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## Transforming the Future of Solar Architecture: The Inaugural IPV Conference 2024 Took Place in Florence, Italy

**Florence, Italy – November 28, 2024:** The 1<sup>st</sup> edition of IPV Conference – an initiative of Seamless-PV project, brought together a vibrant mix of innovation and heritage in the historic city of Florence. With its timeless charm setting the stage, the event became a hub for cutting-edge discussions on Integrated Photovoltaic (IPV) advancements. The conference featured 50 distinguished speakers – including policymakers, researchers, leading IPV enterprises, solar architects, and technicians – and welcomed over 150 participants from across Europe.

The gathering fostered meaningful collaboration, the exchange of breakthrough ideas, and the development of forward-looking strategies aimed at integrating photovoltaic technology seamlessly into urban landscape and modern architectural designs.

[ETA Florence Renewable Energy](#) is the proud organizer of the IPV Conference 2024.



*IPV Conference 2024 welcomed more than 50 expert speakers and 150 participants.*

## Public and Private Leaders Setting the Stage for Solar Innovation

The conference commenced with a warm welcome from Giulio Poggiaroni of ETA-Florence (Italy) and Pierluigi Bonomo of SUPSI (Switzerland). They introduced the [EU Solar Buildings Platform](#), an innovative initiative designed to guide solar architecture and urban planning while showcasing exemplary sustainable architectural projects. In the opening, Pierluigi remarked, as mission of the event, that *“Over the last 15 years, we’ve made BIPV technology reliable as a construction component, thanks to the partnership between research and industry. Europe leads globally, with more than 100 certified BIPV products on the market. Today, it’s time to shift our focus. We should no longer focus on identifying barriers but instead concentrate on the tools to overcome the remaining challenges”*.

Adding to the occasion's prestige, Florence’s Deputy Mayor, Paola Galgani, addressed attendees, underscoring the significance of the IPV Conference 2024 as a key milestone in advancing sustainable urban solutions: *“The conference demonstrates Florence’s forward-thinking and commitment to leading sustainable urban development while honouring our architectural heritage”*.



*Florence’s Deputy Mayor, Paola Galgani, delivered the opening address.*

The opening remarks were further enriched by insights from Roberto Bologna of the University of Florence and The Italian Society of Architectural Technology, setting a collaborative and forward-looking tone for the event.

## Market Challenges and Opportunities in BIPV Construction

The session delved into the transformative potential of integrating solar technology into the construction sector, showcasing perspectives from leading experts. Moderated by Spyros Mathioudakis of the European Builders Confederation (EBC), the discussion featured Pau Garcia Audí from the European Commission, Lorenzo De Simone representing the New Bauhaus Initiative, Claire Morin from Solarpower Europe, Stephanè Garson of Akuo & Sunstyle, Dieter Moor of Arconsol, and Jean-Didier Steenackers of Sunsoak.

Key challenges identified include unfair carbon footprint assessments disadvantaging Building-Integrated Photovoltaics (BIPV) compared to traditional photovoltaic systems, high costs associated with certification, manufacturing, and installation, regulatory issues stemming from competition with non-standardized, non-compliant imports, and a skills gap due to a lack of trained electricians and roofers specialized in BIPV systems.

The renovation of aging heritage buildings and the replacement of asbestos roofs present an opportunity to simultaneously enhance safety and drive the energy transition. Achieving success requires a concerted effort among architects, engineers, and policymakers to address regulatory barriers, share technical expertise, and innovate business models that promote the adoption of renewable energy solutions.



*Spyros Mathioudakis of the European Builders Confederation (EBC) facilitated the session with the panelists.*

*EBC's Spyros Mathioudakis, shared: "The session on Building Integrated Photovoltaics (BIPV) highlighted the construction sector's critical role in driving the energy transition, in line with the EU's Renovation Wave strategy and the Net-Zero Industry Act (NZIA). Solar architecture was showcased as a transformative solution to boost cost-effectiveness in renovations and new construction projects."*

*He added, "I enjoyed the discussion with the experts, they emphasized the importance of scaling BIPV deployment, strengthening the European value chain, and investing in education and collaboration to prepare professionals for the interdisciplinary demands of solar buildings."*

## Bridging Beauty and Function: The Aesthetic Evolution of Solar Architecture

Building on the panel's discussion about the need for aesthetic solutions like BIPV in heritage architecture, Lori Zillante of MCA – Mario Cucinella Architects (Italy), delivered a keynote on the evolving relationship between sustainability and beauty in architecture. She demonstrated how solar photovoltaic (PV) systems can go beyond functionality to become integral design elements that enhance both aesthetics and performance.

Zillante showcased MCA's vision for sustainable architecture, presenting projects where PV and other green technologies seamlessly integrate into cohesive architectural concepts. Emphasizing MCA's philosophy, "Design for life, design for beauty," she encouraged architects to redefine beauty through empathy and sustainability. Her keynote highlighted that eco-conscious design could harmonize form and function, setting a transformative standard for architecture in today's world.



*Lori Zillante and Pierluigi Bonomo during the session.*



Pierluigi Bonomo commented that the visionary approach of Mario Cucinella Architects, inspiring us all with their seamless integration of environmental, technical, and societal challenges into projects that celebrate the beauty of architecture. *He shared: "Their innovative use of solar technology enhances functionality and aesthetics while embodying true sustainability."*

## European BIPV Market: Trends and Industry Insights

Moderated by Philippe Macé of Bequerel Institute and Lara Morandotti of PV Magazine (Italy), this session provided a comprehensive overview of the BIPV market's trends, challenges, and innovative solutions. The discussion highlighted the unique position of BIPV as a niche yet steadily growing sector, with market leaders such as France, Austria, and Switzerland driving adoption. Despite regulatory instability in the past, the industry has seen consistent growth over the last five years, adding 122MW, with France contributing 86MW, Austria 65MW, and Switzerland 62MW.

Kai Buntrock from Autarq GmbH (Germany), Marcus Bäckmann from 3S-Swiss Solar Solutions (Switzerland), and Werther Cambarau from Tecnia (Spain) shared insights on the challenges faced by the industry and potential solutions. They emphasized that fragmented regulations between the construction and electrical sectors, coupled with the absence of mandatory BIPV standards, pose significant barriers to adoption. They advocated for harmonized European certification processes and uniform guidelines to streamline market entry and operations.

The speakers underscored the potential impact of the Net Zero Industry Act, which aims to protect over 30GW of local EU solar market production. The first positive effects of this act are expected to be felt by 2025, providing a much-needed boost to the BIPV industry. They also stressed the importance of leveraging BIPV's unique features, such as its integration into architectural designs, adaptability to various geometries and substrates, and lightweight properties, to meet growing efficiency, safety, and ESG requirements.

BIPV is not intended to replace traditional PV but to complement it through its intrinsic architectural integration and aesthetic appeal. The panelists concluded that achieving the sector's full potential will require a coordinated effort across regulation, education, and public communication to address safety concerns and build broader acceptance.



*The panel discussion during the session.*

*Philippe Macé remarked, “The BIPV industry urgently needs consistent norms and regulations across Europe to reduce costs and create a unified market without compromising quality or reliability.”*

*He added, “With competitive costs and high performance, European BIPV solutions can drive market growth and support the decarbonization of the building sector.”*

## **Agrivoltaics: Scaling from Concept to Commercial Reality**

This session, moderated by Paolo Picchi of ETA-Florence and the Italian Association of Landscape Architecture (AIAPP), explored the transformative potential of agrivoltaics in Europe. Combining energy generation with food production and landscape protection, agrivoltaics is moving from experimental demonstration projects to large-scale, integrated systems.

Angelo Pignatelli from EF Solare Italia shared insights into transitioning from small-scale projects to utility-scale agri-PV systems. Drawing from practical experience, he highlighted the challenges and opportunities of scaling up while maintaining harmony between agriculture and energy goals.

Arturo Ramos Fuente of Sun’Agri, France, emphasized the importance of dynamic agrivoltaics, showcasing how innovative designs can achieve synergy between crop protection, energy

production, and landscape integration. His talk underscored the role of adaptive systems in balancing agricultural and energy needs.

Viktorii Borodina of Next2Sun, Germany, offered best practices for vertical agrivoltaic applications based on pilot projects. She outlined critical dos and don'ts, providing a roadmap for implementing efficient, sustainable, and landscape-friendly agri-PV systems.



*Paolo Picchi and Viktorii Borodina during the session.*

The session highlighted the potential of agrivoltaics as a tool for addressing energy and food security, advocating for a seamless integration of technology into agricultural landscapes to ensure a sustainable future.

*“What we witnessed in this session is a remarkable evolution in how the industry is working on balancing the triple challenge of energy generation, food production, and landscape preservation”, shared Paolo Picchi.*

*“As a landscape architect, I'm particularly encouraged by how these projects are creating new synergies between renewable energy and rural landscapes, proving that with thoughtful design, we can enhance both agricultural productivity and clean energy generation.”*

## Innovation Showcase: EU-funded Projects and Research

This session, moderated by Heinz Ossenbrink (ETA-Florence, Former European Commission JRC), showcased groundbreaking contributions from EU-funded projects aimed at overcoming challenges and advancing photovoltaic solutions across various applications.



*EU project representatives shared groundbreaking insights, advancing the shared mission of BIPV.*

In the field of **agrivoltaics**, Mariangela Latino (CNR, Italy) presented innovations in bifacial PV systems tailored for urban applications. The research demonstrated promising results with a bifaciality factor of up to 87% with a white background, indicating strong potential for environments with diffuse sunlight. The project integrated these solar cells with smart automation systems (Arduino-based monitoring and AI/IoT technologies) to create sustainable urban solutions, particularly for balcony greenhouses that combine energy generation with urban agriculture.

Selçuk Yerci from Turkey's Center for Solar Energy Research and Applications shared insights from the PV4PLANTS project, which involves implementing AgriPV systems across three test sites in Turkey, Spain, and Denmark to grow various crops including tomatoes, microalgae, and leafy greens. The experimental setup compares innovative AgriPV fields against control fields with standard PV panels and fields without any panels. While stakeholders appear supportive of the implementation, preliminary indoor experiments haven't yet demonstrated clear advantages of enhanced red-light spectrum for crop growth, with most test sites falling in the "Marginal Region" based on Bangor's classification.



**The built environment** emerged as another critical theme, with Nicola Baggio (Futura Sun, Italy) highlighting the development of colored PV modules designed to achieve architectural harmony. These high-efficiency n-type cell modules, offering power outputs of 360-390 Wp, have advanced significantly from earlier 250 Wp versions while maintaining competitive pricing below 0.5 €/Wp, which is lower than standard module prices from 10 years ago (which were >0.5 €/Wp). This cost reduction is particularly significant given that electricity prices have doubled during the same period, making BIPV increasingly economically attractive. Successful implementations across Europe, including the largest single-building PV façade in Norway and the Guggenheim Museum in Bilbao, demonstrate the versatility and viability of BIPV in diverse architectural applications.

Paulius Laurikėnas from Solitek R&D (Lithuania) presented findings from a pilot project on photovoltaic noise barriers (PVNB), focusing on their performance and cost-effectiveness. Implemented along Lithuanian railways and highways, the project included pilot installations with capacities of 22.2 kW and 20.7 kW. Economic analysis revealed promising payback periods of 2-3 years for 4-meter post gaps and 5-7 years for 2.5-meter post gaps. The pilots demonstrated successful integration with infrastructure, achieving performance ratios of 0.82-0.84 and supplying power for local needs such as lighting and line electrification.

Wilfried van Sark (Utrecht University, Netherlands) highlighted the Inside Out project, a plus-energy retrofit of high-rise apartment buildings. This project demonstrates the renovation of a high-rise apartment building in Utrecht, Netherlands, into a plus-energy building using various BIPV and BAPV solutions. The renovation included installing 1,118 modules across different building surfaces, totaling 356.6 kWp capacity. The project achieved significant success, generating a surplus of 38.7 MWh in 2023 with a specific yield of 608 kWh/kWp.

Claire Morin (SolarPower Europe, Belgium) emphasized the progress of the INCREASE project in driving PV adoption in urban spaces. The project examines insurance barriers for Building Integrated Photovoltaics (BIPV), highlighting major concerns around fire safety and water damage risks. The research found that limited insurer experience and past negative incidents have made coverage difficult to obtain. The study concludes that harmonizing BIPV standards, especially for fire safety, and implementing standardized training and certification at the European level could improve BIPV insurability and market adoption.

In the realm of **modelling**, Massimo Plazzer from the Province of Trento (Italy) introduced the 3D Solar project – a large-scale assessment of photovoltaic potential across Trentino province using AI and geospatial data to identify suitable areas and calculate solar irradiation at 1m resolution. Study identified total potential of 9.5 GW across 80.3 km<sup>2</sup> of suitable areas, with detailed analysis for 166 municipalities. Results are publicly available via WebGIS platform, helping citizens, technicians, and municipalities plan solar installations while meeting provincial renewable energy targets.

Chen Jiawei (Politecnico di Milano, Italy) discussed a digital twin model designed to predict crop yields in agrivoltaic systems, taking place in Lombardy region as a case study. The project employed



advanced lysimeter systems to evaluate shading effects on crop growth under three conditions: no shading, continuous partial shading, and intermittent partial shading. Research found higher soil moisture retention under panels and varying crop responses to different shading patterns. Project demonstrates potential for developing predictive models using machine learning for large-scale agrivoltaic applications.

Bruno Bueno (Fraunhofer, Germany) and Saptak Ghosh (CSTEP, India) brought a global perspective to the conference with a comprehensive assessment of building-integrated photovoltaics (BIPV) potential in India. Their joint study utilized Local Climate Zone mapping and 3D data from Ahmedabad to evaluate annual irradiance and energy yield, factoring in a 20% module efficiency and an 85% performance ratio. The findings revealed a substantial BIPV potential of 309 GW across India, with Ahmedabad alone capable of supporting 16 GWp of capacity and generating 11 TWh annually.

Regarding innovative **PV components**, Fabrizio Leonforte (Politecnico di Milano, Italy) detailed resource-efficient photovoltaic systems, which introduces a modular solar tile system designed for easy integration into existing pitched roofs, particularly historical buildings. Utilizing up to 70% recycled plastic, this system is lightweight, waterproof, and sustainable, addressing the need for efficient renewable energy solutions in older structures. Its significance lies in promoting decarbonization in the building sector by providing a cost-effective and flexible option for integrating photovoltaic technology into traditional architecture

Chiara Bedon's (University of Trieste, Italy) findings on modeling BIPV thermo-mechanical performance during fire incidents. The research aims to address the vulnerabilities of BIPV systems by developing robust experimental and numerical validation strategies, aiming to establish standardized performance indicators for thermal shock and damage prediction. The significance lies in improving safety and resilience of BIPV installations, particularly in fire-prone environments, which is a critical aspect of the ongoing "3FiRES" bilateral project between Italy and China

Rainer Grischke from Meyer Burger (Switzerland) presented advanced solar roof tiles using SHJ tunnel-IBC cell technology to enhance solar efficiency and durability. This initiative, part of the PILATUS project, aims to achieve a Technology Readiness Level (TRL) of 7 for solar tiles that boast a performance guarantee of over 93% for 30 years, along with waterproof and fire-resistant features. The outcome emphasizes innovation in solar technology that combines aesthetic appeal with high energy yield and structural robustness, making it suitable for diverse architectural applications.

Rafael Pardo Lloría (Flexbrick, Spain) unveiled prefabricated ceramic BIPV panels designed for architectural envelopes, which combine energy generation with architectural flexibility, offering features like customization, thermal regulation, and rapid installation. Tested in real-world conditions, these panels achieved 18.37% efficiency and minimal degradation, proving their robustness for nearly zero-energy buildings. This patented EU-produced system promotes sustainable, aesthetically integrated solutions for both modern and heritage architectures.



César Domínguez (Instituto de Energía Solar, Spain) introduced a semi-translucent BIPV module with integrated tracking micro-concentration for improved power density and daylight management. Using ultra-thin Fresnel arrays and low-cost manufacturing, the innovation improves energy yield, reduces glare, and adapts to various building applications. It represents a breakthrough in combining aesthetics, efficiency, and daylight management for sustainable architectural integration.

John Morello from Freesuns (Switzerland) and HE-SPHINX Project discussed solar roof tiles designed to preserve architectural aesthetics, particularly in heritage and complex roof structures such as slate and terracotta roofs. The HE-SPHINX project focuses on designing and manufacturing matrix-shingled solar tiles, enabling clean energy generation with installations like the College des Parcs in Neuchâtel. This initiative not only brings BIPV manufacturing back to Europe but also demonstrates the scalability and sustainability of these solutions with significant energy and CO<sub>2</sub> savings.

Finally, **resource efficiency** is another critical theme that wrapped up the session. Alessandro Virtuani (CSEM, Switzerland) highlighted groundbreaking advancements in Integrated Photovoltaics (IPV) and Building-Integrated Photovoltaics (BIPV) at a recent conference. In his first presentation, Virtuani examined the carbon footprint of IPV systems, emphasizing their role in reducing CO<sub>2</sub> emissions when installed on building facades, even in suboptimal orientations. The study underscored the transformative potential of "greener PV" technologies in making urban photovoltaics a cornerstone for achieving climate goals.

*As Heinz Ossenbrink shared some thoughts about the session: "The presentations highlight innovative solutions for the growing PV market, focusing on integrating affordable solar systems into visible environments. Topics like agrivoltaics, which protect agriculture from climate challenges, and scalable PV solutions for the built environment underscore the transition from niche adoption to mainstream. Advances in AI and computing power further enable sophisticated planning for large-scale solar deployment."*

*Looking to the future, Ossenbrink added "Integrating PV systems will become the major challenge but also business in the decade to come, as the cost of photovoltaic modules are decreasing to a small share of overall deployment costs."*

## Italy's Leadership in IPV Integration

The IPV Conference also featured two insightful sessions showcasing Italy's innovative approaches to renewable energy integration, emphasizing agrivoltaics and building-integrated photovoltaics (BIPV). These sessions reflected Italy's commitment to harnessing renewable energy technologies for sustainable development and landscape integration, leaving participants inspired by the country's forward-thinking initiatives. They showcased BIPV as a critical tool for achieving Italy's climate goals while preserving architectural aesthetics.

The first session, moderated by Paolo Picchi, explored the emerging role of agrivoltaic systems as tools for agricultural innovation and landscape preservation. An Italian expert panel discussed their alignment with the European Landscape Convention (Florence, 2000) and Tuscany's landscape quality objectives, focusing on regulatory progress and challenges. The conversation underscored the need for agrivoltaics to be more effectively incorporated into regional landscape planning.



*Dynamic idea exchanges took center stage during the Italy-focused parallel session.*

The second session, moderated by Lara Morandotti (PV Magazine) and Lucia Montoni (ETA-Florence and University of Florence), underscored its transformative potential for Italy's energy and construction sectors. Presentations highlighted cutting-edge research, real-world prototypes, and projects that integrate photovoltaics into building facades and infrastructures. Speakers emphasized the need for a coordinated effort among researchers, industry, policymakers, and citizens to address regulatory gaps, foster innovation, and advance energy efficiency and digitalization in construction. Discussions also explored the challenges of integrating BIPV into historical architecture and the importance of workforce training to ensure seamless implementation.

The Italian sessions were attended by panels of experts including Raffaella Bisconti (Sun'Agri Italia Srl), Gabriele Paolinelli (University of Florence and AIAPP), Marco Neri (Confagricoltura Toscana), Angelo

Pignatelli (EF Solare Italia and Symbiosyst Project), Massimo Plazzer (Province of Trento), Laura Maturi (EURAC Research), Marco Barone (Casa s.p.a), Claudio Pirotta (PIZ srl), Carlo Zuccaro (Cooperativa GFF), Diego Prati, (the Italian Confederation of Craft Trades and Small- and Medium-Sized Enterprises), Roamano Mati and Gabriele Giusti from National Association of Building Craftsmen (ANAEPA).

*Lucia highlighted that Building Integrated Photovoltaic (BIPV) projects are pivotal for Italy's cleaner energy future, as evidenced by the inspiring examples shared. She emphasized “there is a need to rethink energy production and consumption to create sustainable, smart, and beautiful cities.” “Achieving this vision requires collaboration among solar architecture stakeholders to drive seamless, innovative, and widely embraced building transformations.”*

## Spotlight on Success: Autarq’s BIPV Leadership

As a proud sponsor of the IPV Conference 2024, [Autarq](#) showcased its pioneering role in advancing Building-Integrated Photovoltaics (BIPV). Founded in 2012 in Germany, Autarq has established itself as a leader in sustainable energy solutions, with over 1,000 installations across six European countries. Its innovative solar roof tiles seamlessly blend with traditional roof aesthetics, offering unparalleled efficiency, safety, and durability.

Autarq’s **SELVA (Safety Extra Low Voltage Architecture)** system is a game-changer, eliminating the need for power electronics on the roof while enhancing performance and minimizing risks. The system is celebrated for its ease of installation, compatibility with diverse roof styles, and high acceptance among building authorities and heritage preservation agencies. By combining cutting-edge technology with timeless craftsmanship, Autarq is setting a new standard for BIPV and empowering property owners to harness clean energy without compromising on design or reliability.



*Kai Bunrock showcased Autarq’s innovative solar roof products and technologies at the conference.*



Conference participants had the opportunity to view Autarq's products firsthand.

*"This conference is about pushing BIPV as a vital segment within the PV industry," said Autarq's Managing Director Kai Buntrock. "Our sponsorship is motivated by raising awareness, not just for Autarq's specific technology, but for the broader BIPV segment.*

*He added: "As young as our segment is, we push each other to new frontiers through individual innovation, driving collective development forward. Competition sparks innovation - when one innovates, others follow. This healthy competition pushes us all to the limits, advancing the entire field through our individual innovations."*

## Conference Resources and Future Engagement

The journey continues with the opportunity to join the [EU Solar Buildings Platform](#) – a hub for advancing solar innovation in architecture. The project will forge ahead, collaborating with sister initiatives and esteemed partners to drive groundbreaking developments.

Excitingly, new short training courses for architects are slated for launch next year, offering cutting-edge knowledge in solar-integrated design.



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## **Want to contribute?**

Companies, authorities, and professionals can join the growing EU Solar Buildings community by submitting a membership letter today at [eusolarbuildings.com](https://eusolarbuildings.com).

## **Want to know more?**

**For more details about the successful IPV Conference 2024 held in Florence, Italy:**

- Full recordings, presentations, and photos: Visit [IPVC – Integrated Photovoltaic Conference](#)

**For updates about next year IPV Conference,** follow [SEAMLESS-PV Project](#) on LinkedIn

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