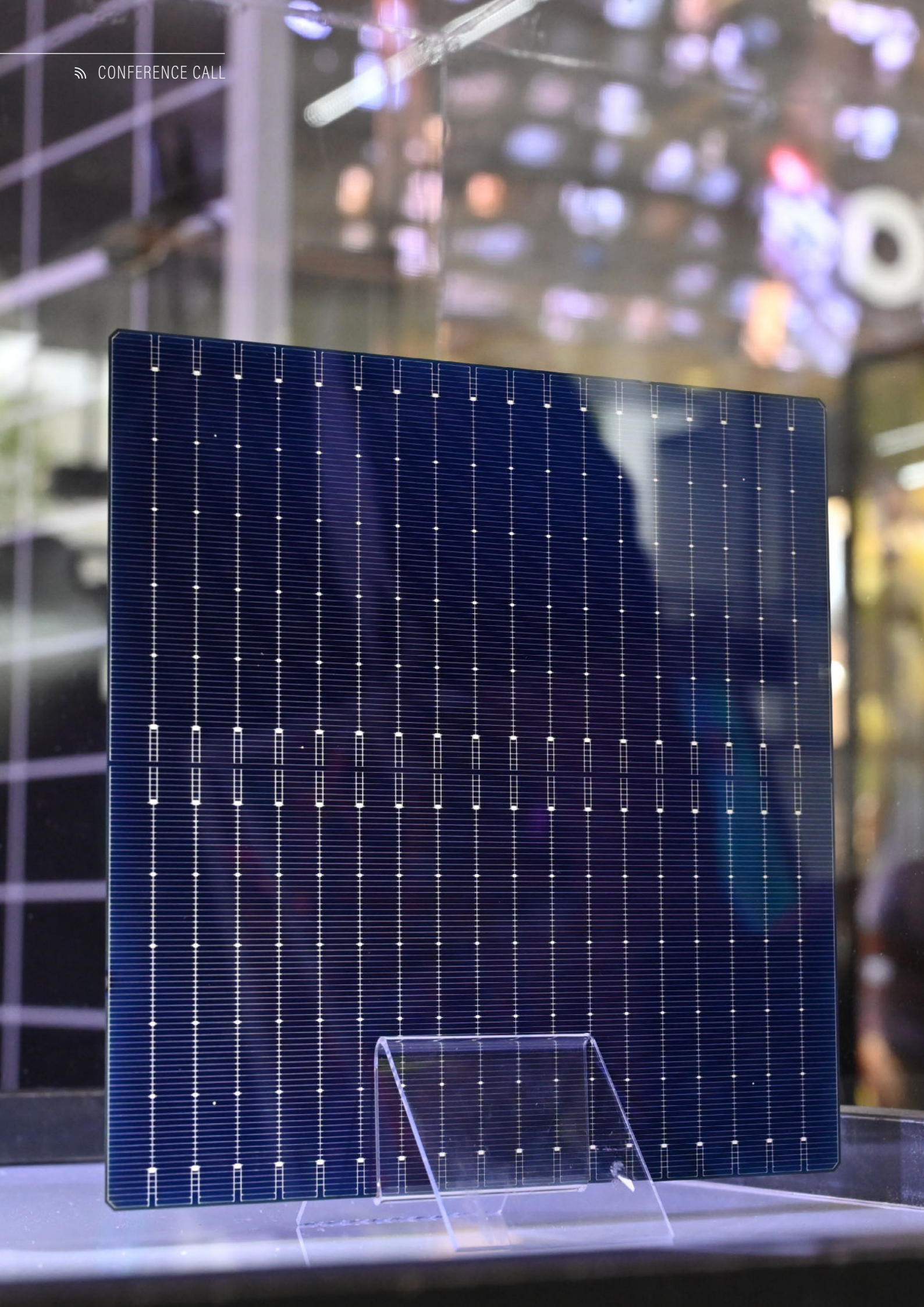

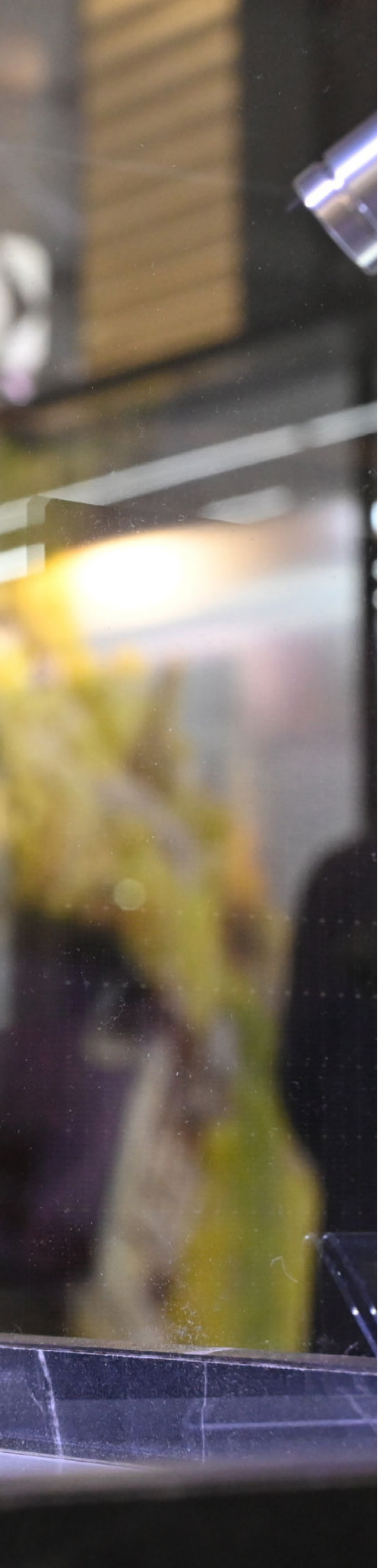

# Solar energy innovations head for Europe

The European solar market is developing dynamically. For the third year in a row, the market grew by 40% or more, to around 56 gigawatts (GW) in 2023. According to a market survey by the European solar association SolarPower Europe, 2023 was the best year for solar power in 20 of the 27 EU member states, with 14 countries installing 1 or more gigawatts. The combined installed capacity in the EU now amounts to 263 GW. With the tremendous growth, there has been a flurry of innovations in the marketplace. New solar cell designs are on the rise. Inverters are taking over new functions. Dual land use is gaining popularity. And new business models allow PV deployment to flourish. These trends are detailed below, and you can experience them first-hand at Intersolar Europe 2024.

Last year, more than one gigawatt of photovoltaic (PV) capacity was installed per day worldwide, equivalent to the output of a large coal or nuclear power plant. Twenty years ago, it took a whole year to reach this amount; in 2010 it took one month.

And there's no end in sight to Europe's solar boom: SolarPower Europe predicts that growth rates will slow in the coming years, but remain in the double digits. For some time, solar energy has been a cost-effective source of electricity. In March 2024, its market value fell below 5 euro per kilowatt hour for the first time since June 2021.

### New solar cell technologies

Solar energy can only succeed if the technology of solar cells is constantly improved. This guarantees a future-oriented, fast growing solar industry and the consolidation of solar energy's pole position as the cheapest electricity generation technology.

A technological shift is underway, moving away from PERC cells (Passivated Emitter and Rear Cells) to TOPCon cells. TOPCon stands for Tunnel Oxide Passivated Contact. The cells have an ultra-thin silicon oxide (SiOx) layer, are more efficient, less prone to degradation, and still effective at low levels of sunlight.

The Fraunhofer Institute for Solar Energy Systems ISE forecasts that, within the next two years, TOPCon cells will dominate the market with a share of almost 40%. TOPCon cells currently achieve efficiencies of up to 26.89%. The introduction of silicon-based tandem solar cells with two different semiconductors is eagerly awaited, and with


it the industrial use of perovskite. Perovskite-silicon tandem solar cells promise efficiencies of over 30% manufacturer LONGi even achieved a record 33.9% in the lab.

### Inverters as all-rounders: from grid stability to solutions for prosumers

A new generation of inverters is on the rise. Hybrid inverters have multiple functions in the home energy system. In addition to their standard task of converting solar power into alternating current, they use excess power to charge battery storage systems or distribute it to the household, electric vehicles or heat pumps on demand. Modern hybrid inverters can even provide backup power in case of a power grid failure.

Hybrid inverters are an all-in-one solution for prosumers, which, in combination with a matching home energy management system, optimize and coordinate the interplay between PV system, energy storage, electric vehicle with home charging infrastructure and heat pump.

In an energy system dominated by renewable energies, grid-forming inverters increasingly include frequency stabilization and voltage compensation functions. Up to now, these functions have mostly been performed by synchronous machines in large thermal power plants. Combinations with large battery energy storage systems (BESS) are now forging new paths.

In Blackhillock, Scotland, a 300 MW/600 MWh pilot plant is being built that is set to be one of the largest in the UK, and a global pioneer in the provision of grid stability services through grid-connected battery storage systems. The system will be connected with a distribution grid operator that acts as off-taker of grid stability services.

### Business models for renewables: energy arbitrage and PPAs

Large-scale storage systems such as Blackhillock can be marketed in different ways, such as to provide operating reserves and grid stability services. Operators may also sell their electricity on the energy exchange to make profits. This concept is known as energy arbitrage. By storing and trading electricity, price differences at the energy exchange are used to make a profit.

As the large-scale power plants of the future, hybrid power plants are particularly well suited for versatile marketing forms, because the electricity is produced at low cost using the sun or wind, or both combined, which is advantageous due to the complementary production times and cost savings, and the associated large-scale storage system allows it to be made available and marketed at the energy exchange.

The electricity is stored when the price is low, a lot of renewable electricity is being produced, the grid may be overloaded or systems are at risk of being curtailed. When it is profitable to sell the stored electricity, it is fed into the grid.

Power purchase agreements (PPAs), typically individually negotiated, long-term electricity supply contracts, are another flexible and market-oriented business model for renewable sources of energy. By creating a direct relationship between the producer and the buyer, PPAs ensure that power generation and consumption are optimally matched. During the energy crisis triggered by the conflict in Ukraine, the PPA market reached an all-time high.

However, PPAs have continued to flourish even after the crisis, because long-term green electricity supply contracts protect companies from price hikes while also helping them to meet their decarbonization requirements.

### PV as a solution for agriculture

Dual land-use concepts could be a game changer in terms of public acceptance of PV and land shortage for solar power generation. Driven in part by climate change, agricultural PV, which combines PV power generation and agriculture on the same piece of land, is currently booming.

According to the systems provider Schletter Solar, the obvious benefit of agricultural PV is the double yield. Depending on the

system configuration, it provides up to 80% of the solar yield compared to conventional ground-mounted systems, while keeping up to 80 percent of the land usable for agriculture. At the same time, installing PV on agricultural land can help adapt to the climate crisis by providing shade and wind protection. At Intersolar Europe, more than 60 exhibitors will present tailored solutions for agricultural PV.

### Intersolar Europe 2024: where the who's who of the solar industry come together

The solar boom is bringing a plenty of 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 marked in the calendar of every energy expert as an outstanding event. 2,800 exhibitors across 19 exhibition halls await more than 115,000 visitors at The smarter E Europe, the continent's largest alliance of exhibitions for the energy industry in Munich.

The 206,000 square meters of exhibition space will be showcasing the latest innovations and applications in photovoltaics, energy storage, e-mobility and charging infrastructure, as well as energy management and integrated energy solutions. What's more, seven exhibition forums will provide a tailored conference program covering pioneering topics such as PV production and solar hybrid systems.

Whether trackers or mounting systems, you will learn everything there is to know about the combination of PV and agriculture at the agricultural PV special exhibit sponsored by our partners BayWa r.e. and ZIMMERMANN PV-Stahlbau in the Outdoor Area. In the Start-up Area, newcomers to the industry will showcase their sector coupling solutions that contribute to the future-proof energy world. To experience the energy transition first-hand, head to the Power2Drive Test Drive for electric vehicles in the Outdoor Area.

### Intersolar Europe Conference 2024: on the hunt for future trends

The Intersolar Europe Conference 2024, which will take place in parallel to the exhibition from June 18–19 at the ICM in Munich, will provide you with the latest expert knowledge and valuable contacts. The conference will focus on the latest solar technologies, from innovations in wafer and cell production to inverters and mounting systems.

The hottest business models will also be discussed: agricultural PV, PPAs, large-scale power stations and hybrid PV power plants, storage, wind and floating PV. The conference sessions on operation and maintenance (O&M) will be about quality management, which will become increasingly important for a mature PV industry.

Sessions on the general market development of solar energy in Europe and in selected key solar markets will provide an overview of forecasts, challenges and opportunities.

Another key topic at the Intersolar Europe Conference: off-grid systems. Sustainability and financing are also on the agenda.

Want to know the best bit? One ticket grants you access to all four conferences: the Intersolar Europe Conference, ees Europe Conference, Power2Drive Europe Conference and EM-Power Europe Conference. Are you a solar expert who likes to broaden their horizon? Attend the many joint sessions of the individual conferences. On the evening of June 18, the conference BBQ will be the perfect opportunity for relaxed networking.

### Award-worthy solutions for a sustainable energy supply

A future-proof energy supply with solar energy as one of its main pillars needs innovative products, services and business models. Each year, The smarter E AWARD honors the best innovations with awards in the categories Photovoltaics, Energy Storage, E-Mobility, Smart Integrated Energy and Outstanding Projects. Exhibitors from all The smarter E international exhibitions are eligible to participate.

The awards will be presented to the 2024 winners and innovators at a ceremony on June 18th at 6pm in the International Congress Center Messe München ICM/ room 1. The event is free of charge and requires no registration.

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