Europe 2025: industry highlights

The growth of renewables has been impressive. According to a study by the International Energy Agency (IEA), nearly 940 gigawatts (GW) of renewable power will be added globally each year starting in 2030, with solar energy making up the majority. Eighty percent of the renewable generation capacity deployed between 2024 and 2030 will be photovoltaics (PV). Even as the energy crisis subsides, renewable energy will continue to lead the global expansion of generation capacity.

Global growth can largely be attributed to falling solar power prices. According to a study by the International Renewable Energy Agency (IRENA), in 2023, solar energy was 56% cheaper than even the cheapest fossil power source.

The costs of PV combined with battery storage systems are also competitive. An analysis by Fraunhofer Institute for Solar Energy Systems (ISE) found that in 2024, the levelized cost of electricity for the combination of PV and storage systems in the utility-scale segment in Germany was between around 6 and 11 euros per kilowatt hour (kWh), while that of coal or gas-fired power plants was between around 15 and 33 euros per kWh.

The widespread deployment of renewable energy generation is driving the necessary transformation of the energy system. To accommodate the increasing volume of power from intermittent renewable sources, we will need smart energy infrastructure solutions, particularly in energy storage and smart power grids.

Solar power is no longer viewed as a standalone energy source but is now integrated with other energy technologies and applications. Advanced energy system solutions will be showcased at Intersolar Europe 2025. Read on to discover what to expect in Munich.

Market launch of tandem solar cells expected for the near future

Rapid advances in solar cell efficiency and durability are key to making solar power more affordable. The next generation of solar cells, which will significantly surpass the efficiency of the current dominant n-type cells, is set to be introduced: Perovskite-silicon tandem solar cells. These cells combine silicon and perovskite, two semiconductor materials, allowing for a broader spectrum of sunlight to be converted into electricity.

Perovskite-silicon tandem cells are expected to achieve efficiencies of up to 45%, with manufacturer LONGi already reaching a lab-record efficiency of 33.9%. According to a study by the German Mechanical Engineering Industry Association (VDMA), mass production of perovskite-silicon tandem cells is expected to begin in 2027.

Ongoing research aims to determine how these high-efficiency cells can be successfully launched and scaled into a standard product.

Storage systems: key elements for the energy transition

The deployment of solar power as an intermittent renewable energy source must be paired with the expansion of storage capacity. Storage systems are versatile solutions that address multiple challenges of a renewable-dominated energy system, such as reducing grid congestion, stabilizing frequency and grid functionality and optimizing the yield of solar farms.

Large-scale storage systems play a crucial role by acting as intermediaries, adapting energy supply to consumption needs. This becomes especially important in situations that require economic curtailment.


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Storage systems can also function as 'virtual transmission lines.' This refers to the use of two storage systems located at different grid points to alleviate congestion during dispatch. For example, when there is excess power at location A and a shortage at location B, but insufficient transmission lines to transfer the power, one large-scale battery can store electricity at point A, while another at point B discharges its stored energy. The impact on the grid is the same as if there were adequate transmission lines connecting the two points.

Battery storage systems also play a key role in providing grid stability services. Historically, frequency regulation was managed by spinning reserves from large fossil and thermal power plants. However, as these plants phase out, batteries, with their fast response times, can offer the same 'synthetic inertia' and, when combined with grid-forming inverters, become the primary grid-forming technology.

Marketing of energy storage systems is evolving with the rise of artificial intelligence (AI). AI systems are now able to analyze electricity market data to determine the most efficient way to charge and discharge batteries based on demand and market prices. This not only maximizes profit but also helps stabilize power grids and supports the continued expansion of renewable energy.

Hybrid power plants: bringing together generation and consumption

Hybrid power plants, which combine energy sources such as solar, wind and hydropower, often complemented by battery storage systems, represent the future of large-scale power stations. By using a shared grid connection and infrastructure, these plants can achieve significant cost savings. The integration of different energy sources allows for a more reliable and balanced energy generation, as each source produces electricity at different times, depending on weather conditions and availability.

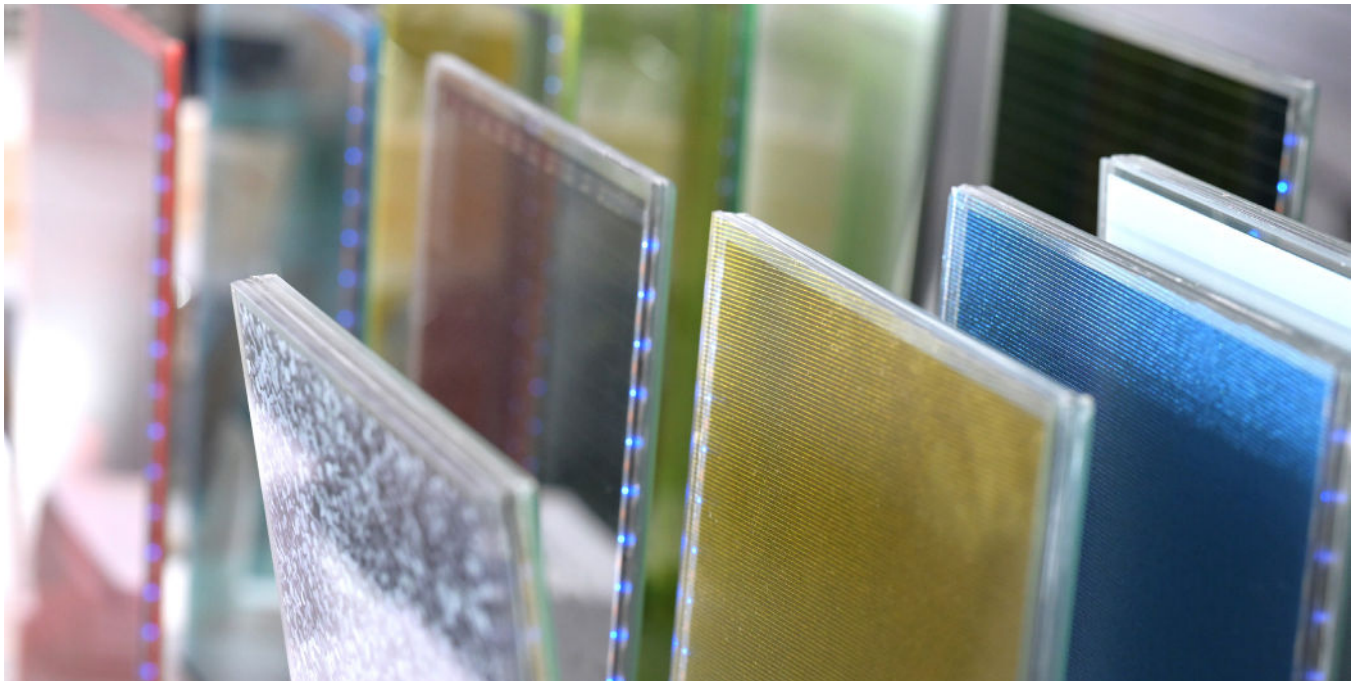
Incorporating a battery storage system further optimizes this balance by aligning generation with consumption, ensuring grid stability and load curve optimization. The system stores electricity when prices are low, renewable energy production is high, or when the grid is at risk of being overloaded or curtailed. Later, when it is economically beneficial, the stored electricity can be fed back into the grid, providing a reliable and efficient energy source during peak demand.

Hybrid power plants help maximize the profitability of solar installations by combining power generation with consumption, enabling their grid-serving operation to be more flexible and responsive. This integration not only increases the financial viability of renewable energy projects but also enhances grid reliability, making hybrid plants a key component in the transition to a sustainable energy future.

Vast savings potential through bidirectional charging

Electric cars are no longer just a means of transportation; they can now play a crucial role in energy management through a process called bidirectional charging. This technology enables electric vehicles (EVs) to store electricity and feed it back into the grid when needed, providing an unprecedented level of flexibility in managing energy demand. According to a study by E.on, a single EV with bidirectional charging capabilities could supply enough electricity to power approximately eleven German households during the evening and night.

The potential savings for utilities and consumers are enormous. Researchers at the Fraunhofer Institute for Systems and Innovation Research (ISI) and Fraunhofer Institute for Solar Energy Systems (ISE) estimate that the European Union could save up to 22 billion euros annually by using EV batteries for grid support. This approach could reduce the need for stationary intermediate storage devices by up to 92%, while simultaneously increasing the installed photovoltaic (PV) capacity by around 40%.



As the demand for this technology grows, some suppliers are already specializing in the vehicle-to-grid (V2G) market. A notable example from France involves a special EV charger with a dedicated tariff that offers free charging in exchange for the car's battery being used to support the energy system.

Looking ahead, in 2025, The smarter E Europe will showcase these technologies and applications, offering demonstrations, lectures and discussions on the future of bidirectional charging. This innovative approach has the potential to revolutionize how we think about energy storage and distribution, making EVs an integral part of a sustainable energy future.

Efficient use of space: parking lot PV

Parking lot PV systems and PV carports offer numerous advantages, effectively transforming parking spaces into dual-purpose areas. By covering parking lots with photovoltaic panels, these spaces can serve as both vehicle storage and clean energy generation hubs. The roofing not only protects from the sun and weather but, when paired with electric vehicle (EV) chargers and charging stations, allows for the electricity to be used directly at the point of generation.

Governments are recognizing the value of parking lot PV as well. In France, it is now mandatory for both new and existing parking lots to be equipped with PV panels. Similarly, six German federal states have enacted regulations requiring newly constructed parking lots to incorporate PV systems.

These initiatives help address the growing demand for land use by integrating renewable energy infrastructure into existing spaces. Parking lot PV thus plays a key role in combating the increasing pressure on available land for solar energy generation, contributing to the broader goal of sustainable urban development.

Promoting sustainability through recycling

The first solar boom in Germany was 2007. Almost 20 years on, the industry has to find a solution to the question of what to do with used modules when solar parks are dismantled at the end of their service life. To make PV a fully sustainable power generation technology, the solar industry must become part of a circular economy, where a maximum of used resources are recovered.

The industry has met that requirement. Pioneering PV recycling companies are working on processes to recover up to 99% of all raw materials. Dedicated PV recycling plants are already being built and industry players are scaling up. The industry offers several different recycling technologies to deal with the growing streams of PV waste.

Intersolar Europe 2025: meet the who's who of the solar industry

The solar boom is bringing many new products and business models. To keep up with these developments, the industry needs to discuss, collaborate and share knowledge. Intersolar Europe, which will take place as part of The smarter E Europe, is noted in the calendar of every energy expert as an outstanding event.

More than 3,000 exhibitors across 19 exhibition halls and an Outdoor Area await more than 110,000 visitors at Europe's largest alliance of exhibitions for the energy industry in Munich.

The 206,000 square meters will showcase the latest innovations and applications in photovoltaics, energy storage, e-mobility and charging infrastructure, as well as energy management and integrated energy solutions. Plus, seven exhibition forums will provide a tailored conference program covering pioneering topics such as large-scale storage systems, PV recycling, solar hybrid systems and building-integrated photovoltaics (BIPV).

In the Start-up Area, newcomers to the industry will showcase their sector-coupling solutions that contribute to the future-proof energy world.

The four conferences of The smarter E Europe, taking place concurrently from May 6th and 7th at the ICM in Munich, will provide the latest expert knowledge and valuable contacts. One ticket grants you access to all four conferences. On the evening of May 6th, the conference BBQ 'Bavarian Night' will be the perfect opportunity for relaxed networking.

Award-worthy solutions for a sustainable energy supply

A sustainable energy supply needs innovative products, services and business models. Each year, The smarter E AWARD honors the best innovations with awards in the categories of Photovoltaics, Energy Storage, E-Mobility, Smart Integrated Energy and Outstanding Projects.

Entries are accepted from all exhibitors at any of the international exhibitions organized by The smarter E alliance of exhibitions. The AWARDs will be presented to the 2025 winners and innovators at a ceremony on May 6th at the International Congress Center Messe München ICM/room 1.

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