





# From rooftop to utility-scale: powering the global solar boom

In the past decade, solar energy has evolved from a niche alternative into one of the fastest growing sources of electricity worldwide. Once limited to rooftop panels and small community installations, solar photovoltaics (PV) are now powering entire cities, industries and national grids. From suburban homes in Germany to sprawling deserts in China, solar is reshaping how the world thinks about energy and the numbers tell a story of unprecedented growth.

As of early 2024, the total installed solar PV capacity worldwide reached approximately 1.6 terawatts (TW), marking a pivotal moment for the renewable energy transition (Green Energy Stocks). This massive figure represents not only technological progress but also a global commitment to cleaner, more resilient power systems. And with the pace of installations accelerating, 2025 is poised to be another record breaking year.

## The scale of the boom

Analysts forecast that global solar PV installations in 2024 fell between 500 and 655 gigawatts (GW), a staggering increase compared to previous years. S&P Global Commodity Insights projected over 500 GW in new installations, while BloombergNEF (via Taiyang News) estimated closer to 592 GW. Some projections even reached as high as 655 GW (PV Tech), a number that would represent more than 40% growth year over year.

This growth is being fueled by a combination of factors: declining costs, improved efficiency, supportive policy environments and rising demand for energy security and

sustainability. Solar power has become the most cost-effective electricity source in many regions, outperforming fossil fuels even without subsidies. As a result, both mature economies and developing nations are scaling up solar deployment at an unprecedented rate.

## China's dominance in utility-scale solar

Leading the global charge is China, which installed 268 GW of new solar capacity in 2023 alone, accounting for more than 60% of all global installations that year (PV Tech). In 2024, China was expected to add approximately 313.7 GW, maintaining its dominant position in the solar market.

These figures reflect China's dual ambition: to meet rising domestic energy demand and to lead the global renewable manufacturing supply chain. Large-scale solar farms in Inner Mongolia, Xinjiang and Qinghai now span hundreds of square kilometers, supplying power to urban centers thousands of miles away. Government incentives, cheap capital and world leading panel production capacity have all helped make this boom possible.

## From rooftops in Rome to mega-farms in Rajasthan, the world is increasingly powered by the sun.

### The US: a strong second

The United States continues to solidify its position as the second largest solar market in the world. In 2024, the country was projected to install around 40.6 GW of solar capacity (PV Tech), driven by a mix of federal tax incentives, state-level renewable mandates and corporate clean energy procurement.

While utility-scale projects dominate in terms of capacity added, rooftop installations, particularly in states like California, Texas and Florida, continue to grow steadily. The Inflation Reduction Act (IRA), passed in 2022, introduced long-term investment tax credits (ITCs) for solar developers, unlocking billions of dollars in new projects across the country. In addition, power purchase agreements (PPAs) and green tariffs are enabling companies like Amazon and Google to go solar at scale.

### India and Southeast Asia: accelerating growth in emerging markets

India is another key player in the solar transition. After facing pandemic-related delays in recent years, the country is regaining momentum. In 2024, India is expected to add 18.1 GW of new capacity (PV Tech), as it pursues its goal of reaching

280 GW of installed solar capacity by 2030. The government's Production Linked Incentive (PLI) scheme aims to boost domestic manufacturing of solar modules, reducing reliance on imports and supporting job creation.

Elsewhere in Asia, Vietnam, Thailand and the Philippines are scaling up commercial & industrial (C&I) and utility-scale solar projects, aided by rising electricity demand and falling solar costs. Southeast Asia's tropical climate and growing urban populations make it a prime region for solar development in the coming years.

### Brazil and Latin America: abundant sunlight, increasing investment

Latin America's solar market is heating up, quite literally. Brazil, in particular, has emerged as a regional leader. As of February 2025, the country had 53.9 GW of installed solar capacity, representing 21.9% of its electricity matrix. Distributed generation has played a significant role, with small-scale rooftop systems making up a growing share of new capacity.

Other countries in the region, including Chile, Mexico and Colombia, are following suit, with large-scale projects being developed in the

Atacama Desert and other high-irradiance zones. Chile's solar sector, for example, contributed 19.9% of national electricity generation in 2023.

### Europe's decentralized solar renaissance

Europe remains a leader in distributed solar, particularly in the residential and C&I segments. Germany is projected to add 16.5 GW of solar capacity in 2024 (PV Tech), boosted by new incentives for rooftop installations and energy storage systems. Italy, the Netherlands and Spain are also seeing strong growth, thanks in part to rising energy prices and the desire to reduce dependence on imported gas.

One of Europe's key strengths lies in its decentralized energy model. Policies such as feed-in tariffs and net metering have empowered households and businesses to become both energy consumers and producers, a model that is being replicated in other parts of the world.

### Australia: a rooftop leader

Australia has one of the highest per-capita rates of rooftop solar adoption in the world. As of September 2024, there were more than 3.92 million solar PV installations across the country, totaling 37.8 GW of







capacity. With abundant sunshine, high retail electricity prices and supportive policies, the rooftop revolution continues to transform how Australians power their homes and businesses.

While most of Australia's solar capacity is distributed, utility-scale projects are on the rise, particularly in Queensland and New South Wales. The integration of battery storage systems, both residential and grid-scale, is also gaining momentum as the country moves toward net zero targets.

#### What's powering the boom?

Several structural and technological trends are converging to drive this global solar surge.

First and foremost is cost reduction. The price of solar modules has declined by more than 90% over the past decade. In 2023 alone, module prices fell by nearly 40% due to supply chain recovery and manufacturing scale (World Energy News). These lower costs have made solar more accessible in both developed and emerging markets.

Secondly, there is policy support. Governments around the world are enacting ambitious climate goals and offering

incentives to accelerate the deployment of renewables. From tax credits in the US to auction schemes in India and subsidies in Europe, these frameworks are playing a critical role in reducing investment risk and driving innovation.

Third, there is consumer and corporate demand. More homeowners are looking to reduce their energy bills and carbon footprints. Corporations, under increasing pressure to meet ESG (environmental, social, governance) standards, are investing in solar to decarbonize operations and supply chains.

Finally, energy security is becoming a strategic priority. The war in Ukraine and global energy price volatility have reminded governments of the risks of overreliance on fossil fuel imports. Solar offers a domestic, resilient and renewable alternative, one that aligns with both economic and environmental goals.

#### Rooftop vs. utility: different paths to the same goal

While utility-scale solar continues to dominate in terms of total capacity, rooftop and distributed systems are playing a vital role in reshaping energy markets. Rooftop

installations reduce transmission losses, ease grid congestion and empower consumers to become energy producers.

On the other hand, large-scale solar farms offer economies of scale, quicker deployment timelines and the ability to power entire cities or industrial zones. Many regions are embracing a hybrid approach, combining centralized and decentralized systems to maximize efficiency and resilience.

#### Looking ahead

As we move deeper into 2025 and beyond, the global solar boom shows no signs of slowing. With trillions of dollars flowing into clean energy, continual improvements in storage and grid integration and mounting climate urgency, solar is no longer an option, it's a necessity.

From rooftops in Rome to mega-farms in Rajasthan, the world is increasingly powered by the sun. And while the scale of this transformation is impressive, the deeper story is one of democratization: solar is giving individuals, communities and nations the power to shape their energy futures.

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