



Twenty years of change: what comes next for solar and storage

Over the past 20 years, solar has moved from an emerging technology to a central part of the global energy system. What can that transformation tell the industry about the next phase of photovoltaic and energy storage development?



From emerging technology to mainstream generation

When JinkoSolar was founded in 2006, photovoltaic technology was still at an early stage of commercial adoption. Module efficiencies were considerably lower than they are today, manufacturing capacity was limited and many renewable energy projects depended heavily on government support.

The market now looks very different. Solar has become one of the world's fastest-growing sources of electricity, supported by improvements in efficiency, more sophisticated manufacturing and falling costs. Governments, businesses and investors increasingly regard renewable

energy not only as an environmental choice, but as an economic opportunity and an important part of future energy security.

That progress has not followed a straight line. The industry has experienced repeated cycles of rapid expansion, falling prices, policy change and market uncertainty. For manufacturers and developers, the ability to keep investing through those cycles has been as important as responding to immediate market conditions.

Frank Niendorf, Vice President at JinkoSolar Europe, says: 'Our 20-year history has taught us that this industry is cyclical. Companies that continue investing during difficult periods

are the ones that emerge stronger. We remain committed to innovation, our customers and the long-term energy transition.'

In Niendorf's view, a long-term approach is particularly important in a sector in which decisions about technology, manufacturing and supply chains must often be made well before market demand becomes clear.

The next stage of photovoltaic development

Innovation in solar is increasingly about the interaction between efficiency, performance, reliability and the practical requirements of a project. Higher module power still matters, but developers also have to consider energy yield, degradation, behaviour in different operating

conditions and the effect that a technology choice will have on the wider system.

JinkoSolar says it reinvests approximately 5% of its annual revenue in research and development across photovoltaic technology, battery storage and energy management. Its current work includes further development of n-type TOPCon products and silicon-perovskite tandem technology, which could support another significant increase in module efficiency.

At Intersolar Europe 2026, the manufacturer presented its Tiger Neo 3.0 portfolio alongside energy storage products for utility-scale, commercial and industrial applications. It also introduced its next-generation Tiger Neo 5.0 platform at SNEC in Shanghai. These launches illustrate the pace of product development, but the wider question for customers is how advances at module level translate into dependable performance over the life of an asset.

Tandem technology is one example of the longer development horizon. By combining silicon with a perovskite layer, researchers are seeking to capture a broader part of the solar spectrum than conventional silicon cells can use alone. The potential efficiency gains are significant, but commercial adoption will also depend on durability, repeatable manufacturing, cost and the ability to meet established testing and warranty requirements.

For manufacturers, that makes innovation broader than an individual product launch. It includes quality assurance, manufacturing, supply-chain management, digital tools and the technical support needed to apply new products appropriately. Close contact with developers, engineering, procurement and construction contractors and asset owners helps connect laboratory progress with the realities of construction and operation.

Reading the current market

The photovoltaic sector is going through another period of adjustment following several years of rapid manufacturing expansion. Module prices have stabilised after a prolonged decline, while strong competition, regulatory change, geopolitical developments and changing investment conditions continue to create uncertainty in several markets.

Niendorf expects these conditions to remain relatively stable through 2027, with a new source of momentum emerging from 2028. He points to electrification, rising power demand, digitalisation and investment in AI-driven data centres as factors likely to support further solar deployment, particularly in Europe.

The forces behind the next phase therefore extend well beyond the photovoltaic sector. Electrification of transport, heating and industrial processes is increasing demand for electricity. At the same time, artificial intelligence and cloud computing require

large volumes of reliable power. Combined with commitments to decarbonisation and energy independence, these developments are expected to sustain demand for renewable generation.

This does not remove the short-term pressures facing the industry. Project economics, grid availability, financing and regulation will continue to influence the timing and viability of installations. However, it places present market conditions within a longer-term change in the way electricity is generated, stored and consumed.

The outlook will also vary by market. In some countries, grid congestion and permitting remain the principal constraints; elsewhere, financing, price volatility or uncertainty over support mechanisms may have a greater effect. Manufacturers therefore have to plan for global demand while recognising that project development remains strongly shaped by national and regional conditions.

Why storage is becoming central

As renewable penetration increases, customers are asking for systems that do more than generate electricity. They also need to manage when energy is available, support grid flexibility, improve resilience and make better use of existing connections. This is changing the relationship between photovoltaic generation and battery energy storage.





JinkoSolar expanded into energy storage in 2022 and now supplies products for residential and utility-scale applications, as well as commercial and industrial projects. The company also has battery-cell production capacity and its own energy management software.

According to Niendorf, around 90% of the company's utility-scale projects now combine photovoltaic generation with battery energy storage. The figure reflects the growing role of hybrid projects in its own order book rather than the market as a whole, but it indicates how quickly customer requirements are changing.

For developers, combining the technologies creates both opportunities and additional complexity. Module and battery selection, system design, controls, grid requirements, warranties and long-term service all have to work together. The value of an integrated approach therefore depends on more than supplying several products: it requires the components and operating strategy to be considered as one system.

This is also where energy management becomes increasingly important. As projects respond to changing power prices, grid constraints and contractual requirements, software has a larger role in deciding when electricity should be stored, used or exported. The quality of those decisions will help determine the commercial performance of the asset.

Long-term operation must be considered at the design stage as well. Battery degradation, augmentation strategies, maintenance access

and the availability of replacement components can all affect lifetime performance. Clear responsibilities between equipment suppliers, integrators and operators become particularly important when a project brings together hardware and software from several sources.

What Europe will require

Europe remains an important testing ground for the next stage of solar and storage. Markets across the region have different policy frameworks, grid conditions and routes to market, while developers face growing pressure to deliver reliable projects in an increasingly complex regulatory environment.

These conditions reward technologies that can be adapted to local requirements, but they also place greater emphasis on technical support, dependable delivery and long-term service. Product specifications alone are not enough. Successful projects depend on co-operation between manufacturers, distributors, installers, contractors, utilities, investors and asset owners throughout the project lifecycle.

The same is true of technology development. Customer feedback helps manufacturers understand how products behave in different climates and applications, while operating data can inform future improvements. In a rapidly changing market, these relationships provide a practical link between research, manufacturing and asset performance.

Supply-chain expectations are evolving too. Customers and investors increasingly want greater visibility of product quality,

environmental performance and the origin of materials, alongside confidence that equipment and technical support will remain available. These considerations can influence procurement just as directly as headline output or efficiency.

Preparing for the next 20 years

The energy system is becoming more electrified, digital and interconnected. Solar generation, battery storage and energy management will increasingly operate together, with each element influencing the performance and value of the others.

Photovoltaic technology will also continue to develop. Higher efficiencies, improved manufacturing and next-generation cell technologies could strengthen the economics of renewable generation, but technical advances will still have to demonstrate reliability outside the laboratory and deliver value throughout an asset's operating life.

For Niendorf, the lesson of the past two decades is that companies must keep a long-term view while responding to immediate market pressures. 'Our anniversary is not simply about looking back,' he says. 'It is about building on two decades of experience to help create a cleaner, smarter and more sustainable energy future.'

The next phase will not be defined by modules alone. It will depend on how effectively the industry combines generation, storage, digital control and practical project expertise to meet changing energy needs.

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