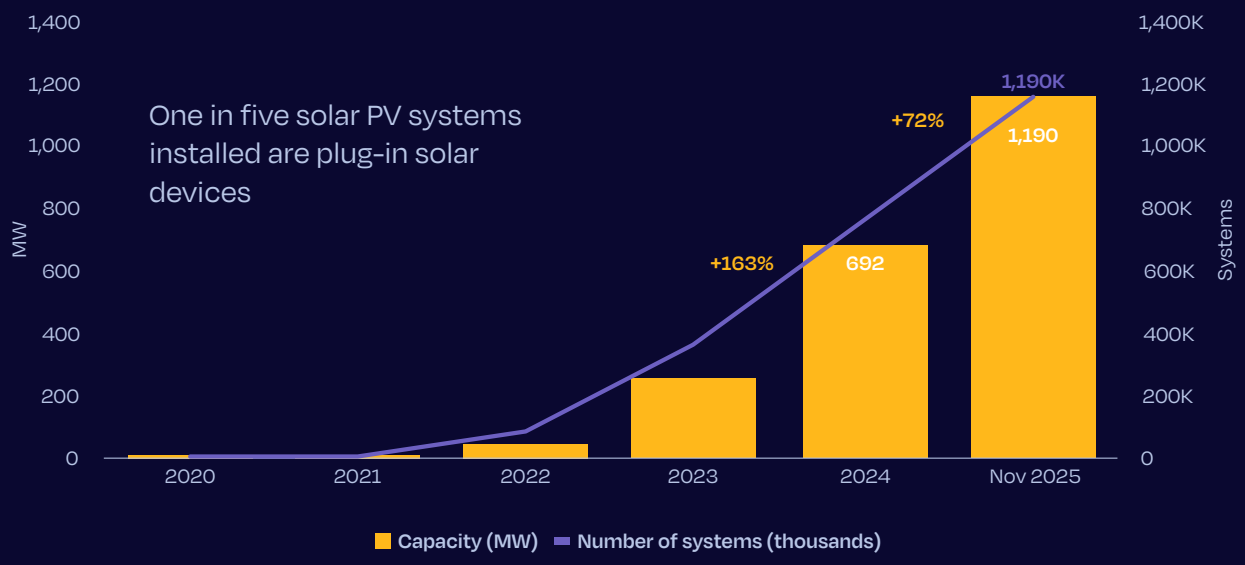
One particular branch of residential solar PV is not only resisting the downward trend, but growing significantly: plug-in solar – commonly known as balcony solar. These small kits (2-6 modules) have grown in popularity in recent years, and, while most available data for this segment exists only for the German market, the trends there are remarkable. Registration data shows that after quadrupling annual installations between 2022 and 2023, and doubling the market again in 2024, by November 2025 Germany has already installed close to 500 MW of plug-in solar PV capacity this year, already a 16% increase compared to 2024 installations.[10]

According to preliminary estimates by SolarPower Europe, out of a total of 800,000 PV systems installed in Germany by end of November 2025, more than 400,000 were plug-in solar, meaning that one in two solar PV systems installed in 2025 were plug-in PV devices. In cumulative terms, with a total 1.2 million plug-in solar devices officially registered with the Federal Network Agency as of November 2025, totalling 1.2 GW of cumulative capacity, one every five PV systems currently installed in Germany today are plug-in solar devices (see Fig. 22).

Figure 22

At 1.2 million devices, one in five solar PV installations in Germany today are plug-in solar

Germany cumulative plug-in solar installed capacity and systems 2020 - Nov 2025



Figures as of November 28th 2025, based on BnetzA data. Not accounting for outstanding late registrations and underreporting.
Source: SolarPower Europe and Bundesverband Solarwirtschaft (BSW-Solar), based on BnetzA data

10 Not accounting for late registrations and underreporting.

The extraordinary growth of this segment in Germany is hard to compare with other EU-27 markets, for lack of available data. Even in Germany, significant underreporting of these devices likely leads to an underestimation of the market: some industry estimates see between 1.5 and 4 million plug-in solar devices are already connected to the German grid,[11] while some estimates for all of Europe see up to 5 million systems could be installed across the continent.[12]

Still, developments in recent years point to increased interest in these systems, and may pave the way for safe and regulated deployment. After 8 years in the making, the German technical regulator VDE is due to publish the world's first product standard for plug-in solar devices (DIN VDE V 0126-95) in December 2025. The standard defines what a plug-in solar device is and what requirements must be met in order for solar modules to be connected to the home grid via standard Schuko plugs. This significant milestone well help harmonise rules for the segment, since manufacturers and suppliers will now know exactly which technical requirements they must meet, and regulators may also look to this standard for guidance. Rules for plug-in PV vary considerably across Member States, with Belgium for example legalising plug-in solar and storage only last April 2025 (see SolarPower Europe's Plug-in Solar PV report from March 2025 for more details).[13]

Solar Panels on apartment balconies, Berlin, Germany.

11 HTW Berlin (2025): **Short report: Plug-in solar 800 W**
12 Plug-in Solar (2025): **Plugin Solar | Join the plug-in solar revolution!**
13 SolarPower Europe (2025): **Plug-In Solar PV**

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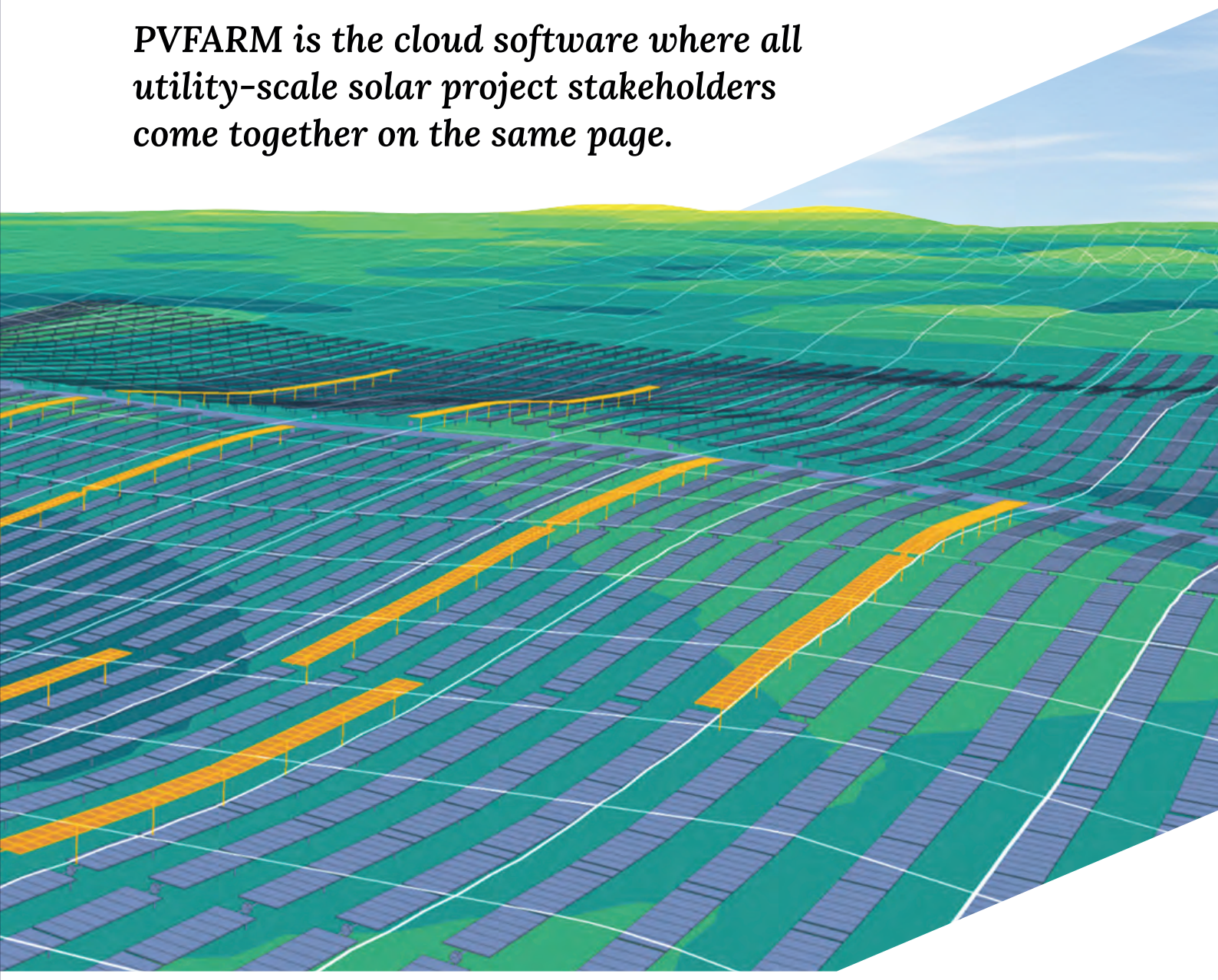

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EU Solar Market Prospects 2026-2030

After EU solar market growth declined in 2025 for the first time in a decade, solar capacity additions are expected to continue trending downward until 2027. Growth is forecasted to resume only after 2027, driven by storage, flexibility, electrification, and improvement in framework conditions. Under today's expectations of the EU policy and market environment, the 750 GW EU solar target for 2030 will not be met – this takes place only in the High Scenario, where today's major barriers are rapidly fixed and strong market growth remains possible.

An updated analysis of EU National Energy and Climate Plans (NECPs) reveals that the aggregate national solar target for 2030 stands at 701 GW, still significantly below the EU solar target. Due to the worsened solar outlook, we forecast that one quarter of EU countries will miss their 2030 national solar target.

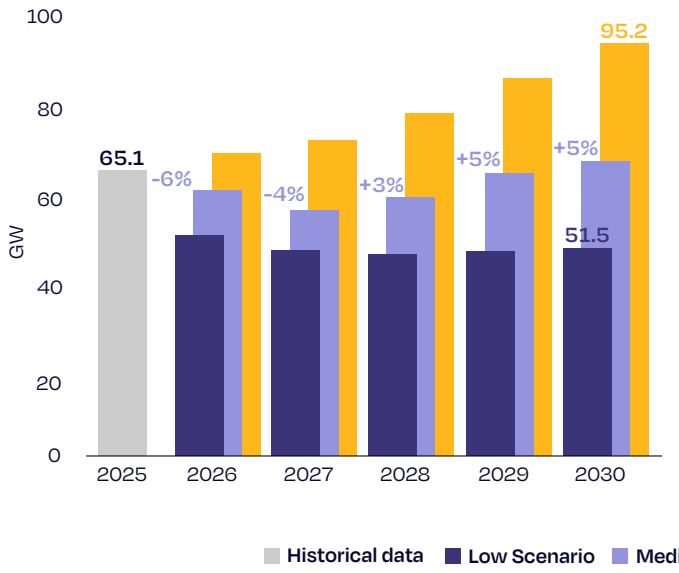
Two more years of solar market decline anticipated before growing again

The EU solar annual market outlook for 2026-2030 reveals three distinct deployment trajectories (Fig. 23). In the Low Scenario, annual additions decline sharply from 2026 onward and stabilise at around 50-52 GW, remaining well below both 2025 levels and the average EU additions 2026-2030 needed to reach the 2030 solar target. The most-likely Medium Scenario shows further single-digit contractions of capacity additions in 2026 and 2027, followed by a gradual recovery that brings annual installations to nearly 67 GW by 2030. For all the years forecasted in the Medium Scenario, installations remain below the average volumes needed to meet the 2030 target. By contrast, the High Scenario depicts a continuous acceleration, with installations rising from roughly 70 GW in 2026 to more than 95 GW in 2030, the only pathway that consistently surpasses the average annual volume needed to achieve the EU 2030 solar goal.

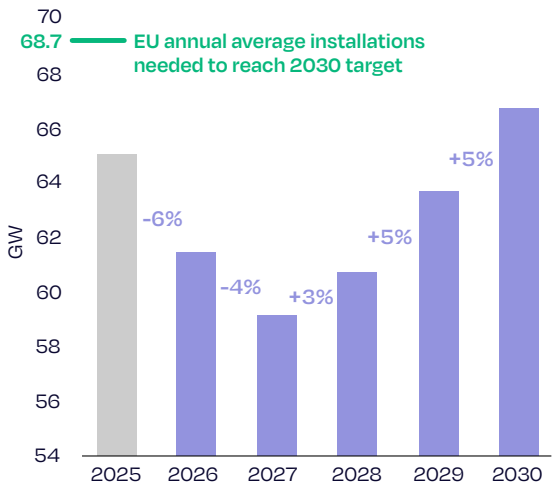
Figure 23

After two years of further downturn, the EU solar market is not expected to return to 2025 levels until 2030

EU-27 annual solar PV market scenarios 2026-2030



Zoom on Medium Scenario



Tied to the U-shaped Medium Scenario are expectations on rooftop market dynamics, flexibility and storage, electrification, regulatory stability, and land availability:

- **Rooftop market dynamics:** After the pronounced 2023-2025 decline across residential and small commercial segments, rooftop solar demand continues to soften in the EU, driven by a phaseout of support schemes for installations on buildings and slower-than-expected adoption of self-consumption enablers. Residential installations react fastest to changing market conditions and today's retail electricity prices are perceived to be much below the levels witnessed in 2022. At the same time, the uptake of heat pumps, EVs and behind-the-meter batteries has to fully take off across the EU and limits the growth of the self-consumption segment. Combined, these factors contribute to the decline in EU-wide installations expected for 2026-2027, with the slowdown in smaller rooftop installations continuing to act as one of the key downward influences.

  From 2027 onwards, however, the solar rooftop business landscape could start to stabilise. Residential decline is expected to bottom out in 2027, with recovery possible from 2028 as the electrification of citizens' energy needs accelerates, energy sharing becomes more common under the Electricity Market Design, and the EPBD rooftop Solar Standard begins to take effect. Small commercial installations follow a similar pattern, also starting to recover after 2027. The industrial rooftop segment, by contrast, is more resilient throughout the period and recovers earlier, supported by industry electrification and improved self-consumption opportunities. As a result, the EU gradually shifts from a rooftop-led market to one where utility-scale and industrial installations become the main growth drivers between 2026 and 2028, before rooftop activity strengthens again in the last third of the decade (see segmentation forecast at p. 64).

7.28 MW rooftop solar at Europe's largest camper and caravan center, Groenlo, the Netherlands.

- **Flexibility and storage to relieve grid pressure:** Grid constraints remain a major bottleneck for solar deployment, driven by both physical limits and administrative issues. In several markets, stalled projects continue to hold grid reservations, adding artificial pressure to hosting capacity and slowing viable developments. At the same time, genuine congestion is leading to more negative price periods and curtailment in high-PV regions. Flexibility and storage are essential to ease this pressure, yet current deployment levels remain insufficient to sustain today's solar growth.

  The inadequate rollout of storage, and other flexibility solutions, increases investor uncertainty, as curtailment risks and volatile revenues deter new projects. Smart meter adoption remains low in key markets, aggregator access is limited, and tariff structures often fail to reward flexible consumption. A dedicated EU Flexibility Strategy and a comprehensive battery storage action plan will be central to closing these gaps. Until then, flexibility shortfalls continue to place downward pressure on annual installations, with stronger rooftop and utility-scale activity expected only once flexibility and electrification begin to accelerate toward 2028.

- **Energy price environment and electrification**: Capture rates for solar reached record lows in 2025, a trend linked to rapid PV deployment and limited flexibility, placing strong pressure on investor confidence, especially for utility-scale assets. Looking ahead, system flexibility becomes increasingly valuable in a landscape where wholesale electricity prices decrease as they become less influenced by fossil fuels. With the spread between electricity and gas prices widening, the economics of EVs, heat pumps and industrial electrification improve, turning growing electricity demand, also driven by surging needs from data centres, into a major driver of future solar deployment. This is much needed as the EU electrification rate has been stuck at around 22-23% over 2019-2024, while the EU electrification goal of 32% by 2030 is approaching.

- **Regulatory and policy stability:** History has shown that policy instability can significantly disrupt solar markets. Sudden changes to rooftop support schemes in countries such as the Netherlands and Italy created sharp swings in rooftop installations, leaving households uncertain about payback times and complicating planning for SMEs and installers. Similar risks exist at the utility-scale level: in France, the discussion of a moratorium on new solar and wind projects in early 2025 cast doubt over the country's long-term commitment to renewables, undermining investor confidence before the proposal was overturned. These examples illustrate how both small-scale consumers and large developers depend on predictable, well-enforced frameworks. Clear support schemes, stable regulatory conditions and consistent national strategies are essential to maintain trust and avoid unnecessary volatility in annual solar deployment.

- **Land availability and spatial planning:** Land availability remains a structural bottleneck for utility-scale solar. Concepts such as agri-PV have gained momentum in countries like Italy and France, partly because traditional ground-mounted projects face increasingly complex regulatory and local acceptance environments. While policy frameworks for dual-use solutions are gradually improving, permitting delays for all ground-mounted projects and unclear land-use rules continue to slow down project development in many Member States. These constraints are expected to weigh on utility-scale deployment in the medium term before more streamlined spatial planning and clearer guidance could take effect.

2030 EU solar target missed in the Medium Scenario and reached only in the High Scenario

Slower rooftop demand, insufficient flexibility, regulatory uncertainties, and persistent land-use and permitting constraints all contribute to more moderate installation trajectories. These pressures shape the cumulative outlook for 2026-2030, with scenario results showing that current policy and market conditions will not be sufficient to deliver the EU's 750 GW solar target by 2030 unless decisive improvements occur.

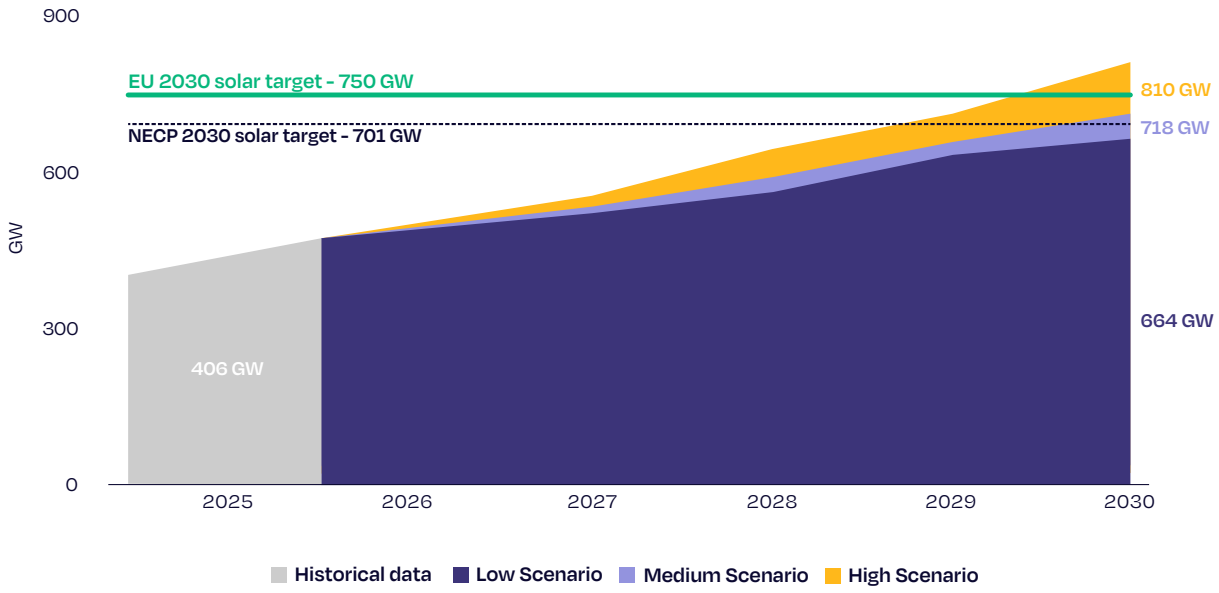
The cumulative scenarios illustrate this clearly (Fig. 24). Under the Low Scenario, EU solar capacity reaches only 664 GW by 2030, falling well short of the target. The most-likely Medium Scenario performs better, but still reaches just 718 GW, missing the EU solar target by over 30 GW, despite steady two-digit annual growth rates in cumulative capacity volumes. Only the High Scenario aligns with the EU's 2030 objective, climbing to 810 GW by 2030. The widening gap between the low and medium trajectories and the EU target underscores the need to address today's hurdles.

The Medium Scenario is also getting closer to the aggregate solar target from National Energy and Climate Plans (NECPs), which, according to our updated analysis, stands at 701 GW by 2030. More insights from our evaluation of final NECPs and their level of ambition can be found at p. 67.

Figure 24

The most likely scenario sees solar fall short of EU 2030 target

EU-27 cumulative solar PV market scenarios 2026-2030



Box 3

Looking back and forth

The comparison across past editions of this EU Solar Market Outlook shows a clear shift in expectations. In earlier editions (ESOs published between 2020 and 2024), historical installation values were almost always revised upwards, reflecting faster-than-anticipated growth. For example, the 2022 figure increased from 27.4 GW in the ESO 2020 to an eventual documented installation level of 42.3 GW, a correction of more than 50% over successive editions. This pattern held through 2023 and 2024, where each new edition pushed historical figures slightly higher as real-world deployment outpaced earlier expectations.

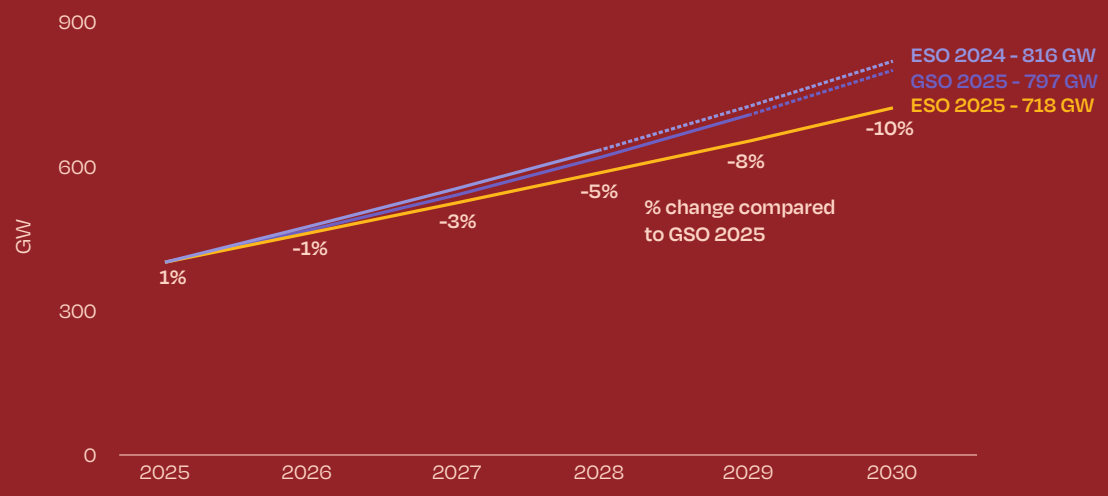
Data for 2025 breaks this trend. The ESO 2024 outlook projected 70.0 GW for 2025, but emerging data through the first half of the year led to a significant downward revision in the July-published 2025 mid-year update (64.2 GW). With stronger-than-expected growth in the second half of 2025, the final ESO 2025 edition adjusts this value only marginally upward to 65.1 GW, illustrating the value of frequent updates.

Looking forward, the shift in expectations remains. Earlier forecasts – including the extrapolated ESO 2024 trajectory and the Global Solar Market Outlook (GSO) 2025 – assumed higher long-term deployment, reaching between 797 GW and 816 GW by 2030 (Fig. 25). In contrast, the current ESO 2025 Medium Scenario reaches only 718 GW in 2030, a 10% reduction compared to the GSO 2025 path. The divergence grows over time: while the difference remains small in 2025 (around 1%), it widens to -5% by 2028 and -8% by 2029, before reaching -10% in 2030. This reflects a significantly more cautious outlook driven by the slower-than-expected progress in flexibility deployment, electrification, policy framework, investment conditions, and overall support to solar.

Figure 25

Long-term solar expectations further decline as existing challenges persist

EU cumulative solar PV capacity comparison Medium Scenario ESO 2025 vs GSO 2025 and ESO 2024



Note: dotted lines indicate extrapolation beyond 5-year forecast.
ESO 2024: EU Solar Market Outlook 2024-2028. GSO 2025: Global Solar Market Outlook 2025-2029.
ESO 2025: EU Solar Market Outlook 2025-2030.

EU solar growth through 2030 remains concentrated in the leading markets

Figure 26 highlights the ten EU markets expected to add the most solar capacity between 2026 and 2030 in the Medium Scenario. Together, these top ten are projected to account for around 80% of all new EU installations by 2030, with the top three alone representing nearly half of total additions. While growth is gradually spreading into smaller markets, the core of EU solar expansion remains highly concentrated.

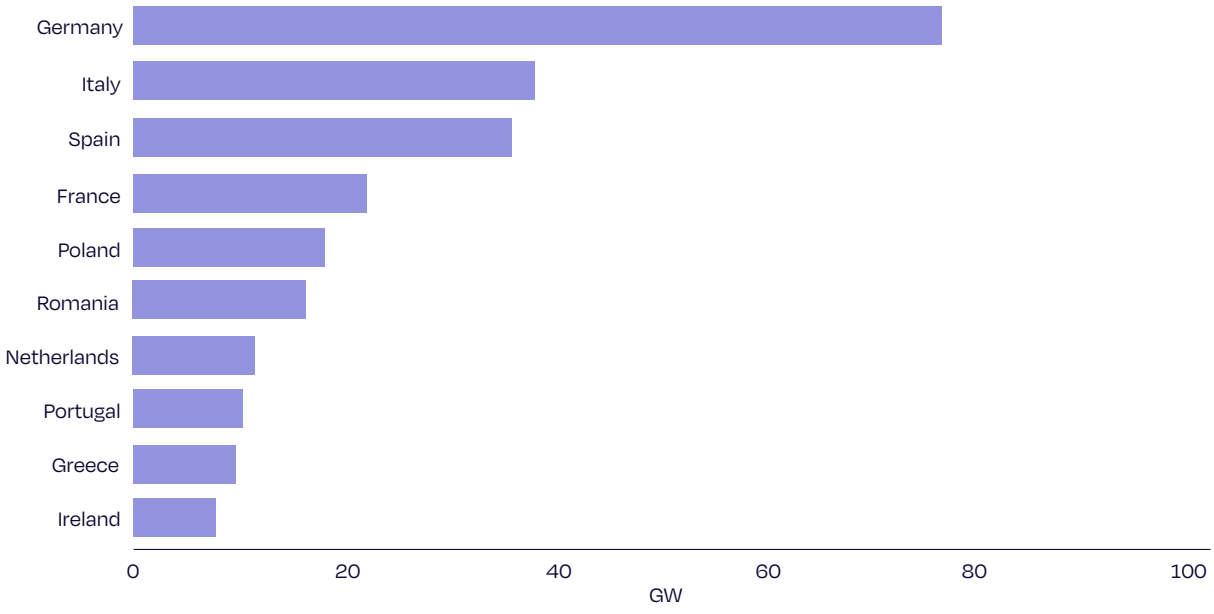
A second trend visible in this ranking is how market dynamics shift over time. While Germany has been Europe's largest solar market for most of the solar history, its lead expands further by 2030, widening the gap with Italy and Spain under all three scenarios. Italy is set to overtake Spain in net additions over the coming 5 years, although, with the current volume of solar capacity operating in Spain, it is unlikely that Italy will have more total installations by 2030. Several emerging markets also accelerate: Romania surpasses the Netherlands to become the sixth-largest source of new capacity, while Portugal and Greece are expected to retain their leading market positions. Ireland, though not in the top 10 markets in 2025, is expected to contribute significantly over 2026-2030. Overall, and despite a degree of diversification across Member States registered over the past few years, the data show a European Union where most new solar capacity continues to come from a relatively small group of countries, highlighting both the leadership role of major markets, and the need for broader participation to meet EU-wide targets.

Box 4 provides an overview of the anticipated market trends, key drivers and main challenges across these ten countries. For more information about each market's expected developments through 2030, please consult SolarPower Europe's member-exclusive Market and Policy Database.

Figure 26

Germany, Italy, and Spain continue as the top EU solar markets toward 2030

EU-27 top 10 markets solar PV additions 2026-2030



Box 4

Overview of top 10 PV markets 2026-2030

1

Germany's growth continues to rely on the utility-scale segment, supported by strong auction pipelines and improving grid-access procedures. Rooftop PV, especially residential and small commercial systems, faces increased uncertainty as shifting support schemes and political disagreement weigh on investment. The overall market is not expected to grow beyond 2025 volumes in the next five years.

Germany

Total capacity: **196 GW** Medium Scenario 2030 #1 in the EU-27

Cumulative CAGR[14]: **11%** Medium Scenario 2026-2030

Drivers

- Long-term commitment to climate targets continues to underpin investor confidence (215 GW solar target by 2030)
- Large PV tenders and incentives for PV-plus-storage provide stable routes to market and better project economics
- Digitalised grid processes and new grid-management rules help ease bottlenecks for small-scale installations

Challenges

- Planned reforms to small-scale support schemes create uncertainty and reduce the appeal for households and SMEs
- Proposed grid-charging changes could raise development costs, particularly in constrained regions
- Political volatility and unclear legislative timelines are delaying investment decisions

2

Italy's growth is set to be driven mainly by utility-scale projects, supported by strong auction activity and a growing pipeline of large-scale storage that can ease integration and enable additional PV buildout. Small rooftop installations remain steady, helped by the expected continuation of the 50% tax deduction, new energy-performance rules and the expansion of energy communities. Overall additions are projected to increase, though progress is tempered by slow permitting, grid congestion and policy fragmentation that keep the outlook positive but uneven.

Italy

Total capacity: **80 GW** Medium Scenario 2030 #3 in the EU-27

Cumulative CAGR: **14%** Medium Scenario 2026-2030

Drivers

- Large-scale auctions, large battery storage buildout and a strengthened policy push enable further utility-scale PV growth
- Small rooftop systems are supported by a 50% tax deduction, new energy performance norms for buildings and the adoption of energy communities
- Repowering potential and emerging frameworks for PPAs and self-consumption open additional routes to market

Challenges

- Slow and fragmented permitting processes for utility-scale solar, particularly around defining "suitable areas"
- Severe grid congestion from high connection requests continues to delay project realisation across several regions
- Policy fragmentation and volatility contribute to uncertainty and slower investment decisions

14 Compound Annual Growth Rate

3

Spain's growth continues to rely on a strong utility-scale pipeline, supported by upcoming grid investments and the potential launch of a capacity market from 2026. Behind-the-meter storage and self-consumption remain weak, dragging on the distributed segment despite increasing public interest. Rising curtailment levels, low solar capture rates, and grid connection constraints continue to weigh on investor confidence and project realisation. Against this background and without adequate storage deployment, the PPA market might slow down.

Spain

Total capacity: **92 GW** Medium Scenario 2030 #2 in the EU-27

Cumulative CAGR: **11%** Medium Scenario 2026-2030

Drivers

- A large and mature utility-scale pipeline continues to advance, supported by extended project milestones and strong grid integration plans
- Upcoming grid reinforcements and the potential launch of a capacity market in 2026 provide new stability and revenue opportunities for large-scale PV
- NextGenerationEU project funds and improving conditions for hybrid PV-plus-storage could stimulate new installations

Challenges

- Behind-the-meter battery deployment remains weak after a sharp decline and has yet to show a meaningful recovery
- Rising curtailment, frequent zero-price hours and deteriorating capture prices reduce confidence and complicate project economics, especially in a PPA-driven market
- Grid connection constraints, rather than permitting, now form the key bottleneck for both utility-scale and rooftop PV

4

France's market remains under pressure as rooftop remuneration declines and land constraints challenge utility-scale growth, while regulatory uncertainty continues to cloud long-term visibility. Some support is maintained through VAT reductions, tender activity and emerging hybrid PV-plus-storage incentives, with integrated project models offering future potential once frameworks mature. Under current and expected conditions, the market is expected to decline until clearer policy direction is restored.

France

Total capacity: **56 GW** Medium Scenario 2030 #4 in the EU-27

Cumulative CAGR: **11%** Medium Scenario 2026-2030

Drivers

- Past tenders continue to drive short and medium term utility-scale deployment
- Reduced VAT for small-scale PV and early incentives for hybrid PV-plus-storage
- Growing interest in diversifying project models, including agri-PV and other integrated solutions, offers potential pathways for future capacity

Challenges

- Steep feed-in tariff cuts and the shift toward less attractive tender schemes are putting strong pressure on rooftop economics
- Limited access to land and slow progress on project siting constrain utility-scale development
- Uncertainty about political commitment towards solar, as solar targets could be further revised downwards

5

Poland's market has shifted from a prosumer-driven boom toward utility-scale growth, supported by strong tender activity and recent regulatory reforms that ease permitting and grid access. Small-scale PV remains attractive for long-term savings but grows more slowly under the net-billing system, while hybrid and storage-linked projects gain importance as flexibility needs rise. Grid saturation, curtailment and new land-use requirements continue to limit project execution and shape the pace of expansion.

Poland

Total capacity: **43 GW** Medium Scenario 2030 #5 in the EU-27

Cumulative CAGR: **12%** Medium Scenario 2026-2030

Drivers

- Utility-scale deployment is strengthening, supported by competitive tenders, economies of scale and growing interest in transmission-level connections
- Recent reforms, including higher licensing thresholds, expanded cable-pooling and more flexible grid-connection rules, reduce administrative hurdles and improve project feasibility
- Updated subsidies for prosumers and a growing focus on hybrid PV-plus-storage solutions help stabilise the small-scale segment and support long-term system integration

Challenges

- Grid saturation, widespread connection refusals and rising curtailment remain the biggest bottlenecks for both new and permitted project
- Land-use restrictions complicate development and slow large ground-mounted projects
- Following the phaseout of net-metering to net-billing for rooftop solar, the market has stabilised at a lower installation pace

6

Romania has emerged as one of Europe's fastest-growing solar markets, driven by rapid utility-scale expansion, short permitting times and strong support for large-scale projects. Distributed PV and storage are also rising quickly, supported by public incentives and a growing prosumer base. Overall, the outlook is positive, though new grid-allocation rules and limited PPA liquidity create some short-term uncertainty as the market transitions into a more mature phase.

Romania

Total capacity: **24 GW** Medium Scenario 2030 #7 in the EU-27

Cumulative CAGR: **26%** Medium Scenario 2026-2030

Drivers

- Rapid utility-scale growth is supported by short permitting times, simplified procedures and strong CfD tender results that boost investor confidence
- Significant EU-backed funding through the Modernisation Fund and National Recovery Plan continues to drive large-scale projects
- A fast-expanding PPA market and rising prosumer activity strengthen both centralised and distributed deployment

Challenges

- The lack of internationally tradable Guarantees of Origin limits liquidity and reduces the pool of PPA offtakers
- The shift from a first-come, first-served grid allocation system to capacity tenders creates short-term uncertainty for developers
- Grid infrastructure remains strained by rapid growth, with connection capacity and planning still lagging behind deployment needs

7

The Dutch market is stabilising after two challenging years, supported by rising storage uptake and stronger expectations for more solar-friendly policymaking following recent elections. Residential PV remains subdued ahead of the 2027 net-metering sunset, while C&I and utility-scale projects continue to face grid congestion and low completion rates despite strong pipelines. Overall additions are set to hold steady, with flexibility, storage and improving policy signals shaping a more favourable medium-term outlook.

Netherlands

Total capacity: **41 GW** — Medium Scenario 2030, #6 in the EU-27

Cumulative CAGR: **17%** — Medium Scenario 2026-2030

Drivers

- Recent election results point toward a more solar- and storage-friendly policy environment, improving medium-term expectations
- Storage adoption is accelerating across residential and C&I segments, driven by congestion issues, dynamic pricing and growing demand for flexibility
- Stabilising annual additions and strong long-term electrification plans support a steady baseline for new solar and storage deployment

Challenges

- Grid congestion and low completion rates for SDE++ awarded projects continue to limit realisation of both rooftop and utility-scale capacity
- The end of net-metering in 2027 and weak short-term policy support weigh heavily on residential PV demand
- Unclear spatial rules for ground-mounted projects and slow progress on permitting create uncertainty for larger developments

8

Portugal's growth continues to be driven by a large and maturing utility-scale pipeline, supported by rising self-consumption across households and businesses. Deployment is expected to remain solid, although low power prices, limited PPA activity and grid-connection bottlenecks keep investor confidence in check. The forecast remains positive, but effective grid expansion and clearer flexibility frameworks will be essential to unlock the next phase of growth and reach the ambitious NECP solar target.

Portugal

Total capacity: **19 GW** — Medium Scenario 2030, #9 in the EU-27

Cumulative CAGR: **18%** — Medium Scenario 2026-2030

Drivers

- A large and advanced utility-scale pipeline, with around 20 GW holding permits or connection points, underpins Portugal's medium-term growth outlook
- Rising self-consumption adoption keeps decentralised deployment steady across residential and C&I segments
- Hybridisation and repowering opportunities offer efficient ways to unlock additional capacity using existing grid connections

Challenges

- Falling wholesale electricity prices and weak PPA uptake reduce revenue certainty and slow final investment decisions
- Grid availability remains a major constraint, with permitting delays and pending grid-development approvals limiting new connection opportunities
- Flexibility markets are still underdeveloped, leaving storage and small producers without clear frameworks to participate

9

Greece remains on a strong growth path, with utility-scale projects driving most new additions and a large storage programme expected to ease integration challenges later in the decade. Residential and C&I segments continue to struggle with policy delays and the shift to net-billing, while rising curtailment and low-price hours weigh on investor confidence. While the overall market is expected to grow in the short term, further expansion is dependent on electricity demand growth, as well on the pace of deploying storage, grid upgrades and self-consumption rules.

Greece

Total capacity: **22 GW**
Medium Scenario 2030
#8 in the EU-27

Cumulative CAGR: **13%**
Medium Scenario 2026-2030

Drivers

- Utility-scale deployment continues to dominate, supported by strong project progression and ample grid connections already secured
- The national storage programme is expanding rapidly, with multi-GW BESS capacity slated for operation before 2030
- Self-consumption potential remains significant, with extra grid capacity set aside and up to 3 GW that could materialise once legislation is streamlined

Challenges

- Rising curtailment and weak electricity demand growth increasingly limit revenues and create uncertainty for developers
- Delays in implementing the new net-billing framework and self-consumption rules hinder residential and C&I uptake
- Zero or negative price events are growing, slower than in neighbouring countries, but still complicating project economics

10

Ireland's solar market has entered a strong growth phase, with utility-scale and C&I projects expanding across multiple segments under supportive auction schemes and streamlined planning rules. Rapid storage deployment and new integration measures reinforce this momentum, though grid congestion and uncertain revenue streams pose increasing challenges. Strong annual additions are expected as grid reforms and hybridisation continue to unlock further potential.

Ireland

Total capacity: **11 GW**
Medium Scenario 2030
#14 in the EU-27

Cumulative CAGR: **27%**
Medium Scenario 2026-2030

Drivers

- Rapid multi-segment growth supported by auctions for utility-scale and C&I projects
- Strong storage deployment and new system-integration measures, including the Scheduling & Dispatch Programme and expanding private-wire opportunities, strengthen flexibility across the system
- Streamlined planning rules, RED III implementation and major grid-connection reforms are set to accelerate development and sustain high annual additions

Challenges

- Grid congestion, curtailment and local bottlenecks increasingly constrain project output as solar penetration rises
- Uncertainty surrounding electricity-market and ancillary-service revenues dampens investor confidence and weakens business cases for batteries and hybrid assets
- Looming reductions to rooftop grants risk slowing momentum in residential and smaller commercial segments

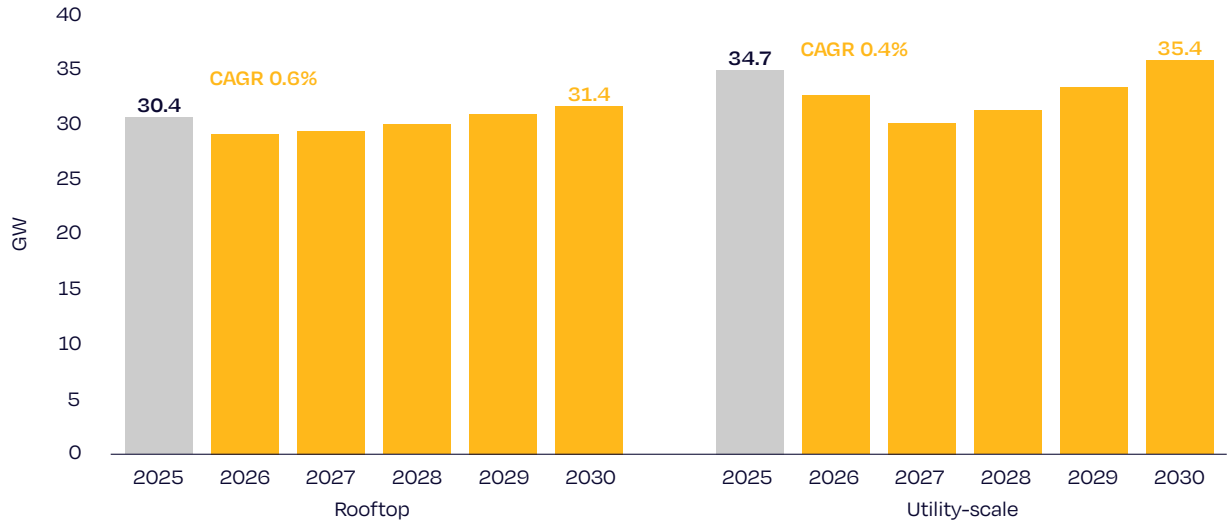
Rooftop solar expected to remain flat; utility-scale volumes to decline before regaining traction

Splitting the rooftop and the utility-scale segments, the annual Medium Scenario outlook forecasts that both will experience a decline in 2026-2027, followed by a gradual recovery toward 2030, slightly exceeding their respective 2025 volumes by the end of the decade (Fig. 27). Rooftop installations remain relatively stable, fluctuating only slightly from 30.4 GW in 2025 to 29.1 GW in 2026, before edging back to 31.4 GW by 2030, with a modest 0.6% CAGR over the period. Utility-scale installations follow a similar pattern but with a more pronounced downturn: volumes fall from 34.7 GW in 2025 to 30.0 GW in 2027, before recovering more strongly to 35.4 GW by 2030, corresponding to a 0.4% CAGR.

Figure 27

Both rooftop and utility-scale solar to decrease in the next two years, before regaining ground towards 2030

EU-27 annual solar PV rooftop and utility-scale segments Medium Scenario 2026-2030



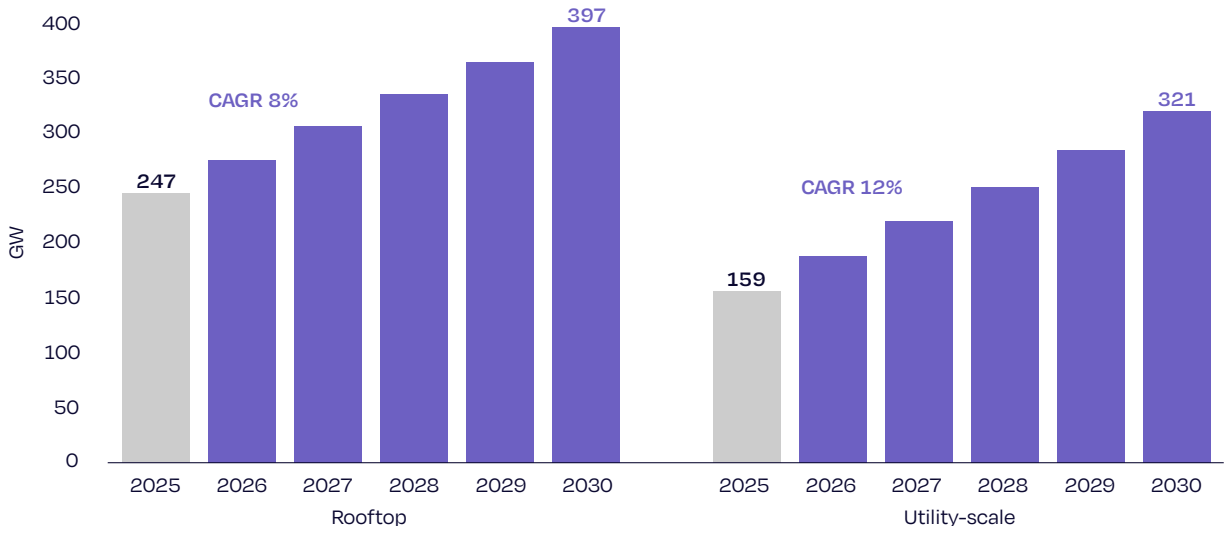
The downturn is driven by the impact of today's structural pressures. For rooftop, weaker residential and small-commercial demand, fundamentally driven by slow electrification uptake, weakened support schemes and recent policy uncertainty, keeps annual additions subdued through the next five years. Under the current political environment, the anticipated untimely and watered-down transposition of EPBD solar mandates into national legislation will likely have much lower positive effects on rooftop solar than originally expected.

Utility-scale installations are more heavily affected by grid constraints, slow flexibility deployment, and persistent permitting and land-use bottlenecks, resulting in a deeper trough before recovery. As system flexibility improves, electrification eventually accelerates, and investment conditions stabilise after 2027, utility-scale recovers faster, due to the pipeline of large projects waiting for clearer grid, permitting and investment frameworks.

Figure 28

Utility-scale solar to increase its EU presence with a projected doubling of operating capacity by 2030

EU-27 cumulative solar PV rooftop and utility-scale segments Medium Scenario 2026-2030



Despite the mid-decade slowdown visible in the annual forecast, cumulative capacity in both segments continues to expand steadily through 2030 (see Fig. 28). Rooftop solar grows from 247 GW in 2025 to 397 GW in 2030, corresponding to an 8% CAGR, reflecting its broad base of residential, commercial, and industrial users. Utility-scale solar expands more rapidly, doubling its operating volumes from 159 GW to 321 GW and a 12% CAGR over the same period, supported by a strong project pipeline in key markets that rebounds once grid conditions, flexibility, and permitting gradually improve. Through the end of the decade, both segments continue to move upward, illustrating that even under today's challenging market conditions, the EU's cumulative solar fleet remains on a long-term growth trajectory, but likely not high enough to meet the 2030 solar target.

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All Member States but one submitted their updated NECP target, but net increase is marginal; aggregate volume still falls short of 750 GW target

By 30 June 2024, EU Member States were due to submit their final updated National Energy and Climate Plans (NECPs) to the European Commission. These plans are effectively the national breakdowns on how the EU will meet its 2030 climate and energy objectives, including reaching a 55% reduction in net greenhouse gas emissions compared to 1990 levels and a 42.5% share of renewable energy in the total energy mix.

The NECPs undergo an iterative process, where drafts are submitted to the European Commission for feedback, before EU Member States submit their final NECP to the European Commission. The latest 'final' NECPs took into account the Commission's feedback on 2023 draft plans. Many NECPs were significantly delayed, and only 14 out of 27 Member States had submitted their final plans by the editorial deadline of our previous EU Solar Market Outlook in December 2024. With Belgium submitting theirs to the EU Commission on 7th October 2025, all 27 Member States, except Poland, have now submitted their final updated NECPs.

NECPs are key to assessing Member States' energy transition strategies. In our analysis, we have compared national solar PV targets for 2030 under the latest NECPs available, with our most-likely market scenario estimates for 2030. This chapter also sheds light on the state of 2030 targets for storage and electrification as set in the NECPs.

It's worth clarifying that not all NECPs provide clear solar targets in GW of installed capacity, as several Member States only outline annual solar production targets in TWh or PJ, or net additions to existing installed capacity, or rather general RES targets without a clear technology breakdown. Further, it is often unclear whether the targets are expressed in AC or DC volumes, requiring assumptions on conversion ratios. For all these reasons, the values presented in this analysis might somewhat differ from those officially reported in the NECP documents. Moreover, in some cases, solar targets set in the NECPs can differ from national targets developed separately in national energy strategies. This can lead to situations where the NECP targets are not seen as the true benchmark for the renewable sector as they don't properly reflect national climate and energy ambitions.

Box 5

What are NECPs?

In 2019, the EU mandated its Member States to publish and implement 10-year National Energy and Climate Plans. Running from 2021 to 2030, NECPs are meant to set out the Member State's targets, policies, and measures that will enable the country to reach the 2030 EU renewable targets. Member states must regularly submit NECPs and update them – the latest update for the final NECP targets for 2030 was due in June 2024 (drafts were first submitted in June 2023). The next full NECP update is expected in 2029, with drafts submitted in 2028, aligning with the EU's longer-term planning horizon toward 2040 and 2050.

Why are the NECPs important for solar?

NECPs form the basis for the EU-27's energy policy and strengthen the business environment for solar investments in Europe – predictability, efficiency, and transparency. Setting clear targets that reflect the true potential of solar PV allows our systems and societies to get ready for the energy transition.

With the right level of ambition, NECPs can act as key market drivers, or at least reflect the realities of solar deployment on the ground. This is why it is important to maintain a high bar in setting solar targets across Member States and steer deployment volumes at the national level in accordance with the trajectory set by REPowerEU targets.

Until December 2024, at the time when we published the last edition of this report, only 14 EU Member States out of 27 had released their final NECP updates, bringing the aggregated solar target to 702.6 GW.[15] Since then, 12 more Member States have published their final NECPs, the last being Belgium in October 2025. The only missing NECP, from Poland, was released in draft version in July 2025 and is expected to go through government committees before finalisation by the end of the year.[16]

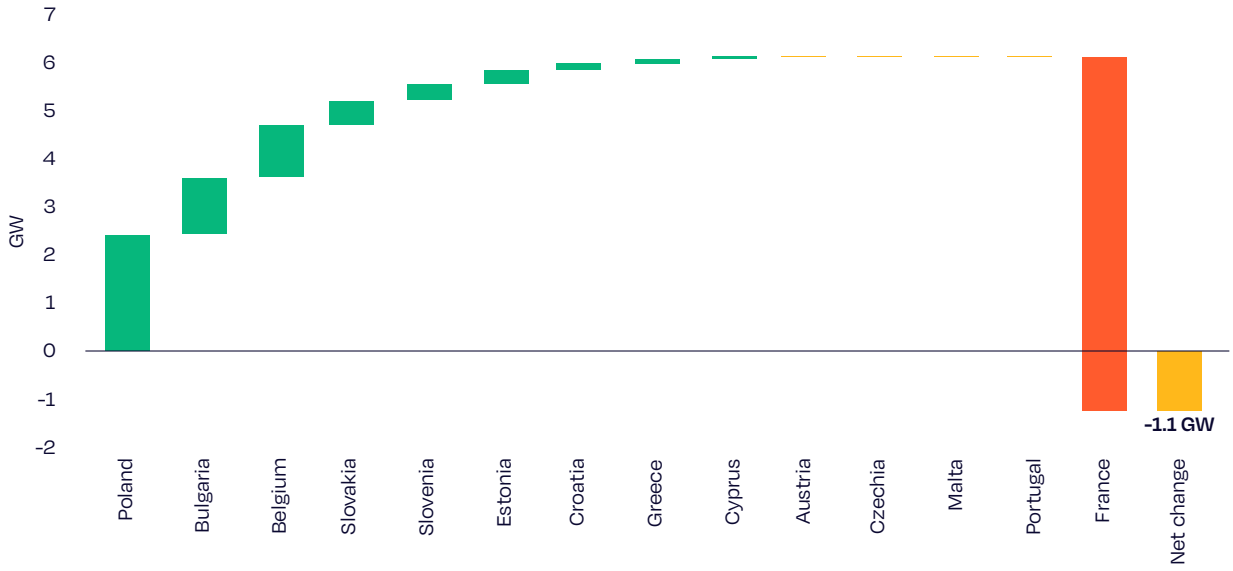
Looking at the 13 NECP draft plans that were not finalised by December 2024, 9 countries have since then increased their 2030 solar targets, while the 4 others have not updated them. The most significant upwards revisions come from Poland, which increased its solar target by 2.4 GW in its latest draft, Bulgaria (+1.2 GW), and Belgium (+1.1 GW). Slovakia, Slovenia, Estonia, Croatia, Greece and Cyprus have marginally increased their targets between 10-500 MW, while Austria, Czech Republic, Portugal and Malta have maintained their previous solar target set out in the 2023 draft NECP (Fig. 29).

15 These numbers have been slightly revised since our previous analysis, primarily based on better visibility on DC/AC conversion rates.
16 In October 2025, the EU Commission referred Poland to the European Court of Justice for failing to submit their finalised NECP update, now over a year late. Still, assuming that the solar target will not be changed since the latest available plan, numbers for Poland's solar target in this chapter are based on the July 2025 version.

Figure 29

Upward NECP revisions in 2025 counterbalanced by France's reduced solar target

2030 solar target updates in final NECPs since December 2024



NECP updated by Dec. 2024

14 countries

Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Romania, Spain, Sweden

NECP updated since Dec. 2024

13 countries

Increased target		No change	Decreased target
Poland* (+2,400 MW)	Estonia (+300 MW)	Austria	France (-7,200 MW)
Bulgaria (+1,197 MW)	Croatia (+144 MW)	Czechia	
Belgium (+1,090 MW)	Greece (+100 MW)	Portugal	
Slovakia (+520 MW)	Cyprus (+37 MW)	Malta	
Slovenia (+324 MW)			

Increased target +6.1 GW

Decreased target -7.2 GW

Net change -1.1 GW

*Based on Poland's latest NECP draft from July 2025

Note: Updates since EU Solar Market Outlook 2024-2029, published in December 2024

However, at the same time, France's NECP solar target has been revised downward by 6 GW_{AC} (7.2 GW_{DC}) in 2025. The French NECP features a solar target as a range, between 54-60 GW_{AC} (64.8-72 GW_{DC}) capacity by 2030. While we previously assumed the higher boundary for the target, current evolutions in the debate surrounding France's energy programming law led us to now consider the lower boundary.[17]

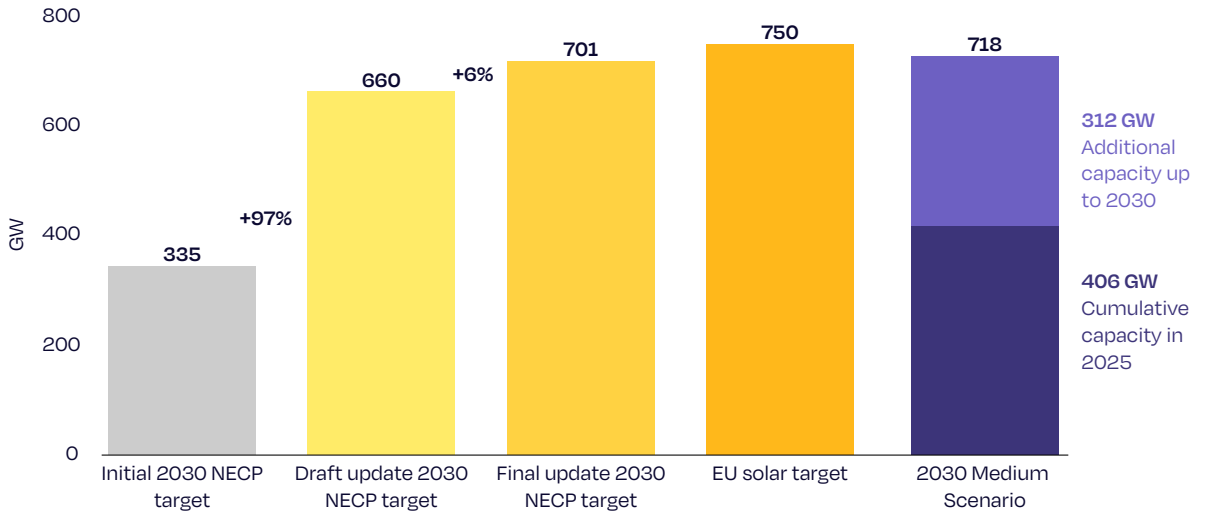
Considering all revisions, the final updated NECP targets now amount to 701.5 GW, with a net decrease of 1.1 GW compared to our previous analysis, despite 9 countries publishing increased solar targets since.

Looking at the evolution of the EU aggregate solar target over time, it has increased considerably since Member States have been required to include their 2030 solar ambition in the NECPs. Compared to the first edition of the NECPs in 2019 (335 GW), the total NECP solar target has more than doubled, while it has increased 6% compared to the 2023 draft update (660 GW). However, the NECP targets are still below the 750 GW solar target set out in the 2022 EU Solar Energy Strategy, missing it by 49 GW, or 6% (Fig. 30). Despite the recent revision round, in several cases NECPs are still not reflecting the realities of the market and the potential of the industry. Compared to our most-likely Medium Scenario forecasts, the aggregate NECP target falls short by 17 GW.

Figure 30

Total NECP solar targets increased 6% since 2023 drafts, but still fall short of EU solar target by 49 GW

Evolution of NECP solar targets since 2019 versus current and forecast EU-27 solar PV installed capacity



NECP: National Energy and Climate Plan

17 France's Multiannual Energy Plan (PPE3) – opened for public consultation in March of 2025 – set 54 GW_{AC} as the solar target for 2030, rather than the more ambitious 60 GW_{AC} on the higher end of the NECP range. Furthermore, given the country's current political landscape and budget constraints, this target might be lowered again before the final draft. Another leaked draft from July 2025 suggests the target may be further reduced to 48 GW_{AC}.

A quarter of EU Member States now expected to miss their solar targets as solar business case worsens

According to our latest market analysis, four Member States (15%) have already achieved their 2030 solar target in 2025 (Latvia, which has no solar target, Malta, Estonia and Cyprus); 16 Member States (59%) will reach it by 2030; and lastly, 7 Member States (26%) – Austria, Denmark, France, Germany, Ireland and Portugal and Sweden – will fall short of their 2030 solar target altogether, given current market and policy conditions (Fig. 31). This outlook has significantly worsened compared to last year, where only three Member States were expected to miss their 2030 targets. Across the board, the slowdown in the market has shifted the expected time when countries will reach their targets.

Figure 31

Due to worsened outlook, one quarter of EU countries are set to miss their national solar target for 2030

Projected timeline of EU-27 countries achieving solar PV targets under their National Energy and Climate Plans (NECPs)

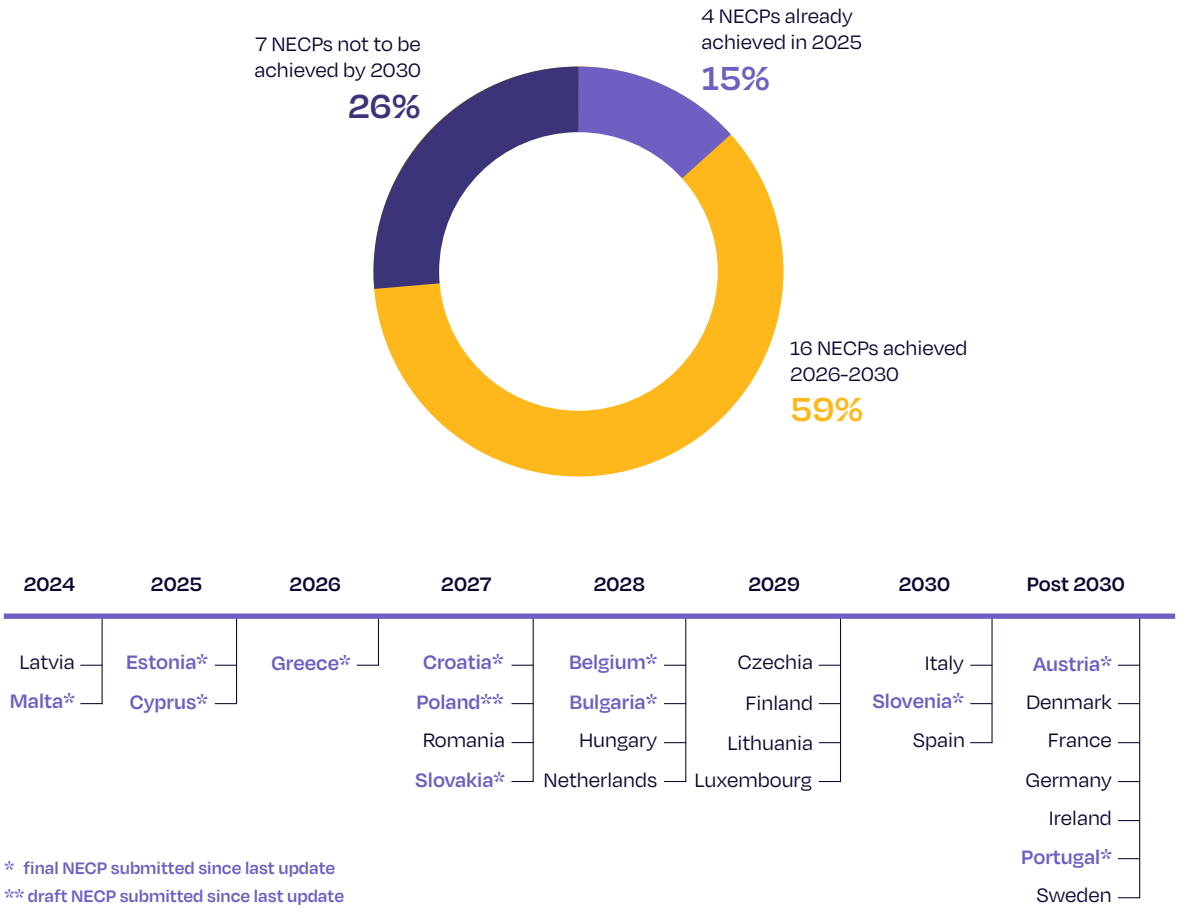


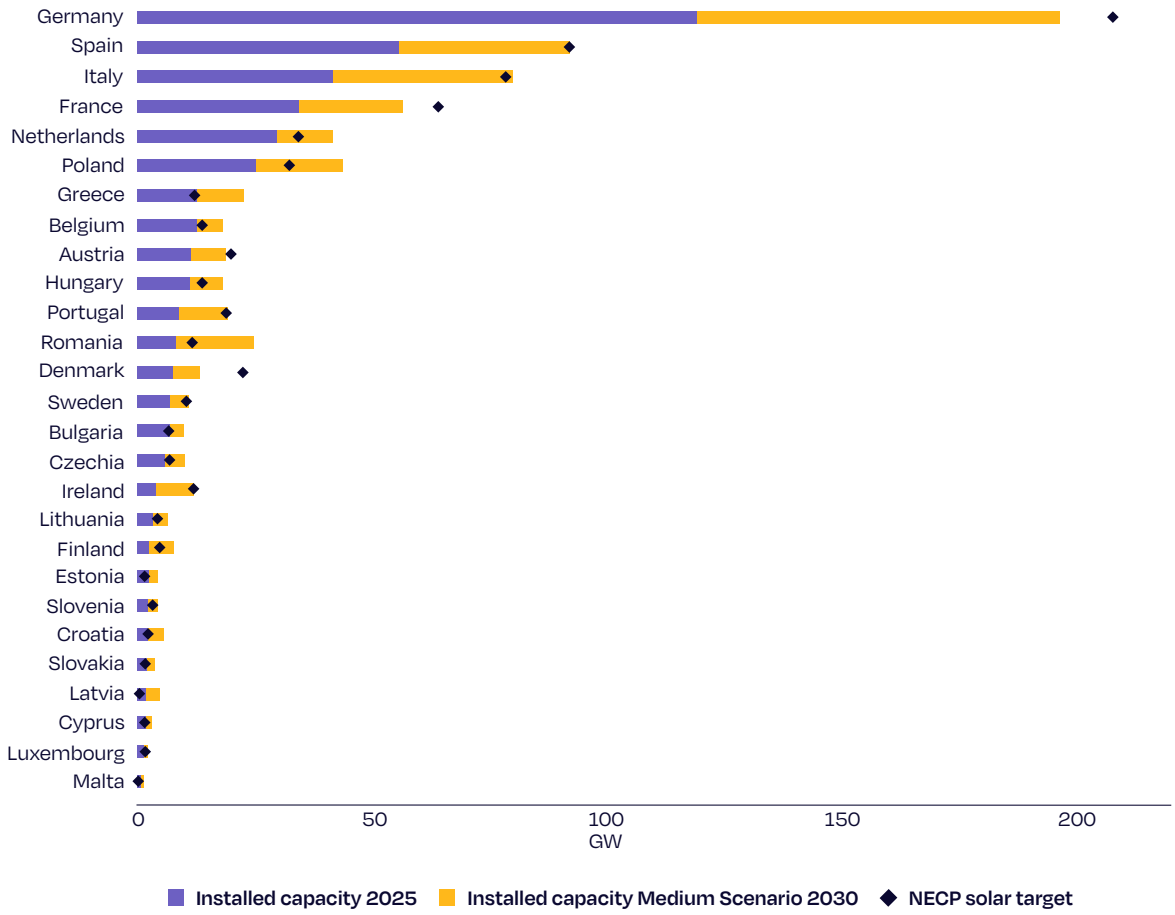
Figure 32 displays each Member State's most recent NECP target, compared to the current installed capacity and to the Medium Scenario forecast to 2030 based on expected market evolution. The chart also illustrates the size of individual countries' contributions to the aggregate NECP target.

Compared to last year's analysis, most of the largest EU markets have decreased their 2030 cumulative capacity projections by a significant margin. Due to this worsened outlook, three out of the top 10 markets by total PV capacity in 2030 - Germany, France, and Austria – are no longer expected to reach their national solar target on time under current policy conditions, unless corrective action is taken. Last year, it was only two.

Figure 32

Three of the top 10 EU markets to miss 2030 national solar targets

EU-27 total solar PV capacity 2025 and Medium Scenario 2030 forecast, compared to NECP targets



NECP: National Energy and Climate Plan

Our 2030 capacity forecast for **Germany** has decreased again compared to last year's edition of this report, considering increased high political uncertainty, system flexibility challenges, and worsening grid bottlenecks in this mature market. Anticipating a total solar PV operating fleet of 196 GW by 2030, Germany will miss its 215 GW solar target by 9%.

A new entry in this list despite a strong performance in 2025, **France's** solar market outlook for 2030 has been revised downwards significantly. With reduced ambition and decreased support for solar deployment, as well as overall political turmoil and growing opposition to renewables expansion, uncertainty in this market is expected to slow down growth. France is expected to miss its 64.8 GW (54 GW_{AC}) 2030 solar target by 8.5 GW or 13%.

Although previously within reach, we now expect **Austria's** 21 GW solar target for 2030 to be missed by 12%, with the contraction in the rooftop market leading to a reduced market outlook in the coming years.[18] **Denmark** will miss its ambitious 24 GW solar target by 46%. **Portugal**, **Sweden** and **Ireland** are also expected to miss their 2030 solar targets by 10%, 4%, and 13% respectively.

8 MW, Bullstown PV park, Ashbourne, Ireland.

18 Austria's NECP solar target is 19 TWh of PV electricity by 2030 – this was converted to equivalent cumulative DC capacity.

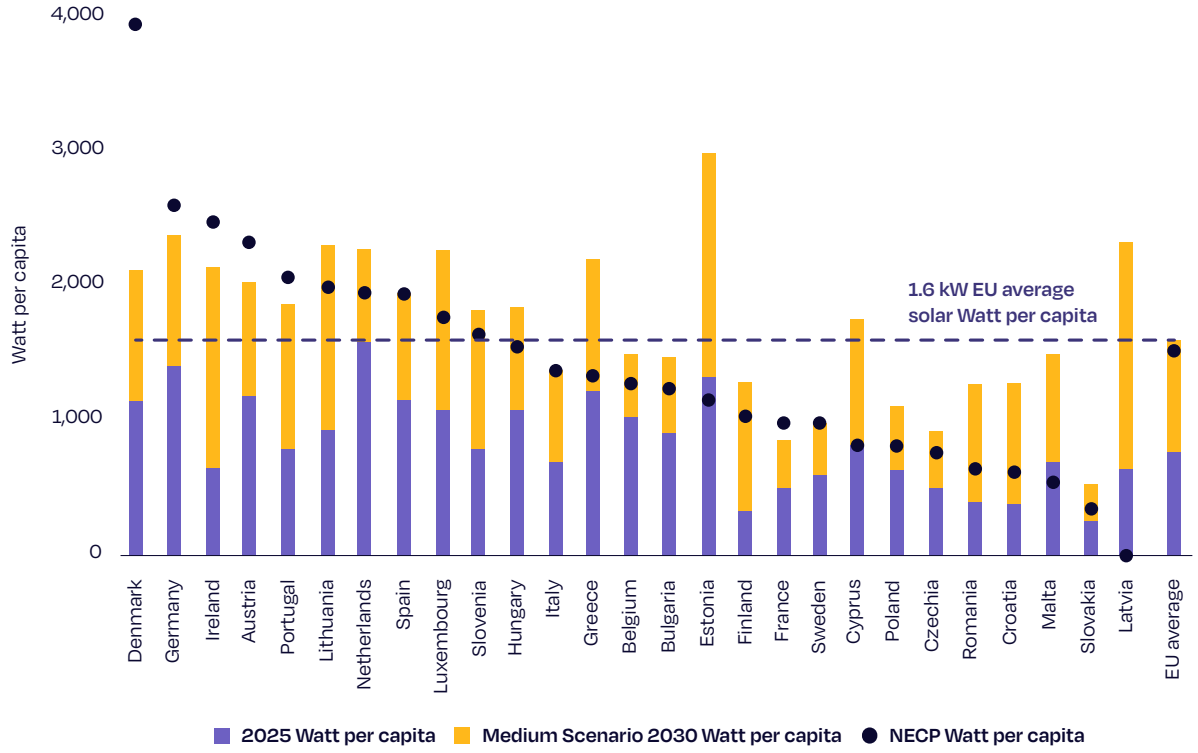
Final NECP solar targets raise overall 2030 EU solar per capita levels, with average 1.6 kW per person by 2030

By comparing solar targets and cumulative capacities per person, we have analysed countries of different sizes and their solar ambitions. Figure 33 shows current installed PV capacity, projected 2030 installed capacity and solar NECP targets per capita for each Member State.

Figure 33

National solar targets to bring on average 1.6 kW per person in the EU by 2030

EU-27 solar PV cumulative capacity 2025 and Medium Scenario 2030 forecast compared to NECP target



NECP: National Energy and Climate Plan. © SolarPower Europe

Denmark has the highest solar target per capita in the EU, surpassing all its peers by a large margin. This is due to Denmark's highly ambitious NECP target compared to its population, at 17.8 GW_{AC} (24 GW_{DC}) for 6.1 million inhabitants estimated by 2030.

Looking at countries' individual performances, Sweden, Czech Republic, France and Slovakia will not reach the milestone of 1 kW of solar capacity per person by 2030. Last year, only Slovakia was expected to miss this mark, reflecting a worsened outlook for these markets, based on developments in 2025. Under current market and policy conditions, the EU is expected to reach, on average, 1.6 kW per inhabitant by the end of the decade, in line with the average solar capacity under NECP targets, which will also be 1.6 kW by then.

The five Member States with the highest Watt per capita solar target – Denmark, Germany, Ireland, Austria, and Portugal – are all above the 2 kW per capita threshold, but are all expected to fall short of this goal. The remaining two Member States forecasted to miss their solar target, France and Sweden, stand at a much lower level below 1 kW per capita.

13 EU Member States now have storage targets in their NECPs, but aggregate volumes remain underwhelming

Achieving EU solar targets and increasing the share of renewables in the EU power mix urgently requires enhanced grid flexibility, especially through storage, along with an acceleration of electrification of energy systems. This is the reasoning behind SolarPower Europe's call for a tenfold increase in battery storage by 2030 to boost the European energy transition, security, and competitiveness, from around 75 GWh at the end of 2025 to at least 750 GWh in 2030.

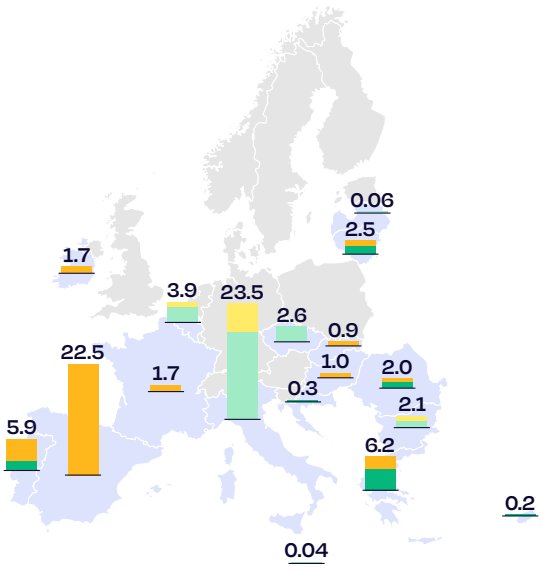
Energy storage – including battery energy storage systems, pumped hydro, and other technologies – is increasingly addressed in NECP documents, recognising its importance for grid flexibility and integration of renewables. At present, 13 Member States now include dedicated storage targets in their final NECPs. Among these, 7 countries include specific BESS targets (see Fig. 34).

However, ambition levels vary widely. Out of the 13 Member States with quantitative storage targets, only a few have set multi-GW goals (Spain, Greece, Portugal, Lithuania, and Romania), while the remainder have set targets in the GW range or below. Additionally, some Member States mention in qualitative terms their storage strategies without specifying numeric targets.

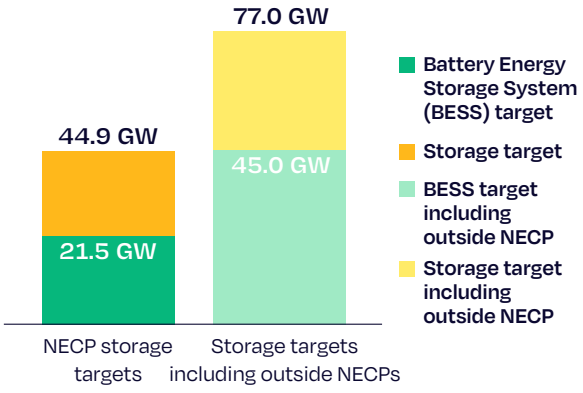
Figure 34

Most EU countries have energy storage or battery targets in their national strategies, but overall ambition remains limited

EU map of energy storage targets in National Energy Climate Plans or equivalent



EU-27 storage targets 2030



Data based on published NECPs and available equivalent energy strategy documents. Internal assumptions have been used to aggregate the cumulative BESS target, in cases where BESS capacity is not specified (e.g., Spain), or is expressed in GWh (e.g., Italy).
 Source: SolarPower Europe, Wood Mackenzie.

Spain has by far the most ambitious NECP energy storage plan, with a 22.5 GW target by 2030, slightly raising its draft target of 22 GW. It includes a mix of 10 GW of seasonal storage, and 12.5 GW of short-duration battery storage (3.6 GW of which being solar thermoelectric storage).[19]

Second ranked in this list, Greece set a 4.3 GW target for battery storage, and a separate 2 GW target for pumped hydro, by 2030. The share of pumped storage in the Greek target has shrunk throughout the drafts, with BESS's share increasing, now up from 3.1 GW in the 2023 draft. Despite the increase, the Greek solar association HELAPCO considers the target highly unambitious, as it will be exceeded by market dynamics, and yet falling short of the volume needed to manage renewable energy curtailment.[20]

Portugal, in addition to 5.9 GW in pumped-hydro capacity, raised its BESS target to 2 GW in its final NECP, up from 1 GW in the 2023 draft version, while Lithuania set a 1.5 GW BESS target together with 1 GW hydro-pumped storage. Romania aims for 1.2 GW (or 2.4 GWh) of BESS by 2030, alongside 800 MW of pumped storage. Ireland has fixed a 1.7 GW target for long-duration energy storage, while Hungary's NECP plans for 1 GW of both battery and hydro storage by 2030. Croatia, Cyprus, Latvia, and Malta's NECPs also include quantified storage targets, all below 1 GW by 2030. France and Slovakia have set pumped storage targets, but no BESS target.

Together, quantified storage targets detailed in the final NECP add up to a meagre 45 GW by 2030, 21.5 GW of which are estimated BESS capacity. This figure is underwhelming and largely surpassed by today's operating storage capacity, as SolarPower Europe estimates that the EU-27 already hosts about 37 GW of battery storage in addition to 46 GW of pumped hydro storage.

In some cases, like Finland, Member States give an indicative outlook for the planned or expected storage capacity, without strictly calling it a target with a specific time horizon. The phrasing is then subject to interpretation on whether this consists a "target" or not.

44 MW solar park in Las Rozas, Seville, Spain.

19 i.e. thermal energy storage (TES) used in conjunction with concentrated solar power (CSP) projects.
20 See Greece's GW market article, p.137.

Even so, most NECPs do highlight energy storage as a key for decarbonising energy mixes through increased renewables integration. Germany, for instance, does outline measures to improve flexibility in the energy system through an increased deployment of storage systems, although not defining clear targets nor quantifying flexibility needs. The plan refers to its Electricity Storage Strategy launched in 2023, but there are few specific timelines for implementation and cross-border cooperation to address structural grid congestion. The German solar trade association BSW-Solar has recently called on the federal government to impose a target of 100 GWh of cumulative operational BESS capacity by 2030,[21] estimating that installed battery storage capacity will likely exceed 25 GWh by the end of the year.

In fact, in various Member States, the NECP is not the sectoral guideline for storage targets. The most notable member of this group is Italy. While its NECP doesn't give a single aggregated storage target, in 2024 the TSO Terna set a 71.5 GWh storage target for the country for 2030 in the 2024 Scenario Description Document (SDD). This document sets out the necessary development plans for the Italian transmission and transfer grids in the electricity and gas sectors and it is recognised as the sector's target. This is also the case in Latvia, which published in May 2025 a national energy strategy that includes a storage forecast of 315 MW by 2030, 5 times the capacity included in the NECP.

Considering all storage targets across NECPs and equivalent documents, the aggregate storage capacity target stands at 77 GW by 2030, including 45 GW from BESS. Assuming an average 3-hour capacity storage duration by 2030, this translates into just 135 GWh of BESS operating in the EU by 2030, a volume expected to be reached already by 2027 according to SolarPower Europe's forecast.

NECP electrification trajectories fall short of EU goal for 2030

Electrification rates in the EU have remained largely stagnant over the past decade, persisting around 23%. The European Commission has recently established a non-legally binding target of achieving an EU-wide electrification rate of 32% by 2030.

It's important to acknowledge that, while stagnant, electrification rates vary widely within the EU, across different sectors. These differences can be correlated in part to the varying levels of implementation of existing EU legislation – notably the availability of dynamic tariffs and the roll-out of smart meters, which enable consumers to benefit from low prices when electricity is cheap, clean and abundant.

According to an analysis from Ember, the final NECPs indicate that Member States collectively aim for an electrification rate of around 30% by 2030.[22] This means that the Member States' commitment to electrify the energy system is lower than what's needed to reach the EU Commission electrification target.

In terms of explicitly quantified targets, which provide a clear signal for electrification ambitions, only Spain has included an overall electrification target in its plan, at 35%, increased from 32% in its draft plan. For most other Member States, electrification strategies either quantify specific sectoral electrification targets, for mobility, heating, or industry, or provide qualitative strategies for these sectors.

Clear electrification indicators in future NECPs would ensure transparent monitoring and effective policy planning. To do so, SolarPower Europe recommends the EU Commission to create an electrification indicator in the NECPs through the revision of the Governance Regulation.

21 BSW-Solar (October 2025): Solarwirtschaft fordert 2030-Ausbauziel für Batteriespeicher
22 Ember (2025): EU national targets show gas in decline

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Chapter 3

EU solar hot topics

In 2025, the change in the EU solar market dynamics has affected several parallel areas, including the trends in EU auctions and corporate PPAs; the relationship between solar and flexibility, and between solar and battery storage; solar's employment creation in the EU. In this chapter, we delve into the details of each of these key topics.

3.1 Solar auctions and corporate PPAs

Auctions and tenders

Solar auctions and tenders remain as one of the most important mechanisms to scale up solar PV generation in Europe. They offer structured, competitive pathways to secure long-term contracts, at stabilised prices with bankable project structures.

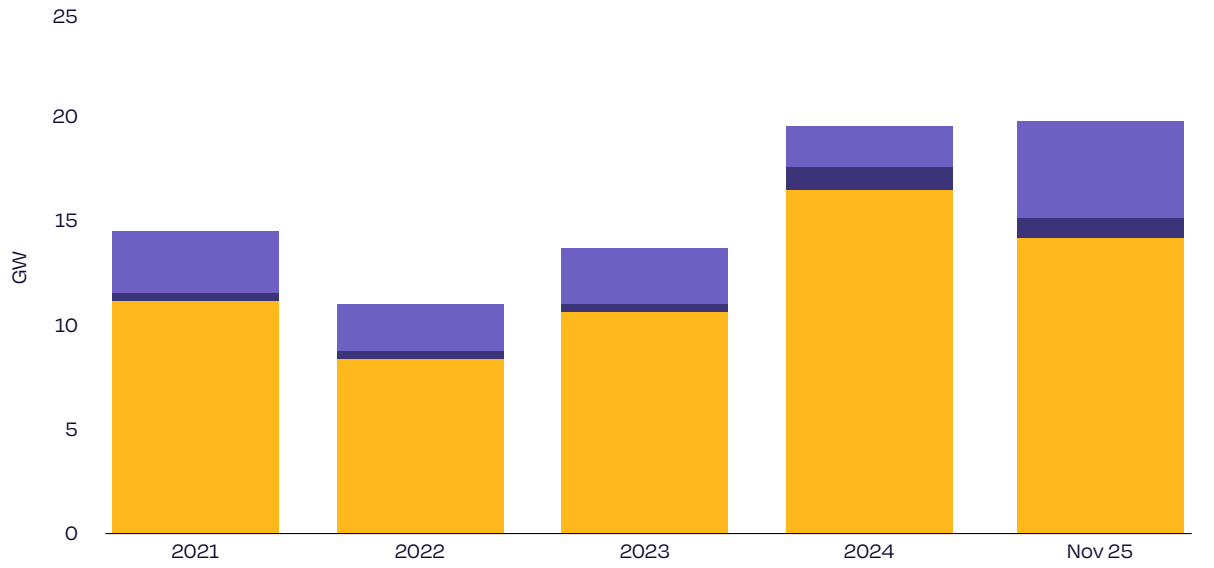
2024 marked an absolute record year for solar auctions and tenders in the EU, with almost 20 GW of solar PV capacity awarded (see Fig. 35). This new height surpasses the previous peak of nearly 15 GW achieved back in 2021.

Following the trend of previous years, ground-mounted projects absorbed an even larger capacity (84%), and the segment alone was awarded more capacity than the total in 2021. In contrast, rooftop auctions experienced a 30% decline in total awarded capacity compared to 2023, and saw its relative share decrease to 10%. The drop in relative terms was partially gained by the hybrid PV segment, which was awarded nearly two times more capacity than in 2023 (1.1 GW). This is due to the fact that innovation tenders in Germany managed to allocate all the offered co-located capacity, and witnessed a significant oversubscription rate in the second round.

Figure 35

Solar auctions and tenders register a new record level in 2025

EU annual solar PV awarded capacity in auctions and tenders, 2021-Nov 2025



Last year's success culminates the reform and expansion process of solar auctions and tenders in the EU, which experienced a notable decline since 2021. The energy crisis of early 2022 drove up PV equipment prices and led to higher bids amid rising inflation. This worsened economic reality was not adequately reflected in scheme designs. As a result, auctions and tenders were a notably less attractive route to market for developers, who either refrained from bidding or sought alternative options to develop projects.

Significant increases in ceiling prices in 2023-2024 helped accommodate these conditions, and boosted a recovery in the most important markets. In 2024, the 5 biggest auction markets (Germany, France, Italy, Netherlands and Poland) delivered 75% of the total PV capacity in the EU. This highlights once again the enormous concentration of public support for solar PV in these Member States. Germany was again the undisputed leader with 6.3 GW awarded in 2024.

By November 2025, total contracted volume amounts to 20 GW, already marking an all-time high. Utility-scale auctions continue to dominate the mix with more than 70%, but show a notable decline from last year, while rooftop increases its contribution to almost 25%. The innovation tenders have allocated the remaining capacity to hybrid PV+BESS.

Simtel's 5.5 MW solar park in Salonta, Romania, using Longi PV modules and FIMER inverters.

Corporate Power Purchase Agreements

After several years of rapid growth, the annual corporate PPA market is now stabilising, reaching around 4.6 GW of announced contracted solar PV capacity across Europe at the end of Q3 2025 (see Fig. 36). This marks the first year of stagnation since PPAs began playing a significant role in renewable energy project financing; a stagnation reflected both in deals and capacities signed. The slowdown is largely driven by the sharp decline of what was historically Europe's second most dynamic PPA market, Germany. Annual announced solar PPAs have fallen from around 1.5 GW in 2024 to less than 300 MW in Q3 2025 in Germany. Such a significant drop reflects a combination of factors, including uncertainty around the political support for solar and storage versus new fossil generation, and the market's ongoing adjustment to negative price events, which expose the lack of flexibility in the German energy system.

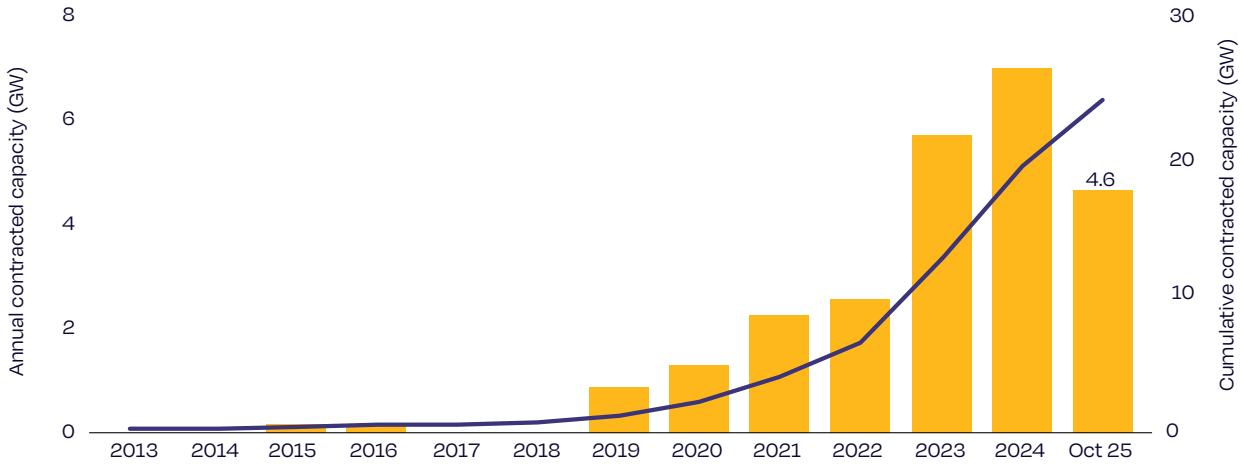
Other dominant European markets, such as Denmark, Sweden, or France are also showing signs of stagnation, as the pace of electrification remains slow and, with it, the demand for corporate PPAs. As Europe's electricity mix continues to decarbonise, only a faster electrification of end-use sectors can drive competitive decarbonisation by procuring cheap renewable electricity and stimulating PPA market growth. In contrast, Italy has experienced a particularly strong year, doubling its announced contracted capacity from 500 MW to 1 GW, the largest increase in Europe, as renewable generation continues to displace fossil fuels from the electricity mix.

Innovation appears to be the way forward in ushering in a new era of PPAs, driven by technological combinations and hybridisation with battery energy storage systems. While a few pioneering hybrid PPAs have been signed in previous years, 2025 marks a milestone with pioneer solar + BESS agreements concluded with corporates in France (ZE Energy and Orange), Spain (Q Energy and Nexwell Power), and Bulgaria (Enery and Teva).

Figure 36

EU corporate PPA market poised to stagnate for the first time in years

EU annual contracted corporate PPA announced capacity and cumulative announced capacity 2013-Oct 2025



3.2 Solar and flexibility

In Europe and worldwide, solar power is driving a revolution in the energy sector, growing much faster than anyone would have expected. With the global PV market on track to reach the terawatt level of annual installations by the end of the decade, solar capacity deployment has also accelerated in the European Union, with the interim REPowerEU target of 400 GW_{DC} by end of 2025 expected to be narrowly reached this year.

As more and more solar PV capacity injects electricity into the power grid to meet an increased demand for green and affordable electricity, several EU Member States are now running almost entirely on renewable electricity during the spring months. As reported by Eurostat[23], five EU countries (Denmark, Latvia, Austria, Croatia, and Portugal) reached a renewable electricity share over 85% in Q2 2025, with solar providing the largest share of electricity across the EU in the same period.

Against this backdrop, the EU energy sector needs to undergo a transformation that does not come without challenges. With such levels of solar and renewable penetration, our electricity system, historically designed for centralised, conventional assets, is starting to face issues related to the smooth integration of variable renewable generation. The issues are both technical – related to the integration of renewable projects into the grid, increasing the level of curtailment – and financial, in relation to the market structure, investment attractiveness and remuneration of renewable producers.

To address these challenges, flexibility solutions play a fundamental role in a power system characterised by a large share of variable renewables. As outlined in SolarPower Europe's Mission Solar 2040 report[24], tapping flexibility potential allows to make better use of abundant, clean, and cheap electricity, reducing total energy system costs through smart electrification while drastically cutting GHG emissions from the energy sector.

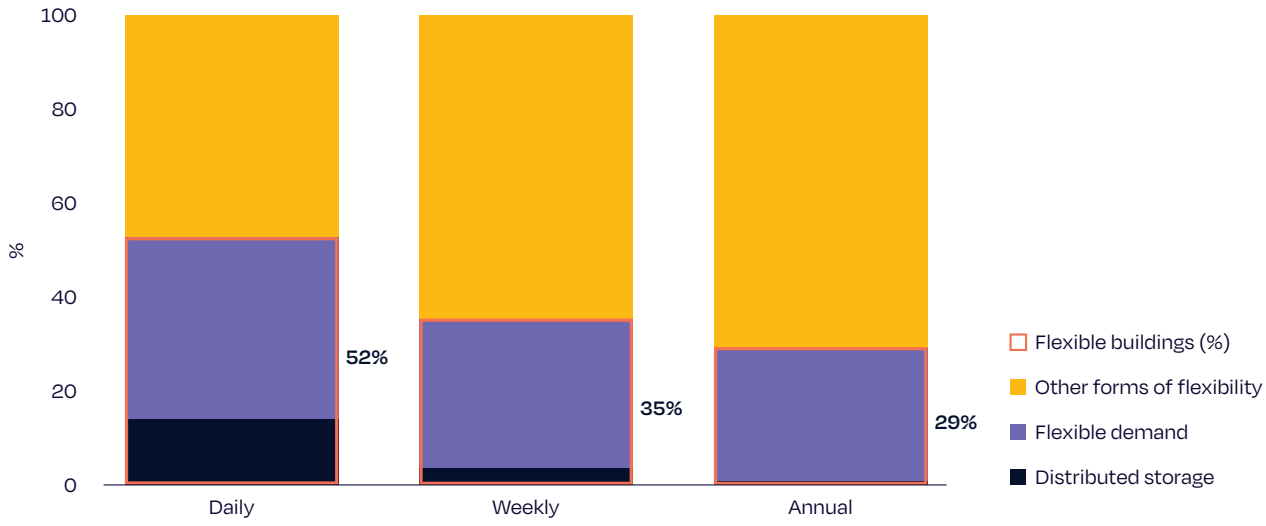
65 MW solar park by Jorge Energy and JinkoSolar in Zaragoza, Spain.

23 Eurostat (2025): Solar: main source of EU electricity in June with 22%
24 SolarPower Europe (2024): Mission Solar 2040

To maximise the benefits of energy system flexibility, the solutions available at different scales must be tapped. At distributed level, buildings can play a central role as energy hubs, providing flexibility to the system and contributing to its efficient operation while reducing costs for owners and tenants. This can be achieved through the synergies of today's flexible technologies at the distributed level: solar PV systems, behind-the-meter battery storage, heat pumps, electric vehicles, and smart energy management systems. SolarPower Europe's *Flexible buildings, resilient grids* report illustrates the immense transformative potential of building flexibility, estimating that by 2030, flexibility solutions from buildings have the potential to meet 52%, of daily, 35% of weekly, and 29% of annual flexibility needs (see fig. 37).[25]

Figure 37

Buildings' contribution to EU flexibility needs 2030



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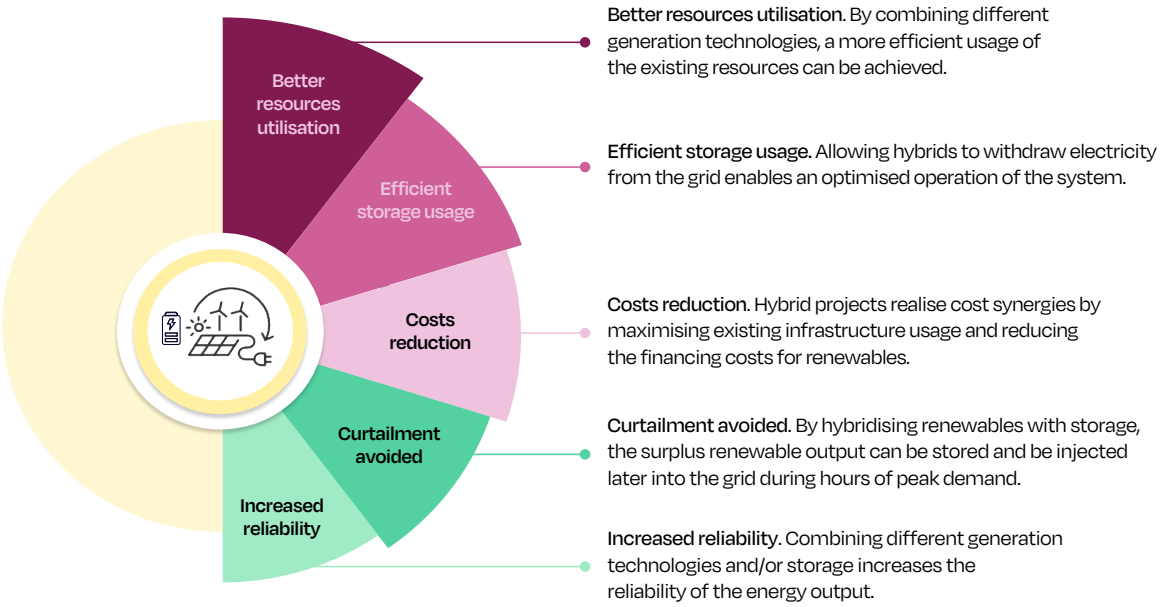
60.5 MW solar park, to be hybridised with 11.2 MW wind, in Gundelsheim, Germany.

25 SolarPower Europe (2025): Flexible buildings, resilient grids: How rooftop solar strengthens the electricity system

At the large-scale level, hybrid PV systems stand as an important piece of the flexibility puzzle. Combining solar PV with storage or wind and sharing a single grid connection access point, these systems improve project cost-effectiveness, improve the reliability of electricity generation, and support system flexibility (see fig. 38). As outlined in SolarPower Europe's report *Embracing the benefits of hybrid PV systems for Europe's energy transition*, the EU has yet to fully exploit the potential of hybrid PV projects by removing barriers to their deployment with a supportive policy framework.[26]

Figure 38

Benefits of hybrid projects



For more information on the area of solar and flexibility, check our recent reports:

- Mission Solar 2040
- Flexible buildings, resilient grids: How rooftop solar strengthens the electricity system
- Embracing the benefits of hybrid PV systems for Europe's energy transition

26 SolarPower Europe (2025): Embracing the benefits of hybrid PV systems for Europe's energy transition

3.3 Solar and battery storage

Battery storage has emerged as the fastest-growing energy technology globally, playing a pivotal role in shaping the future of energy transformation. Batteries are the absolute shortcut to delivering flexible and electrified energy systems across the globe, and are fundamental for the growth of solar PV. Off their radar until recently, policymakers and investors have now recognised the central role of batteries for the energy transition.

According to our recent *European Market Outlook for Battery Storage 2025-2029*, in 2024 Europe installed 21.9 GWh of battery energy storage systems, continuing an uninterrupted streak of record-breaking annual additions that began more than a decade ago (see Fig. 39).[27] This brought the total installed capacity across the continent to 61.1 GWh by the end of the year.

However, the pace of growth slowed significantly, with annual expansion dropping to 15% after three consecutive years of doubling new capacity. As electricity prices fell and major support schemes were phased out in 2024, the household segment declined.

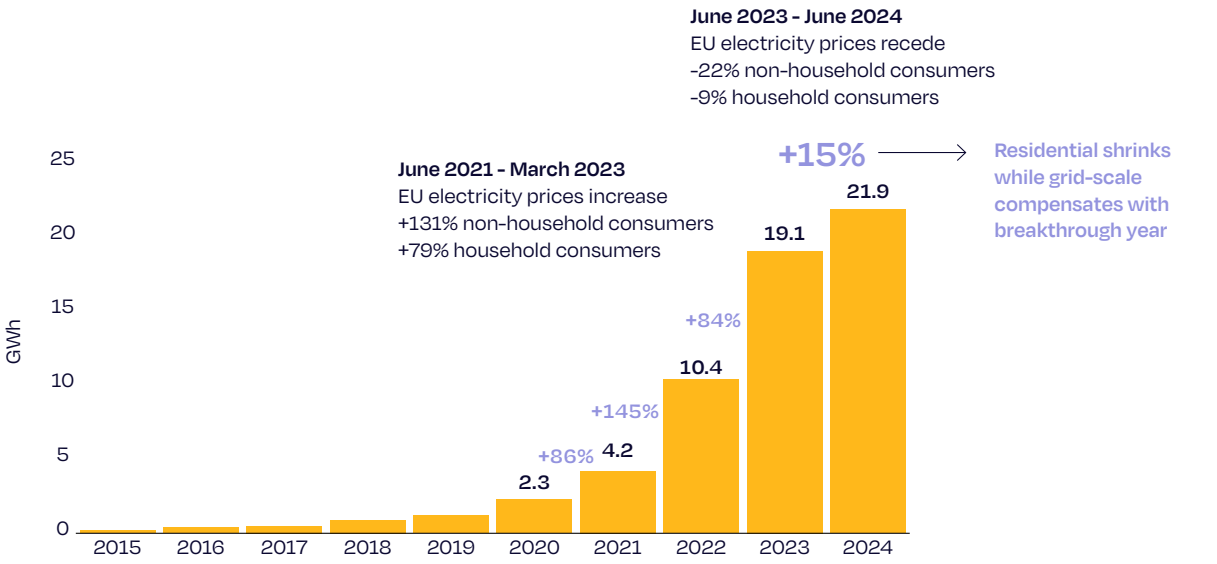
That drop was counterbalanced by a strong growth in large-scale installations, which helped sustain overall momentum. The year marked a turning point for the battery market, as shifts in power prices, policy support, and borrowing costs had a clear and visible impact on deployment trends.

Germany, Italy, and the UK remained Europe's leading BESS markets, adding almost 70% of yearly deployment. Austria and Sweden joined the top five for the first time, and surpassed the GWh-scale.

Figure 39

Europe breaks another battery storage record in 2024, though growth curve flattened after 4 years of extraordinary growth around the energy crisis

Europe annual BESS capacity 2015-2024



27 SolarPower Europe (2025): European Market Outlook for Battery Storage 2025-2029

Looking ahead, our Medium Scenario projects a steep rise, with annual installations reaching almost 120 GWh in 2029. Large-scale batteries, which will already account for 55% of new capacity in 2025, will dominate further, comprising 68% of annual additions by 2029.

This would lead to around 400 GWh of total installed BESS capacity by 2029, representing a sixfold expansion in just five years (see Fig. 40). In contrast, the High Scenario, driven by improved policy and market conditions, results in approximately 600 GWh of operational capacity by 2029, while the Low Scenario expects around 250 GWh by that year.

To reach the High Scenario, and beyond, framework conditions need to be radically improved, which requires decisive action. Similar to the EU Solar Strategy, adopted in 2022, we call on the European Commission to adopt a Battery Storage Action Plan for the EU. This plan should set ambitious deployment targets, outline a pathway to eliminate existing barriers, and develop an industrial strategy to support resilient and sustainable battery supply chains.

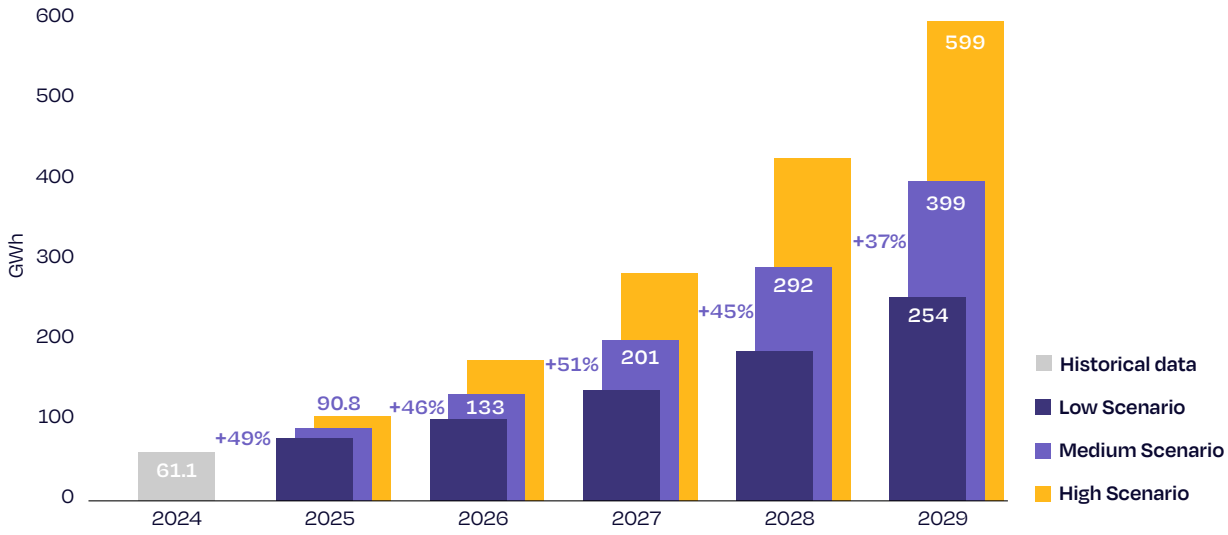
To bring together industry leaders to make battery storage and flexibility a political priority in EU energy and industrial policymaking, SolarPower Europe has created the Battery Storage Europe Platform.

For additional insights about the dynamics, drivers and challenges of battery storage in Europe, download SolarPower Europe's European Market Outlook for Battery Storage 2025-2029.

Figure 40

European battery fleet on track to reach 400 GWh by 2029 but High Scenario lies 200 GWh above

Europe cumulative BESS market scenarios 2025-2029



SolarPower Europe

BATTERY STORAGE EUROPE PLATFORM

A new platform by SolarPower Europe to promote the development and expansion of battery storage in Europe

3.4 EU solar jobs

In 2024, solar employment grew modestly to 865,000 full-time equivalent (FTE) jobs, a 5% increase over the 826,000 FTEs recorded in 2023 (Fig. 41). Direct jobs, involved in the core solar value chain (such as manufacturing, project development, and installation), accounted for 377,000 FTEs, or 44% of all jobs. Indirect jobs, supporting a diverse range of connected activities in upstream or downstream sectors, made up 488,000 FTEs (56%).

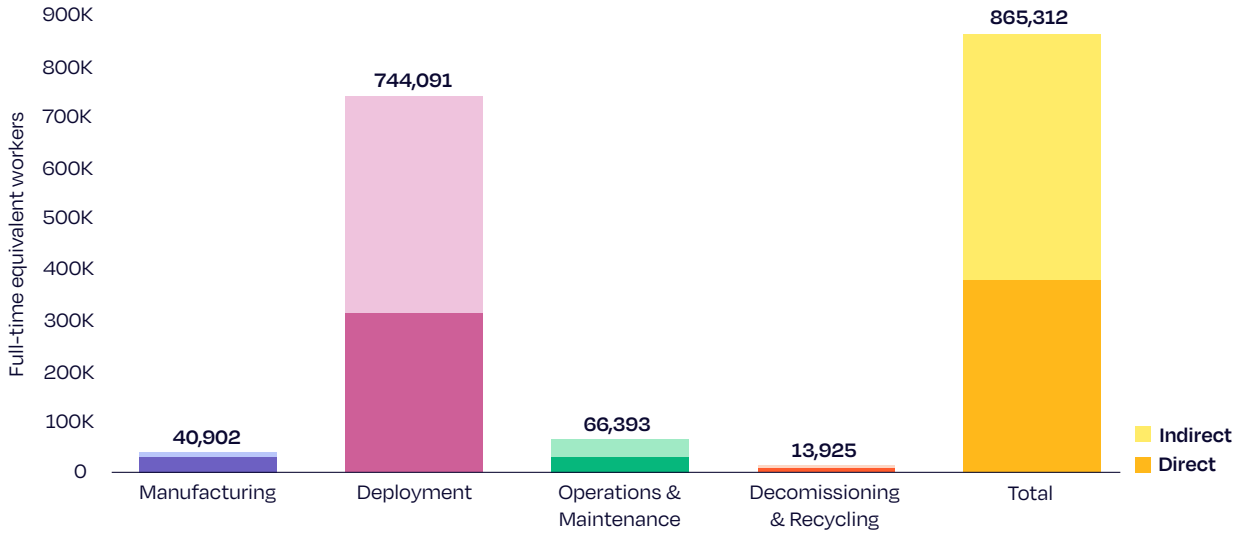
The vast majority of jobs, 744,000 FTEs or 86% of the total, are concentrated in solar deployment activities. This highlights both the vitality and vulnerability of the sector: job creation is highly dependent on ongoing market expansion and installation activity. Operations & Maintenance (O&M), an area steadily gaining importance as the installed base grows, generated 66,000 FTEs (8% of total jobs) in 2024. Solar PV manufacturing, a segment that plays an essential role not only within the broader solar ecosystem but also from the perspective of EU strategic autonomy and energy independence, contributed 59,000 FTEs. The segment is facing strong challenges posed by international competition and supply chain uncertainties. Lastly, the still emergent Decommissioning and Recycling segment represents promising avenues for future employment as Europe's solar fleet matures.

Germany remained the leading EU country for employment, with around 128,000 direct and indirect FTEs, though this was a decrease compared to the previous year. Spain ranked second with 122,000 FTEs, maintaining strong employment levels despite a slight drop in installations. Italy saw significant growth, with the solar job market surpassing 100,000 workers, placing it third in the EU. Other top markets included Poland (90,000 FTEs), France (66,000 FTEs), Romania (62,000 FTEs), and Hungary (47,000 FTEs). Overall, the largest national solar markets also represented the largest sources of solar employment in the EU as of 2024 (Fig. 41).

Figure 41

EU solar PV employment reaches 865,000 in 2024, split between direct and indirect jobs

EU-27 solar job market in 2024



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A closer look at market forecasts anticipates a further loss of momentum in solar employment creation. The slight solar PV market contraction anticipated in 2025 is expected to temporarily reduce solar jobs, which decrease by 5% to 825,000 FTEs under the Medium Scenario (Fig. 42). Nevertheless, as solar PV installations will regain a positive growth rate towards 2029, employment is expected to rise again, reaching 916,000 FTEs in the Medium Scenario by that year, and up to 1.1 million in the High Scenario.

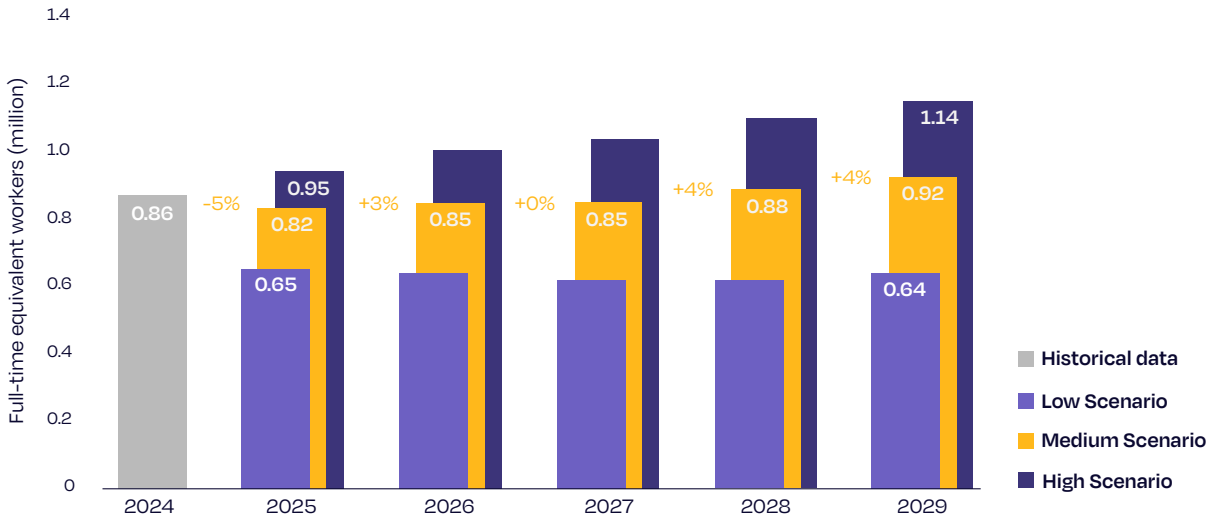
The EU solar jobs landscape displays a nuanced portrait of a sector in transition. The solar industry's recent rapid expansion and record employment gains are now tempered by emerging headwinds, including the slowdown in residential solar, the scaling back of supportive policies, and the inadequate levels of system flexibility. Growth of solar employment in the EU will depend on the sector's ability to adapt to changing market conditions, ensure viable business models the value chain, and secure the necessary financial and regulatory backing for sustainable growth. Against this background, EU-funded projects like RESkill4NetZero aim to address the shortage of skilled workers in the renewable energy sector, in particular solar PV. To do so, the project is advancing cross-renewables training frameworks to standardise competences across technologies.

For more information on solar employment in the EU, please check our recent EU Solar Jobs Report 2025.

Figure 42

EU solar employment projected to fall for the first time in years, with lacklustre performance ahead

EU-27 solar PV FTE scenarios 2025-2029



EU solar manufacturing update 2025

The European solar manufacturing sector is facing significant challenges due to global overcapacity and falling prices, leaving it mostly far short of the Net-Zero Industry Act's 2030 targets.

In 2025, the solar manufacturing landscape continues to be limited by domestic production capacity across the value chain, persistent challenges for module, cell, and production equipment manufacturers, while ingots and wafer capacities have disappeared. Meanwhile, the inverter and mounting system segments remain the most active in the EU, with several leading global players; but companies in these segments are increasingly under pressure as well due to lacking growth and low-price competition from abroad, primarily China.

Since signing the European Solar Charter and adopting the NZIA in 2024, several countries including France, Italy and Austria have begun translating pledged commitments to preserve the European PV sector into concrete measures at the national level.

EU solar manufacturing lags behind 2030 targets in most value chain steps, despite promising flagship projects and upcoming policy initiatives

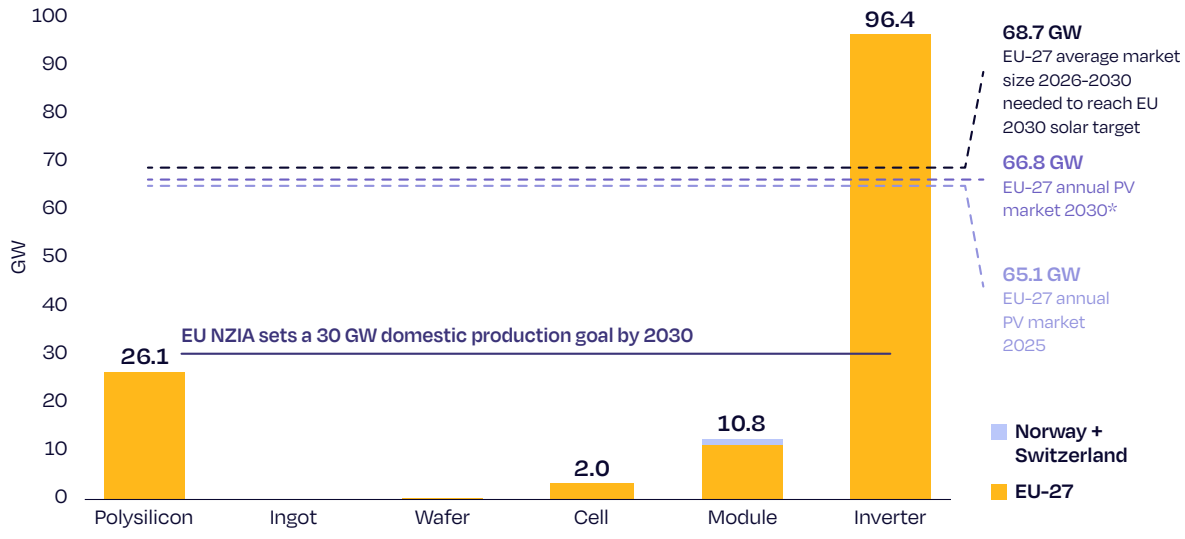
The Net-Zero Industry Act (NZIA) formally entered into force on 29 June 2024, setting a **goal for the EU to reach at least 30 GW of solar manufacturing capacity by 2030**, at each stage of the value chain, recognising the crucial need to strengthen resilience in European PV supply chains. This chapter takes stock of the state of EU solar manufacturing in 2025 across the silicon-to-module and inverters value chain, as EU producers face serious challenges due to global overcapacities, all within an evolving EU framework for cleantech manufacturing. A new feature in this year's report, the chapter also provides an overview of key players in the EU solar mounting systems and production equipment segments.

Across the solar value chain in Europe, from inverters to polysilicon and modules, the climb to the 30 GW production capacity target is steeper for some segments than for others (Fig. 43). Solar inverter manufacturing has long surpassed this milestone, reaching **96 GW** in 2025, supported by a mature European industry with strong domestic activity and a solid presence in international markets such as the US and Australia.

Figure 43

European solar manufacturing falls short of EU targets and annual solar installation demand

2025 European solar PV manufacturing capacities vs EU annual installations



*SolarPower Europe Medium Scenario for 2030

Within the module chain, polysilicon production comes closest to the 30 GW threshold, at **26 GW**, though capacity is concentrated in a single established company, part of which is allocated to the semiconductor sector. For the rest, the challenge is more significant. Module production capacity, now contracted to around **11 GW**, needs to triple by 2030, while PV cell manufacturing, still at **2 GW** in 2025, needs to grow 15-fold in just 5 years. Cell producers rely on non-European imports for the middle stages of the value chain – ingot and wafer production – since these are now **completely absent in the EU**, after the closure of several key players in the last two years.

In short, despite the emergence of a handful of promising flagship projects, the solar PV manufacturing sector this year was again marked by several closures and insolvencies. In 2025, the gap between EU solar manufacturing capacity and the 2030 targets has further widened, with some production steps now entirely missing in Europe. Without considering previous production steps, current EU module capacities alone, even producing at full capacity, would meet only 17% of EU solar PV demand in 2025, and 16% in 2030. Based on all announced projects, up to 20 GW of new module production capacity may be added between now and 2030; if all realised, EU solar manufacturing could then meet 45% of solar PV demand expected in 2030.

With the rapid growth of the EU solar market between 2021 and 2023, many companies announced plans to open or expand solar production capacities in Europe, especially in the module segment, with some projects even aiming to integrate wafer-cell-module production. However, since 2024, market growth in Europe has stalled, while PV product prices continued to fall sharply. The massive wave of new global and notably Chinese manufacturing capacities that came online in 2023 and 2024 triggered severe supply-demand imbalances, driving module and component prices to historic lows. This placed enormous pressure on European and global manufacturers alike, leading to widespread announcements of factory closures, mothballing of production lines, and bankruptcies, particularly among module makers, and many new plans have been delayed, postponed, or cancelled.

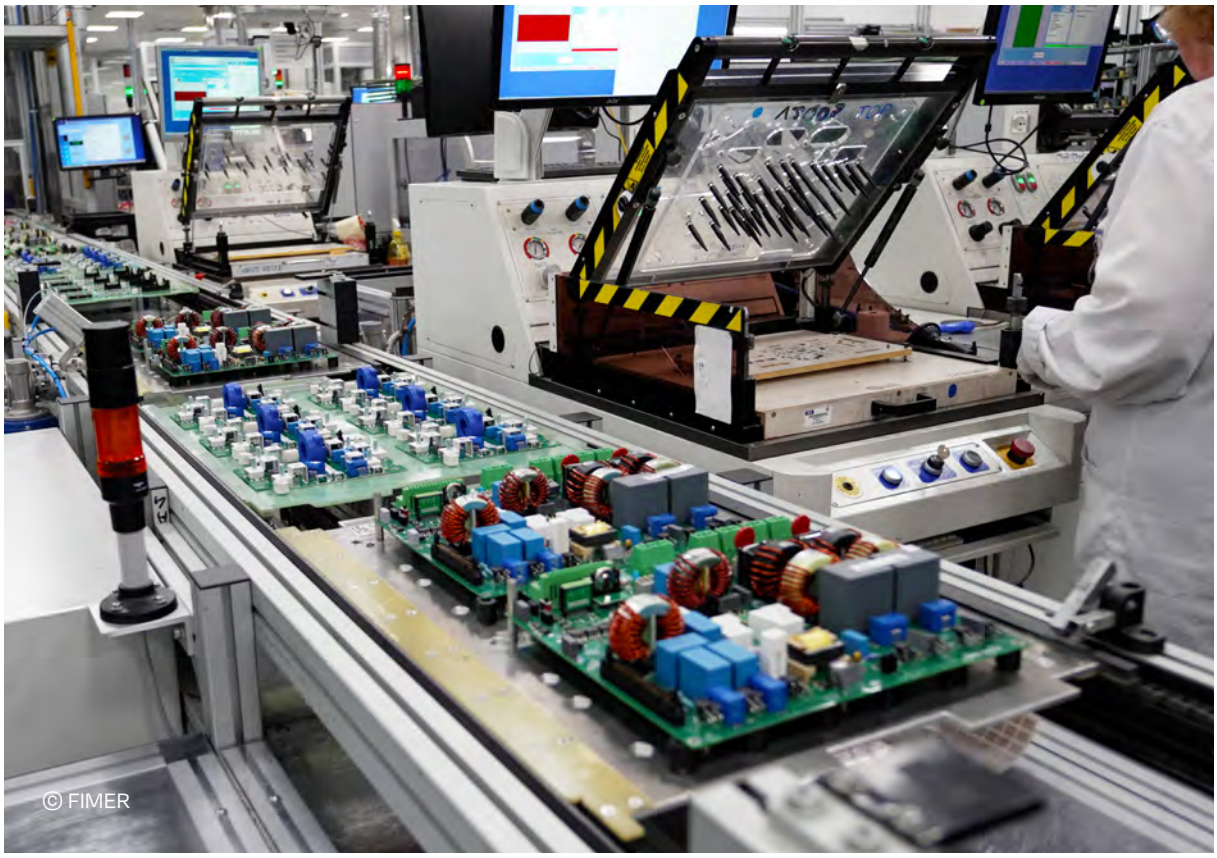
736 kW PV system on the rooftop and façade of K2 Systems' headquarters in Renningen, Germany.

The European solar industry is now navigating an uncertain landscape: while political momentum and new EU initiatives aimed at supporting 'Made-in-Europe' solar manufacturing are gaining traction, the sector is facing ongoing consolidation, with only the most competitive or strategically supported players positioned to survive the global oversupply crisis.

Among European manufacturers still operational in 2025, many are running at low utilisation rates, reducing the actual output compared to installed potential. At the same time, manufacturers are increasingly exploring opportunities outside of Europe, where conditions are currently more favourable, such as India, China, or the United States. The US notably emerged as an attractive destination for EU producers since the Inflation Reduction Act (IRA) was enacted in 2022, although new tariffs and potential changes to the federal tax credits under the Trump administration are creating uncertainty in the long-term. In fact, the 'One Big Beautiful Bill' Act has led to a shortening of the original timelines proposed under the IRA. Whilst there's an increase in stringency surrounding the use of non-US produced system components, there's no clear indication this will lead to stronger deployment of US-made solar, especially as the market shrinks following the incentive phaseouts.

Needless to say, there is an **urgent need to support EU domestic production of solar PV technology**. Since signing the European Solar Charter in April 2024, and the adoption of NZIA in June of the same year, several countries have begun translating pledged commitments to preserve the European PV sector into concrete measures; see examples from France, Italy and Austria on pages 103 and 104.

In September 2025, SolarPower Europe published a new study in collaboration with Fraunhofer Institute for Solar Energy Systems (ISE), *Reshoring solar module manufacturing to Europe*[28], revealing that the cost gap between NZIA-compliant modules and Chinese imported modules can be reduced to below 10% with the right urgent policies. For more on this see page 105.



FIMER production plant in Terranuova Bracciolini, Italy.

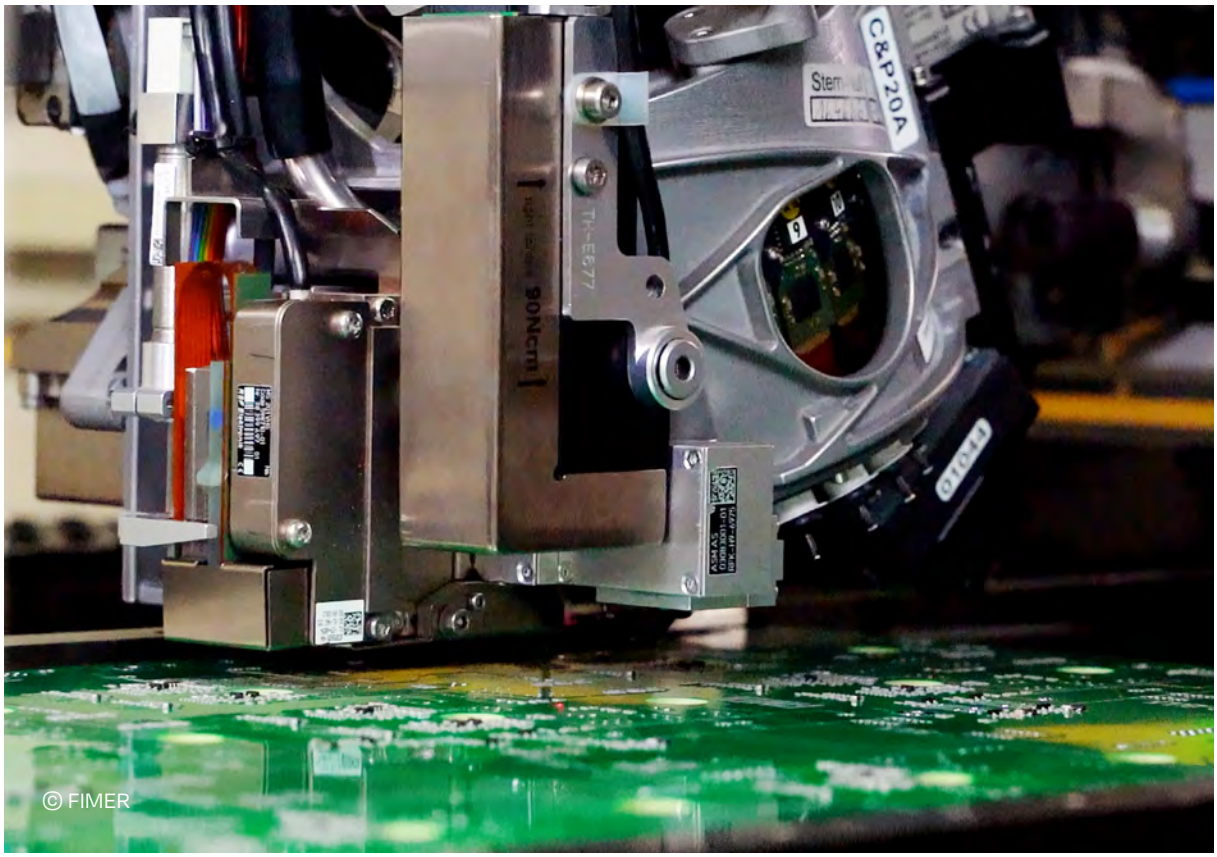
28 SolarPower Europe (2025): Reshoring solar module manufacturing to Europe: A cost gap analysis and policy impact simulation

Module, cell, ingot, and wafer production struggle, while inverter and mounting system sector comes strongly under pressure in 2025

Solar module and inverter value chain

The map of the solar manufacturing landscape in the EU, Switzerland, and Norway has been updated, based on the industry developments that took place throughout 2025. The objective of this map is to illustrate today's production capacities across key segments in the solar value chain in the region. The companies actively involved in silicon, ingot/wafer, cell, module, and inverter manufacturing, including both late-stage start-ups and those offering commercial products in 2025, are illustrated on our solar manufacturing map (see Fig. 44).

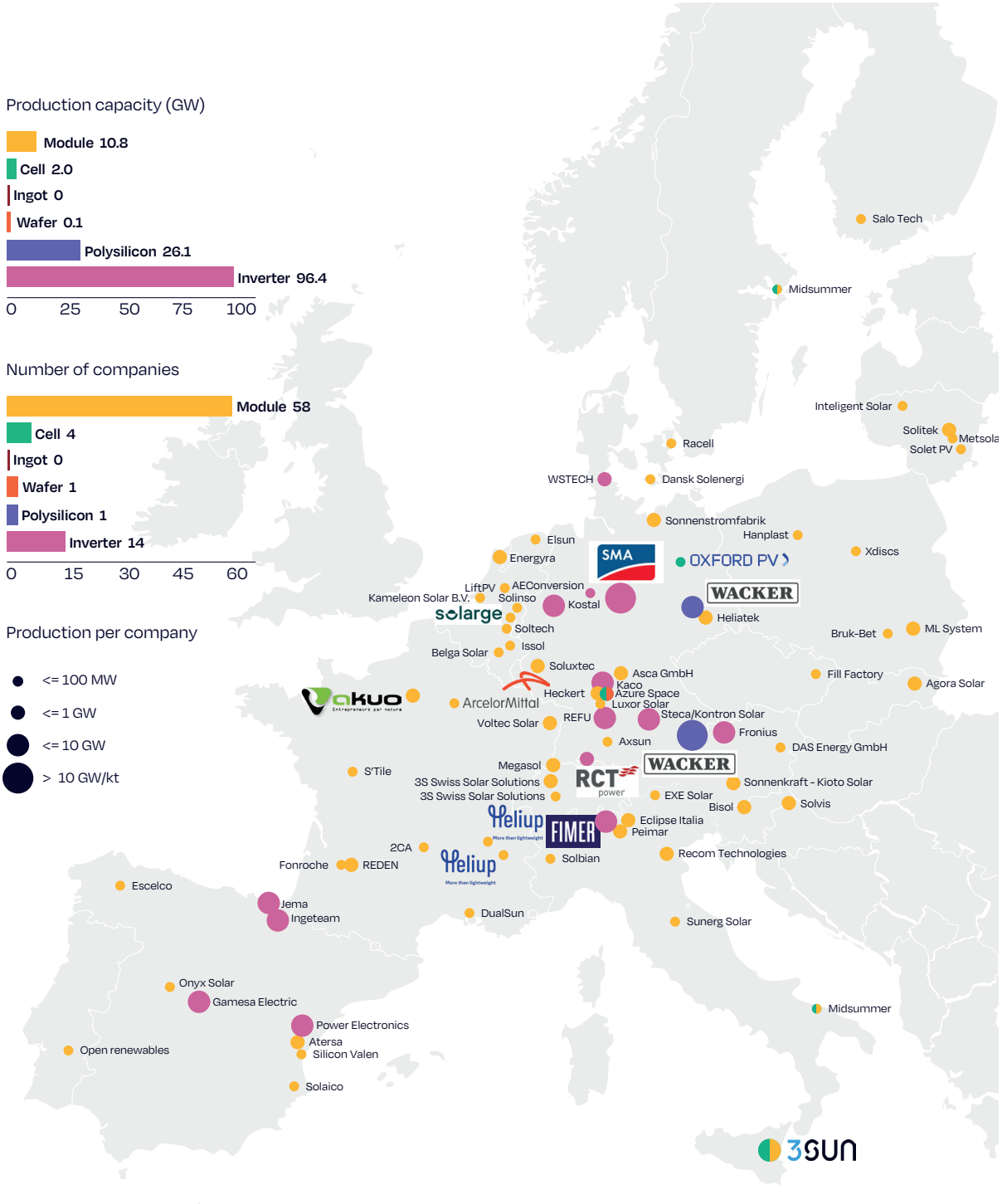
Production capacities are calculated and announced by companies publicly, based on methodologies that usually consider the production hardware's technical production capacity, the availability of labour and materials, the number of shifts needed to maintain 24/7 production, etc. It's important to note, across all segments, that manufacturers' stated production capacity does not usually correspond to the actually produced output in a given year. This is especially true in recent years, where challenging market conditions forced manufacturers in Europe as well as globally to slow down production activities, pushing utilisation rates down, as low as 20-30% for some, while others managed to maintain up to 80% utilisation of production capacity.



FIMER production plant in Terranuova Bracciolini, Italy.

Figure 44

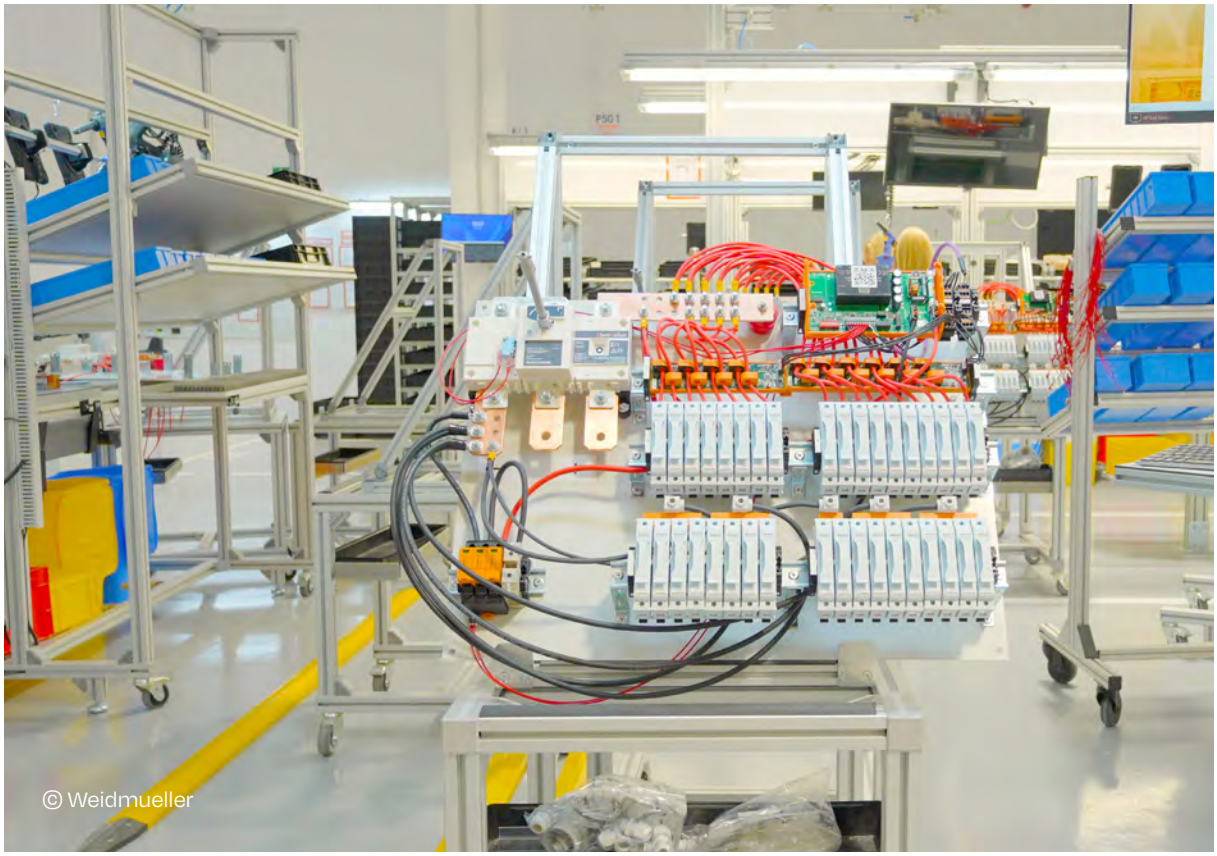
Solar polysilicon-to-module and inverter manufacturing map - EU-27, Norway, and Switzerland



Note: Production capacities are based on company announcements.
Missing providers and updates can be notified to the report authors.

Within the PV module value chain, from silicon through to finished modules, **Wacker Chemie** remains the EU's sole **polysilicon** producer for the solar industry. Operating across two German sites, the company has a combined capacity of around 60,000 metric tons – equivalent to about 26 GW of potential ingot, wafer, and cell production. However, not all of this output is directed to solar PV, as a significant share also serves the semiconductor sector. One development in this segment comes from the Netherlands, where Dutch start-up **RESiLICON** recently announced the start of the first phase of its planned polysilicon plant, after securing €14 million in funding from the Dutch government, a technology licence from Advanced Materials Solution (AMS) (US) and an EPC contractor. Once completed, the plant will supply the solar, semiconductor and battery sectors with polysilicon.

By contrast, the next steps of the value chain, **ingot** and **wafer** production, remain the most fragile parts of Europe's PV value chain, hit hard by adverse market conditions and insufficient policy support. Following the 2023 closures and suspended operations of Norwegian producers Norsun and Norwegian Crystal, wafer production in Europe has effectively fallen to zero. One promising project on the horizon is **Nexwafe**, a German start-up developing next-generation solar wafers in Bitterfeld-Wolfen, which secured funding in 2023 for a 250 MW pilot line. Although the first wafers are expected in 2025, as of writing no announcements have been made yet on start of production this year. In November 2025, Nexwafe was chosen as one of eight companies to receive funding in the latest round of the European Commission's Strategic Technologies for Europe Platform (STEP) Scale Up call, an initiative addressing a market gap in deep tech funding in Europe. French start-up **Carbon's** gigafactory project in France also includes plans for integrated wafer production, with expected 5 GW capacity by 2030.



Weidmueller's manufacturing facility of grid-connection equipment near Barcelona, Spain.

The **cell** segment maintains 2 GW capacity, despite significant developments in 2025. While **Enel 3SUN's** 3 GW module and cell manufacturing plant project in Sicily has scaled up to 1.8 GW capacity in 2025, at the same time, Swiss **Meyer Burger** declared insolvency for its German subsidiaries in May 2025, including its 1.4 GW of solar cell production in Talheim, Saxony. Despite efforts to keep its facilities open during restructuring, the company ceased operations at its German sites after failing to find new investors. Finnish cell and module manufacturer Valoe went bankrupt in April 2025, but assets were bought in July 2025, and restructuring may yet allow activities to continue in Finland. Future projects in EU cell manufacturing include plans from Dutch producer **MCPV**, which secured 4.2 million EUR financing from the Dutch government in 2024 through the first phase of its SolarNL manufacturing programme.[29] The funds will support the construction of a 4 GW solar cell plant in the Netherlands, with production due to start in 2026. However, after allocating the consortium a total €135 million in funding in the first phase, in September 2025 the Dutch government cancelled the remaining 277 million EUR conditionally awarded for phases two and three. This will not affect already allocated funds for MCPV's project. Meanwhile, French start-up **Carbon's** gigafactory is planning to integrate 5 GW of cell production capacity in Fos-sur-Mer, France, by 2028.

Finally, the **module** segment has seen several changes in 2025. Overall, module production capacities in the EU have been revised downward this year, from 12.6 GW in 2024, to 10.8 GW in 2025, mostly due to a re-estimation of **RECOM Technologies'** production capacity. Previously marked at 3.2 GW, reports state that the company only ever reached a maximum of 500 MW capacity before moving operations from France to Italy in 2024. Nevertheless, while **Enel 3SUN's** gigafactory scaled up module production capacity to 1.8 GW, and other smaller manufacturers also expanded their existing capacities, the segment did suffer several closures this year. The first blow to the industry came from French **Photowatt**, one of the world's oldest PV companies, which closed its operations in early 2025, after years of increasing losses and failure to secure a buyer to sell the business. In addition to this and the aforementioned Valoe, **Aleo Solar**, German branch of Taiwan-based Sino-American Silicon, also closed down PV module production Germany in March 2025.

Looking to the future, a number of gigafactory projects are expected to start ramping up in the next few years. Already in 2025, Chinese **DAS Solar** started construction of its 3 GW module plant in Mandeure, France, with plans to start production by the end of the year. French start-up **Carbon** plans to start PV module production at its gigafactory in Fos-sur-Mer, France, as early as 2026, progressively scaling capacity up to 4 GW by 2030. Other gigafactory projects in the EU include **Holosolis** (5 GW) and **Voltec** (5 GW) in France, **MCPV** (2.5 GW) and **Iberdrola** (2.1 GW) in Spain, and **FuturaSun's** (1.4 GW) FENICE Innovation Fund project in Italy. Together, these announced plans are meant to add close to 20 GW of extra module production capacity by 2030. However, some projects are experiencing delays, or serious setbacks: for example, Spanish **Silicon Valen**, which had announced plans for a 1.2 GW module factory in Spain, are now having to relocate their production after the devastating Dana flood in Spain from late October 2024 destroyed their factory in Massanassa.

Aside from the module value chain, the EU is also home to world-leading players in the **solar inverter** segment. Inverters, the "brain" of the PV system, are the largest solar manufacturing segment by far. EU production capacities in this segment increased 4% in 2025 to reach **96 GW**, compared to 92.4 GW in 2024. Inverter manufacturers are still the backbone of solar employment in the EU, as shown in SolarPower Europe's latest EU Solar Jobs Report 2025[30], with at least 14 organisations representing 80% of total employment in the solar manufacturing sector. Several of these European companies are international leaders like **SMA** from Germany, or **FIMER** from Italy. However, many EU inverter manufacturers faced serious challenges in the last two years: high inventories among wholesalers, weak market demand due to falling energy prices, subsidy uncertainties, and aggressive pricing from global competitors, especially in the residential segment, all contributed to a difficult operating environment for domestic producers, as some were forced to lay off staff throughout 2024-2025. Progressively losing market share in their home markets to non-EU inverter manufacturers, EU inverter producers often thrive in overseas markets instead, like the US or Australia.

29 The SolarNL programme comprised a consortium of solar companies that aimed to build solar manufacturing capacity in the Netherlands and included, among others, MCPV, Solarge, HyET Solar and research group TNO.

30 SolarPower Europe (2025): EU Solar Jobs Report 2025

Solar mounting systems and production equipment

The EU is also home to world-leading players for **other balance-of-system (BOS) components**. BOS components are the hardware and infrastructure products needed to support the operation of a solar PV system, beyond solar panels. In addition to inverters, the EU hosts an industrial ecosystem of **mounting system** producers, as well as **wiring and cabling** providers (see Fig. 45).

Figure 45

Solar Balance of System (BoS) manufacturing map - EU-27, Norway, and Switzerland

Note: Companies known to SolarPower Europe at the time of publishing. Missing providers and updates can be notified to the report authors.

Figure 46

Solar production equipment manufacturing map - EU-27, Norway, and Switzerland

Note: Companies known to SolarPower Europe at the time of publishing.
Missing providers and updates can be notified to the report authors.

The field for **mounting systems** for solar panels has often been overlooked but is a crucial segment with a rich industry in Europe, and where EU players often dominate in domestic markets. Whether rooftop, ground-mounted, fixed or tracking structures, made of steel or aluminium, Europe hosts over 40 solar mounting systems companies, ensuring the durability, resilience and energy system flexibility for PV projects worldwide. EU leaders in the fixed segment include **K2 Systems** and **Zimmerman PV-Steel Group** from Germany, **Enstall** from the Netherlands, which recently acquired Germany-based leader **Schletter**, among others. Smaller players like Polish start-up **enson** and French BIPV mounting system producer **GSE Intégratio**n also contribute to this rich industrial landscape. A number of internationally active solar tracker suppliers are based in Europe too, such as **Trina Solar's** TrinaTracker in Spain. US-based **Nextpower** holds the majority of the EU market specifically for tracker systems (see SolarPower Europe's Mounting Systems Explained[31] report from July 2025 for a deep-dive into this essential segment for PV value-chains).

Many cables and connectors for solar systems come from Asian companies, although European leaders include German **Weidmüller**, Spanish **Unex**, and **Stäubli** from Switzerland, also very well known for its robotics and automation business, with products on offer for solar module manufacturers as well.

In addition, 38 European companies are also active in **PV production equipment** for solar manufacturing, providing the machines and technology needed to produce solar components across module the value chain (Fig. 46, previous page). Active across nine countries (CH, DE, ES, FI, FR, HU, IT, NL, NO), European equipment providers are mostly specialised in the cells and modules equipment manufacturing segment (wet chemical tools, laminators, stringers, etc). Much like for the module value chain, the solar production equipment sector also originated in Europe, but is now dominated by Chinese companies today. Still, key players here include Spanish **Mondragon Assembly** and Italian **Ecoprogetti**, which both produce fully-integrated module assembly lines. For more on this topic, consult SolarPower Europe's Solar Production Equipment[32] report from March 2025.

Lastly, the **PV recycling** sector is emerging as a major growth opportunity. By the end of this decade, significant volumes of long-serving solar modules will begin reaching the end of their operational life – a trend that will accelerate in the years ahead. Across Europe, a growing number of start-ups are developing advanced processes to recover valuable materials from decommissioned panels for reuse in new solar production or other industries. Among them, **SOLAR MATERIALS** stood out by winning SolarPower Europe's 2024 Solar Sustainability Award.

Europe's solar research and innovation landscape is anchored in a dense network of interconnected ecosystems for **research and development (R&D)** (see Fig. 47). European solar manufacturers collaborate closely with specialised PV research institutes spread across the continent – including **AIT** in Austria; **Fraunhofer ISE & CSP,** and **ZSW** in Germany; **CEA-INES** and **IPVF** in France; **TNO** in the Netherlands; **EURAC** in Italy; **Tecnalia** in Spain; and **CSEM** in Switzerland, among others. Some smaller European equipment manufacturers like **M10 Solar Equipment** also specialise in niche applications like shingle matrix modules. These institutions drive scientific progress across the full PV value chain and a range of applications, playing a central role in strengthening the competitiveness and quality standards of Europe's solar manufacturing sector.

31 SolarPower Europe (2025): Solar Mounting Systems Explained
32 SolarPower Europe (2025): Solar Production Equipment - Explained

Figure 47

Solar research institution map - EU-27, Norway, and Switzerland

Note: Organisations known to SolarPower Europe at the time of publishing.
Updates can be notified to the report authors.

Member States have begun rolling out national PV support schemes with NZIA resilience rules and Made-in-Europe bonuses

Since signing the European Solar Charter in April 2024, and the adoption of NZIA in June of the same year, several countries have begun translating the pledged commitments to preserve the European PV sector into concrete measures at the national level.

In **France**, the implementation of the NZIA is progressing, particularly in the PV sector, with a focus on enhancing supply chain resilience. The simplified tender (*Appel d'offres simplifié*, or AOS) process is the first scheme in France to apply the NZIA resilience criterion, creating a market segment that excludes competition from production of third dominant countries by using the resilience criterion as an eligibility requirement. This tender targets the development of 1.4 GW of capacity in the commercial and industrial rooftop PV projects (100-500 kW segment). The first application period for this tender ran from 22 September to 2 October 2025, with a cap of 192 MW and a price ceiling of 95 EUR/MWh.

Manufacture of rails for K2 solar mounting systems at Richter Aluminium.

Additionally, from 1 October 2025, in all residential buildings, the installation of solar panels with a capacity of less than 9 kW is now subject to a reduced VAT rate of 5.5%. The application of this reduced rate is conditional on the modules meeting environmental criteria, including a maximum module carbon footprint threshold of 530 kgCO2/kW and other material content thresholds. The aim of the reduced VAT rate is to steer the private market towards more environmentally-friendly solar PV products.

Italy has started implementing the NZIA through its FER X auctions, introducing a dedicated "resilient" track for PV projects to strengthen supply chain security in 2025. Although FER X will expire at the end of 2025 under the Temporary Crisis and Transition Framework (TCTF), and will be replaced by the Clean Industrial State Aid Framework from 2026, a new regime is already being planned for 2026-2030, which will implement all NZIA provisions through auctions.

The initial FER X auctions applied the resilience criterion as a pre-qualification requirement: PV modules must not be assembled in China, PV cells and inverters must not be of Chinese origin, and at least one additional key component must also be non-Chinese. These requirements extend to products manufactured in facilities located in China, managed by companies headquartered in China, or belonging to corporate groups with a Chinese parent company. Compliance must be certified through official documentation (DSAN and Factory Inspection Certificates) at various project stages.

The registration period for the first FER X auction closed on 31 October 2025, with a slight oversubscription of the 1.6 GW allocated for this round (despite this is significantly lower than the initial expressions of interest, which accounted to 3 GW). Auction results will be published on 15 December 2025.

Italy's 2025 NZIA-aligned FER X auction serves as a pilot phase. The current approach introduces strict resilience criteria for PV components, but further developments are anticipated, including expanding the list of eligible components, introducing 'Made-in-EU' and sustainability bonuses, and integrating circular economy, energy efficiency, and innovation targets.

While not strictly falling under NZIA, **Austria** implemented a 'Made-in-Europe' bonus to support the domestic PV supply chain in 2025. This initiative is part of Austria's broader renewable energy strategy under the Renewable Energy Expansion Act (EAG) with two funding calls scheduled for June and October 2025.

Effective from 23 June 2025, a 'Made in Europe' bonus of 20% is applied to government funding for PV and energy storage projects utilising components manufactured within Europe. Financial incentives are available for key PV components (modules, inverters, and electricity storage systems) provided they are listed on an official whitelist and verified by accredited institutions. To qualify for the bonus rate, these components must meet strict manufacturing criteria defined by the Austrian Ministry of Economic Affairs, Energy and Tourism: for PV modules and inverters, all specified production steps (such as assembly, wiring, testing, and packaging) must be completed within the EU, EEA, or Switzerland, while for storage systems, at least one critical step (like battery cell production or integration) must occur in these regions. Manufacturers are required to provide valid inspection certificates, and detailed guidelines are available to ensure compliance with the 'manufactured in Europe' definition. Proof of European added value from a relevant conformity assessment body must be submitted through the EAG portal, and compliance will be checked during the final settlement stage.

Austria has allocated 60 of its 70 million EUR renewable energy budget for PV and storage projects in 2025 to target incentives that strengthen supply chains and encourage the use of 'Made in Europe' components.

Box 6

EU-made solar manufacturing competitiveness

In September 2025, SolarPower Europe published a new study with Fraunhofer Institute for Solar Energy Systems (ISE), indicating that the cost gap between Net-Zero Industry Act-compliant modules and Chinese imported modules can be reduced to below 10% with the right urgent policies.[33] The report quantifies the cost differences between EU-made solar modules that comply with the NZIA, imported solar modules that comply with the NZIA, and solar modules imported from China.

The report highlights the risk that, without additional measures, NZIA provisions could support solar supply chain diversification without boosting European solar manufacturers, as there remains a significant cost difference (2.2 to 5.8 EUR c/W) between NZIA-compliant EU-made and NZIA-compliant non-EU modules.

The cost gap for producing NZIA-compliant solar modules in Europe is significant. Manufacturing a solar module in Europe with EU cells costs about 10.3 EUR c/W more than in China. This is due to higher costs for equipment (+40%), building and facilities (+110%), labour (+280%), and materials (+50%). As a result, European PV systems cost about 60.8 EUR c/W compared to 50.0 EUR c/W for Chinese systems in the utility-scale segment, leading to a Levelised Cost of Electricity (LCOE) that is about 0.75 EUR c/kWh or 14.5% higher for European-made modules.

33 SolarPower Europe (2025): Reshoring Solar Module Manufacturing to Europe: A Cost Gap Analysis and Policy Impact Simulation

Despite this, the additional cost falls within the 15% cap outlined in the NZIA for non-price criteria in renewable auctions. The cost gap can be reduced to below 10% with the right mix of policies, such as combining CAPEX and OPEX support for manufacturers and project developers, and output-based support schemes. Output-based support, directly linked to manufactured products and domestic value creation, has proven effective in the US and India. The report assumes output-based support of 2 EUR c/W for both cell and module production, while the US IRA provides up to 11 EUR c/W.

Three system scenarios were analysed:

- A fully EU-based PV system (polysilicon to modules, including solar glass and inverters).
- A system with EU-based cells, glass, modules, and inverters, but Chinese polysilicon, ingot & wafers.
- A system with Southeast Asian cells, glass, modules, inverter, and Chinese polysilicon, ingot & wafers.
- The scenarios indicate that a fully EU-based system is 12.8 EUR c/W more expensive than a NZIA-compliant system without any EU-made component.

According to the analysis, each GW of EU PV manufacturing capacity creates up to 2,700 new full-time equivalent jobs per year and generates 12.6–66.4 million per year in tax and social revenues, depending on the scenario. The support needed varies:

- 172.6 million EUR per GW per annum (5.2 billion EUR for 30 GW) for fully reshoring the EU-based value chain;
- 45.3 million EUR per GW per annum (1.4 billion EUR for 30 GW) for an NZIA-compliant supply chain without any EU-based component.

Notably, upfront costs are partly (28–39%) recovered through macroeconomic benefits, which are highest for a fully EU-based system.

To achieve the EU's 30 GW solar module manufacturing target by 2030, the study recommends two key actions. First, establishing an EU-level output-based support scheme for solar manufacturing, covering capital and operational expenditures. Second, effectively implementing NZIA policy schemes across Member States, including 'Made-in-EU' bonus points or preference approaches in support schemes, especially for rooftop and public procurement segments.

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INFINITY RT

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- 60+ GWp cumulative module deliveries
- Tier 1 manufacturer by BloombergNEF
- Top 10 global PV module supplier (PVTECH, InfoLink, Wood Mackenzie)
- Top Brand PV Modules by EUPD Research
- Committed to the environment, social and corporate governance (ESG report)

TIER 1 Bloomberg NEW ENERGY FINANCE

Certisolis Carbon Footprint

SOLAR STEWARDSHIP INITIATIVE CERTIFIED ESG SITE - SILVER -

EUPD RESEARCH TOP BRAND PV MODULES IT, UK, DE 2025

TOP PERFORMER 2025 kiwa PV MODULE RELIABILITY SCORECARD

ABT DMEGC Solar ADVANCED BLACK TECHNOLOGY

DMEGC Solar PFAS-free Solar Modules

SILVER | Top 15% ecovadis Sustainability Rating FEB 2025

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GW-scale solar markets

In 2025, 14 EU-27 markets installed over 1 GW of solar capacity in a single year, two less than in 2024. The 2025 GW-scale markets are Germany, Spain, France, Italy, Poland, Romania, Greece, the Netherlands, Bulgaria, Portugal, Hungary, Austria, Denmark, and Ireland. For the third consecutive year, more than half of the EU countries achieved GW-scale installations.

5.0 GW-scale solar markets

The number of GW-scale solar markets in the EU decreases for the first time in a decade, with 14 Member States adding over 1 GW of solar in 2025, two less than last year

In our December 2024 EU Market Outlook, we projected 16 EU markets would reach GW-scale in 2025, the same amount as in 2024. However, the list this year is two countries shorter than previously expected, due to slower market growth in Belgium and the Czech Republic in 2025. Of all the countries that reached GW-scale last year, Belgium, the Czech Republic, Lithuania and Sweden are out, while Denmark and Ireland join the GW-scale club – the former for the second time after a first installation boom in 2022, the latter for the first time.

While 8 of this year's GW markets experienced an increase in installation volumes this year (Bulgaria, Denmark, France, Ireland, Germany, Hungary, Romania, and Spain), 6 markets saw negative annual growth in 2025 (Austria, Greece, Italy, the Netherlands, Poland, and Portugal).

Clonfad 175 MW solar park in County Westmeath, Ireland.

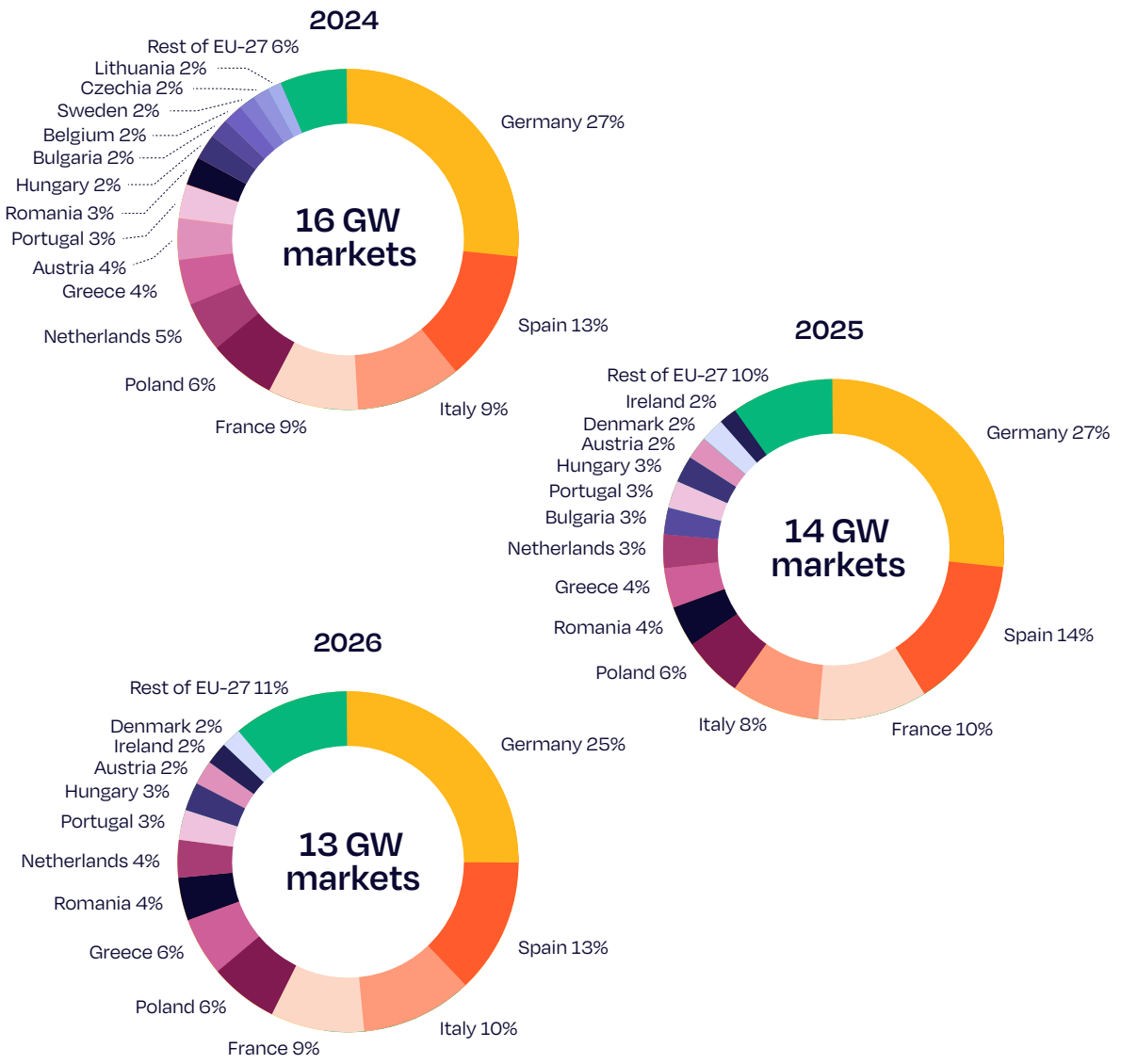
Looking ahead to 2026, we anticipate that the EU GW-scale market club will shrink further, with 13 Member States reaching this thresholds (see Fig. 48).

In this chapter, we traditionally invite our national solar/renewables association members to provide their local expert views on their home countries (which sometimes slightly differ from our estimates, which are based on several sources). For this edition, we have received contributions from national associations of 13 out of 14 GW-markets in the EU-27. In the few cases where we haven't received a contribution, we have prepared the deep-dive article internally, with the support of SolarPower Europe members that are active on those markets.

Figure 48

EU-27

EU-27 GW-scale solar markets 2024-2026



5.1 Germany

Overall stable PV deployment masks market uncertainty in Germany

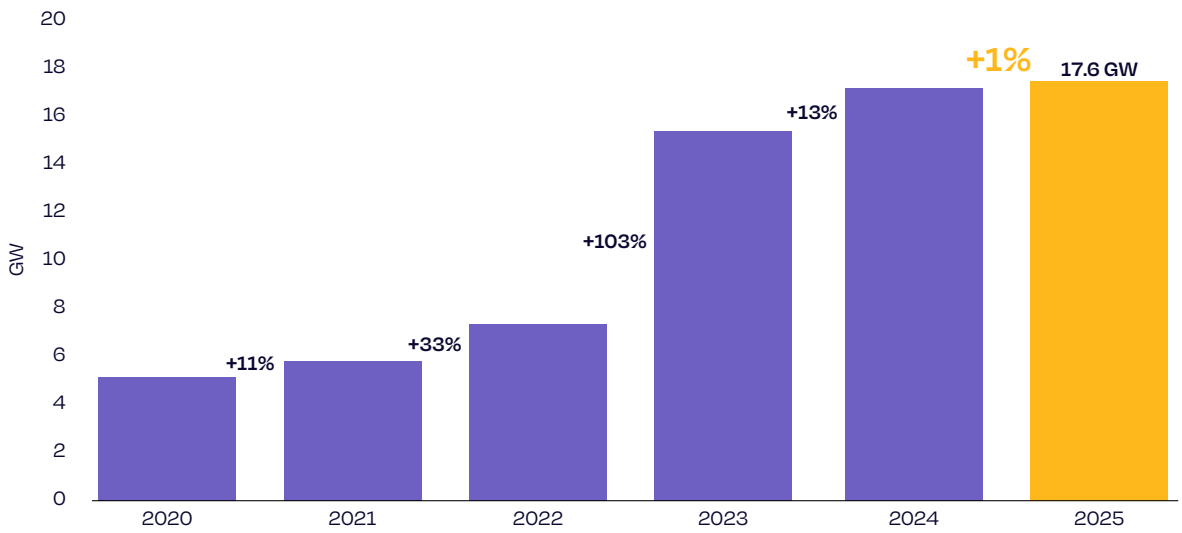
Overview of PV developments

In 2025, Germany is expected to add 17.6 GW of new solar PV capacity, similar to additions in the previous year and bringing the country's cumulative installations to 118 GW. Germany remains Europe's largest solar market, both in annual additions and total installed capacity. However, the pace of growth is slowing down. The 2025 increase represents only a 1% year-on-year expansion, compared to growth rates of 13% in 2024, 103% in 2023, 33% in 2022 and 11% 2021 (see GW Fig. 1.1). This slowdown indicates that the German solar sector has entered a new phase of the energy transition, shaped by regulatory uncertainty and shifting market conditions.

GW Figure 1.1

Germany

Annual solar PV installed capacity 2020-2025



Utility-scale versus distributed solar PV

After robust expansion in 2022 and 2023, the **residential PV market** (below 10 kW)[34] contracted in 2025. This is attributed to the end of the installation boom driven by the energy crisis and a less favourable economic climate. The government's intention to further integrate smaller solar installations into the market while eventual plans to restrict funding are likely to create challenging conditions. The key challenge ahead is ensuring that residential PV systems, especially those combined with battery storage, operate in a way that benefits both the electricity market and the grid. On the smaller scale, plug-in solar systems are growing in capacity, supported by recent legislation allowing larger system sizes. In 2025, over 360,000 new systems were added and registered before October 2025, with the actual number likely higher due to unregistered installations.

The **C&I segment** (10-999 kW) maintained similar capacity additions to 2024's high level. However, economic uncertainty and a lack of planning security due to political changes are dampening investor confidence. Persistent problems with grid operators, such as delays in grid connection and poor communication, are also holding back the segment. Digitalisation and standardisation of grid connection processes are also urgently needed.

Ground-mounted PV installations enjoyed another strong year, reaching 8.1 GW, thanks to increased tender volumes under the EEG scheme. While the government is committed to accelerating ground-mounted PV deployment, negative electricity prices and curtailment are compromising the solar PV business case. As a result, developers are increasingly considering battery energy storage systems alongside PV, although some regulatory challenges remain. Innovative systems like agri-PV are still awaiting EU state aid approval for a new tender scheme, but there is optimism that approval will follow the intended introduction of a clawback mechanism in tendering procedures. New regulations now allow "overbuilding" of PV, wind, and BESS at shared grid connection points to maximise grid efficiency.

185 kW (114 kW roof, 71 kW façade) residential PV, Aschersleben, Germany. Project converting a prefabricated building into an almost energy-self-sufficient residential building.

34 SolarPower Europe describes the residential PV sector in this article (and unless specified otherwise throughout the report) as installations <10 kW. Note that German solar PV data from BSW-Solar uses a ≤30 kW threshold.

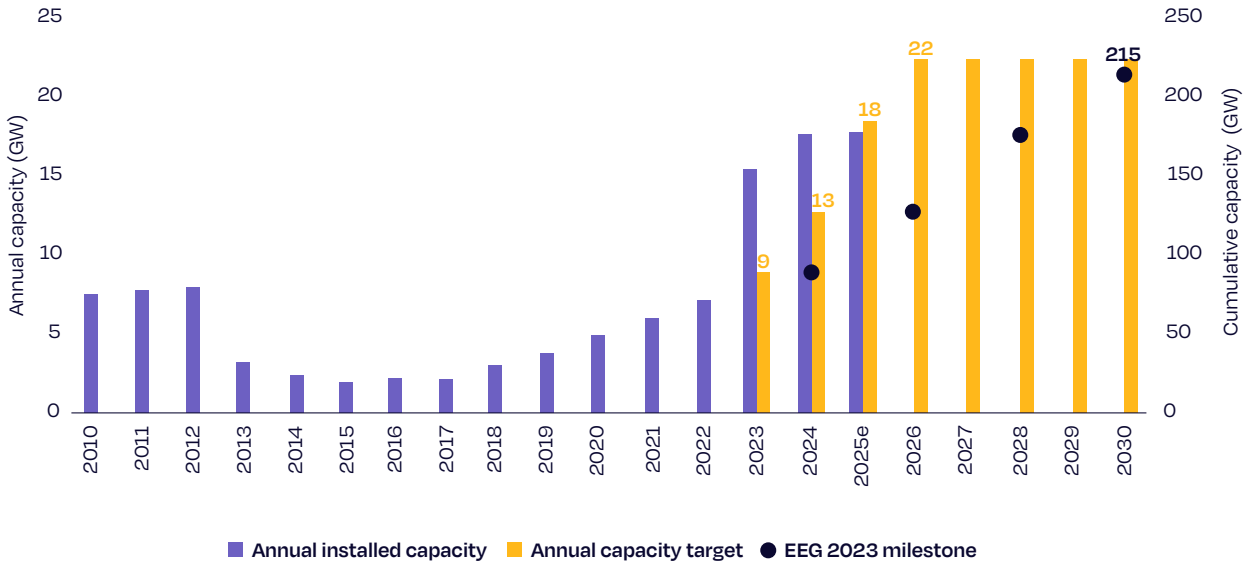
Solar PV targets

Since the passing of the EEG 2023 (passed in mid-2022), which drastically raised the national solar capacity targets, Germany is aiming for 215 GW of PV by 2030. To reach this, the former government set rising annual installation targets as a possible growth path for meeting this milestone: 9 GW in 2023, 13 GW in 2024, 18 GW in 2025, and 22 GW per year in 2026-2030. Actual market deployment in 2023 and 2024 has exceeded the targets (15.4 GW in 2023 and 17.4 GW in 2024), demonstrating the effectiveness of the support measures and strong investor interest (see Fig. 1.2). 2025 is therefore the first year for which the actual installation level matches the capacity growth path targeted by the government.

GW Figure 1.2

Germany

Annual solar PV installed capacity 2010-2025 and targets 2023-2030



On storage, while no official targets for battery storage deployment have been set by the German government, recent debates regarding the utilisation of generated electricity highlight the need for increased deployment. With a battery storage deployment of 6.1 GWh in 2023, 6.2 GWh in 2024 and potentially slightly more in 2025 (pending market developments in the fourth quarter), installed battery storage capacity will likely exceed 25 GWh by the end of the year, over 19 GWh of which in the residential segment. While Germany remains the frontrunner market for battery storage in the EU,[35] reaching a cumulative capacity of 100 GWh by 2030 would therefore require an acceleration to 15 GWh of installed capacity each year. Especially in the utility scale PV segment, co-located storage as the PV + storage business model of the future will prove to be crucial in ensuring continuity in investments, but this requires conducive legislative frameworks. A few key decisions increasing investment security into battery storage and removing the disadvantageous treatment of "dual usage" storage with respect to double grid charging were passed as recently as November 2025 and have the potential to unlock additional private investments in these segments.

35 SolarPower Europe (2025): European Market Outlook for Battery Storage 2025-2029

Challenges for the solar PV market

In September 2025, the Federal Ministry of Economic Affairs and Energy (BMWE) presented a special monitoring report on the energy transition. The report, written by the Institute of Energy Economics at the University of Cologne (EWI) and BET Consulting, emphasises that solar targets may not be met if the support framework changes (e.g. regarding funding, land availability, economic factors). Any reduction in support or added administrative complexity could further slow adoption, especially for residential and small commercial installations. The report also forecast slower growth in electricity consumption than initially anticipated, which could slow down the deployment of renewables.

Alongside the monitoring report, BMWE also published an action paper which suggests a shift away from longstanding support mechanisms. It notably includes the elimination of fixed feed-in tariffs for PV plants up to 100 kW. The change, combined with planned mandatory direct marketing for new installations, would increase complexity and reduce the attractiveness of solar PV for private households and SMEs. In addition, the possible introduction of capacity-based network charges and regionally differentiated grid cost allocations could further raise the cost of project development in areas with grid bottlenecks.

Political uncertainty is creating additional challenges for the solar sector. Although Economics Minister Katherina Reiche plans to push through new energy policy reforms her proposals to reduce PV support schemes for small PV plants are facing growing resistance from the coalition partner SPD. The uncertainty about the regulatory challenges, the discussion about the introduction of new and untested CfD-types and the outstanding state aid approval of the Solar package 1 is creating a volatile and uncertain environment for planning new solar projects.

At the same time, Chancellor Merz has indicated that Germany may be able to "expand renewables a little less" than originally planned. This statement suggests that the government could consider slowing down renewable deployment in order to reduce costs, which adds another layer of concern for the solar market. Combined with unclear timelines for legislation, these uncertainties could delay investment decisions and temporarily slow the rate of new PV installations

Key drivers for solar growth

While slowing down, Germany's solar PV market still benefits from a combination of policy commitments and regulatory improvements. The special monitoring report commissioned by the BMWE emphasised that renewable energy expansion is essential to meet climate targets, providing a positive signal for investor confidence and long-term market stability.

The development of ground-mounted PV also continues to be supported through large tender volumes, while innovation tenders for PV combined with storage encourage hybrid solutions that improve revenue streams and grid flexibility. Regulatory measures also allow overbuilding at grid connection points, enabling multiple renewable power plants (solar PV, wind, BESS) to share infrastructure, maximise grid efficiency, and reduce connection costs.

Grid access, historically a major bottleneck, is becoming easier to navigate. The introduction of mandatory digitalised connection processes for systems up to 30 kW streamlines approvals for small-scale rooftop installations, while the 'Solarspitzengesetz', passed in the Bundestag in January 2025, allows grid operators to remotely manage systems of 7 kW and above, improving flexibility for grid management.

As much as they can threaten solar PV deployment, political dynamics also provide support. The resistance from parts of the coalition against the reduction of PV subsidies signals continued political backing for renewable energy, particularly for rooftop and small-scale PV.

Conclusion

Germany's solar sector stands at a pivotal moment. While installations remain high and policy commitment to renewable expansion persists, the slowdown in growth signals that the market is entering a more complex phase of the energy transition. Regulatory uncertainty, evolving support schemes, and grid integration challenges are reshaping both investor expectations and project business models. At the same time, opportunities are emerging around storage integration and co-location, which can enhance both resilience and profitability. A continued focus on clear regulatory signals, streamlined grid access, and stable support mechanisms will be essential to sustain momentum. If these conditions are met, Germany will remain a leading solar market and a blueprint for renewable development in Europe.

Authors: *Christophe Lits,* SolarPower Europe; Special Thanks to the *Bundesverband Solarwirtschaft e. V.* (BSW-Solar) for valuable input. BSW-Solar market data is available here: https://www.solarwirtschaft.de/en/press/market-data/

5.2 Spain

Solar PV market sees sustained growth in 2025, while facing structural challenges

Spain remains one of Europe's most dynamic solar PV markets, with steady utility-scale deployment but mounting concerns around self-consumption, curtailment, and market signals. The country added over 5.6 GW of new PV capacity in the first ten months of 2025, compared with just 3.8 GW in the same period of 2024, confirming its role as a leading European market for ground-mounted solar. Yet, behind this headline figure, the different market segments show diverging trajectories.

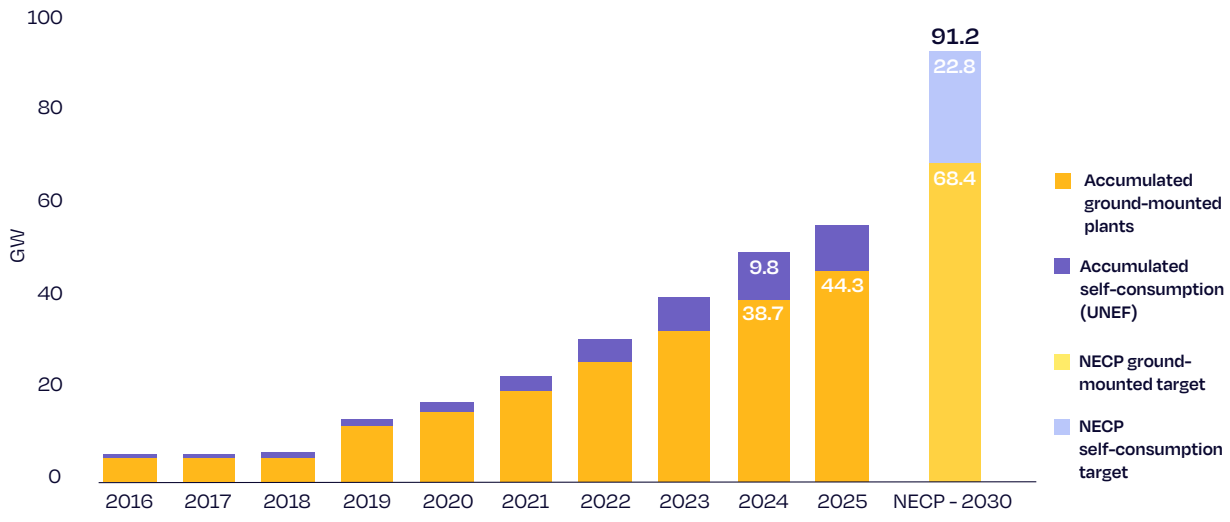
Utility-scale deployment continues to dominate. Developers benefitted from extended project milestones in 2024, which created greater stability and enabled projects to advance toward commissioning. These improvements place the ground-mounted segment within reach of its 2030 target of 68.4 GW (57.3 GW_{AC}), with 44.3 GW currently installed (GW Fig. 2.1).

In contrast, after years of rapid expansion, the self-consumption segment has lost momentum and slowed down significantly. Annual additions decreased by roughly 30% in both 2023 and 2024, and preliminary data suggest that 2025 will likely close at similar installation levels to those seen in 2024. Despite some recent signs of recovery, the market remains flat, well short of the annual pace of 1.8 GW required to meet the PNIEC target of 22.8 GW (19 GW_{AC}) by 2030.

GW Figure 2.1

Spain

Cumulative solar PV installed capacity 2016-2025 and NECP target



Note: Capacities updated as of 2025-09-22 (not including 2025 self-consumption figures).

The behind-the-meter battery market has followed a similar trajectory, with installations dropping by more than 30% in 2024. There are indications of renewed consumer interest after the nationwide blackout earlier this year, but confirmation will only be possible once consolidated figures are available at the end of 2025. Battery storage could play a key role in supporting both utility-scale projects and rooftop PV, since Spain's daily price spreads create attractive opportunities for developers and consumers alike.

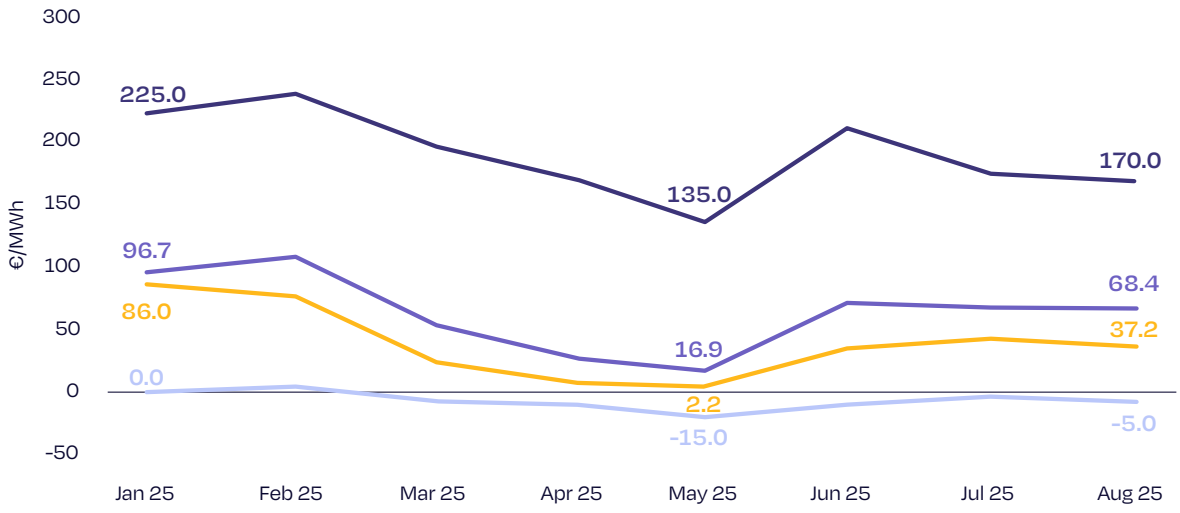
This dual trajectory – utility growth against distributed stagnation – highlights broader systemic challenges. The utility-scale pipeline is large and mature, with many projects already holding administrative permits but not yet commissioned or grid-connected. The bottleneck is no longer permitting but grid connection capacity, raising concerns over whether new plants will secure sufficient access to inject electricity. Rooftop PV and storage, meanwhile, are constrained by insufficient fiscal policy support and persistent difficulties in feeding surplus electricity into distribution networks. RD-law 7/2025, which failed to complete the legislative process, had included provisions to promote behind-the-meter batteries, and many of these measures are expected to be reintroduced via Royal Decree, potentially restoring investor confidence.

Spain's abundance of renewable capacity has driven wholesale electricity prices to among the lowest in Europe, excluding the Nordics. While this benefits consumers, it complicates the business case for ground-mounted PV. Developers face deteriorating market signals, with 759 zero- or negative-price hours already recorded this year by end of August 2025, already higher compared to the total seen in all of 2024, and curtailment rising significantly. In 2024, physical PV curtailments represented 0.78% of annual PV generation (345.9 GWh out of 44.6 TWh). The situation has worsened in 2025: curtailment jumped from 3% of PV output in August 2024 to 11% in August 2025. Such volatility poses risks to project bankability and undermines investor confidence.

GW Figure 2.2

Spain

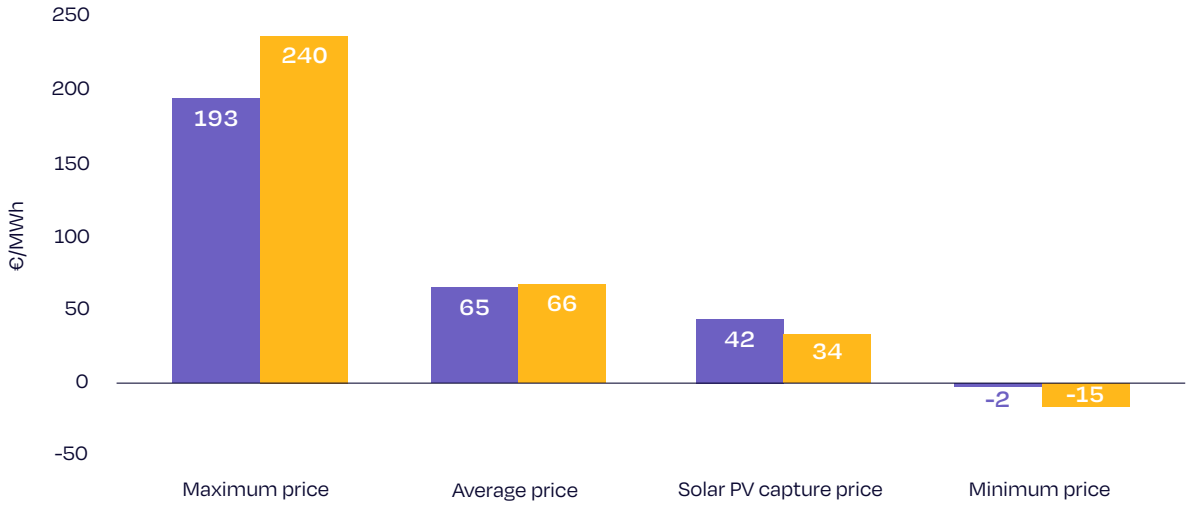
Solar PV capture price vs electricity spot market prices, 2025



GW Figure 2.3

Spain

Solar PV capture price and electricity spot market prices, 2024-2025



© SolarPower Europe. Source: Red Eléctrica (TSO) & UNEF

Even so, several factors could sustain growth. Regulatory adjustments to support battery deployment and streamline market access are expected to generate new momentum. The grid incident (Iberian blackout) earlier this year increased public awareness of resilience, reportedly spurring interest in rooftop PV and batteries. While average spot prices remain low, intraday spreads are wide enough to support new business models, particularly for batteries in balancing markets, which could accelerate hybrid PV-plus-storage projects. In parallel, the government has put forward a proposal to expand both distribution and transmission networks, a critical step towards unlocking further capacity for large-scale solar.

The contrast between utility-scale and self-consumption remains pronounced. Ground-mounted projects are delivering consistent additions, supported by extended deadlines and a strong pipeline. On the other hand, self-consumption is struggling to regain the pace needed to contribute meaningfully to the energy transition. Unless new incentives or financing solutions are introduced, rooftop deployment risks falling well below target.

Spain's solar PV sector is therefore at a crossroads. Although strong ground-mounted growth keeps the country broadly on track for its 2030 utility-scale target, distributed generation and storage are lagging further behind, threatening the overall balance and resilience of the transition. The challenges are well known: curtailment and zero-price hours are eroding confidence, while grid capacity is a persistent constraint. While Spain offers attractive intraday and spot price spreads, the market framework still lacks the stable and predictable mechanisms required to fully unlock investments in flexibility. The solutions are also clear: reinforce networks at both transmission and distribution levels, deploy storage at scale across all segments under a supportive regulatory framework, and stimulate new demand through electrification and sector coupling. With decisive action, Spain can consolidate its leadership in European solar, combining large-scale deployment with a revitalised rooftop market. Without it, the country risks widening the gap between utility-scale success and distributed stagnation, with consequences for both its 2030 targets and the resilience of its energy system.

Author: *Martín Behar,* Director of Research and Environmental Affairs, Unión Española Fotovoltaica (UNEF)

Little Bustard (Tetrax tetrax), a steppe bird, at the 50 MW, Puertas Palmas solar plant, Merida, Spain.

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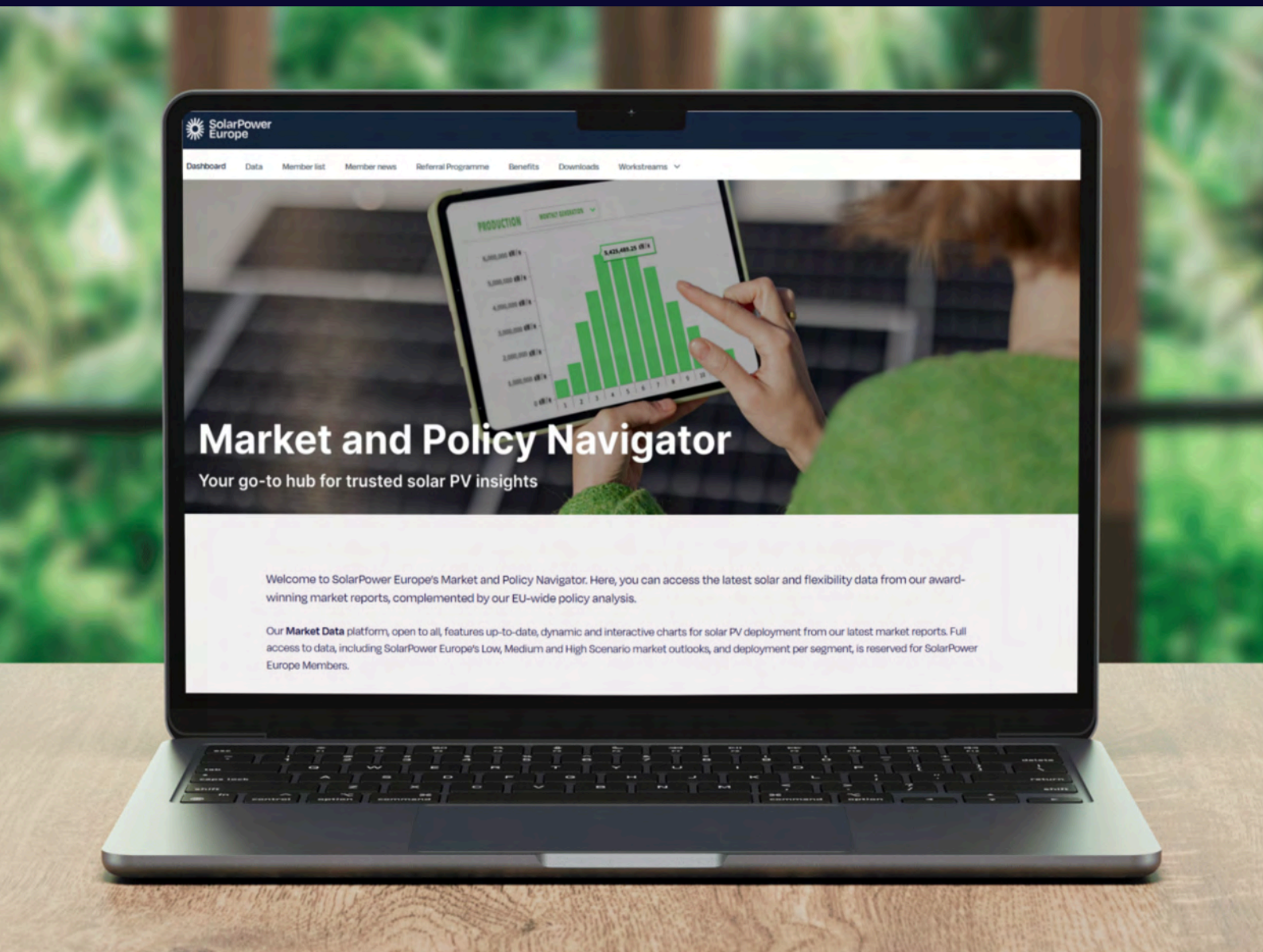


5.3 France

Solar energy in France: Visibility and versatility at stake

Overview of solar PV developments

The French solar market is currently under pressure. While 2024 set new records, the landscape is shifting in 2025. Political instability, coupled with evolving regulatory and economic frameworks, is introducing complexities that may significantly influence the industry's trajectory.

In 2024, the French PV market recorded significant growth, with an additional 5 GW_{AC} (6 GW_{DC})[36] of capacity installed. The total number of operational solar installations now exceeds 1 million, reflecting the continued expansion of the sector.

This growth was predominantly driven by medium-sized commercial and industrial rooftop projects ranging from 100 to 500 kW; largely supported by a feed-in tariff, which ended in September 2025 and will be replaced by a tender-based system with target volumes. In this segment, a slight decline was observed in Q2 for the first time in five years, with 718 MW connected in Q2 compared to 769 MW in Q1 2025. However, the segment bounced back in Q3 with 772 MW connected. The evolution of this segment in the coming quarters will be critical, given significant regulatory changes: a 40% tariff reduction over three years, the transition from open access to a tendering process, and the shift from a purchase obligation to a supplementary remuneration mechanism.

Large PV plants (>500 kW) showed a modest increase in Q2 2025 (+504 MW) (compared to +460 MW in Q1), though growth remains limited. In Q3 2025, an additional 599 MW were connected to the HTA network. This segment is mainly driven by CRE 4 and PPE 2 tender projects, for which grid connections had previously been delayed due to sanitary and inflation crises.

Residential PV is experiencing a significant slowdown in 2025, with a 39% decline in the number of self-consumption installations connected by the end of Q3 2025 compared to the same period last year (for low-voltage connections < 36 kW). This decrease was expected given recent regulatory changes such as a reduction in feed-in tariffs and bonuses, despite the introduction of a VAT reduction.

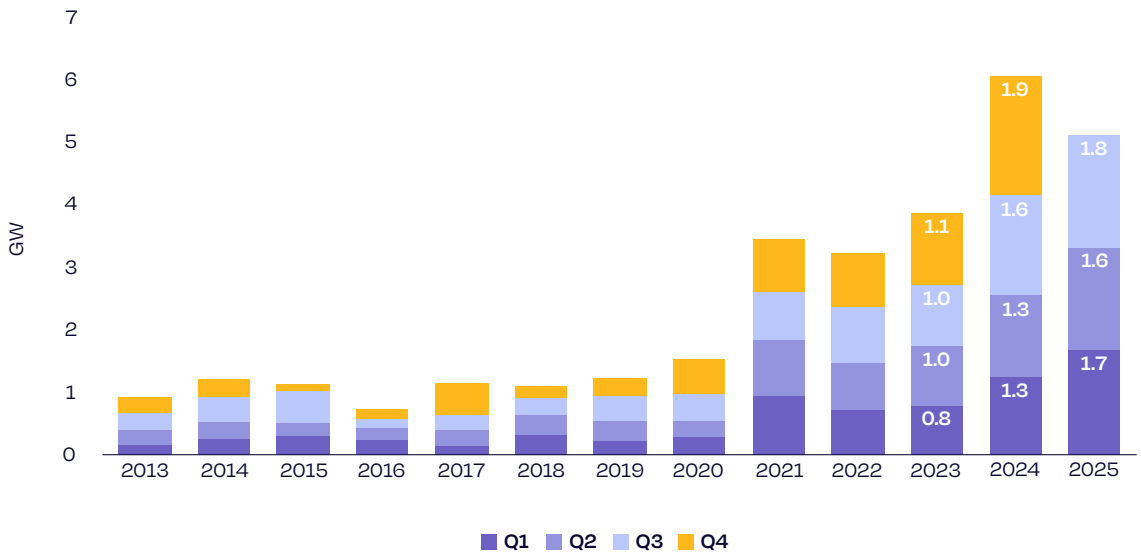
Q3 in general was marked by a record 1.8 GW installed across all segments, the most solar PV ever installed in a single quarter, bringing the country to a total 5.2 GW PV capacity installed in the first 9 months of 2025 alone (Fig. 3.1). One third of all installed modules by the end of Q3 are rooftop installations below 100 kW (Fig. 3.2).

36 Since official statistics are provided in AC values, data hereafter in this article have been converted to DC values using a DC/AC ratio of 1.2.

GW Figure 3.1

France

Connected solar PV capacity per quarter 2013-2025

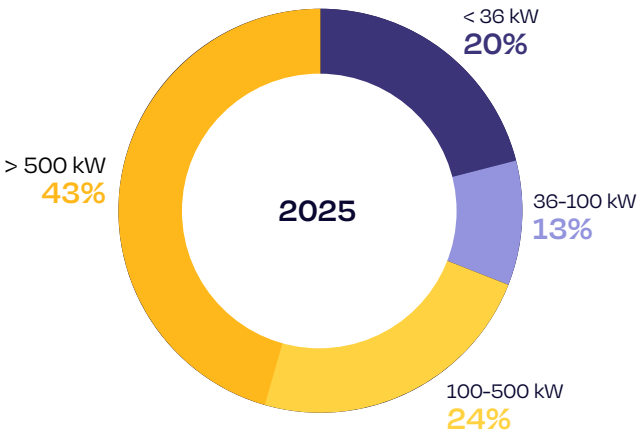


© SolarPower Europe. Source: French Ministry of Ecological Transition

GW Figure 3.2

France

Segmentation of cumulative solar PV installations in 2025, up to Q3



Note: Official AC data was converted to DC values using a DC/AC ratio of 1.2
© SolarPower Europe. Source: French Ministry of Ecological Transition

Empowering solar: boosting flexibility and reducing reliance on subsidies

Hybrid PV/Storage

The development of projects combining solar power and energy storage is still at an early stage in France. In the first three quarters of 2025, most of the 5.2 GW of new PV capacity was installed without batteries, compared to only 162 MW with storage, most of which was installed with utility-scale projects. Still, it does mark a significant increase compared to 2024, with only 28 MW_{AC}/34 MW_{DC} for the whole year.

To support this segment, the French Energy Regulatory Commission (CRE) is planning an experimental measure to encourage the deployment of solar projects with storage. It aims to adjust remuneration rules to create a stronger incentive for developers to integrate storage systems that flatten generation profiles and align production with market signals.

Reduced VAT

Last year, the SER successfully advocated for a reduced VAT of 5.5% for residential PV systems included in the 2025 Finance Law. The implementing decree, effective October 1, encourages energy management and storage and prioritises low-carbon panels, favouring European manufacturers.

Encouraging PPA growth

The PPA market in France remains relatively new and limited compared to state-supported volumes and European standards. Contract signings grew significantly in 2022–2023 during the energy crisis but slowed in 2024 as wholesale electricity prices declined. To stimulate the development of PPAs, CRE recommends, together with the SER revising eligibility criteria. This could include, for example, requiring a portion of electricity production to be marketed outside of public support mechanisms and introducing tailored risk-sharing arrangements to improve the bankability and attractiveness of PPA-based projects.

375 kW rooftop solar PV, Les Brelutières, France.

Challenges and solar PV targets in France

The market is currently operating without clear direction and lacks a defined roadmap for the next decade. France is already two years behind on the publication of its updated energy strategy, known as the Multiannual Energy Plan (PPE3). This delay creates significant uncertainty and instability, as the PPE provides the essential framework for public support in a market that is still largely driven by public tenders.

Moreover, with each new draft document released, the PV development targets are being revised downward. The target for 2030, for instance, was reduced from 54 GW_{AC} (65 GW_{DC}) in the public consultation last spring to 48 GW_{AC} (58 GW_{DC}) in a leaked draft published in July. Similarly, the 2035 targets have also been lowered – from an initial range of 65-90 GW_{AC} to a new range of 55-80 GW_{AC}.

However, reaching this milestone is essential to ensure the development of a European market for photovoltaic manufacturing. France is currently working to introduce ambitious NZIA criteria into its support mechanisms, with implementation planned from 2026 onwards, in order to strengthen and sustain its national industrial base.

Author: *Salomé Durand*, Responsable solaire, Syndicat des Energies Renouvelables (SER)

5.4 Italy

A new phase for the Italian solar PV market

Overview of PV developments

After three years (2022-2024) of growth in new solar PV installations in Italy, the first half of 2025 saw a 25% decrease compared to the same period in 2024. A total of 2.8 GW was installed in H1 2025 compared to 3.3 GW between January and June 2024. This brings Italy's solar fleet to a cumulative capacity of 39.9 GW, totalling almost 2 million PV systems.

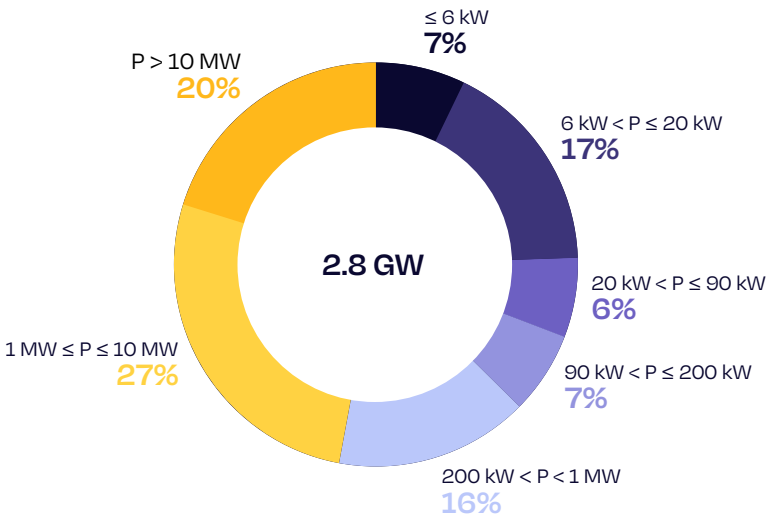
If we consider individual segments (see GW Fig. 4.1), the bulk of new installations in H1 2025 came from utility-scale plants (1.3 GW), with 47% of total additions. Residential systems below 20 kW lost shares in new installations, down to 24% and 685 MW, while commercial PV systems between 20 kW and 1 MW contributed the remaining 29% with 804 MW.

After the golden era of the 'Superbonus' (Italy's generous tax rebate mechanism), the residential segment in particular is now stabilising at almost 1.5 GW per year. It's important to note that in the first half of 2025, around 80% of new residential installations were coupled with a storage system. Conversely, the C&I segment is experiencing significant uncertainty, mainly linked to the fact that almost every region in Italy provides CAPEX support through tenders. As a result, SMEs often postpone their decisions and wait for the next regional tender to launch their solar project – this is what is generating volatility in the segment. However, the biggest challenge arises at the grid connection stage. The high volume of TSO grid connections (about 150 GW as of the start of October 2025) creates grid congestion, project prioritisation and infrastructure bottlenecks that can also delay or deprioritise distributed grid connections.

GW Figure 4.1

Italy

Segmentation of new solar PV installations in H1 2025



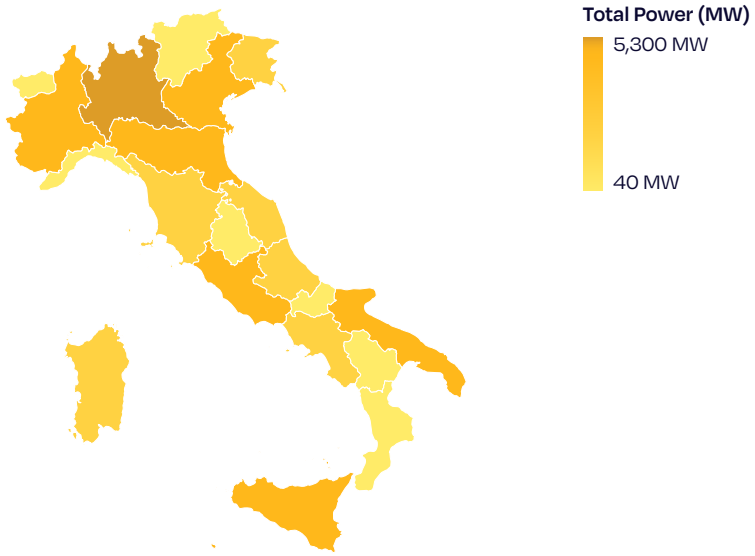
The regions with the highest operating capacity are Lombardy (5.3 GW) and Veneto (4 GW), followed by Apulia (3.9 GW), while those with the lowest installed capacity are Molise (269 MW), Liguria (252 MW) and Aosta Valley (41 MW) (Fig. 4.2).

Based on the latest Q3 data, the outlook for the second half of 2025 projects moderated growth, resulting in an estimated total of 5.0-5.5 GW of annual installations for the year. This pace falls below the required 6.5 GW/year to meet Italy's NECP 2030 solar target.

GW Figure 4.2

Italy

Cumulative solar PV capacity per region 2025



Public solar PV targets

The updated draft National Energy and Climate Plan, sent to the European Commission in June 2024, sets a target of 54 GW of new PV power capacity in the 2022-2030 period out of the total 70 GW target for new renewable power capacity. This would lead to a total solar capacity of almost 80 GW by 2030.

The Italian associations ANIE Rinnovabili, Elettricità Futura, and Italia Solare agree that Italy must accelerate the pace of new installations in line with other European countries like Spain and Germany and achieve at least 7 GW of new solar PV power per year in the 2025-2030 period. By 2030, solar PV would then account for the majority (61%) of Italy's total installed renewable energy capacity. It will be critical that the bulk of deployed capacity be comprised of utility-scale plants to minimise costs while ensuring security for the energy system, and considering synergies between the energy and agricultural sectors. Moreover, repowering PV plants could result in up to 15 GW of added PV capacity, from 7.5 GW of utility-scale plants that are more than 10 years old. The associations also point to the strategic role of storage capacity in Italy, which must increase to at least 72 GWh[37] of new large-scale storage to securely and efficiently integrate new power into the grid.

37 Total capacity that the Italian TSO consider adequate by 2030 in line with the RES national targets.

Key challenges and drivers for the solar market in Italy

To exploit Italy's significant solar potential, several key challenges must be addressed and overcome. Permitting for large-scale solar projects remains a crucial challenge, as well as grid congestion – especially in southern regions. The identification of suitable areas for project construction should be supported by regional actors, who, in several cases, have complicated the process. The policy framework for PPAs and self-consumption must also be improved to allow RES to deliver cheaper electricity to final customers (starting with energy-intensive industries).

Unfortunately, several challenges persist in the solar sector compared to the past two years, namely:

- A fragmented and uncertain regulatory framework for the definition of 'suitable areas' and 'acceleration areas' for new and already-in-development renewable plants. In the autumn of 2025, the government should review the article regulating the duties of regions in the field of 'suitable areas', to help streamline the process;
- The simplification of authorisation procedures;[38]
- Increasing investment costs for agrivoltaic projects due to the government favouring elevated systems and prohibiting vertical and inter-row configurations;
- The delayed development of mechanisms allowing RES to enter operation with auction bases adjusted to the LCOE ('DM FER X definitivo', FER Z);
- The need to review connection regulations to overcome virtual grid saturation;
- Strengthening the European PV and BESS technological supply chain for improved energy resilience and decreased dependency on non-EU countries.

38 The Ministry of Agriculture has clarified that the CAP, the economic support for farmers, applies exclusively to elevated agrivoltaic solutions.

Against this background, positive normative developments took place in 2025, which could favour new installations in the coming months and years:

- In the utility-scale segment, in the second half of 2025, the 'FER X Transitorio' mechanism successfully auctioned 10 GW of new RES capacity (solar and wind) – a total of 10 GW of solar PV projects was submitted, exceeding the maximum quota of 8 GW;

- In the residential segment, the expectation of maintaining a 50% tax deduction mechanism for the main residence, new norms on buildings' energy performance linked to the EPBD Directive, and the development of energy communities;

- In the C&I sector, the 'Transizione 5.0' scheme, and the 'Energy Release' scheme for energy-intensive companies, support the adoption of energy efficiency and renewable energies for self-consumption;

- As for repowering, the 'Decreto Bollette' (Energy Bill Decree) provided simplifications for wind farms up to 30 MW or with power increases up to 20%. The finalisation of the Testo Unico (Consolidated Act) could also unlock and accelerate the repowering of PV projects, adding up to 15 GW of capacity and 18 TWh of production;

- For PPAs, the government is reviewing a proposal for a 'Piattaforma PPA' that would allow voluntary long-term contracts for solar power plants nearing the end of their incentive period, offering predictable pricing;

- The scope for self-consumption mechanisms has been expanded, raising the demographic limit for eligible municipalities (from 5,000 to 50,000 inhabitants) in which PV plants can benefit from PNRR funding, when integrated into an energy community configuration.

Authors: *Michelangelo Lafronza*, Secretary, ANIE Rinnovabili; *Paolo D'Ermo*, Head of Studies and European Affairs, Elettricità Futura; *Federico Brucciani*, General Secretary, Italia Solare

5.5 Poland

From prosumer boom to large-scale, flexible growth

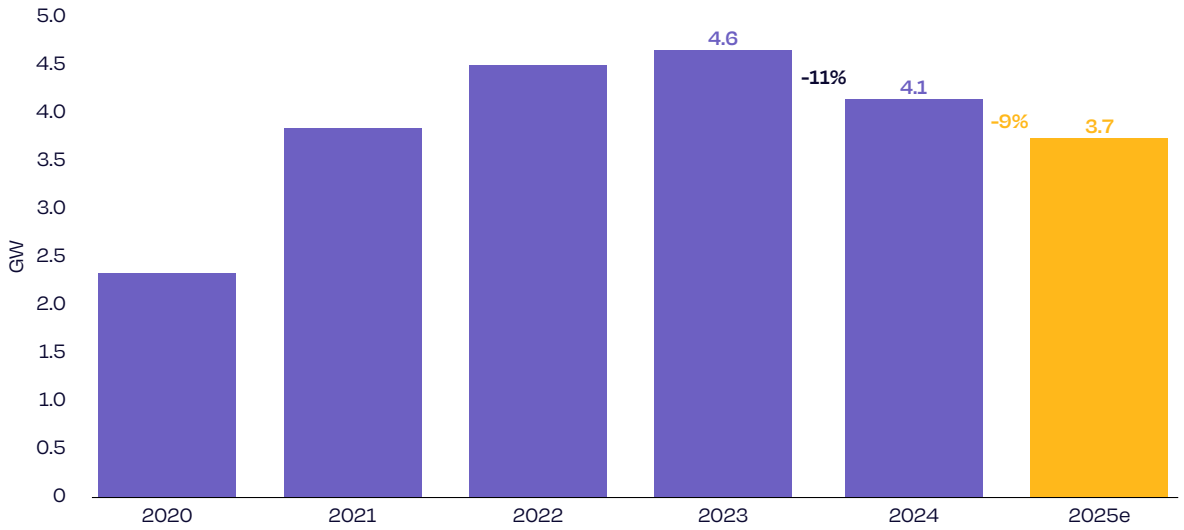
Overview of PV developments

Poland's solar PV sector has experienced strong growth in recent years, cementing the country's status as one of Europe's top solar markets. Cumulative PV capacity doubled in only three years, from about 12.2 GW at the end of 2022 to an expected 24.6 GW by the end of 2025, driven initially by a boom in residential installations and increasingly by large-scale solar farms. But after a peak in annual installations in 2023 at 4.6 GW, the last two years have marked a slow-down as new installations decreased 11% in 2024, at 4.1 GW, and another estimated 9% in 2025, at 3.7 GW (see GW Fig. 5.1).

GW Figure 5.1

Poland

Annual solar PV installed capacity 2020-2025



From prosumer boom to utility-scale growth

Residential and small commercial installations (micro-installations up to 50 kW) have been the backbone of Poland's solar expansion until recently. By the end of 2023, Poland had well over 1.3 million micro-PV systems installed, totalling about 10.4 GW in capacity. These are mostly rooftop systems on homes and small businesses, which constituted about two-thirds of the nation's total PV capacity. The popularity of this segment was spurred by favourable conditions under the old net-metering scheme and grants that made rooftop PV highly attractive. This generous policy, combined with high electricity prices in 2022, led to a mass adoption of residential PV.

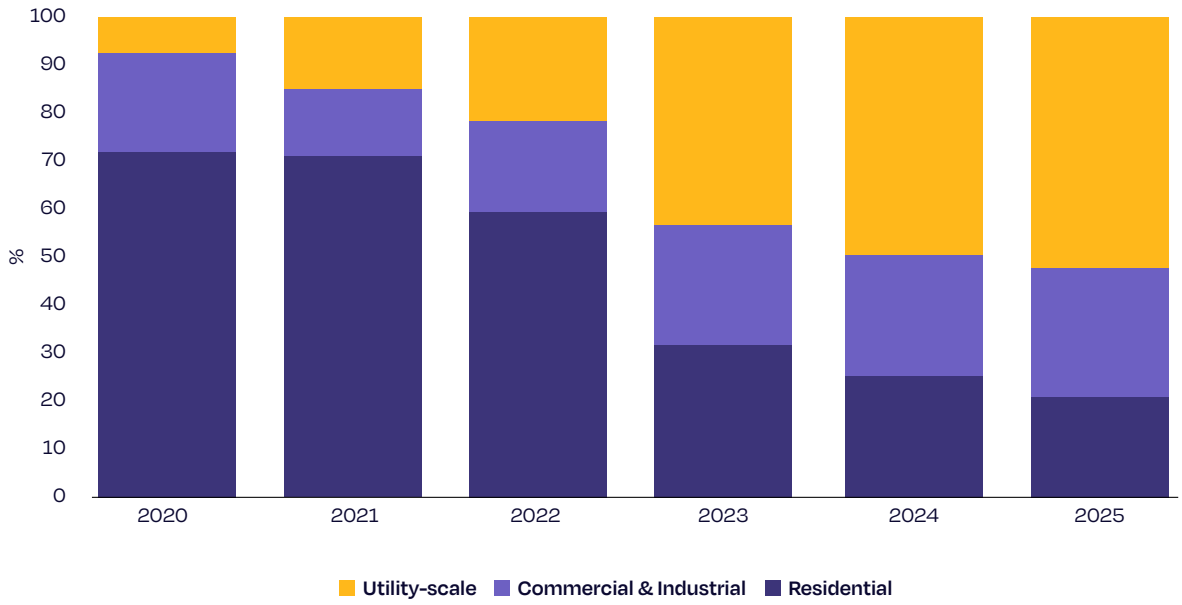
The economics for prosumers dramatically changed in April 2022, when Poland switched from net-metering to a net-billing system for new installations. Under net-billing, prosumers sell excess energy to the grid at the wholesale market price and buy electricity at the retail price, with hourly netting. In practice, prosumers now usually receive monetary credits for their exports (valued at market rates), which reduces their electricity bills. This reform was implemented to align with EU energy market principles, and to reduce the strain that rapid prosumer growth placed on the grid and utilities, but it made new small PV systems less lucrative than before. In consequence, the rush of new micro-installations cooled, and the growth rate slowed compared to the net-metering-fuelled boom of 2020-2022. In addition to the net-billing scheme, the 'My Electricity' ('Mój Prąd') grant programme, which provides direct subsidies for small-scale renewable (including solar PV, storage, and heat pumps), has also helped to sustain interest in this segment, despite the transition from net-metering to net-billing. The 6th edition of the programme opened in September 2025 and allocated a record 1.85 billion PLN (435 million EUR) for rebates. While residential solar remains attractive for long-term savings and energy independence, the immediate payback has become less attractive, slowing that segment's growth relative to the peak.

In the meantime, medium and large-scale PV segments have surged to pick up some of the residential demand reduction. C&I solar (250 kW – 1 MW) installations, but especially utility-scale systems (>1 MW), have gained momentum in 2023-2025. While C&I systems' annual installed share jumped by 4 % points in three years to reach 25% in 2023, a level it has since kept, large utility-scale projects have constantly improved, turning into the major pillar of the solar market. Five years ago, the share of utility-scale PV was only 7% in 2020, roughly tripling, to 22% in 2022, doubling again to 43% in 2023, and finally reaching 50% of annual installations for the first time in 2025 (see GWFig. 5.2). Although utility-scale solar also doubled its share of the total installed capacity from 2022 to 2025, from 16% to 32%, in terms of actual newly installed capacity the growth has been much lower, and is now even negative, due to the shrinking market size. In 2025, 2 GW of utility scale solar was installed, compared to 4 GW in 2024.

GW Figure 5.2

Poland

Annual solar PV segmentation 2020-2025



Aside from reduced support for residential solar, there are other reasons for this shift towards larger-scale PV systems. First, Poland's auction scheme for renewables has prepared the foundation for utility-scale's dominance today. The last round from July 2025, for solar and wind projects greater than 1 MW, saw 1.67 GW of PV being allocated, with solar accounting for 178 of the 181 successful bids. Second, utilities and investors are also drawn by economies of scale and the opportunity to sell power on the market or via PPAs, especially as larger projects can connect directly to the high-voltage transmission grid, which can host more capacity than some local distribution grids. This has encouraged developers to pursue bigger projects that qualify for transmission-level connection, in order to circumvent saturated local networks.

Overall, Poland's support framework is transitioning from maximising PV deployment on roofs towards integrating solar into a smarter energy system. The combination of net-billing and updated subsidies nudges prosumers to consume more of their solar generation (or to store it) rather than inject it into the grid, and encourages technologies that complement solar, like batteries and heat pumps. This should foster a more sustainable long-term growth of the prosumer segment, albeit at a slightly moderated pace. Meanwhile, utility-scale developers continue to receive support through auctions.

Challenges

Growth in 2024 and 2025 slowed slightly compared to previous years, indicating a stabilisation of annual installations. This plateauing is attributed to new challenges, grid bottlenecks, curtailment, and land access.

On the grid side, Poland's infrastructure is struggling to keep pace with the solar boom. In 2023, grid operators rejected 7,448 connection applications, totalling 83.6 GW of renewables, more than the country's entire installed capacity. These refusals stem from outdated infrastructure and overloaded supply points, particularly in regions with intense renewables development. Many projects are delayed or shelved despite having land and financing, and speculative applications have worsened the queue. Curtailment has also emerged as a new challenge, with grid operators increasingly forced to reduce solar output during periods of oversupply. In the first five months of 2025, solar curtailment reached 590 GWh, a 36% increase from the same period in 2024. This introduces revenue uncertainty and affects project economics as solar capture prices fall. As a result, the development of stand-alone solar is halting, and many developers are focusing their activities on the development of storage projects. Nevertheless, as a relatively new business model, banks and financing institutions remain hesitant to finance storage systems until they show real financial returns.

Concerning land use, a 2023 reform of the Spatial Planning and Development Act now requires most new solar installations to be located in areas covered by a local zoning plan. This change restricts the previous practice of using individual zoning decisions and introduces significant administrative burdens, especially for large ground-mounted projects. Only small systems under 1 MW on low-grade or non-agricultural land are exempt. The reform aims to improve control and steer solar development towards less controversial areas, but in the short term, it may slow down project developments. Agrivoltaics is a promising solution, but without legal recognition of dual-use, it remains rare, and developers continue to focus on brownfields or poor-quality land.

Policy developments

To address these issues, the government introduced major reforms in 2024 and 2025. In May 2025, Poland adopted the UDER29 amendment to its Energy Law, introducing major positive measures for renewable energy installations, including solar PV. The reform raised the licensing threshold from 1 MW to 5 MW, meaning smaller PV projects no longer require a full concession, significantly reducing administrative complexity. It also expanded the 'cable-pooling' mechanism, allowing multiple installations and energy storage units to share a single grid connection, thus promoting hybrid PV + storage projects.

New changes also include mandatory transparency from grid operators, flexible connection agreements allowing limited output until upgrades are completed, and higher financial requirements to reduce speculative applications. Investment in grid infrastructure has doubled, and innovations like cable pooling and dynamic grid management are being adopted. Nevertheless, while these changes are being finalised and already alleviate pressures on the grid, energy storage is also being promoted by developers to enhance flexibility, with discussions underway about incentives for large-scale batteries and pumped hydro. It is expected that the development of stand-alone utility-scale batteries will start early to take advantage of the opportunities offered by Frequency Containment Reserve (FCR), while batteries will be deployed along hybrid systems (PV+BESS or wind+BESS) at a later stage.

In the long term, Poland's push for electrification of heating and transport, along with pricing reforms, could help absorb midday solar output and support more sustainable solar growth. This is translated in Poland's updated NECP, released in draft version in July 2025, which revised upwards its solar PV targets, aiming for 31.7 GW by 2030 (up from 29.3 GW in the previous draft) and 51.2 GW by 2040 (up from 46.2 GW). However, the 2030 solar target, incremented by 2.4 GW, remains significantly below current market trends.

Outlook

Poland's solar market experienced significant growth until 2023, followed by two years of decline. At present, while the different segments have followed separate growth paths – with utility-scale solar finally becoming the largest solar application – they are all supported by a series of adaptive policy measures. The main challenges now stem from structural bottlenecks, notably grid capacity, permitting, and land availability. Ongoing regulatory reforms, including grid-access facilitation and simplified permitting, are aiming to address these barriers. If effectively implemented, these measures could enable Poland to consolidate its position as a leading EU solar market, largely exceeding its NECP solar target.

Author: *Christophe Lits,* SolarPower Europe

100 MW Rutki solar park, Niemodlin, Poland.

5.6 Romania

Romania's solar capacity soars to nearly 9 GW in 2025, creating over 60,000 clean energy jobs

Overview of PV developments

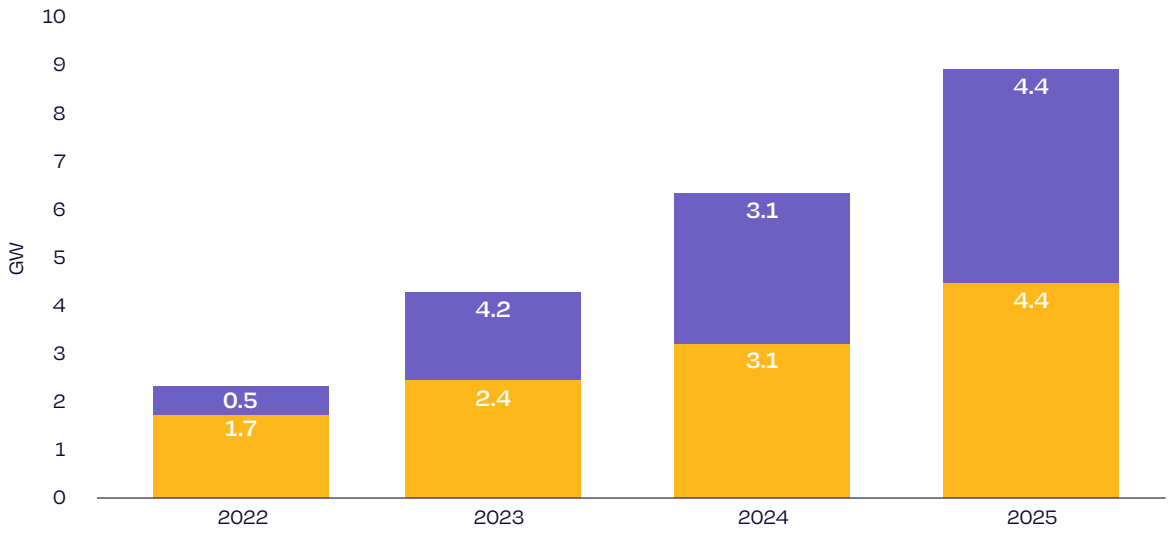
2025 marks the third consecutive record year of GW-scale growth for the Romanian solar sector, taking the country's total installed capacity from 6.3 GW_{DC} (5 GW_{AC})[39] in 2024 to close to 9 GW_{DC} (7 GW_{AC}), and reinforcing its position as one of the fastest-growing markets in Central and Eastern Europe.

After several years in which distributed generation was the driver of expansion, the utility-scale segment has gained strong deployment momentum. With the addition of 1.3 GW_{DC} (1 GW_{AC}), centralised PV capacity now exceeds 4.4 GW_{DC} (3.5 GW_{AC}), reflecting a 40% year-on-year increase compared to 2024 (see GW Fig 6.1). The distributed generation segment expanded at a similar pace, bringing total capacity to 4.4 GW_{DC} (3.5 GW_{AC}). By the end of 2025, the number of prosumer households, firms, and institutions has reached close to 300,000. The residential sector accounts for more than 80% of installations, totalling 2.2 GW_{DC} (1.7 GW_{AC}), while C&I comprises the remaining share, with another 2.2 GW_{DC} (1.8 GW_{AC}). The increase in generation capacity has significantly strengthened the role of solar in the national electricity mix, with PV consistently covering between one-fifth and one-third of daytime demand throughout the year.

GW Figure 6.1

Romania

Cumulative solar PV installed capacity 2022-2025



Note: Original AC data was converted to DC using a 1.25 ratio
 Source: ANRE, Transelectrica & RPIA

39 Since official statistics are provided in AC values, the data in this article has been converted to DC values using a DC/AC ratio of 1.25 across all segments.

The rapid development of the solar PV sector has been paralleled by a rising deployment of BESS, at both the centralised and decentralised levels. In 2025, the country added an estimated total of 800 MWh of storage capacity across both utility-scale projects and the prosumer segment, with the market expected to reach GW-scale and multi-GWh-scale deployment in the upcoming years.

In addition to the contribution to energy security, new investments in solar led to an increase in clean energy employment, as every million EUR creates, on average, 6.1 jobs, according to RPIA. In 2025, the number of FTEs in the solar sector alone exceeded 60,000 people, placing Romania among the top markets in this segment.

National targets for solar PV

In terms of renewable energy objectives, Romania's Integrated National Energy and Climate Plan and Energy Strategy set a RES share target of 38.3% by 2030 and 44% by 2035, slightly below the country's potential. For solar, this translates into a goal of 12.5 GW_{DC} (10 GW_{AC}) by 2030, 8 GW_{DC} (6.4 GW_{AC}) of which in utility-scale projects, an increase of more than 3 GW over the current capacity, and 4.4 GW_{DC} (3.5 GW_{AC}) of rooftop PV, a target that was already surpassed by the end of 2025. While the target for large-scale solar is broadly on par with projected market trends, the target for distributed solar underestimates its development and potential. To better reflect the deployment pace and align with the EU's ambition level, RPIA's Roadmap to 2030 suggests that the target for the rooftop segment should be increased to 6 GW_{DC} (5 GW_{AC}).

Beyond the 2030 horizon, Romania's Energy Strategy envisions 18 GW_{DC} (15 GW_{AC}) of solar by 2035, although it does not specify allocations between market segments. Given the current and expected deployment levels, both the 2030 and 2035 targets are not only attainable but also likely to be exceeded.

63 MW + 16 MWh BESS, Lumina PV park, Solar Open Day III, Romania.

Drivers for solar growth

The expansion of the Romanian solar sector has been underpinned by a series of legislative changes that facilitate the deployment of new PV capacities, from simplified procedures for projects under 50 hectares (approximately 42 MW) to a more integrated approach to grid connection. At the EU level, the country has one of the shortest permitting times for both utility-scale and decentralised segments. For large projects, the process ranges from 12 to 24 months depending on size and complexity, while for distributed capacities up to 400 kW, approvals are generally granted within one to three months.

Beyond the legislative dimension, other factors driving Romania's solar growth include unprecedented levels of public funding for large-scale projects through the National Recovery and Resilience Facility and the Modernisation Fund, amounting to nearly 1 billion EUR. Moreover, the successful 2024 and 2025 CfD tenders, which will support the addition of around 2.4 GW_{DC} (2 GW_{AC})of new solar capacity, have sent a stability signal, reinforcing investor confidence in the sector. In parallel, Romania's PPA market saw strong development in 2025, with almost 10 new contracts signed, bringing the total number of PPAs to nearly 30.

For the distributed segment, the market has been supported under the National Recovery and Resilience Plan, which provides CAPEX funding for more than 30,000 beneficiaries.

Challenges

While the framework for RES development is constantly improving, the industry still faces a series of legislative and structural challenges. A primary issue derives from the fact that Romania is not a member of the Association of Issuing Bodies. As a result, guarantees of origin are not transferable internationally, limiting the potential PPA off-takers to local buyers. Therefore, despite its growth, the market cannot reach its full potential due to limited liquidity.

From a grid connection perspective, starting January 2026, the "first-come, first-served" system will no longer apply to projects above 5 MW, and it will, instead, be replaced by a capacity tender. While the goal is to increase transparency and efficiency in grid allocation in the long run, the new system may, in the short term, generate uncertainty among developers and delay investment decisions until the detailed rules are clarified. The full implications of this shift are yet to be understood, particularly in terms of its impact on project timelines and planning.

Outlook for 2026-2029

Romania's solar sector is evolving from an emerging to a mature market, underpinned by strong deployment rates, supportive policies, and increasing private participation. The progress on grid access reform, guarantees of origin, and market liberalisation will be critical to unlocking its full potential. With deployment accelerating across both utility-scale and distributed segments, the country is expected to exceed its RES targets and significantly contribute to regional energy security.

Author: *Irene Mihai*, Policy Officer, Romanian Photovoltaic Industry Association (RPIA)

5.7 Greece

Is a slowdown inevitable?

Overview of PV developments

First, the good news. In 2025, Greece will install almost as much solar PV as in 2024, around 2.5 GW (Fig. 7.1). The final annual installed capacity may reach 3 GW, contingent upon the connection of certain large utility-scale power plants scheduled either for later this year or early next year.

With currently over 12 GW of cumulative solar PV installed capacity, Greece is set to exceed its 2030 National Energy and Climate Plan (NECP) PV target of 13.5 GW as early as 2026.

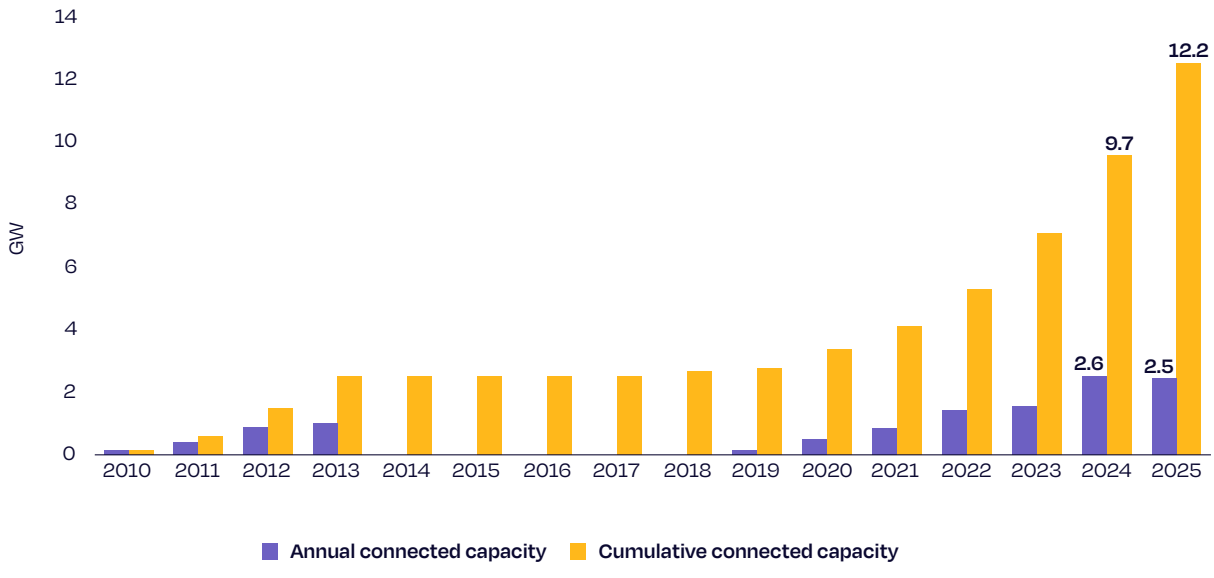
The utility-scale segment saw a significant increase in the number of installations this year due to the progression of large-scale projects. In the C&I segment, adjustments to and the gradual discontinuation of the feed-in premium scheme resulted in reduced growth for medium-sized industrial systems. Meanwhile, the residential sector experienced changes in 2025 as the previous net-metering scheme was phased out and the implementation of the new net-billing scheme encountered delays and administrative challenges. In 2025, the residential segment and self-consumption systems relied on remaining provisions from previous support programmes.

Self-consumption systems have surpassed 1 GW in total capacity. While community solar projects account for nearly 20% of total installed PV capacity, most are not used for self-consumption, and their significance in terms of new installations is declining.

GW Figure 7.1

Greece

Annual and cumulative solar PV installed capacity 2010-2025



Challenges to the solar market

Recent changes in the Greek market include an increase in curtailments, which have impacted many investors. Electricity demand has not kept pace with PV development, resulting in excess production. Energy storage solutions are not yet in place, although plans exist, and interconnections are currently limited. About 8% of potential renewable energy generation is curtailed, and this rises to over 11% for solar PV output.

Zero or negative prices in the day-ahead electricity market almost doubled in 2025 compared to the previous year. Still, the number of hours impacting power plant revenue remains lower than in many other European countries.

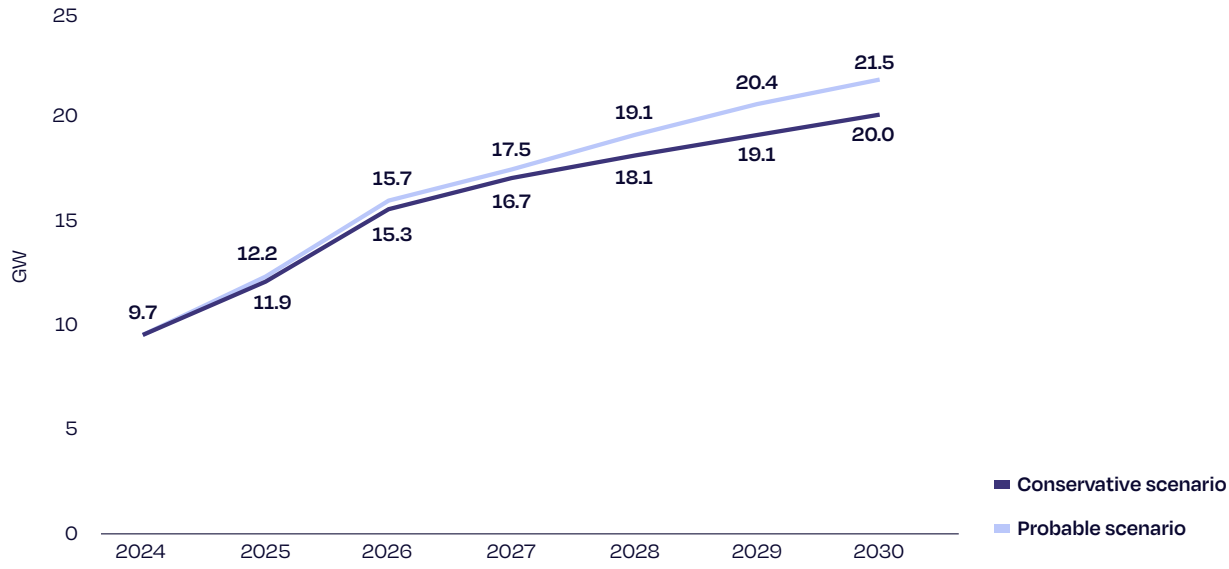
Outlook

The Greek market is highly promising, as many projects secure grid connections, and extra capacity is set aside for self-consumption. This translates to a theoretical cumulative capacity of 27 GW by 2030. Although its full potential may not be realised, the cumulative solar PV capacity is projected to almost double within five years (see GW Fig. 7.2).

GW Figure 7.2

Greece

Cumulative solar PV outlook 2025-2030



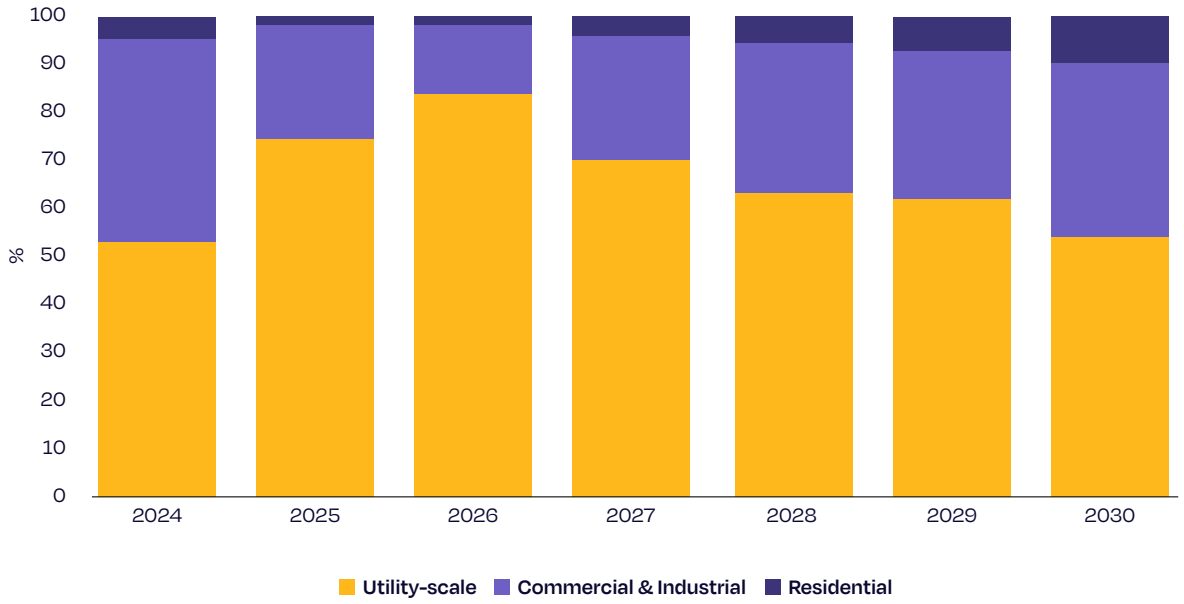
© SolarPower Europe. Source: HELAPCO

GW Fig. 7.3 provides a segmentation breakdown according to the most likely market scenario. The utility-scale segment is expected to further increase its dominance, as worsened conditions for C&I lead to a significant reduction compared to 2024 levels and residential solar remains marginal.

GW Figure 7.3

Greece

Annual solar PV segmentation 2024 and outlook 2025-2030



© SolarPower Europe. Source: HELAPCO

7 MW, Corinth Pipeworks industrial rooftop PV, Thisvi, Greece.

The Greek NECP includes a 4.33 GW battery storage target and a 1.93 GW target for pumped storage by 2030. In 2024, three auctions granted 900 MW to BESS projects, which are expected to start in 2026. The government also announced 4.7 GW of stand-alone BESS grid connections, aiming for operation by late 2028. Altogether, about 6.4 GW of BESS could be available by 2030, exceeding NECP targets but still falling short of the estimated 8 GW needed to manage renewable energy curtailments.

2025 marked a transition, with new regulations requiring all systems over 400 kW to install equipment for grid operator set-point orders, previously mandatory only for high-voltage connections. A compensation mechanism is also being developed to distribute curtailment losses among investors fairly.

Smaller PV companies are concerned about delays in self-consumption legislation. Despite national and EU directives requiring streamlined procedures, governing bodies are missing deadlines. Self-consumption projects could add 3 GW by 2030, supporting the market and clean jobs.

Some international stakeholders whose pipeline projects are unlikely to mature by 2030 are divesting from Greece. However, this remains a relatively minor trend. Opportunities persist in energy storage, as well as within the secondary PV market (i.e. the acquisition of existing permits by new investors), particularly for operational plants or projects with secured grid connections that are currently experiencing financial challenges.

Author: *Stelios Psomas*, Policy advisor, HELAPCO

5.8 Netherlands

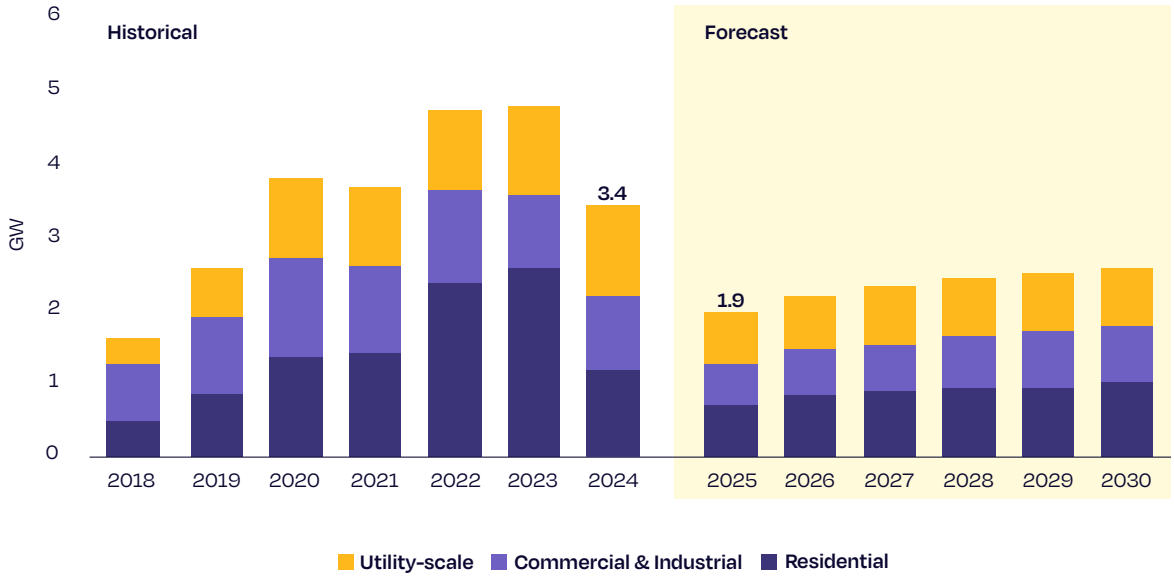
At the frontlines of the energy transition: Flexibilisation is coming

The solar market in the Netherlands has faced significant challenges over the past two years. An estimated 3.4 GW was installed in 2024, down from almost 5 GW in 2023. This decline in newly added capacity is mainly due to a nearly 50% contraction in the residential segment (from 2.3 GW in 2023 to 1.1 GW in 2024). Despite these challenging conditions, the Dutch solar market is expected to stabilise in the coming years at an annual level of 3 to 4 GW of new installations (see GW Fig. 8.1). As of Q4 2025, the Dutch market has surpassed the milestone of 30 GW in installed solar capacity.

GW Figure 8.1

Netherlands

Annual solar PV installed capacity 2018-2024 and scenarios 2025-2030



The total SDE++ subsidy scheme pipeline is not necessarily a precise indicator of market growth. Even after successful subsidy allocation, project completion is far from guaranteed. Completion rates for C&I projects with SDE++ subsidies have dropped to 30%, largely due to grid congestion and low capture prices. For utility-scale (ground-mounted) projects, completion rates are around 60%. This results in an effective pipeline of approximately 2 GW annually in the C&I and utility-scale segments.

National targets for solar PV

The Dutch government's long-term projections for 2050 – covering solar, wind, nuclear, and CCGT plants powered by green hydrogen or carbon capture and storage (CCS) – assume significant year-on-year growth in solar PV. Solar capacity would need to grow by 5 GW annually, not the current 3-4 GW, to meet these targets. The recent market slowdown has not gone unnoticed by the government's independent climate advisory body, which estimated the likelihood of reaching the 2030 climate targets at below 5%. While over 50% of total electricity supply now comes from solar and wind, electricity demand is not growing significantly. This is largely due to the slow substitution of natural gas, putting additional pressure on the solar sector.

The coalition government formed in 2024 has taken a clear stance, stating that no additional policy or support will be granted until it is accepted that the national climate targets will not be reached. Despite the government advisory body's conclusions in October 2024 and 2025 on the very low probability of meeting the targets, no major policy initiatives are expected before Q2 2026, when a new government is anticipated, since the government collapsed in the spring of 2025.

Flexibilisation in the residential market

2024 saw extreme policy swings regarding the Dutch net-metering scheme. While discussions on a phase-out have been ongoing since 2017, a bill to phase it out was passed by the lower house in December 2023 but rejected by the Senate in February 2024. This led to renewed optimism in the market, resulting in around 100,000 residential installations in March, April, and May. However, in May 2024, the new coalition government, previously against the phase-out, announced that the net-metering scheme would be abolished entirely as of 1 January 2027, with no transition period. This caused significant turmoil in an already volatile market. In November 2024, both the Parliament and Senate approved the legislation to end the scheme by 2027.

35 MW, Kriekampen solar park, Oirschot, Netherlands

The decline in solar PV interest has led to a surge in the residential battery market. At the time of writing, several hundred MW of residential storage have been installed – a remarkable growth from what was previously a near-zero market. Although business models for home batteries are still evolving, the impending 2027 deadline has prompted more consumers to rethink how they manage their solar installations. Increasing grid congestion on low-voltage levels and concerns about the volatility of international gas markets further encourage adoption of home energy storage, both for new PV systems and for the retrofitting of the 3+ million households already equipped with solar.

The Dutch market is relatively unique in that the residential segment comprises a large share of total installed capacity, with 12.9 GW or 43% out of a total 30.2 GW in 2025. One clear benefit of this strong residential base is widespread public support for solar energy: 96% of households and SMEs believe their solar PV investment has been beneficial and financially sound.

However, this large segment is difficult to manage from a power market perspective. The number of negative-price hours on the day-ahead market has exceeded 600 annually, mainly during the midday-peak solar hours. Interestingly, the depth of negative pricing is decreasing, indicating that the market is adapting to a volatile baseload supply and that demand is becoming more flexible. Households are leading this flexibility shift: over 700,000 (nearly 10%) now have fully dynamic electricity contracts based on 15-minute day-ahead prices. Moreover, dynamic EV charging projects – both private and public – have proven highly successful from both a consumer behaviour and energy system perspective.

The shift from grid feed-in to maximising self-consumption is particularly evident among households with batteries and EV chargers. On the heating front, the 2024 government also cancelled the hybrid heat pump mandate, which was due to take effect in 2026. This mandate would have required the installation of at least a hybrid heat pump when replacing a gas boiler – a device still present in over 90% of Dutch homes. The cancellation led to a major slump in the heat pump market, with 2025 installations down to just 30% of the peak in 2023. Notably, there is a strong correlation in the Dutch market between heat pump adoption and solar PV ownership, making a quick recovery unlikely.

The residential solar market must now adjust to a future with reduced political support. The key challenge will be to ensure that PV systems remain central in the home energy setup, especially for new electrified energy demands such as heating, EV charging, and storage. Interoperability in the smart home will be crucial to reignite market growth. New standards for energy management systems and device interoperability are currently being developed with government support. As low-voltage congestion grows, enabling flexibility in household assets will be vital to control costs. Dynamic electricity contracts are expected to grow in popularity, given that households on such contracts currently enjoy 17% lower energy bills on average. Upcoming reforms in grid tariffs and improved market integration for residential consumers will further accelerate this trend. In this respect, the Netherlands truly stands at the forefront of the next phase of the energy transition.

Opportunities abound in the C&I market

While the C&I solar pipeline has remained relatively stable in recent years, it is not meeting its full potential. As mentioned earlier, completion rates for SDE++ projects have fallen below 30%. Nonetheless, there are noteworthy developments. The C&I segment is now the largest growth area for energy storage systems, with over 500 batteries installed in 2025, ranging from 0.1 MWh to over 100 MWh and totalling more than 1.5 GWh of capacity.

Grid congestion has created new opportunities. The demand for offtake contracts with TSOs and DSOs is now significantly higher than for feed-in contracts. With long waiting times for grid expansion, many businesses are seeking alternatives. Solar PV combined with battery storage offers a compelling solution, enabling flexible demand and eliminating the need to wait for grid upgrades. Furthermore, the Dutch government has announced in its September 2025 'Electrification Action Plan' that electrification is the go to for the decarbonisation of the industry, for the first time explicitly choosing electricity over hydrogen or CCS as a solution. We expect that this Action Plan will thus lead to a more comprehensive policy framework for electrification in the industry in the coming years.

Electric charging for heavy-duty vehicles, in particular, shows strong potential. With more than 340,000 medium-sized electric trucks and over 29,000 heavy-duty trucks expected to be on Dutch roads by 2030, direct charging from rooftop solar is an increasingly attractive option. This trend is also leading to more subsidy-free, fully merchant solar projects.

However, there is concern in the sector over the current government's minimalistic implementation of the Energy Performance of Buildings Directive (EPBD), which requires only low levels of solar capacity on commercial roofs. The upcoming elections in late October 2025 will be crucial in determining whether this mandate becomes more ambitious or remains a missed opportunity for the solar sector.

EOS+Solar park Vossenberg, Laarbeek, Netherlands

Ground-mounted solar parks: a new development phase

Ground-mounted solar in the Netherlands has long been a topic of political debate, with concerns over land use, biodiversity, and public acceptance.

The sector has worked hard to address these concerns. In September 2025, Europe's largest study on the combination of solar PV and biodiversity was completed by a consortium led by Wageningen University & Research. The findings have been translated into a certification scheme that allows developers to demonstrate that their projects benefit biodiversity. Many of the costs associated with making a park "nature-inclusive" are covered under the SDE++ scheme.

Nevertheless, new national spatial planning rules were introduced in 2024, and provincial governments have adapted or modified them in varying ways. This has led to confusion over what types of solar parks are allowed in which regions. Generally, projects that are not multifunctional (e.g., agri-PV, water management, proximity to infrastructure or offtakers) are becoming increasingly difficult to permit. For agri-PV, policies are slowly being clarified, particularly regarding eligibility for agricultural subsidies. With rising pressure on Dutch farmers to reduce nitrogen emissions, agri-PV is increasingly seen as a viable path to maintaining income while reducing livestock numbers.

Regarding feed-in congestion, the implementation of congestion management programmes and the mandatory participation of installations above 1 MW have begun to yield positive results. Grid capacity is slowly being freed up, allowing more projects to come online. New standardised contracts for flexible grid connections are being introduced, offering shorter lead times and promoting broader adoption.

The utility-scale battery storage market, previously slow to take off, is gaining momentum due to persistently low capture prices – driven in part by residential systems not responding to market signals. A soon-to-be-announced policy change is expected to boost SDE++ support for projects that include co-located batteries, particularly benefiting ground-mounted solar parks without nearby offtakers.

Outlook

The Dutch solar PV industry is steadily transitioning toward a flexible, decentralised energy system. This transition brings growing pains – lower capture prices and reduced growth among them – but the path forward is becoming clearer. Decentralised systems can work, and solar PV is increasingly recognised as a cornerstone of that future. As electrification of heating, mobility, and general energy use continues to accelerate, solar and storage are poised to grow more sustainably. The sector has reason for cautious optimism.

Authors: *Nold Jaeger*, Policy Director; *Wijnand van Hooff*, CEO, Holland Solar

5.9 Bulgaria

Sustained growth in solar is supported by the fast expansion of battery energy storage

Overview of solar PV developments

For the third year in a row, Bulgaria has maintained its position as a GW-scale PV market. Following the record-breaking years of 2023 and 2024, many anticipated a slowdown; however, despite a slight deceleration in new project initiations, several large-scale PV installations were commissioned in 2025.

With cumulative installed PV capacity now close to 6 GW[40], Bulgaria has achieved new milestones in renewable generation. Solar power now accounts for over 14% of the national electricity mix annually, while during midday peaks, PV can supply 70-75% of domestic electricity demand.

115 MW Karlovo solar PV plant with co-located 34 MW/ 68 MWh BESS, Dubene village, Bulgaria

40 Since official statistics for PV capacity are provided in AC values, the data in this article has been converted to DC values using a DC/AC ratio of 1.15.

The market remains primarily dominated by utility-scale projects, with approximately 90% of total installed capacity concentrated in large ground-mounted installations. Nevertheless, the C&I segment continues to expand too, driven by the pursuit of long-term price stability and greater energy autonomy. In recent years, hundreds of rooftop PV plants for self-consumption have been installed across factories and industrial sites – although, to date, no official data is available for these systems.

Drivers for solar growth

Bulgaria's continued solar expansion is underpinned by state-funded initiatives under the National Recovery and Resilience Plan (NRRP), which prioritise large-scale deployment of BESS. Energy storage has proven to be a crucial enabler, mitigating negative and low PV power pricing during midday peaks, while simultaneously reducing morning and evening price surges for consumers. BESS also provide essential flexibility and grid stability, addressing the intermittent nature of solar generation.

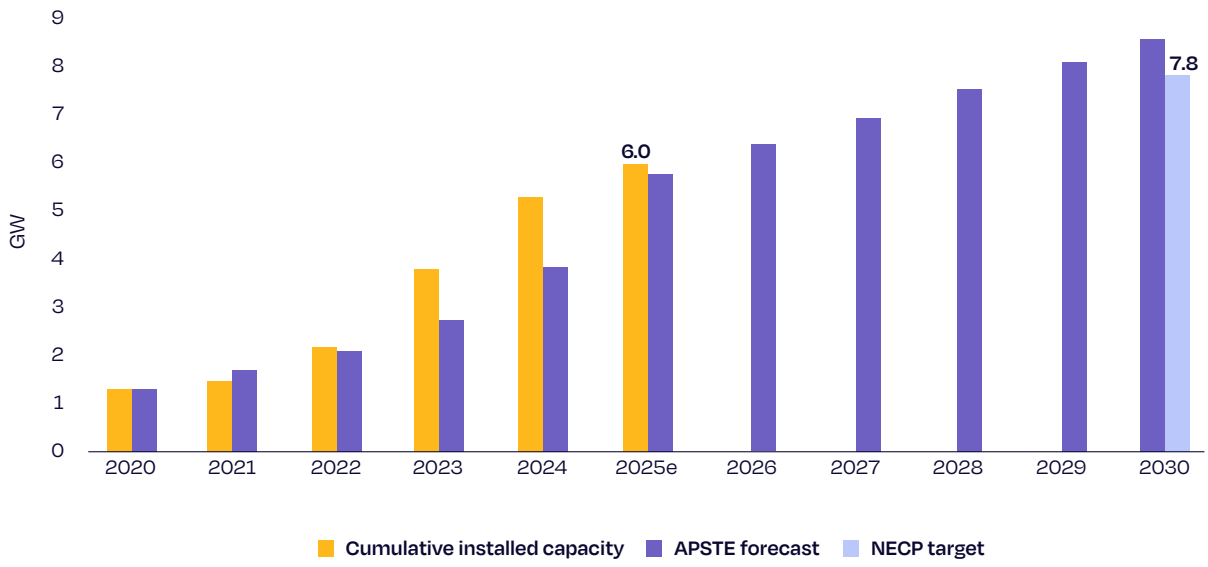
As of September 2025, approximately 600 MW / 1,500 MWh of BESS have been added to the system and this capacity is expected to grow to over 12 GWh by mid-2026. According to the national electricity system operator, grid-connection contracts for 7.5 GW / 23 GWh have already been signed. Most of these planned investments have applied for funding under the NRRP programmes and should start operation by the end of March 2026. A total 9.7 GWh of stand-alone BESS projects were awarded in the last tender while another call for 1.9 GWh is currently accepting bids.

Long-term PPAs are also gaining momentum, offering mutual benefits for both renewable energy producers and large industrial consumers.

GW Figure 9.1

Bulgaria

Cumulative solar PV installed capacity 2020-2025 and forecast 2026-2030



Note: Official statistics in AC values were converted to DC values using a DC/AC ratio of 1.15
© SolarPower Europe. Source: ESO, SEDA, APSTE

Challenges

The development of the residential sector remains a key challenge. The delayed liberalisation of the electricity market for residential consumers and the lack of net metering or other support measures for small-scale installations limit the market to self-consumption systems.

Outdated regulatory frameworks present further complications. The existing eco-tax regime imposes disproportionately high recycling fees for PV modules and batteries – estimated at five to ten times higher than comparable charges in other EU Member States – potentially deterring future growth.

In addition, grid connection capacity remains a limiting factor, as modernising and expanding the electricity grid requires substantial time and investment.

Outlook

Based on licenses issued by the national energy regulator, Bulgaria's cumulative PV capacity is expected to reach 7 GW by mid-2026 (Fig. 9.1). The Association for Production, Storage and Trading of Electricity (APSTE) projects the solar sector to keep growing, albeit at a modest pace, by 450-750 MW of new annual capacity in the coming years.

Future projects will likely integrate storage as a standard feature to ensure the financial and operational viability of projects. The expansion of battery-backed portfolios and an increase in PPA-driven investments are expected to define the next phase of Bulgaria's solar market evolution.

Author: *Desislava Mateva*, Administrative Director, Association for Production, Storage and Trading of Electricity (APSTE)

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5.10 Portugal

Solar PV drives Portugal's ambitious climate targets, with 6.3 GW total solar PV capacity so far in 2025

Overview of PV developments

Portugal has firmly established itself as a frontrunner in renewable energy. The rising adoption of renewable energy in Portugal has had a positive impact on the country's electricity production. In August 2025, renewables' share in total electricity generation for the present year reached 76.9% – an achievement that places the country among Europe's most advanced markets for clean energy investment.

Solar PV is gaining shares in the electricity mix in mainland Portugal, with production reaching 726 GWh in August 2025. In the same period last year, production equalled 644 GWh.

3.5 MW Beja solar PV plant (Hidroerg), Beja, Portugal

Since 2018, Portugal has established itself as one of Europe's most dynamic solar markets, leveraging its abundant solar resources to rapidly scale its PV fleet and reach its ambitious energy and climate targets. Following a particularly strong 2024, with 1.8 GW of new capacity added, 2025 has seen a slowdown in PV deployment. Nonetheless, deployment volumes remain significant, with 643 MW of solar installed between January and August 2025, compared with 1 GW for the same period in 2024.

The significant increase in renewable capacity experienced in recent years has led to a decrease in hourly electricity prices in the wholesale market. In March 2025, electricity in the Iberian market reached a new negative price record, due to the abundance of renewable resources, especially solar. Portugal experienced its first rise in negative market prices in the Iberian spot electricity market (MIBEL) in 2024.

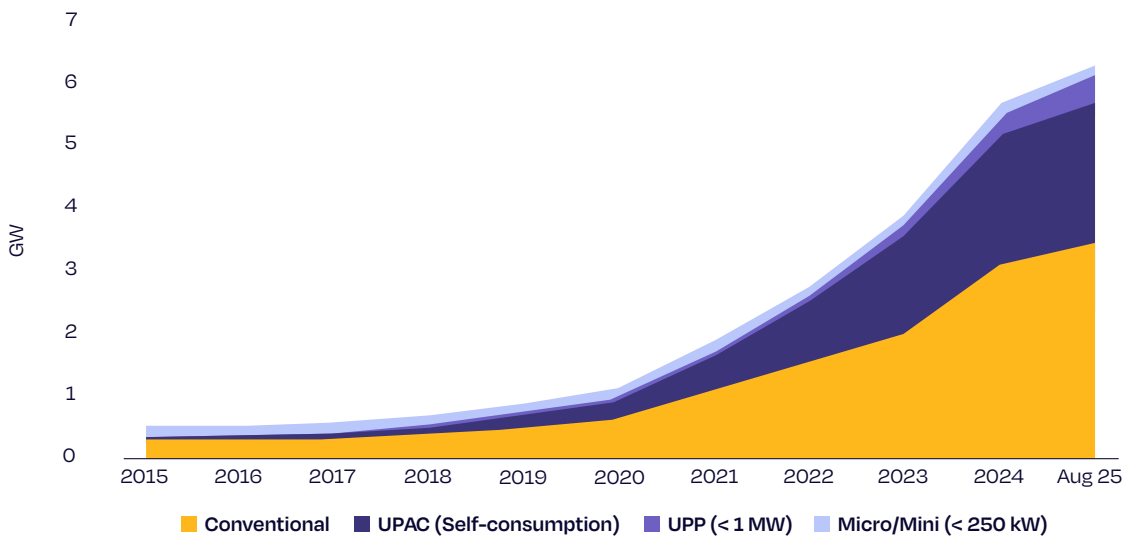
As of August 2025, Portugal has reached a cumulative PV capacity to 6.3 GW, with 643 MW added since the start of the year (see GW Fig. 10.1). Self-consumption systems (UPAC) account for 31% of new additions, highlighting the relevance of decentralised generation in the built environment and the role of prosumers. This trend strengthens the residential and C&I sectors as drivers for PV adoption, positioning self-consumption among Portuguese consumers as a key pillar of Portugal's broader energy transition.

According to National Energy and Climate Plan targets, Portugal is expected to reach 8.4 GW of installed solar PV capacity by 2025, a challenging milestone to achieve until the end of the year, given current permitting bottlenecks. Looking towards the end of the decade, the solar target stands at 20.8 GW, with a contribution of 15.1 GW from large-scale installations and 5.7 GW from the small-scale (including the capacity for hydrogen projects). The pressure to deliver in the next five years is significant, since the NECP also foresees a 93% renewable electricity generation share by 2030 (excluding hydrogen production). These targets position solar PV as a cornerstone in the country's decarbonisation strategy.

GW Figure 10.1

Portugal

Cumulative solar PV installed capacity 2015- August 2025



Note: Conventional encompasses the larger and centralised power plants; UPAC means self-consumption units; UPP stands for small production units (<MW), and Micro/Mini are installations under the old small-scale regime (<250 kW).

Challenges and opportunities

Considering the decrease in hourly wholesale electricity prices, Portugal's solar attractiveness has been hindered, leading to a slowdown in the market, with many projects still awaiting a Final Investment Decision (FID). On the other hand, the uptake of Power Purchase Agreements (PPAs) has also been low, limiting long-term price security for investors.

Likewise, flexibility markets are still far from fully operational: participation is limited, and clear frameworks for the role of storage and the protection of small independent producers have not been established. These are essential to ensure system stability and to maximise the value of renewables.

Additionally, Portugal continues to face key challenges regarding permitting procedures, while a one-stop shop is yet to be implemented. The lack of grid availability also remains one of the main barriers to greenfield project development. There is an urgent need to develop new connection points through the expansion and upgrade of grids, as described in the latest Development and Investment Plan for the Electricity Transmission Grid (PDIRT-E) and Distribution Grid (PDIRD-E) – still pending government approval.

Grid availability largely determines where renewable projects can be developed. However, projects increasingly intersect with complex territorial dynamics, where environmental protection, land-use planning, and local development must coexist. While these interactions can generate tensions and delays, they also create opportunities for synergy. Well-designed projects can restore degraded areas, enhance ecological connectivity, and promote biodiversity gains through habitat regeneration, soil recovery, and landscape integration measures. By aligning energy and environmental objectives, renewables can become active drivers of territorial resilience rather than sources of conflict.

181 MW Santas solar PV plant (Akuo). Monforte e Borba, Portugal

Despite current challenges, Portugal holds a solid pipeline of around 20 GW of projects with approvals from grid operators and assigned connection points or production permits. There is significant potential to further optimise electricity supply through hybrid projects by using existing connection points and repowering existing power plants. This would allow for a 20% increase in connection capacity. Unlocking this potential will be critical in the coming years for Portugal's solar trajectory towards its 2030 targets.

Outlook 2026-2030

To meet its 2030 solar target, Portugal must install at least 3.5 GW per year (290 MW per month).

To achieve this, the country will need to focus on key actions:

1. Approving the investment and grid development plans, fundamental to unlocking new connection opportunities;
2. Transposing RED III, which is still pending: when completed, it is expected to accelerate sector growth;
3. Implementing the measures introduced in response to the blackout in April 2025 over the coming years;
4. Securing grid connection agreements for projects with system operators;
5. Advancing project hybridisation and the repowering of existing power plants;
6. Streamlining and digitalising permitting procedures to enhance predictability, inter-agency coordination, and decision-making speed, while reinforcing human and technical resources of competent authorities;
7. Integrating renewable deployment into spatial and land-use planning instruments to anticipate conflicts and safeguard high-value ecosystems;
8. Strengthening dialogue with local communities and territorial stakeholders to increase acceptance and ensure that renewable projects deliver visible local benefits;
9. Promoting nature-positive approaches that turn renewable projects into levers for ecosystem restoration and biodiversity gains;
10. Promoting self-consumption and energy communities to optimise local generation and consumption, reduce grid congestion, and enhance system flexibility and resilience.

During this period, distributed solar, including rooftop installations and energy communities, is expected to expand steadily as costs continue to decline and implementation rules are eased. In parallel with increased consumer participation in the upcoming flexibility market, the true value of self-consumption will be reached once time-of-use tariffs align with evolving aggregated electricity consumption profiles (a proposal for new time schedules is soon to be put under public consultation by the regulator).

As of 2025, Portugal is a rapidly expanding yet still transitional solar market: already successful, but highly dependent on effective policy implementation and strategic grid planning to realise its full potential by 2030.

Authors: *Mariana Carvalho, Stela Brito* and *Susana Serôdio*, Policy and Market Intelligence, Associação Portuguesa de Energias Renováveis (APREN)

5.11 Hungary

Hungary adds 1.1 GW solar capacity in 2025, amid rooftop market decline and regulatory shifts

Overview of PV developments

Hungary's solar PV market continued to experience a slight decline in 2025. Still, it has already reached the 1 GW milestone for new capacity again this year, after installing a total of 1.5 GW[41] of new solar PV capacity in 2024. In the first 8 months of 2025, an additional 1.1 GW of capacity was added compared to last year's 1.3 GW in the same period, bringing cumulative capacity to 10.2 GW by end of August.

Rooftop systems up to 50 kW: adapting to regulatory changes

Rooftop systems up to 50 kW are adapting to regulatory changes in the market. For systems under 50 kW in capacity, there are two rooftop market segments: residential and small commercial.

41 Since official statistics are provided in AC values, data has been converted to DC values using DC/AC ratios of 1.2 for the residential segment, 1.25 for the C&I segment and 1.3 for the utility-scale segment.

The residential solar segment is still facing significant challenges in 2025 after the termination of the net-metering system at the end of 2023, which significantly reduced the attractiveness of residential investments. However, the solar & storage support scheme introduced in 2024 had some positive "after-effects" in 2025. Nevertheless, Hungary's centrally regulated, capped household electricity prices are the lowest in the EU; this does not stimulate market-based decisions in the residential sector. On the other hand, small commercial systems up to 50 kW do have a solid base for growth due to market-based electricity prices, although this segment is still quite narrow.

In total, new capacity of under 50 kW systems dropped by almost 50% in the first 8 months, down to 149 MW compared to new additions in 2024. This brings total cumulative capacity in this segment to 3.4 GW by end of August 2025.

C&I segment (systems between 50 kW and 5 MW): moderate growth

The C&I segment in Hungary mostly consists of behind-the-meter systems that do not feed electricity into the grid. Although streamlined permitting and high energy prices have been driving the segment, there is not yet significant growth reflected in the data, despite strong fundamentals.

According to end-of-August 2025 data, cumulative capacity in this segment has now reached 781 MW, of which 110 MW was connected this year, compared to last year's total new additional capacity of 161 MW. The government plans to provide significant support to this segment: 50 billion HUF (about 130 million EUR) will be available to support industrial energy storage facilities alongside PV through the Jedlik Ányos Energy Programme.

This market segment is believed to have strong potential for growth in the coming years, possibly doubling or even tripling in size.

C&I rooftop solar PV, Székesfehérvár, Hungary.

Utility-scale segment: short-term strength, and long-term challenges

After the utility-scale segment dominated 2024's new installations with a total 948 MW, this segment continues to form the backbone of Hungary's solar PV market. 2025 resulted in 839 MW new capacities in the first 8 months, totalling 6 GW cumulative capacity by end of August. Growth in the segment was primarily driven by the completion of previously initiated projects. Some of them will still be built under the KÁT feed-in-tariff system introduced in 2016. The pipeline of utility-scale projects with grid connection permits counts a total 4.5 GW capacity, to be connected gradually until 2029.

However, the segment's future prospects are concerning. No new grid connection permits have been issued for utility-scale projects in the past two years. This will lead to a slowdown in the segment in the coming years, with projections of 1-1.2 GW of new installations for 2025 and similar or slightly lower levels in 2026.

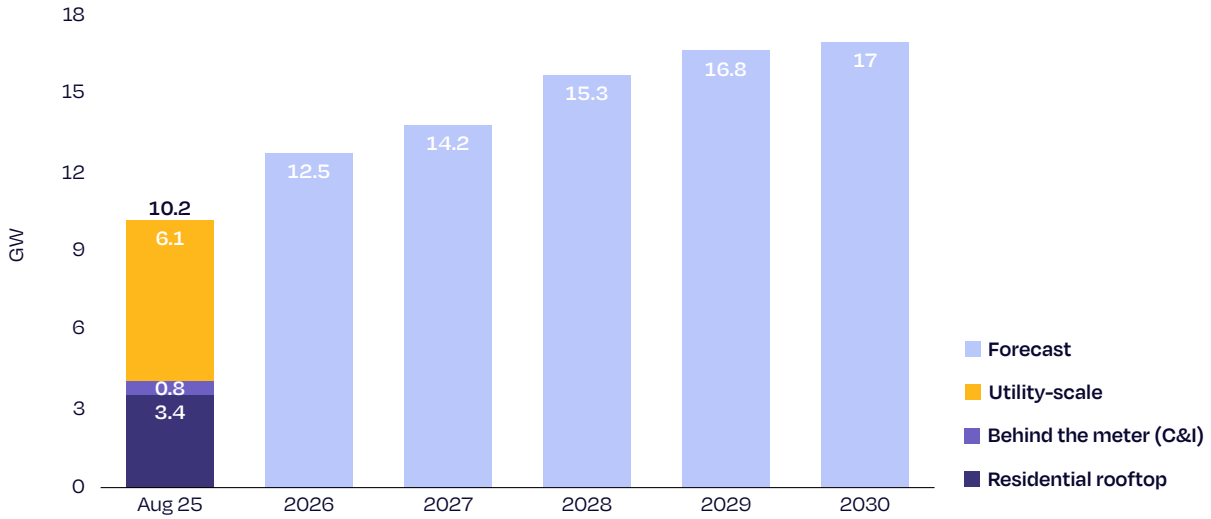
Outlook for 2025-2030

Hungary's solar PV capacity is expected to grow at a more moderate pace in the coming years. Forecasts suggest that capacity could grow to 15.3 GW by 2028, based on a gradual but stable expansion from the current 10.2 GW (Fig. 11.1). The decline in growth rate is attributed to three main factors: regulatory challenges in the residential segment, grid constraints for utility-scale projects, and stabilised electricity prices in the EU.

GW Figure 11.1

Hungary

Cumulative solar PV capacity Sept 2025 and MANAP forecast 2026-2030



Note: Forecast based on application, granted capacity and projection from the TSO

Energy storage integration

To address the intermittent nature of solar PV electricity, Hungary is taking significant steps on the energy storage front. Alongside the METÁROLÓ subsidy scheme, which aims to add 440 MW of new storage capacity by end of 2026, several utility-scale battery projects have been launched in 2025, including MET Group's 40 MW / 80 MWh capacity system (for electricity market services) and MAVIR's 20 MW / 60 MWh TSO-owned battery (as a grid asset). The country now counts a total of 114 MW of battery capacity, and has fixed an official target of reaching 1 GW capacity by 2030. However, industry players foresee a more dynamic growth, with estimates ranging between 1.5 GW and 2 GW by the end of the decade.

Regulatory environment and support

Government attitudes towards PV have shifted, from active support, to a more moderately positive position. As solar PV produced about 25% of total electricity generated in Hungary in 2024 (a world record for solar generation), addressing grid challenges and implementing upgrades has become increasingly critical. The development of a regulatory framework for co-location is underway, aimed at enabling the installation of energy storage facilities behind existing generation units, at a given connection point. This framework supports grid flexibility, while also enhancing the stability and profitability of existing business models.

Challenges for the market

Apart from the above-mentioned Jedlik Ányos C&I support scheme, no other subsidy programmes for PV are planned or foreseen, in either residential or C&I segments. Furthermore, from January 2025, the inflation-linked pricing system of the KÁT feed-in tariff was abolished, negatively affecting the profitability of utility-scale investments. Another burden slowing the development of solar is the additional 31% corporate tax payable by energy producers, on top of the standard 9% tax rate. Finally, the Hungarian solar sector is also experiencing a noticeable decline in investor interest, which can be attributed to the state's pre-emption right, occurring when a solar park is proposed for sale to foreign investors. These factors account for the anticipated deceleration in both the utility-scale and rooftop segments.

In the coming years, the key to success will lie in the development of grid infrastructure, the expansion of energy storage capacities, and the establishment of regulatory stability.

Authors: *Ádám Szolnoki*, President, MANAP (Hungarian Photovoltaic Industry Association); *László Gaál*, Secretary General, HREA (Hungarian Renewable Energy Association)

5.12 Austria

Further decline with 32% annual decrease in installations expected, while reaching 11 GW cumulative capacity

Overview of PV developments

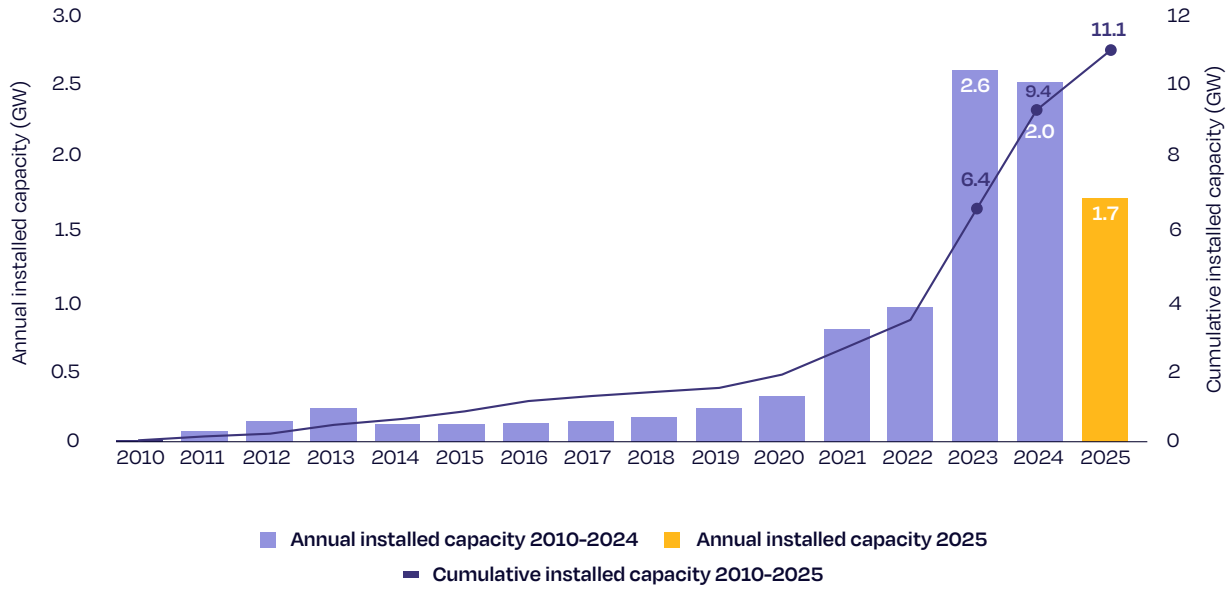
After years of continuous growth, we expect a further decline in PV expansion in 2025, this time quite drastic. Although official data will not be published until mid-2026, Austria is expected to add around 1.7 GW of new PV capacity this year, i.e. approximately 32% less compared to the previous year (Fig. 12.1). A total fleet of around 11.1 GW of PV systems is expected to be in operation by the end of 2025.

Unfortunately, no clear statement can be made about the distribution of utility-scale, small PV systems or rooftop PV developments in Austria. However, we do know that 88% of all PV systems installed in 2024 were decentralised systems. It is therefore assumed that in 2025, the majority of newly installed PV systems will also be rooftop systems, with utility-scale and Agri-PV installations covering a minor share.

GW Figure 12.1

Austria

Annual and cumulative solar PV installed capacity 2010-2025



National PV Targets

As a contribution to achieving the European Union's 2030 renewable energy target, Austria has defined binding national goals for its energy transition through the Renewable Energy Expansion Act (EAG) in 2021. Primarily, the EAG includes Austria's plan to cover 100% of its total electricity consumption with renewables by 2030 and sets a direction to become climate-neutral by 2040. To achieve the 2030 target, the EAG specifically mentions that renewable electricity generation must be increased by 27 TWh by 2030, compared to 2020 levels at 56 TWh. Of this renewable generation target, 11 out of 27 TWh must be generated by PV. In contrast to the EAG, the current National Energy and Climate Plan (NECP) contains a different target. According to the NECP, Austria will need at least 19 TWh of electricity generation from PV by 2030, compared to 2 TWh in 2020.

Drivers for solar growth

Low system prices remained a key market driver in 2025. Despite this, governmental investment funding for PV systems (part of the EAG) was expanded to include a 'Made-in-Europe' bonus. This bonus allows for 10% or 20% increase in funding if PV modules and/or an inverter with European added value are used for the installation of a PV system. The results of the second call – the first to include the 'Made-in-Europe' bonus – showed that every second application featured an inverter classified as 'made in Europe', resulting in an at least 10% higher funding rate.

Challenges for the market

Austria is currently facing EU deficit proceedings. The reduction of VAT from 20% to 0% for private individuals installing PV systems up to 35 kW, which came into force at the beginning of last year and was supposed to remain in effect until the end of this year, was therefore stopped prematurely. Additionally, all climate-related subsidies were recently evaluated, resulting in the discontinuation of many popular PV subsidy programmes, with no indication that they will be reintroduced at a later date. This has led to a sharp decline in demand.

400 kW rooftop solar PV, Domaine Albrechtsfeld, Andau/Burgenland, Austria

The lack of grid capacity is still a major obstacle. On the one hand, grid expansion is lagging behind the expansion of renewables, while on the other hand, important laws – such as the Electricity Act (ElWG), key for establishing the necessary framework for a modern and a more flexible electricity grid infrastructure in Austria – were still not passed this year. Without prompt and decisive action at a political level, Austria risks missing its climate targets.

Another domestic problem is complex permitting procedures and a lack of acceleration areas for ground-mounted PV systems. As Austria follows a federal structure, the competence for permitting and acceleration areas for PV lies with individual federal states. To date, more than 30 individual laws contain different permitting requirements and only three out of nine federal states have designated acceleration areas. The Renewable Energy Expansion Acceleration Act (EABG) included proposals to standardise both. This law is currently under review and will bring standardised permitting procedures. However, the promised binding requirements for the designation of acceleration areas are unfortunately no longer included in the law.

Outlook

The future of the Austrian PV sector and its further expansion depend heavily on the willingness of the current Austrian government to consistently push ahead with the energy transition. If the important framework laws (ElWG, EABG) are not passed quickly, PV expansion will continue to lose important ground, which will ultimately mean that Austria's climate targets will not be met. Although the Austrian PV sector has once again impressively demonstrated this year that it can work with uncertainties. But resilience also has its limits – politics must act now.

Author: *Lisa Grün*, Bundesverband Photovoltaic Austria (Federal Association for Photovoltaics in Austria)

PV-Suntracker at Zotter Chocolate Factory, Riegersburg, Austria

5.13 Denmark

Return to GW-scale utility volumes with some clouds ahead

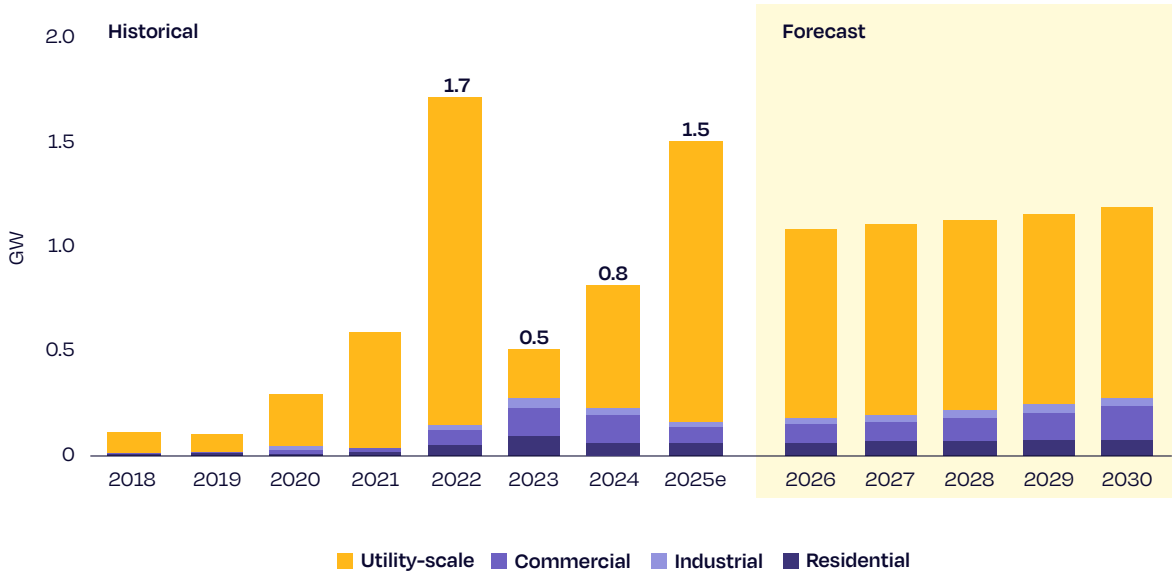
The solar PV market in Denmark has seen a significant decline since its peak in 2022 and 2023.

Utility-scale project installations peaked in 2022, in a rush to connect before connection charges were increased on 1 January 2023. In comparison, deployment in all rooftop segments peaked in 2023 due to high power prices experienced all over Europe, as a consequence of the war in Ukraine and associated gas price hikes.

GW Figure 13.1

Denmark

Annual solar PV market 2018-2025 and forecast 2026-2030



In 2025, Denmark experienced a stable market in the residential rooftop segment, whereas C&I deployment volumes decreased by around 40% compared to the year before (Fig. 13.1).

The stability in the (small) residential market stands in contrast to the decline observed across the rest of Europe, and may be attributed to sustained interest among some customers in PV+BESS solutions for achieving self-sufficiency and energy independence. This may offset the decline in sales from customers who are more focused on financial returns and project payback time.

The decline in the C&I segment may be attributed to a drop in overall focus among business owners on the electrification agenda, as well as fewer attractive business opportunities, and challenges experienced when dealing with financing, insurance institutions, and fire authorities. Municipalities' mandates are also somewhat restricted in terms of operating PV installations partly based on self-consumption.

In 2025, several initiatives have been taken by the Danish government to support further growth in the rooftop segment. These include:

- Increased depreciation: commercial and industrial facilities can now depreciate solar investments up to 1 MW at 108% in both 2025 and 2026;
- Third-party financing: as of 1 July 2025, commercial, industrial, and selected public rooftop PV systems are eligible for leasing and other third-party financing models;
- Tax deductions for residential solar: prosumers can now receive tax deductions for labour costs associated with the installation of residential PV systems;
- A smaller subsidy scheme for multi-storey residential buildings: as of 30 September 2025, funding is available for solar installations on residential buildings with more than one storey.

In general, these initiatives are expected to boost deployment in the residential and C&I rooftop segments by 5-15% YoY for the next five years, and even by 25% for the largest (>1 MW) rooftop systems, as compared to 2025, with annual PV installations reaching around 88 MW for the residential and 205 MW for C&I rooftops by 2030. Since 2020, cumulative rooftop PV deployment in all three segments has doubled, from 808 MW to 1.67 GW in 2025.

215 MW Lidsø PV park, Lolland, Denmark

The rooftop segment has also drawn increased attention due to the local and regional elections held on 18 November 2025, as land-use planning and local acceptance are becoming increasingly important.

Among the outstanding challenges which still hinder a recovery of market attractiveness for rooftop systems, electricity tariffs with double taxation of BESS charge/discharge and import+export connection charges are key still topics to be addressed.

As for the utility sector, Denmark has seen a significant uptick in the market since 2022, mostly due to clearer and more transparent connection charges (geographically and voltage-level differentiated), as well as a reprioritisation of projects towards high connection voltages. The expected volume of utility-scale PV for 2025 may go beyond 1,200 MW, a significant increase from the 550 MW installed in 2024.

Looking ahead, like for most of Europe, the Danish utility sector is experiencing a difficult financial environment, and several investment decisions among major developers have been postponed. The challenges relate to the difficulties in achieving reasonable PPA or offtake agreements for generated power, at least for PV-only projects. At the same time, issues related to system technical design, grid compliance documentation and verification, revenue forecasting and overall bankability of PV+BESS systems are significantly more difficult to clarify, with the effect that many otherwise ready-to-build projects are being paused.

Recently, the government has launched a policy initiative, 'More Solar and Wind on Land – with Greater Consideration for Neighbours and Project Developers'. It consists of 17 initiatives aimed at accelerating onshore renewable energy deployment, while improving local engagement, permitting, and fairness, mostly concerning the utility sector and solar PV on public buildings. The package is currently being negotiated amongst relevant political parties in the Danish Parliament and is about to be implemented in 2026.

Battery energy storage systems

As in the case all over Europe, batteries have become an important factor to consider for almost all PV project opportunities, and often a main driver for investment decisions.

This is visible from feedback received by installers and from the large number of applications for grid connection registered by the Danish TSO Energinet, as well as all DSOs. By mid-August, Energinet had 6.4 GW of BESS project applications on its desk – almost a doubling of the 3.5 GW registered last year. In addition, the major DSOs in the Eastern part of Denmark, Cerius and Radius, have registered more than 3.5 GW of project applications. This high interest in BESS reflects the growing need to handle record-low and even negative electricity prices caused by high renewable penetration on sunny and windy days, as well as the need to provide flexibility, balance the grid, and store surplus energy for when it's needed most.

Although there is currently no centralised database for grid-connected BESS in Denmark, the capacity of systems approved for participation in the Danish ancillary service market is currently around 100 MW.

Author: *Flemming Kristensen*, Chairman of the Board, Danish PV Association

5.14 Ireland

Building generation for generations

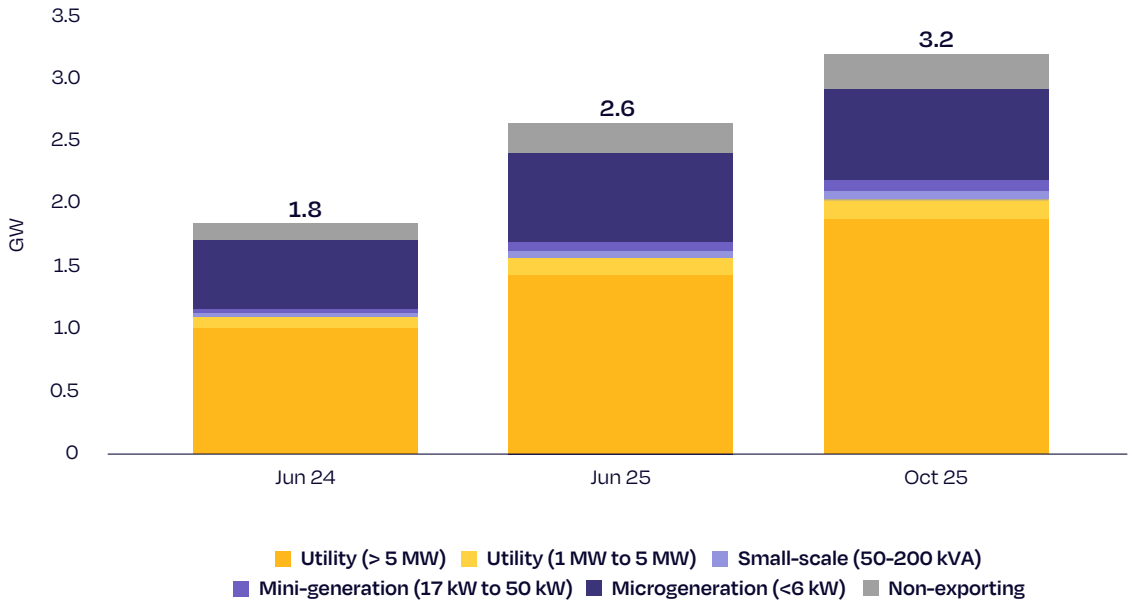
Overview of PV developments

Ireland's solar market has shifted from promise to delivery. By October 2025, installed solar PV capacity reached 2.2 GW_{AC} (3.2 GW_{DC})[42, 43], up 209% since 2023 – the fastest growth rate among Ireland's renewables (Fig. 14.1). For the first time, Ireland is on track to exceed 1 GW_{DC} of new annual installations this year, firmly establishing solar as a central pillar of the national energy transition.

GW Figure 14.1

Ireland

Cumulative solar PV installed capacity June 2024-October 2025



Note: All capacity numbers were converted from AC to DC using a ratio of 1.67 for utility-scale, 1.25 for C&I, and 1.2 for the residential segment.
 Source: Solar Ireland, SolarPower Europe

42 Including 169 MW_{AC} (210 MW_{DC}) of non-injecting self-consumption solar.
43 All capacity numbers converted from AC to DC using a ratio of 1.67 for utility-scale, 1.25 for C&I, and 1.2 for the residential segment.

Growth has been broad-based, with capacity additions between June 2024 and October 2025 spanning large-scale farms, commercial rooftops, community projects, and households. In the utility-scale segment above 5 MW, 1.1 GW_{AC} (1.9 GW_{DC}) cumulative capacity was reached, with new flagship projects in 2025 including Power Capital's 130 MW Lysaghtstown Solar Farm in Cork, and ESB's 8.4 MW Bullstown Solar Farm in Meath. Both highlight scale while delivering community benefits. In the 1–5 MW segment, a total of 87 MW_{AC} (146 MW_{DC}) was reached through the Small-Scale Renewable Electricity Support Scheme (SRESS). In the large commercial segment (200 kVA-1 MW), 2.3 MW_{AC} (2.9 MW_{DC}) was installed, with strong uptake in agri-processing, logistics, and retail. In the small-scale segment (50-200 kVA), 50 MW_{AC} (63 MW_{DC}) was installed, supported by SEAI grants and the Solar for Schools initiative, while mini-generation (17-50 kVA) accounted for 70 MW_{AC} (88 MW_{DC}), primarily in farming and rural SMEs. Microgeneration (≤6 kW) accounted for 682 MW_{AC} (818 MW_{DC}), installed on more than 159,500 homes. This represents just over 15% of Ireland's 1 million solar-suitable rooftops. Finally, newly installed non-exporting self-consumption PV plants totalled 169 MW_{AC} (210 MW_{DC}), typically for agri-food processors and industrial campuses.

This segmentation demonstrates a uniquely balanced market: utility-scale projects driving volume, with rooftops and distributed systems ensuring solar's visibility in everyday life.

Solar PV generation breaks records

By October 2025, solar PV had already generated 1,073 GWh in the Republic of Ireland and 1,190 GWh across the island: for the first time, Ireland has surpassed the **1 TWh milestone in annual solar output**.

Month-on-month growth has been striking. April and May 2025 set new national records (136 GWh and 182 GWh, respectively), with solar meeting 6.5% of monthly electricity demand in May. On 18 May, solar output peaked at 21.1% of national demand, a new record for solar penetration.

This performance demonstrates solar's increasing role not only in energy supply but also in shaping system behaviour, price formation, and flexibility needs.

8 MW, Bullstown PV park, Ashbourne, Ireland

Storage and system integration

Ireland's battery fleet has scaled at pace: operational capacity in June 2025 in the Republic of Ireland reached 837 MW / 1,183 MWh, and 1,049 MW / 1,313 MWh for all-island. This is already well beyond the 640 MWh forecast for 2025 in earlier European market outlooks. According to data from the Green Collective, by end-2024, the Republic had already reached 943 MWh.

Drivers and challenges for solar growth

First, the Scheduling & Dispatch Programme (SDP), although delayed to November 2025, will be critical for allowing batteries to submit both charging and discharging notifications to grid operator SEMO, boosting transparency and wholesale participation.

On the other hand, the **Temporal Scarcity Scalar (TSS)**, currently central to DS3 ancillary service revenues, is under consultation for removal. This could reduce revenues unless new streams emerge. **Private wires** present a potential for solar & storage projects to supply large energy users directly, though uptake may depend on future regulation of data centre demand.

Since late 2024, Ireland's batteries have already begun charging during daytime solar peaks, even including pumped hydro at Turlough Hill – a visible sign of solar reshaping market dynamics.

8 MW, Bullstown PV park, Ashbourne, Ireland

Policy and regulatory framework

The regulatory landscape for Ireland's solar sector has advanced rapidly. In 2024, the **RESS 4** auction awarded nearly 1 GW of solar contracts, and, in 2025, **SRESS** supported smaller-scale projects for SMEs, communities, and farms. The **Planning & Development Act 2024** has streamlined approvals, with solar-specific provisions, while the grid connection policy **ECP-GSS** will double grid connection capacity from 2026. Finally, implementation of the transposition of the **RED III Directive** will enforce faster (two-year) planning and connection timelines, with new Renewables Acceleration Areas expected to further speed up solar development.

These changes have accelerated deployment, but challenges remain: grid congestion, curtailment, and looming rooftop grant cuts risk slowing momentum.

Economic and social impact

According to KPMG's *Sunrise* study[44], the solar PV industry in Ireland could contribute **6.2–7.3 billion EUR in economic output and 2.3-2.7 billion EUR in gross value added (GVA)** between 2025 and 2030. Employment already stands at 5,500–6,500 and could rise above 7,000 by 2030, with most jobs created outside Dublin.

Community impact is tangible: RESS-backed solar farms now provide millions annually to local funds, while initiatives like EnergyCloud redirect surplus renewable electricity to households in energy poverty. Projects like Bullstown Solar Farm demonstrate how clean power can go hand-in-hand with local investment, biodiversity measures, and education.

Outlook to 2030

Ireland's pathway to **8 GW_{AC} (13 GW_{DC}) solar by 2030**, as per on the country's NECP target, will require sustained annual additions of 780-1,330 MW_{AC} (1,258-2,145 MW_{DC}). Current trends suggest yearly installations of 1.2-1.5 GW_{AC} (1.9-2.4 GW_{DC}) are feasible from 2026 onwards, contingent on grid and planning capacity.

Emerging trends include the hybridisation of solar and storage projects, which are optimising exports. Floating solar pilots are beginning on inland waters, with offshore research now underway. Agri-PV is enabling dual land use models that combine food production and energy generation. Community solar initiatives are also expanding access, with schools, sports clubs, and cooperatives playing an increasing role.

In conclusion, Ireland has moved from laggard to leader in under three years, crossing the 1 TWh milestone and exceeding battery forecasts. While challenges remain, the momentum is undeniable.

Authors: *Ronan Power*, CEO; *Priscila McGeehan*, Director of Communications and Strategy, Solar Ireland

44 KPMG Ireland (2024), Sunrise: Economic Impacts of the Solar Energy Industry in Ireland

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