

German solar at a turning point

Germany has long been one of the defining solar markets in Europe. It helped turn photovoltaics from a subsidised early-stage technology into a mainstream part of the power system, then lived through the consequences of market contraction, policy change and intense global competition. Today, German solar is back at the centre of the country's energy transition, but the story is no longer simply about adding more panels.

By the end of 2025, Germany had around 117 GW of installed solar capacity, with 16.4 GW added during the year.¹ Photovoltaics generated approximately 87 TWh of electricity in 2025, up by around 21% compared with the previous year, and moved into second place in Germany's public net electricity generation mix behind wind.²

That's a major achievement. However, it's also not enough. Germany's target is 215 GW of installed photovoltaic capacity by 2030. To reach it, the country needs to add an average of 19.6 GW of solar capacity each year through to the end of the decade.¹ In other words, Germany is already one of Europe's largest and most experienced solar markets, but it still needs to accelerate from an already high base.

The next phase of German solar will be shaped less by whether the market believes in PV and more by whether the wider system can keep up with it. Grid connection, storage, land use, rooftop access, digitalisation, supply chain resilience and market design are now just as important as module prices.

A market with momentum, but no room for comfort

Germany's solar recovery has been one of the most important renewable energy stories in Europe over the last few years. After a long period in which annual deployment was far below the levels needed for the country's climate and energy security goals, the market has regained scale. The 2023 record year showed that the sector could still move quickly. The 2025 figures confirm that high annual deployment is no longer a one-off.

The political direction is also clear. The Renewable Energy Sources Act sets a target of 215 GW of solar by 2030, with the government aiming for a strong mix of rooftop and ground-mounted systems. That balance matters. Germany cannot reach its target with residential roofs alone, but it can't rely only on large solar parks either.

The Solar Package I, adopted in 2024, was designed to remove some of the practical barriers that had slowed deployment. It simplified rules for balcony PV, improved the framework for larger commercial rooftop systems, strengthened tenant electricity options and supported faster growth in ground-mounted installations.³

For the industry, the change is welcome, but the task remains demanding. Germany has to keep building at a pace while dealing with growing grid congestion, more frequent periods of very low or negative wholesale prices, regional variation in permitting and a tougher commercial environment for European solar manufacturing.

This is why the German market is so interesting. It is not an emerging solar market, learning the basics. It is a mature market adapting to a much higher share of solar and other variable renewables.

Rooftop solar moves into the mainstream

Rooftop solar remains one of Germany's great strengths. It is visible, decentralised and closely linked to household and business decisions about energy costs. For many families, solar is no longer a purely environmental choice. It is part of a wider package that may include a battery, an electric



vehicle, a heat pump and a smarter approach to using electricity at home.

Germany's original solar boom was built around feed-in tariffs. The newer phase is increasingly built around using more solar power onsite, helped by higher electricity prices, batteries and changing customer needs. Fraunhofer ISE has shown that PV self-consumption has risen sharply, reaching 12.28 TWh in 2024 and accounting for 17% of net electricity generation from photovoltaics.⁴

For installers and technology providers, that makes the residential market more sophisticated. Customers are no longer simply buying panels. Increasingly, they are looking for a joined up energy system. That system may need to manage generation, storage, electric vehicle charging, heat pump loads and variable tariffs. This creates



Rooftop solar, Beeskow, Germany

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opportunity, but it also raises expectations around installation quality, software, aftercare and consumer trust.

Commercial rooftops are equally important. Germany has a large stock of industrial buildings, logistics sites, retail premises, agricultural buildings and public facilities that can host solar generation close to demand. Solar Package I strengthened the framework for larger rooftop systems, including improved support for larger commercial roof installations and higher auction volumes for large rooftop PV from 2026.³

This is where the next wave of German rooftop solar could come from. Residential demand is already well established, but commercial and industrial roofs still offer significant untapped potential. For energy-intensive businesses, onsite solar can support

cost control, corporate decarbonisation and resilience against volatile electricity prices. For the solar sector, it offers a way to grow without adding the same level of land use pressure that can accompany very large ground-mounted projects.

The obstacles are practical rather than ideological: roof condition, ownership structures, lease arrangements, grid limits, insurance, financing and internal decision making. Those are not always the most exciting issues, but they decide whether potential capacity becomes real capacity.

Balcony PV shows the human side of the transition

One of the most distinctive features of the German solar market is the rise of plug-in balcony PV. It is a small part of the total installed capacity, but a large part of the public story.

The Bundesnetzagentur registered about 430,000 new plug-in balcony solar panel installations in 2025. Together, they accounted for around 0.5 GW of new solar capacity, or approximately 3.2% of Germany's total solar additions that year.¹

The numbers are modest compared with utility-scale projects, but the symbolism is powerful. Balcony PV allows tenants, flat owners and households without suitable roofs to take part in the energy transition. It turns solar from something installed by homeowners and developers into something that can appear on apartment balconies, terraces and small urban spaces.

Solar Package I helped by reducing bureaucracy around these systems and making participation easier.³ That matters in a country where tenant participation has often been one of the harder



Solar farm Germany

parts of rooftop solar policy. Germany's energy transition has always relied on public participation. Balcony PV keeps that tradition alive in a modern, highly visible form.

The challenge now is to keep the market credible. Simpler rules should not mean poor quality equipment, unclear safety responsibilities or unrealistic consumer claims. If balcony PV is handled well, it can strengthen public support for solar. If it is handled badly, it could create a backlash out of proportion to its technical role in the system.

Ground-mounted solar becomes unavoidable

Germany cannot reach 215 GW without large volumes of ground-mounted solar. That is the uncomfortable truth for anyone hoping the rooftop market can do all the work. Rooftops are essential, but the scale, speed and cost profile of ground-mounted PV make it a central part of the 2030 pathway.

Auction results show that competition remains strong. In the July 2025 auction for ground-mounted solar and other first segment installations, the Bundesnetzagentur awarded around 2.27 GW. Successful bid prices ranged from 4.00 to 6.26 cents per kWh, with an average volume-weighted award price of 4.84 cents per kWh. Bavaria again accounted for the largest awarded volume.⁵

Those numbers show why ground-mounted solar is so attractive. It is fast, competitive and technically proven. It also creates the clearest planning and land use debate. Germany's solar expansion needs agricultural land, conversion areas, roadside and railway corridor sites, former industrial land and more innovative formats such as agrivoltaics.

Agrivoltaics is particularly relevant for Germany because it speaks directly to the land use question. It offers the possibility of combining agricultural production with solar

generation, rather than treating the two as automatic competitors. It will not be the answer everywhere, but it can help change the tone of the debate from land taken out of use to land used differently.

The industry still has to earn trust. Local communities need clear information, fair benefit models, good landscape design, biodiversity measures and credible long-term management. A solar park may be part of the national energy strategy, but it is experienced locally as a change to a familiar place. Developers who understand that will have an advantage.

Solar and storage are now inseparable

Germany's solar market is increasingly a storage market as well. As more PV enters the system, the value of electricity depends more on when it is generated and how flexibly it can be used.

At household level, batteries are already becoming normal. Fraunhofer ISE expects PV self-consumption to continue rising, helped by high electricity prices and the success of battery storage systems. The institute also points to the role of solar power in running heat pumps and charging electric cars.⁴ This makes rooftop solar more attractive and can reduce pressure on the grid when systems are operated intelligently.

At system level, the storage picture is growing quickly but remains uneven. The Bundesnetzagentur reported that network operators received 9,710 connection applications for battery storage at medium voltage level and above in 2024. These applications represented around 400 GW of planned power capacity and 661 GWh of planned storage capacity. At the time of publication, 921 operational battery storage facilities at medium voltage level and above were connected, with around 2.3 GW of net rated power and 3.2 GWh of storage capacity.⁶

The difference between applications and operational assets is striking. It shows both the intensity of market interest and the risk of a crowded connection pipeline. Not every proposed battery will be built. Some will be speculative. Some will be delayed. Some will depend on market design, grid charges and revenue certainty.

For solar developers, however, the direction is clear. Standalone PV will still be built, but the commercial logic increasingly points towards co-located storage, flexible offtake, smarter dispatch and better forecasting. The value of solar power will depend not only on how cheaply it can be generated, but also on how intelligently it can be integrated.

The grid is the real delivery test

Germany's solar target is a capacity target, but the harder challenge is system integration. Solar can be installed quickly. Grids cannot always be reinforced at the same pace.

The German electricity system is already dealing with regional congestion, connection delays, redispatch costs and growing pressure on distribution networks. Much of the rooftop and small commercial market connects at distribution level, while larger ground-mounted projects and storage assets increasingly compete for grid capacity in the same regions.

This is why digitalisation matters. Faster connection processes, better visibility of local grid capacity, smart meters, controllable loads and grid-friendly storage operation are no longer secondary issues. They are part of whether the next phase of solar growth can be absorbed efficiently.

There is also a market design question. As solar generation rises, midday output can push prices very low, sometimes below zero. That does not make solar less valuable in climate or energy security terms, but it does

change project economics. Developers, investors and asset owners must think more carefully about capture prices, curtailment, storage, power purchase agreements and flexible demand.

Germany has already shown that very high solar deployment is possible. The next question is whether it can build the operational intelligence around that deployment quickly enough.

A difficult moment for manufacturing

Germany's solar market is growing, but German and European solar manufacturing remain under severe pressure. This is one of the central tensions in the market.

The country wants more solar for energy security, climate policy and industrial competitiveness. Yet much of the module supply chain is dominated by low-cost Asian imports, and European manufacturers have struggled to compete. The insolvency proceedings linked to Meyer Burger's German subsidiaries in 2025 have become a visible symbol of that pressure, with the company citing difficulties competing against lower cost production from China.⁷

For PES Solar readers, this raises an important distinction. Germany is a strong deployment market, but deployment strength does not automatically create domestic manufacturing strength. Installation, project development, engineering, software, operations, maintenance, storage integration and power electronics may offer more immediate domestic opportunities than large-scale module manufacturing.

That does not mean manufacturing is unimportant. Supply chain resilience, product quality, traceability and strategic autonomy are now part of the European solar debate. But rebuilding manufacturing capacity requires more than market demand. It needs a bankable policy, procurement signals, capital, scale and a clear answer to the price gap with imported modules.

Germany's challenge is therefore twofold: keep solar deployment moving at speed, while deciding how much industrial capability it wants to protect or rebuild at home.

The real test ahead

The German solar story in 2026 is not a simple success story, and it is not a crisis story either. It is more interesting than that.

Germany has scale, experience, public familiarity with solar and a clear 2030 target. It has a large rooftop base, a growing commercial market, a competitive ground-mounted sector and one of Europe's most active storage conversations. It also has grid constraints, price volatility, land use tensions, skills needs and a difficult manufacturing environment.

The next few years will show whether these pieces can move together. Solar capacity

needs to keep rising, but success will depend on more than added capacity. Germany also needs faster connections, smarter storage, stronger commercial rooftops, credible local engagement, better data, resilient supply chains and market rules that reward flexibility.

For the wider European solar sector, Germany remains a reference market. It shows what happens when solar becomes central rather than marginal. It also shows that maturity brings a new set of problems. The question is no longer whether solar can grow. The question is whether the system around it can grow quickly enough.

If Germany can make that transition, the achievement will be about more than adding gigawatts. It will show how a major industrial economy can move solar from rapid deployment to fuller integration into the wider energy system. That is the real test now.

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