The next phase of Europe's energy transition

Europe has proved it can deploy renewable generation at scale. The next challenge is making every kilowatt-hour work harder. Jia Chao, President of LONGi Europe for Distributed Generation, explains why intelligent energy systems, battery storage and predictive technologies will define the next stage of Europe's energy transition.

**Norway's largest rooftop solar project at the Ahlsell Norge warehouse. LONGi installation. Project partner and image credit: Solcellespesialisten

For much of the past two decades, the European solar industry has been driven by a clear objective: generate more renewable electricity. That ambition has transformed the continent's energy landscape. Photovoltaic module efficiencies have continued to improve, installation costs have fallen dramatically and solar power has evolved from a niche technology into one of Europe's fastest-growing sources of electricity generation.

Millions of homes, businesses and public buildings now generate their own clean energy, while large-scale solar farms have become an increasingly familiar part of Europe's infrastructure.

This success, however, is changing the questions the industry needs to answer.

Rather than focusing solely on how much renewable electricity can be generated, attention is now turning towards how that electricity can be used more effectively. It is a subtle shift, but one with significant implications for how energy systems are designed, operated and managed.

Electricity demand continues to grow as transport, heating and industrial processes become increasingly electrified. At the same time, digitalisation is creating new demands on the grid, with data centres, artificial intelligence and digital infrastructure all requiring reliable power. Meanwhile, renewable generation continues to expand rapidly across Europe.

Together, these developments are creating the most complex electricity system Europe has ever managed. Success is no longer defined simply by adding more renewable generation. It depends on how effectively generation, storage and consumption can work together.

I have the opportunity to meet customers across Europe almost every week. Whether those conversations take place in Germany, Spain, Italy or the Nordic countries, the priorities have become remarkably consistent. Module performance remains important, but it is rarely the starting point.

Businesses increasingly want to understand how they can increase self-consumption, reduce their exposure to volatile electricity prices, strengthen operational resilience and prepare for growing electricity demand. A manufacturer may be focused on reducing peak demand charges, while a logistics operator is more concerned with maintaining continuity during supply interruptions. A retail business may want to reduce operating costs, while a data centre requires uninterrupted access to reliable power around the clock. Although their priorities differ, they all face the same challenge of making better use of the renewable electricity they generate.

That is why intelligent energy systems are becoming just as important as photovoltaic generation itself.

A new challenge for Europe's electricity networks

The rapid growth of renewable generation has created challenges that would have been difficult to imagine only a decade ago.

In many European electricity markets, there are now periods when renewable generation exceeds demand, resulting in negative wholesale electricity prices. Germany provides one of the clearest examples. In 2025, the country's day-ahead electricity market recorded 573 hours of negative pricing. During the first half of 2026 alone, a further 291 hours were recorded. Germany is not unique.

According to the International Energy Agency, countries including France, the Netherlands and Spain also experienced negative wholesale electricity prices during around six per cent of trading hours in 2025.

Grid congestion is also becoming an increasing obstacle in several regions, delaying new renewable projects and restricting additional connections. These developments should not be viewed as signs that the energy transition has stalled. On the contrary, they demonstrate how successfully renewable generation has been deployed across Europe.

The challenge now is ensuring that this growing supply of renewable electricity can be used when and where it delivers the greatest value.

This requires a more flexible energy system, one capable of balancing generation with demand while reducing pressure on electricity networks. It also requires businesses to think differently about how they consume energy, moving away from passive electricity use towards actively managing when and how power is stored, consumed and exported.

Jia Chao

Storage is only part of the solution

Battery storage has become one of the most important technologies supporting this transition.

For commercial and industrial organisations, batteries provide the flexibility to store surplus electricity generated during periods of high solar production and use it later when demand increases. This can increase self-consumption, reduce peak demand charges and improve resilience during interruptions to grid supply.

For many businesses, battery storage has become an important element of operational continuity as well as energy management.

Yet while battery specifications remain essential, I believe the industry sometimes focuses too heavily on the hardware alone.

Capacity, efficiency and cycle life all provide important measures of battery performance, and every customer should understand them. They do not, however, determine the overall value of an energy system.

A battery stores electricity. An intelligent energy system creates value.

Two organisations may install battery systems with identical technical specifications and achieve very different financial outcomes. A food manufacturer operating around the clock has very different energy requirements from a warehouse that operates primarily during daylight hours. Electricity tariffs vary between regions. Weather conditions influence photovoltaic generation. Operating schedules change throughout the year and future business expansion can significantly alter electricity demand.

Every one of these variables influences how a battery should operate.

That is why energy management has become just as important as energy storage itself.

The financial return generated by a battery is not created on the day it is installed. It is created through thousands of operational decisions made every year throughout its lifetime. When should electricity be stored? When should it be discharged? Should surplus photovoltaic generation be exported to the grid or retained for later use? How should battery operation change as electricity prices fluctuate?

These decisions determine whether organisations capture the full value of their investment.

Software is therefore becoming one of the most important components of modern energy systems. Intelligent energy management platforms continuously evaluate operating conditions, electricity demand, weather forecasts and customer priorities before automatically optimising energy flows. Better operational decisions increase self-consumption, reduce electricity costs and help batteries operate more efficiently over many years.

Artificial intelligence is expected to strengthen these capabilities further. By analysing large volumes of operational data, AI can identify patterns that would be difficult for operators to detect manually, supporting faster and more consistent decision making while helping businesses optimise system performance as operating conditions evolve.

Safety becomes a strategic priority

As battery storage becomes more widely deployed across commercial and industrial sites, safety is becoming a more important consideration for developers, operators, insurers and regulators. Battery energy storage systems are no longer viewed as standalone assets. They are increasingly being integrated into critical infrastructure, supporting manufacturing facilities, logistics centres, office campuses and public services where reliability is essential.

This changing role brings new expectations. Operators not only need batteries to perform efficiently, but also to operate safely and reliably over many years. Asset owners are placing greater emphasis on understanding the condition of their systems throughout their operational life, rather than simply responding when faults occur.

Traditional protection systems are designed to react once an issue has already developed.

Makado Beek Shopping Center, 1.55 MW LONGi installation with partner Generation Green

Italy: LONGi's first integrated solar + storage project in Europe

While these systems remain essential, the industry is increasingly looking towards predictive approaches that identify the earliest signs of abnormal behaviour before normal operation is affected.

Detecting potential issues months in advance allows operators to investigate emerging problems, plan maintenance during scheduled shutdowns and reduce the likelihood of costly unplanned outages. As battery installations continue to increase in both size and number, this shift from reactive protection to predictive asset management is likely to become an increasingly important part of long-term system reliability.

One example of this approach is LONGi's Intelligent Cell Connection System (iCCS). Rather than monitoring battery performance only at system level, the technology continuously analyses the condition of individual battery cells. Small deviations that might previously have remained unnoticed can be identified long before they develop into operational risks. Independent testing has demonstrated that potential thermal events can be detected months before they could occur, giving operators valuable time to assess the situation, schedule maintenance and minimise disruption.

This reflects a broader direction of travel across the industry. As energy systems become more intelligent, monitoring technologies are evolving from simply reporting faults to helping prevent them altogether.

Unlocking greater value from existing solar assets

While much attention is focused on new photovoltaic installations, one of Europe's greatest opportunities already exists in the systems that have been operating successfully for many years.

The first phase of Europe's solar transition was centred on deploying renewable generation at scale. That objective has largely been achieved. The next phase will focus on extracting greater value from the assets that are already connected to the grid.

Across Europe, millions of residential and commercial photovoltaic systems were installed before battery storage became a standard part of system design. These systems already generate significant volumes of clean electricity, yet many continue to export surplus energy during the middle of the day before drawing electricity back from the grid later in the evening.

Adding battery storage and intelligent energy management allows far more of that renewable electricity to be used where it is generated. Instead of treating photovoltaic generation, storage and consumption as separate technologies, they become part of a connected energy ecosystem that continuously adapts to changing operating conditions.

This transition is expected to accelerate rapidly over the coming years.

The European Union installed 27.1 GWh of new battery storage capacity during 2025, bringing total installed capacity to 77.3 GWh. However, according to SolarPower Europe, around 750 GWh of battery storage will be required by 2030 to provide the flexibility needed for a renewable electricity system. Achieving that target will require another tenfold increase in installed storage capacity within the next five years.

Those figures demonstrate the scale of the opportunity ahead. They also illustrate that Europe's next phase of energy investment will not simply involve building more renewable generation, but ensuring that existing generation can be managed more intelligently.

From generating electricity to creating value

Every successful industry eventually reaches a point where creating greater value becomes more important than increasing volume. I believe the European energy sector has now reached that stage.

Renewable electricity is becoming increasingly abundant. The challenge is no longer simply producing clean energy, but ensuring that every kilowatt-hour delivers the greatest possible benefit for businesses, consumers and the wider electricity system.

Achieving that goal will require more than improvements in photovoltaic modules or battery technology alone. It will depend on how effectively generation, storage and intelligent energy management are integrated into a single, coordinated system that can respond dynamically to changing demand, electricity prices and operating conditions.

Europe has already demonstrated that it can deploy renewable generation at a remarkable scale. The next stage of the energy transition will depend on making renewable electricity work harder through greater flexibility, smarter software and more predictive asset management.

Looking back, the European solar industry spent many years asking how we could generate more renewable electricity.

The more important question for the years ahead is different.

How do we create more value from every kilowatt-hour we already produce?

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