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The EnergyEvolution Awards, Conference and Expo 2025 invites you to the vibrant city of Spain.

# **Evolution Awards, Conference & Expo 2025**

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#### **Energy Magazine**

## 1. 1500 kWhofPower, Zero Noise: The First Silent Wind Turbine for Home Energy Efficiency

Asignificant advancement in wind energy technology is set to reshape the landscape of residential selfconsumption. The Liam F1, recently introduced by Dutch startup Archimedes, offers a silent, highly efficient alternative to traditional solar panels. With an impressive annual power output of up to 1500 kWh, the Liam F1 promises to redefine how urban households generate clean, sustainable electricity.

Inspired by the nautilus shell and the golden ratio, the Liam F1's innovative spiral rotor design allows it to capture wind from multiple directions, unlike conventional turbines that depend on specific wind patterns. Its conical structure self-aligns with wind currents, eliminating the need for additional hardware. Available in two sizes—a 1.5-meter model generating 550W and a smaller 100W version—it operates quietly at below 45 dB, making it ideal for residential areas and harmless to wildlife.

In addition to its land-based innovations, Archimedes is also developing marine wind turbines for sailing vessels and exploring hybrid wind-solar systems for both small and large-scale applications. As colder months complicate photovoltaic solar panel efficiency, the Liam F1 provides a versatile and reliable option to sustain year-round self-consumption, contributing to the growing demand for clean energy solutions.





#### Energy Magazine

## 2. ENOS Renewable Energy Strengthens Japan's Offshore Wind Presence with 20% Stake in GoliatVind, Norway

## ENEOS Renewable Energy Acquires Stake in Norway's GoliatVind Floating Offshore Wind Project

ENEOS Renewable Energy, a subsidiary of Japan's ENEOS Holdings, has secured a 20% stake in the GoliatVind floating offshore wind farm project, located at the boundary of the Norwegian and Barents Seas. The project will have an installed capacity of 75MW, featuring five 15MW wind turbines mounted on Odfjell Oceanwind's semi-submersible steel foundations. The wind farm is targeting commercial operations by 2028.

Other key stakeholders in GoliatVind include Source Galileo, the largest shareholder with 40%, along with Odfjell Oceanwind and Kansai Electric Power Group, each holding 20%. The project recently received Nkr 2 billion (\$189 million) in state funding, reinforcing Norway's strategic focus on floating offshore wind as a vital component of its offshore industrial future.

This marks ENEOS Renewable Energy's second major investment in the floating offshore wind sector, following its participation in the Gotō City project in Japan. Floating wind technology is critical to Japan's target of developing 45GW of offshore wind capacity by 2040.

In a similar development, Tokyo Gas, Japan's largest city gas supplier, acquired a 21.2% interest in the operational WindFloat Atlantic project in Portugal, aimed at gaining expertise in the emerging floating wind sector.





## 3. Italian startup Italgam debuts EVO 2.0, a novel bird proofing solution for rooftop PV Panels





Bird infestations, particularly from pigeons, have become a significant issue for rooftop solar installations, often leading to reduced efficiency and long-term damage. Addressing this problem, Italian startup Italgam SrI has introduced the EVO 2.0, an innovative bird-protection solution designed to prevent pigeons from nesting beneath solar panels, ensuring optimal system performance and durability.

The EVO2.0 solution consists of specially designed brushes that fit between the backside of solar panels and the roof, effectively blocking bird access without impacting system performance. Available in two types with varying diameters, the brushes feature bristles made of anti-UV-treated polypropylene to prevent crystallization, while the steel wire core is composed of low-carbon stainless steel to resist corrosion.

Inspired by a gutter-cleaning brush seen in British Columbia, Italgam CEO Maurizio Chiacchierini developed and patented the EVO 2.0 after a solar installer inquired about pigeon prevention. Pigeonrelated issues now account for 90% of the company's production, and the brush is used by over 1,300 solar companies globally.

Chiacchierini explained that bird infestations, not the brushes, lead to reduced system efficiency, with soiling potentially decreasing energy output by up to 30%. The brushes are designed to allow for proper airflow and rainwater drainage while adapting to various roof types, including corrugated sheet metal. EVO 2.0 ensures protection against overheating and potential fire hazards caused by nesting materials.



## 4. Clean Power Alliance: UK's Strategic Commitment to Leading Global Renewable Energy Effort

The UK's newly elected Labour government has announced the establishment of a 'Global Clean Power Alliance,' aimed at enhancing global renewable energy deployment, particularly in developing nations facing challenges in their net-zero efforts. Foreign Secretary David Lammy introduced the initiative in his first major address since taking office, highlighting the importance of international cooperation in addressing climate change.

Lammy asserted that the rising frequency of extreme weather events, such as droughts and hurricanes, reflects "failures of politics, of regulation, and of international cooperation." He noted that Prime Minister Keir Starmer has prioritized reshaping the UK's climate approach, including lifting the de facto ban on onshore wind, committing to end new oil and gas licenses, and launching GB Energy, a national clean power company. The Labour government has set an ambitious goal to position the UK as the first major economy to achieve a net-zero grid by 2030. "We will leverage that ambition to build an Alliance committed to accelerating the clean energy transition," Lammy stated. He emphasized the need to support nations that are "getting left behind" in this transition, calling for significant global finance mobilization, diversification of critical mineral production, and expansion of grids and storage to facilitate this crucial shift.

## **5. Energy Storage Positioned as Core Focus in Azerbaijan'ss COP29 Strategic Plan**

As the host nation for COP29, Azerbaijan has positioned energy storage at the forefront of its strategic agenda for the upcoming climate summit, proposing a six-fold increase in global capacity by 2030. Scheduled for November 11-22 in Baku, COP29 President-Designate Mukhtar Babayev unveiled several ambitious initiatives designed to accelerate climate action.

A key highlight is the commitment to elevate global energy storage capacity to 1.5TW by 2030, significantly surpassing 2022 levels. Additionally, Azerbaijan plans to invest in the expansion and refurbishment of over 80 million kilometers of energy grids by 2040. This initiative aligns with prior agreements from COP28 to triple renewable energy generation and double energy efficiency.

However, the action plan has faced scrutiny for its omission of strategies to phase out fossil fuels. Instead, Azerbaijan has proposed a voluntary climate finance fund financed by fossil fuel producers to support vulnerable and conflictaffected communities and assist developing nations. Other significant initiatives include setting sectoral targets for methane emissions, a COP29 Hydrogen Declaration aimed at unlocking the global clean hydrogen market, and a "COP Truce Appeal" to address the intersection of climate and conflict. Babayev underscored the importance of individual actions, stating, "Every action matters because every fraction of a degree matters.





## 6. BMW Bgins Trial of Aerominne's Groundbreaking Motionless Wind Power Technology in the UK

In a significant push towards sustainability, BMW is trialing an advanced "motionless" wind power system, marking a departure from conventional turbine designs. The automotive giant has installed a prototype developed by US-based Aeromine Technologies at its Oxford facility, where the iconic Mini is manufactured.

The Aeromine unit utilizes vertical airfoils that create a vacuum effect, drawing air behind an internal propeller to generate clean electricity. This bladeless design minimizes noise and vibrations, ensuring minimal disturbance to nearby structures and wildlife.

While specific power output figures for the Oxford installation have not been disclosed, Aeromine indicates that a 10-unit system installed on a 15-meter-tall building in areas with an average annual wind speed of six meters per second could produce approximately 100 MWh annually.

BMW aims to complement this innovative wind technology with its existing solar installations, reinforcing its commitment to decarbonizing operations through on-site renewable energy sources. This initiative highlights the automotive industry's ongoing efforts to integrate sustainable energy solutions and enhance energy efficiency in production processes.



## 7.Sharp Launches High-Efficiency 22.52% Ntype Bifacial Solar Panels with TOPCon Technology



harp has announced the launch of its latest series of n-type monocrystalline bifacial solar panels, utilizing advanced oxide tunnel passivated contact (TOPCon) cell technology. These new modules achieve a power conversion efficiency of up to 22.52% and a power output ranging from 430 to 450 W.The bifacial models, designated NBJG445R and NBJG450R, incorporate 96 halfcut solar cells based on G12 wafers and 16-busbar design. The panels. а measuring 1,762 mmx1,134mmx30mm and weighing 25kg, feature white back sheet that enhances efficiency through light reflection.Certified under IEC61215 and IEC61730, these panels have an operating temperature coefficient of-0.29% per °C and a bifaciality factor exceeding 80%. Sharp's robust design includes a two-sided glass coating that provides stability and protection against moisture. temperature variations, and mechanical stress. The company offers a 30-year linear power output guarantee, ensuring that the panels will retain at least 87.5% of their nominal output power after three decades, alongside a 25-year product warranty.

## 8. Hyzon Motors Begins Production of Innovative Fuel Cell Electric Trucks, Targeting Sustainable Logistics

Hyzon Motors has announced the Start of Production (SOP) for its Class 8 200kW Fuel Cell Electric Truck (FCET), marking a significant milestone in the company's commitment to delivering zeroemission solutions for heavy-duty transportation. This development follows Hyzon's collaboration with Fontaine Modification, which will handle vehicle assembly at its facility in Charlotte, North Carolina."Today marks the beginning of a new chapter for 'hard-to-decarbonize' heavy-duty industries, as Hyzon sets the standard for high-performance, zero-emission alternatives to diesel," stated Hyzon CEO Parker Meeks. The 200kW FCET, designed with a single stack fuel cell system, is 30% lighter and 25% more cost-effective than traditional dual-system configurations. The HyHD8-200 truck features an impressive output of 450 kWpeak(275 kWcontinuous) and a range of up to 350 miles, with a refueling time of just 15 minutes at 350 bar. Hyzon plans to announce the start of production of its unique single stack 200kW Fuel Cell System at its Bolingbrook facility in the coming weeks, aiming for ISO 9001 certification by Q4 2024.



















# Industry Articles

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## 1. Decentralized Grids: Powering the Future of Renewable Energy

### Localized Power Generation for Enhanced Resilience

Decentralized grids are rapidly emerging as a cornerstone in the transformation of the energy sector, particularly in the integration of renewable energy. Unlike traditional, centralized power systems that rely on large, remote plants, decentralized grids distribute generation across smaller, localized power sources such as solar panels, wind turbines, and energy storage systems. This shift is empowering communities and industries with greater energy autonomy, resilience, and efficiency.

## Reducing Transmission Losses and Improving Reliability

The appeal of decentralized grids lies in their ability to harness renewable energy closer to the point of consumption, reducing transmission losses and enhancing grid reliability. This approach is particularly vital in regions with unreliable infrastructure or remote locations where centralized grids struggle to deliver consistent power. With microgrids, energy islands, and peer-to-peer (P2P) energy trading platforms, decentralized grids provide a flexible and scalable solution for incorporating distributed renewable energy sources.





#### **Innovations Driving the Transition**

Key innovations driving this transition include advancements in battery storage, smart grid technologies, and blockchain-based energy trading. These tools allow for real-time energy balancing, enabling homes and businesses to become both energy producers and consumers, or "prosumers.

### Fueling the Next Generation of Renewable Energy

In the context of the global push for carbon neutrality, decentralized grids are poised to play a pivotal role in reshaping the energy landscape. They offer not only sustainability but also energy security and affordability, helping fuel the next generation of renewable energy deployment on a global scale.



## 2. Techno–Energy Evolution: The Global Shift Phasing Out Fossil Fuels

#### The Rise of Renewable Energy Technologies

The global energy landscape is undergoing monumental а transformation as the push for cleaner, more sustainable alternatives intensifies. The techno-energy evolution is at the heart of this shift, driven by rapid advancements in renewable energy technologies, battery storage, and grid modernization. As these innovations mature, they are enabling the gradual phasing out of fossil fuels, historically the backbone of global energy supply.

#### Solar and Wind Power Leading the Charge

Solar and wind power, once deemed intermittent and costly, are now the fastest-growing sources of electricity worldwide. In 2023 alone, over 300 gigawatts (GW) of renewable capacity was installed globally, with solar accounting for 60% of new capacity. Countries like China, the U.S., and India are leading this revolution, rapidly scaling up renewables to meet growing energy demands while cutting emissions.

#### Battery Storage and Grid Modernization

Battery storage systems are also playing a critical role in reducing dependence fossil on fuels. Newinnovations, such as solid-state batteries and lithium-sulfur technologies, are significantly improving the capacity and lifespan of energy storage solutions, making renewables more reliable. This, in turn, is boostina investment in decentralized grids and microgrids, further reducing fossil fuel reliance.

#### Green Hydrogen: Decarbonizing Heavy Industry

Additionally, hydrogen is emerging as a key player in decarbonizing industries that are hard to electrify, such as steel and cement. Green hydrogen projects are multiplying, with Europe and Australia at the forefront.

#### **A Post-Fossil Fuel Future**

As technological breakthroughs continue to accelerate, the global energy mix is steadily transitioning towards a post-fossil fuel era, setting the stage for a sustainable, low-carbon future.





# **3. Windows of Opportunity: The Bold Future of Transparent Solar Cells**

#### Harnessing Light with Transparent Solar Technology

Transparent solar cells are set to revolutionize the renewable energy landscape, offering an exciting new frontier for power generation. Unlike traditional opaque solar panels, transparent solar cells allow visible light to pass through while capturing ultraviolet (UV) and infrared light to generate electricity. This innovation opens up possibilities for integrating energy generation into everyday surfaces like windows, vehicle sunroofs, and even smartphone screens.

#### **Advances in Materials Science**

Recent advancements in materials science are accelerating the development of these cells. Organic photovoltaics (OPVs) and perovskite-based technologies are leading the charge, offering flexibility, efficiency, and transparency. Researchers have already achieved transparency rates of up to 80%, with efficiency levels around 10%, and these figures are rapidly improving. For instance, a team at Michigan State University recently demonstrated a fully transparent solar cell with an efficiency of 8.1%, a breakthrough that brings commercial applications closer.

#### **Immense Market Potential**

The potential market for transparent solar cells is immense. The global demand for building-integrated photovoltaics (BIPV) is expected to surpass \$32 billion by 2026, with transparent solar solutions playing a key role. Commercial skyscrapers and office buildings with glass façades are prime candidates for this technology, allowing cities to transform into vertical power plants without sacrificing aesthetics.

#### Integration into Automobiles and Electronics

Additionally, the automotive and consumer electronics sectors are exploring transparent solar applications. Electric vehicle (EV) manufacturers are experimenting with solar sunroofs, while smartphone companies are investigating ways to extend battery life through transparent cells integrated into device screens.



#### A Game-Changer for Sustainable Energy

As efficiency improves and costs come down, transparent solar cells could become a game-changing technology in the global energy transition, transforming how we think about sustainable power generation in both urban and personal environments. The bold future of solar energy is not only bright but clear.

## 4. Closing the loop: Circular Economy Perspective in Managing End-of-Life Solar Panels

#### The Growing Challenge of Solar Panel Waste

As the global adoption of solar energy accelerates, managing end-of-life solar panels is becoming an urgent issue. Solar panels typically last 25 to 30 years, and the International Renewable Energy Agency (IRENA) projects that over 78 million metric tons of panels will reach their end of life by 2050. To address this challenge, the circular economy offers a sustainable solution, focusing on resource recovery, reuse, and recycling.

#### **Recycling Solar Panel Materials**

In a circular economy model, materials from decommissioned solar panels, such as glass, aluminum frames, silicon, and precious metals like silver and copper, are recycled and reintegrated into new production cycles. Several European nations, driven by regulatory frameworks like the Waste Electrical and Electronic Equipment (WEEE) Directive, have alreadv established robust recvclina infrastructure for solar panels. Companies such as France's Veolia are pioneering specialized facilities capable of recovering up to 95% of materials from old panels.

#### **Technological Advancements in Recycling**

Advances in technology are also improving recycling efficiency. Innovations in chemical and thermal processes can now extract high-purity silicon from solar cells, reducing the need for energy-intensive new materials. Moreover, emerging businesses are focusing on panel refurbishment and reuse, extending the life cycle of components.





#### **Challenges and Opportunities**

However, significant challenges remain, including the economic viability of large-scale recycling and the development of consistent global regulations. In the U.S., the solar industry is still working towards implementing widespread recycling systems, though initiatives like the Solar Energy Industries Association's (SEIA) recycling program are gaining momentum.

#### **Ensuring Sustainability Through Circular Economy**

The circular economy approach is crucial to ensuring that solar energy remains a truly sustainable solution, minimizing waste and conserving valuable materials as the global energy transition continues.

## 5. Future-Proofing Energy: The Importance of Hybrid Renewable Systems in Climate Mitigation

#### Maximizing Efficiency and Reliability

Hybrid renewable energy systems, which combine multiple renewable energy sources like solar, wind, and hydropower with energy storage technologies, are playing a critical role in climate mitigation. By blending these resources, hybrid systems maximize efficiency and reliability, overcoming the intermittency issues associated with single-source renewables. This approach is vital for ensuring a stable energy supply while transitioning away from fossil fuels.



#### **Case Studies in Hybrid Systems**

In recent years, the integration of solar and wind with battery storage has gained significant momentum, especially in regions with variable weather patterns. For example, India's first solarwind hybrid project, commissioned in 2020, has successfully generated continuous power by balancing solar generation during the day with wind at night. This not only reduces the need for backup fossil fuel-based energy but also ensures a more resilient and sustainable grid.

#### **Flexibility and Emission Reduction**

Hybrid systems also allow for greater flexibility in energy management. With advancements in smart grid technologies and energy storage, hybrid systems can store excess energy and deploy it when demand peaks or renewable generation dips. This reduces greenhouse gas emissions by minimizing reliance on traditional power plants.

#### A Pathway to Climate Targets

Incorporating hybrid renewable systems into national energy strategies is key to achieving climate targets. As countries ramp up their commitments under the Paris Agreement, hybrid systems offer a pathway to decarbonizing the energy sector while ensuring grid stability and security. These systems represent a powerful tool for mitigating climate change, improving energy efficiency, and supporting global sustainability goals.



## 6. Can Carbon Capture Support the Renewable Energy Transition? Exploring the Synergy



#### A Dual Approach to Climate Change

As the world races to mitigate climate change, both renewable energy and carbon capture technologies are increasingly viewed as essential tools. While renewables like wind and solar are integral to reducing emissions, they cannot do the job alone. Carbon capture and storage (CCS) could fill critical gaps in hardto-decarbonize sectors, making it a potential ally in the renewable energy transition.

#### The Role of Renewables and Their Limits

Renewable energy is rapidly becoming the cornerstone of clean energy systems. However, variability in energy production from renewables like solar and wind can lead to periods of overproduction or shortages. This intermittency creates a need for complementary technologies that stabilize the grid. Additionally, certain industries, such as cement and steel, are notoriously difficult to decarbonize solely with renewable energy.



Carbon Capture: A Complementary Technology

Carbon capture works by trapping CO2 emissions from industrial sources and storing them underground. It offers a way to reduce emissions from fossil fuel plants during the transition to cleaner energy. By capturing emissions from sectors where renewables are less effective, CCS can act as a bridge technology, smoothing the transition to a zero-carbon future.

#### **Challenges and Integration**

Despite its potential, carbon capture is still expensive and energy-intensive. For CCS to fully support renewable energy, it must become more costcompetitive and energy-efficient. Additionally, integrating CCS with renewable energy sources requires careful planning to avoid prolonging fossil fuel dependency.

#### Bridging the Gap

While not a silver bullet, carbon capture can play a vital role in the renewable energy transition by addressing emissions in hard-to-decarbonize sectors. Together with renewables, it offers a more comprehensive approach to achieving net-zero emissions.

## **7. From Gray to Green: Hydrogen's Journey** Toward Net Zero

#### Hydrogen's Growing Role in Decarbonization

Hydrogen is emerging as a key player in the global push towards net-zero emissions. With its versatility and potential to decarbonize hard-to-electrify sectors, hydrogen is increasingly viewed as an essential part of the energy transition. However, significant challenges remain in scaling its production, distribution, and use.

#### **Green Hydrogen: The Cleanest Option**

The cleanest form of hydrogen, often called green hydrogen, is produced through electrolysis using renewable energy. It generates no emissions and offers a pathway to decarbonize industries like steel, chemicals, and transportation. However, the high cost of electrolyzers and the limited availability of renewable energy for large-scale production currently hinder its adoption.

#### Blue Hydrogen: A Bridge Technology

In the short term, blue hydrogen—produced from natural gas with carbon capture and storage (CCS) may act as a bridge technology. While it reduces emissions compared to conventional hydrogen production, it is not entirely carbon-free. Nevertheless, it offers a more immediate solution for industries that require hydrogen before green hydrogen becomes economically viable.

#### **Challenges in Scaling Hydrogen**

The hydrogen value chain faces multiple hurdles, including the need for vast infrastructure investment in production facilities, pipelines, and storage. Additionally, hydrogen's low energy density poses challenges for transportation and distribution, making it more complex to deploy than traditional fuels.

#### Hydrogen's Future in a Net-Zero World

While hydrogen is not yet a fully developed solution, its potential to decarbonize energy-intensive industries makes it a crucial part of the journey toward net-zero emissions. Continued innovation and investment will be key to realizing its role in the energy transition.





## 8. Real-Time Data for a Connected World: The Promise of LDES

#### The Need for Long-Duration Energy Storage

As renewable energy generation continues to grow, the need for effective energy storage systems is critical to ensure grid reliability. Long-Duration Energy Storage (LDES) technologies promise to address this challenge by storing energy for extended periods and making it available when demand exceeds supply. By harnessing real-time data, LDES can play a transformative role in creating a more resilient and connected energy system.

#### How LDES Enhances Grid Flexibility

Renewable energy sources like solar and wind are intermittent by nature, often producing more energy than needed during peak times and less when demand spikes. LDES can store excess energy during periods of high generation and release it when renewable output drops, offering a reliable backup. By leveraging real-time data from the grid, LDES systems can predict demand fluctuations and adjust storage and discharge in realtime, making the grid more flexible and efficient.

#### The Role of Data in LDES Optimization

Real-time data enables continuous monitoring of both energy supply and demand, improving LDES performance. Advanced analytics, powered by artificial intelligence and machine learning, can optimize when and how energy is stored and released. This allows operators to make better decisions, reduce costs, and maximize the value of stored energy over long periods.

#### **Challenges and Future Potential**

Despite its promise, LDES still faces challenges such as high capital costs and scalability issues. However, as technologies advance and real-time data integration improves, LDES has the potential to revolutionize the energy landscape by providing critical support to renewable energy systems.

#### A Data-Driven Future for Energy

The combination of LDES and real-time data analytics offers a pathway to a more connected and reliable energy grid. As the technology matures, it will play a vital role in supporting the global transition to renewable energy.



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