



PHOTOVOLTAICS IN HISTORIC BUILDINGS

A HISTORY POWERED BY THE SUN

Designed and Manufactured in Poland

– Proven Across Europe

Historic buildings can generate energy without compromising their aesthetics. ML System's Building-Integrated Photovoltaics (BIPV) solutions are based on **100% Polish technology, backed by 22 proprietary patents and manufactured in the heart of Europe.**

Our active materials have successfully passed rigorous heritage conservation approval procedures in international markets. They discreetly protect buildings of the highest heritage status, from traditional Alpine architecture and castles to historic public offices in Bavaria. Full control over the manufacturing process gives conservation authorities and investors confidence in the safety and reliability of our solutions.

Principles of BIPV Implementation in Historic Environments

We understand that any intervention in a historic building requires an individual assessment. That is why we design and implement our technological solutions in accordance with fundamental conservation principles:



Respect for Authenticity: Integrated photovoltaics preserve the historic structure, roof form and traditional appearance of the building.



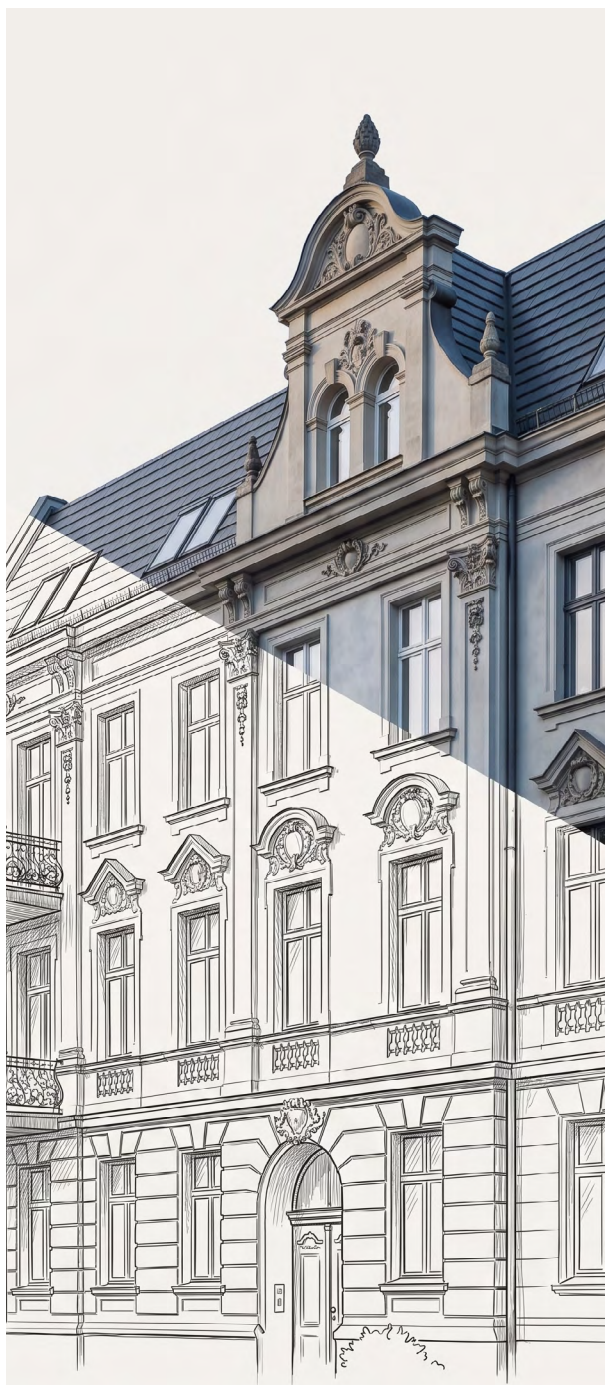
Minimal Intervention: The installation of our systems minimizes interference with the original building fabric and avoids placing additional loads on historic structures.



Reversibility: BIPV mounting methods are designed to ensure a high degree of reversibility, allowing the components to be removed without damaging the historic fabric.



Landscape Integration: Active building materials replicate the texture and colour of traditional roofing materials, ensuring seamless integration into historic surroundings.



Preserving Heritage in a New Energy Reality

The modern-day management of historic buildings presents a challenge in which effective budget management is becoming increasingly important. Owners and managers of heritage properties must contend with rising operating costs while seeking a balance between necessary modernisation and respect for the building's original fabric.

At ML System, we demonstrate that energy modernisation does not have to be a financial burden. It can become a tool for reducing fixed costs and funding further conservation work.

Guidelines of the General Conservator of Monuments (15 May 2023)

"Renewable energy generation and heritage conservation must be treated as equally important public interests. [...] The generation of clean energy should be pursued while preserving and protecting the historical character, traditional appearance and structure of entire historic complexes and individual monuments."

PhotonRoof photovoltaic roof tiles fully comply with the guidelines of the General Conservator of Monuments. Unlike conventional solar panels, which are often rejected as "foreign and disharmonious structures", ML System's technologies preserve the historical character and traditional appearance of the building. The entire system ensures the full protection of the historic fabric.

Most importantly, this technology has already passed the most stringent approval procedures in Europe, providing investors with a solid basis for their applications and significantly accelerating the formal approval process.

Proven Performance Through Projects Across Europe

The preservation of cultural heritage requires solutions that fully respect the historical context and stringent conservation guidelines. Rather than forcing compromises on historic buildings, we provide technologies that protect them. The effectiveness of our solutions is demonstrated by projects across Europe, tested in widely varying climatic and regulatory environments.

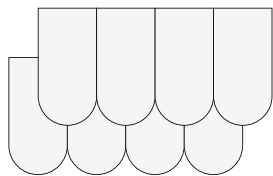
ML System products are designed to deliver reliable performance regardless of weather conditions. Resistance to extreme temperature fluctuations, heavy snow loads and certified mechanical strength against hail demonstrate the exceptional durability of the materials used.

For building managers, this means confidence that the installed technology provides a safe, fully watertight and maintenance-free protective barrier for the historic fabric.

Both heritage protection authorities and bodies responsible for landscape preservation reject the introduction of “foreign structures” into protected building forms. The approval of our solutions at sites with the highest level of protection demonstrates that ML System technology can fully respect historical aesthetics and the strict requirements of its surroundings. The new function does not dominate the historic building but integrates discreetly while preserving its integrity.



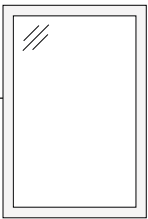
Comprehensive ML System Solutions for the Protection of Historic Buildings and Landscapes



PhotonRoof

Photovoltaic Ceramic
Roof Tiles

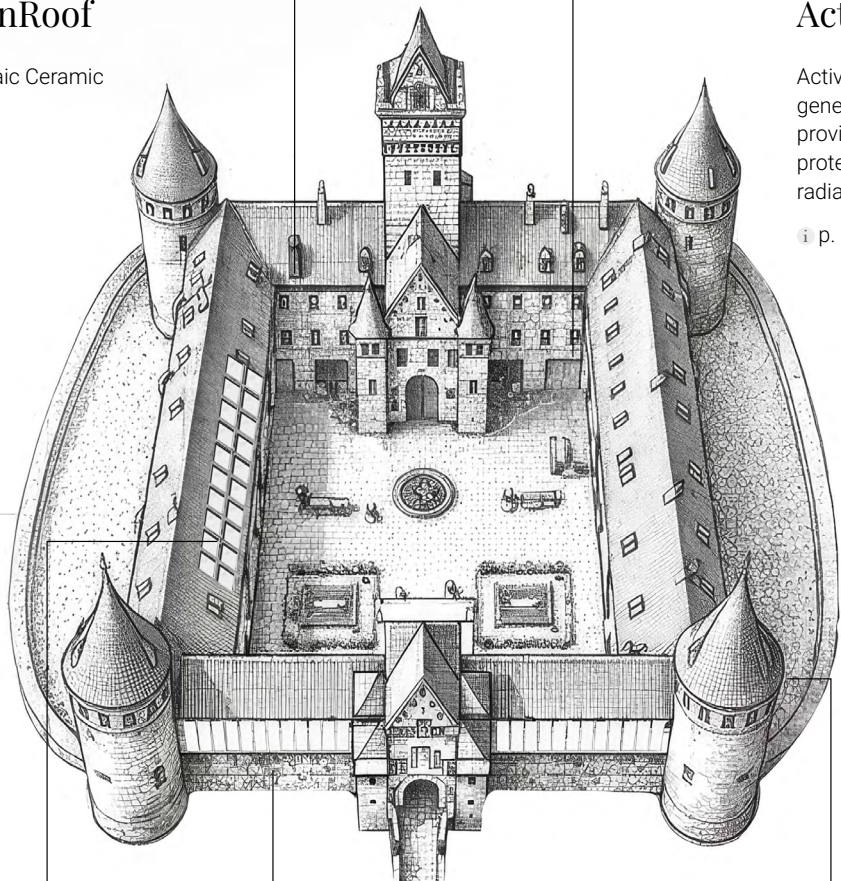
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Active Glass

Active glass that
generates energy,
provides heating and
protects against UV
radiation.

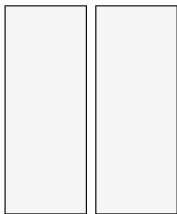
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Photovoltaic Skylights

Energy-Generating Glass for
Atriums and Courtyards

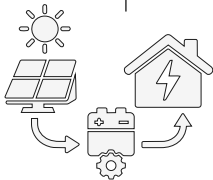
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PhotonWall

BIPV Photovoltaic Façade
Panels

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nexuView Scada

Invisible Energy Control and
Management System

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Photovoltaic Ceramic Roof Tiles



PhotonRoof

PhotonRoof is an energy-generating roof tile that combines the functions of a traditional roofing material and a photovoltaic system. It replaces conventional roofing while preserving its form and proportions, discreetly generating clean energy for the building. The solution has been designed for architecture where aesthetics, technology and environmental responsibility must go hand in hand.

With PhotonRoof, the roof remains a cohesive and harmonious element of the building's overall design while becoming a reliable source of energy that meets stringent quality and safety standards.



AI Visualisation | Illustrative Purposes Only



- **Roofing and Photovoltaics in One** — PhotonRoof eliminates the need for unsightly conventional solar panels. **BIPV roof tiles completely replace traditional roofing materials.** The uniform roof surface does not compete with the historic building's architecture but faithfully preserves the lines, rhythm and proportions of a classic roof.
- **Faithful Reproduction of Historical Materials enables discreet integration of the technology.** The unique surface of the active roof tiles precisely replicates the texture, structure and colour of traditional roofing materials, from clay fish-scale tiles and natural slate to rustic wooden shingles.
- **Respect for Historic Fabric and Structure.** The absence of heavy external support systems **eliminates additional structural loads on the original historic roof trusses.** BIPV tiles function as an alternative, energy-generating roofing material, providing a natural, exceptionally watertight protective barrier designed to last for decades.
- **Passive Tiles** Visually Identical to Active Modules. These ensure that the entire roof surface, even in permanently shaded areas, maintains complete visual uniformity. Passive tiles can also serve as a fully independent roofing solution. Although they contain no photovoltaic cells, they retain all the technological and aesthetic advantages of the PhotonRoof system, including durability, the highest standards of fire safety and faithful reproduction of historical materials. They are an ideal choice for investors seeking a roof that can function independently or complement active roof sections with perfect visual consistency.

PhotonRoof – Perfection in Every Detail

Roof Tiles Combining Cutting-Edge Technology with Design.



Hail Resistance:
75 mm at 140 km/h



Temperature Resistance:
From -50°C to +90°C



30-Year
Warranty



Scratch Resistance:
Hardness Rating of 8/10 on the
Mohs Scale



BROOF(t1)
Highest Classification for
Resistance to External Fire
Exposure



High Wind
Resistance



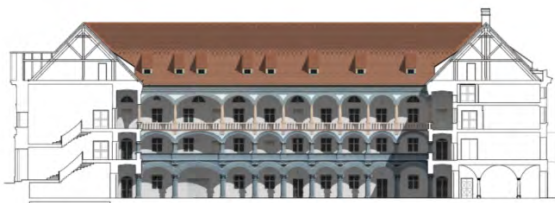
NRO Classification
Non-Fire-Spread Material

Munich, Germany

Alte Münze

A 16th-century Renaissance building, home to the Bavarian State Office for the Preservation of Monuments since 1986.

The Alte Münze building was constructed between 1563 and 1567 by Duke Albrecht V to serve as the court stables and an art chamber. Today, it plays an important role in the protection and conservation of Bavaria's cultural heritage, making particular care essential during renovation to preserve its historic character.



Instead of conventional solutions, **PhotonRoof photovoltaic roof tiles** were installed on the building, integrating cutting-edge technology with historic architecture. To preserve the roof's aesthetic character and historical authenticity with precision, we implemented a **unique mosaic effect** in which varying shades of the modules faithfully **replicate the ageing process and texture of historic ceramic tiles**.

This fully customised colour scheme received full approval from the stringent heritage conservation authority. As a result, without any visible alteration to the monument's visual character, the roof of the Alte Münze became an active energy source, **generating 32 MWh of green electricity annually**.

Installation Specifications

Roof Area	400 m²
Installed Capacity	30 kWp



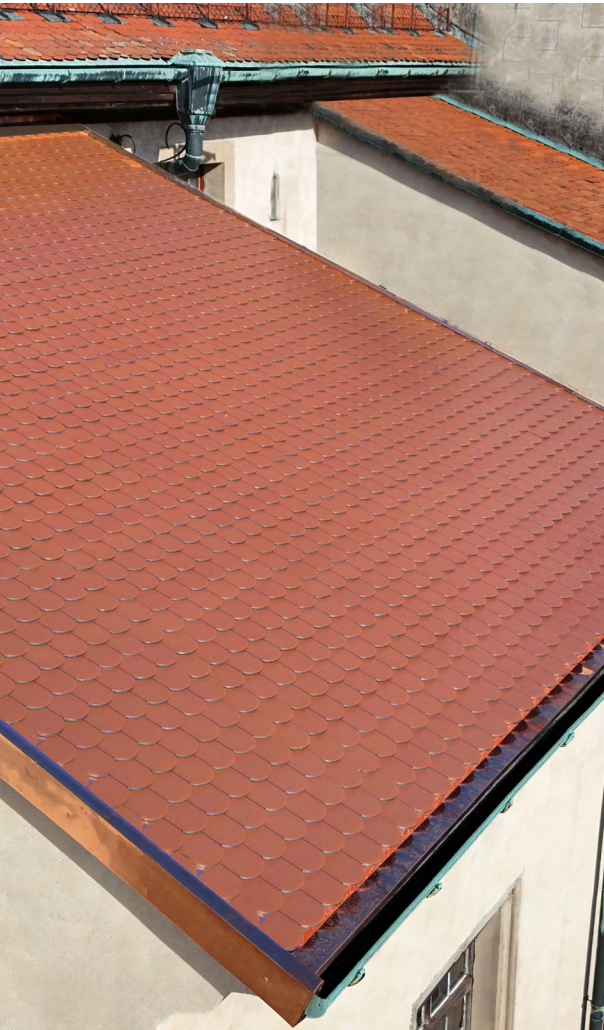
"It is a great honour for us that our PhotonRoof ceramic photovoltaic tiles have been installed in such a prestigious building as the historic mint in Munich. Meeting the stringent heritage conservation requirements called for full colour customisation, allowing us to demonstrate that modern photovoltaics can blend harmoniously with even the most demanding historic architecture."

— Dawid Cycoń, Vice President of ML System

Stary Wiśnicz, Poland

A 14th-century medieval residence of the Kmita family, expanded in the 17th century by the Lubomirski family into a grand early Baroque fortified complex.

The castle's monumental architecture and stringent heritage protection status required the integration of renewable energy sources in a highly discreet manner, ruling out conventional PV panels to preserve the building's historic appearance.



On the mono-pitched roof above the projecting tower on the side facing the so-called Kmitówka, we installed **PhotonRoof photovoltaic roof tiles**, which naturally combine the function of traditional roofing with electricity generation. **The modules faithfully reproduce the form and colour of classic ceramic roof tiles**, maintaining complete visual consistency with the building's historic fabric.

The system eliminates the effect of a “modern overlay” and **is virtually indistinguishable to the observer**. Its direct integration into the roof covering **enables clean energy generation without the need for additional mounting structures**. The solution received **full approval from the heritage conservation authority**, confirming that advanced solar technology can operate in complete harmony with the most valuable historic fabric.

Installation Specifications

Roof Area	50 m ²
Installed Capacity	3,9 kWp



"Wiśnicz Castle is a significant landmark among Poland's historic monuments and the second-largest castle in the Małopolska region."

"ML System is proud to have installed PhotonRoof photovoltaic roof tiles at this exceptional site. The solutions supplied and installed had to blend harmoniously with the monument's historic character, preserving its aesthetics, colour scheme and architectural details in accordance with conservation requirements."

— Sylwester Korzeniak, Project Director, ML System

Chamonix, France

Ski House

Photovoltaics Integrated into Alpine Architecture.

This private residence, located at the foot of the Mont Blanc massif, sits within one of **Europe's most strictly protected landscape regions**. Local architecture relies exclusively on traditional materials such as wood, stone, wooden shingles and slate, while any alterations affecting roof aesthetics are subject to stringent regulations.



To meet the exceptionally stringent requirements of the landscape conservation authority, which prohibited the installation of conventional PV modules, **we implemented the PhotonRoof photovoltaic roofing system, precisely engineered to faithfully replicate the texture and colour of traditional wooden shingles**. This advanced solution enabled seamless integration with the traditional Alpine architecture.

The building gained its own energy source through efficient electricity generation, without any visible PV installations, while preserving the roof's authentic appearance. The seamless fusion of innovation with natural aesthetics resulted in **official approval from the local heritage authorities**, setting an exceptional precedent in the highly demanding conditions of the French Alps.

Installation Specifications

Roof Area	200 m²
Installed Capacity	15 kWp



"To meet the highest landscape conservation requirements, the PhotonRoof photovoltaic roof tiles were colour-matched to the traditional wooden shingles used in the region. This project addresses the need to preserve landscape harmony while enabling renewable energy generation."

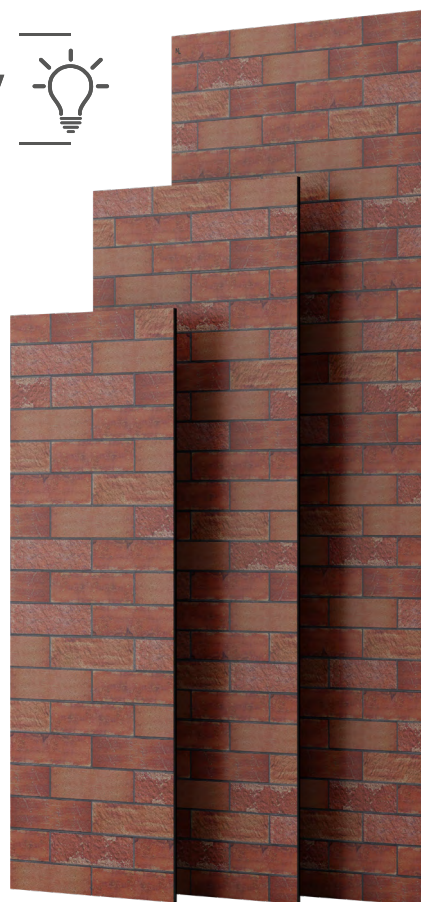
— Miłosz Dąbrowski, PhotonRoof Product Manager

Photovoltaic Façade Panels

PhotonWall

PhotonWall photovoltaic façade panels enable the creation of aesthetically pleasing, practical and unique designs using advanced solar energy technologies, whether for new-build projects or the modernisation of existing buildings.

Solar architecture, based on the use of materials that generate free, emission-free energy, represents a new reality that combines practical functionality and business efficiency with environmental responsibility. The functional, modern and elegant designs made possible by PhotonWall photovoltaic façade panels are attracting the interest of architects, investors and contractors alike.



"Kilar House" Music Education Centre, Katowice

Medina Azahara Museum, Córdoba

Custom-designed roofing
seamlessly integrated into the
natural landscape of Andalusia
and the limestone and Corten
steel architecture.

Madinat al-Zahra is a refined architectural masterpiece by Nieto Sobejano Arquitectos, honoured with the prestigious Aga Khan Award for Architecture in 2010. Seamlessly integrated into the Andalusian landscape, the museum complex features geometric volumes, terraces and planted areas that blend into the natural surroundings.

To preserve this vision, we installed PhotonWall photovoltaic façade panels, carefully tailored to the building's austere architecture, including its texture, colour and matte finish.

The solution provides an independent source of green energy while preserving the building's understated form, demonstrating how advanced technology can harmonise with outstanding architectural design.



Panorama of Córdoba, Spain

Installation Specifications

Roof Area	660 m²
Installed Capacity	111 kWp

"Taking part in the modernisation of the Madinat al-Zahra Museum is both a unique challenge and a source of pride for us. In a demanding market such as Spain, we have demonstrated that ML System's BIPV solutions can become an integral part of world-class architecture, recognised with prestigious awards such as the Aga Khan Award for Architecture. Our active roofing system at the museum in Córdoba proves that technology can fully respect the unique landscape and historic fabric."

— Piotr Golas, Business Development Manager, ML System

Active Glass

ML Glass



For centuries, windows have been the weakest thermal link in buildings, while modernising them in historic properties has raised significant concerns about the loss of authenticity. Today, active coating technology opens a new chapter in heritage conservation. We offer more than just replacement glazing – **we provide an intelligent energy barrier that protects historic fabric** while helping buildings become energy self-sufficient.

Our approach is built on three pillars:

Absolute Discretion: Windows retain their original divisions, colours and transparency, generating clean energy in a way that is virtually invisible to the naked eye.

Preventive Protection of Colours and Materials: The coating acts as an intelligent filter, selectively blocking UV radiation responsible for fading textiles, furniture and polychrome decorations. This protects the historic interior while eliminating the need for intrusive curtains or blinds.

Energy Security: Transforming glazed façades into energy-generating surfaces helps finance the ongoing maintenance of historic buildings while meeting the stringent requirements of the EU Energy Performance of Buildings Directive (EPBD).

Our active glazing and skylights featuring active coatings deliver on these principles, providing a non-invasive energy barrier that protects historic fabric.

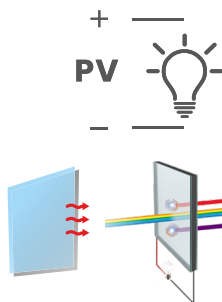
"Photovoltaic glass, which can also serve as a source of space heating, may be used wherever the use of ordinary or laminated glass is recommended or permitted."

— Guidelines of the General Conservator of Monuments



Wiśnicz Castle

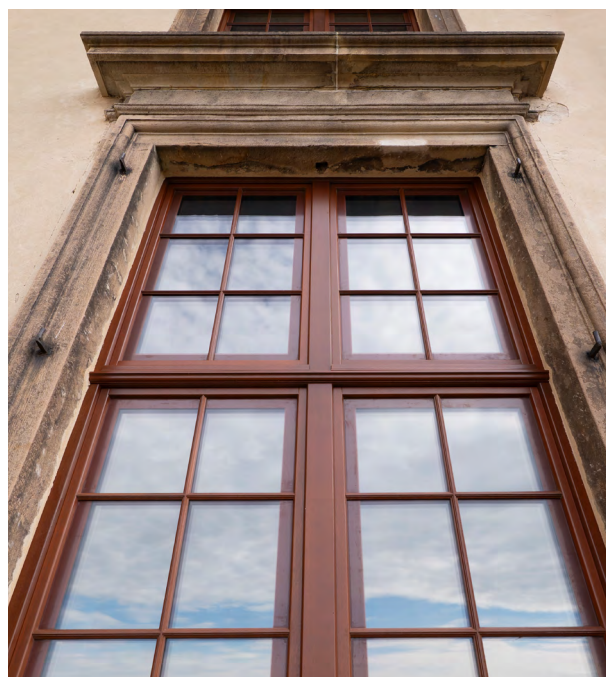
Wiśnicz Castle, Stary Wiśnicz, Poland



Harmony of Innovation and Baroque Tradition in the Ballroom

Wiśnicz Castle, a gem of early Baroque residential and defensive architecture, has become the site of a pioneering implementation of BIPV technology.

In the magnificent Ballroom, we demonstrate that outstanding energy efficiency can be achieved without invasive intervention while fully complying with stringent heritage conservation requirements.



To ensure visual consistency, we installed **insulating glass units with a quantum coating that actively generate energy**, functioning as invisible power sources for the building. The new **windows faithfully reproduce the original form and historic details**, including the original colour scheme and operable elements, blending seamlessly into the Baroque interior.

Crucially, to protect the museum's sensitive collections, the glazing incorporates an **integrated heating function** that helps maintain a stable temperature, while the entire installation is optimised by a **central SCADA management system**. With the preservation of the architectural heritage in mind, the window replacement was carried out using a **minimally invasive installation method**, ensuring full protection of the original historic masonry.

"The new windows supplied by ML System blend perfectly with the castle's historic character, harmoniously combining innovative technical solutions with historical tradition. They provide excellent thermal insulation, enabling us to effectively maintain a stable microclimate in our historic interiors."

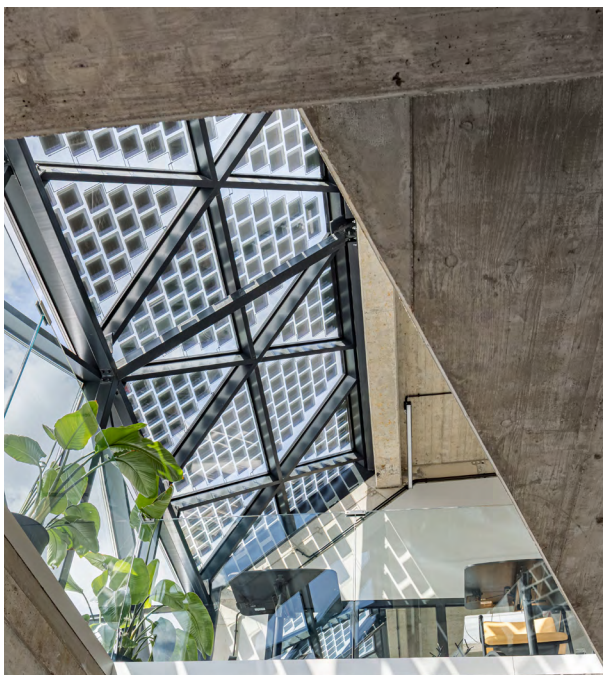
— Kinga Adamczyk, Wiśnicz Museum

Photovoltaic Skylights



ML System photovoltaic skylights are designed for the most demanding spaces, including atriums, courtyards and winter gardens in historic buildings. Instead of conventional glazing, we offer active building envelopes that not only illuminate interiors but also become their primary source of energy and a means of thermal control. Thanks to glass-to-glass technology, these skylights serve three key functions:

- **Light Management:** They create a rhythm of shadows or provide full transparency (active coating), while protecting interiors from excessive heat build-up and UV radiation.
- **Active Snow Removal:** The integrated heating coating prevents snow from accumulating on glazed surfaces, ensuring structural safety and a consistent flow of daylight throughout the year.
- **New Usable Space:** Covering open courtyards with active skylights brings previously underused areas to life. The building gains a new, prestigious space — such as a year-round café or foyer — without altering its historic layout.
- **Complete Weatherproofing:** The module connection system creates a fully sealed “canopy” over the courtyard. The original masonry is no longer exposed to rain or snow, effectively halting its deterioration and stabilising the microclimate.



Centrum aktywności studenckiej, Gliwice



University of Agriculture – Pojnarówka, Kraków



„Dom Kilara”, Katowice Kilar Music Education Centre, Katowice



A Harmonious Dialogue Between Light, Music and Modern Energy

The Music Education Centre was established in a truly unique place — the home where the distinguished composer Wojciech Kilar lived and worked. Here, BIPV technology demonstrates that modern sustainable solutions can harmonise with the spirit of art.

We deliberately incorporated two types of glazing: **fully transparent active skylights** that flood the interiors with natural light, **and modules with visible photovoltaic cells** that give the glazed surfaces a rhythmic, dynamic structure. This combination creates a unique interplay of light throughout the building, fostering an inspiring atmosphere for students and visitors alike.

Importantly, for a public building, **the modules feature an active heating coating** that prevents snow accumulation and ensures consistent energy performance throughout the year.



Installation Specifications

Roof Area	78 m ²
Installed Capacity	10 kWp

Modern solar architecture at the Kilar House is about more than energy savings. It harnesses the sun to create a living, ever-changing play of light that respects the history of this place while bringing it in line with the energy standards of the 21st century.

— Sabina Kozieł, Commercial Director, ML System

Safe Energy Management System

– nexuView

A historic building is a unique and delicate structure in which every intervention must be justified and precisely executed. NexuView SCADA is our supervisory system, integrating all ML System technologies — from active roofs (PhotonRoof) and façades (PhotonWall) to glazing and skylights — into one cohesive system. It is more than a monitoring solution: it provides intelligent management that discreetly and fully automatically ensures every part of the building contributes to its efficiency and safety.

- **One System, Complete Control NexuView SCADA** is a control centre that “understands” the entire building. It integrates the operation of all active building components, whether generating electricity or managing temperature. The entire ML System ecosystem works seamlessly together, optimising energy yields in real time.
- **Preventive Safety Management** for historic buildings, predictability is essential. The system not only monitors equipment performance but also continuously analyses trends to detect anomalies across the installation before they develop into faults. This enables proactive intervention, protecting the building against unplanned downtime.

- **Phased System Expansion:** renovation projects involving historic buildings can span many years. The NexuView architecture allows additional zones — such as photovoltaic roofs, façades or active glazing — to be integrated as conservation work progresses, without replacing or rebuilding the central system.
- **Uncompromising Cybersecurity:** as a Polish manufacturer with its own research and development facilities, ML System provides fully proprietary software. This eliminates the risk of hidden security vulnerabilities and unauthorised access that users of imported technologies may face.



AI Visualisation | Illustrative Purposes Only

Energy Storage Systems

Energy Autonomy: Stabilising and Protecting Historic Fabric The full potential of the ML System ecosystem is realised when energy independence is achieved. By integrating energy storage, a building is no longer reliant on the external grid and becomes a self-sufficient unit. In the context of historic buildings, an energy storage system is more than just a device — it is a strategic element in protecting the property against the consequences of power failures.

Optimising Costs for Conservation

Maintaining a historic building presents a significant financial challenge. Integrating energy storage into the ecosystem prioritises the use of energy generated by ML System's active products. Instead of exporting surplus electricity to the grid, it is used to meet the building's own energy needs.

Protecting Microclimate Continuity (HVAC)

Sudden changes in humidity and temperature caused by power interruptions pose one of the greatest threats to historic interiors, including polychrome decorations, furniture and architectural details. Integrating energy storage with the NexuView system ensures the uninterrupted operation of HVAC systems, including ventilation and dehumidification, eliminating the risk of thermal shock to historic interiors.

Operational Security

The building gains energy independence. Despite rising energy prices or external grid failures, it can maintain full functionality. This predictable and reliable solution enables museums and educational institutions to plan activities with confidence, knowing that their energy system will not fail at a critical moment.



How We Work

Advanced Scanner

A laser scanner captures ultra-precise 3D data to create an accurate digital model.



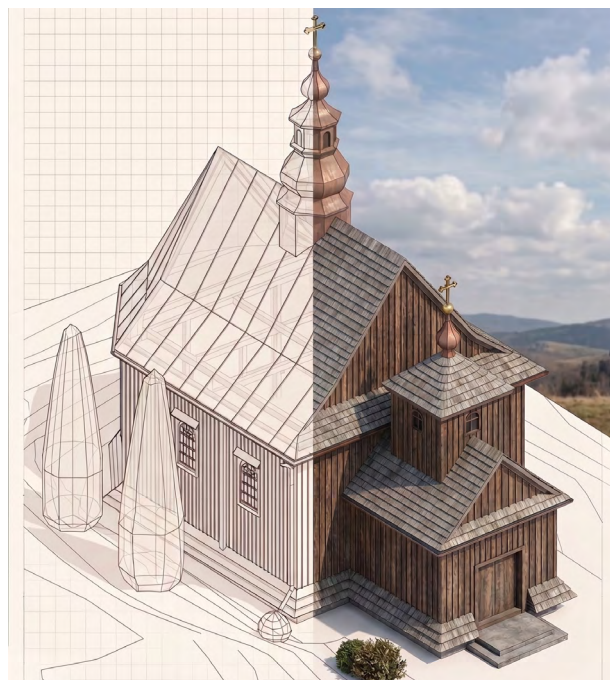
Drone

Captures precise images from multiple angles and perspectives to create comprehensive photographic documentation of the roof.



Comprehensive 3D Digitisation

Combining laser scanning with drone photography enables the creation of a highly accurate, professional 3D model of the entire building.



Quality Guaranteed by an Innovation Leader

Global Experience

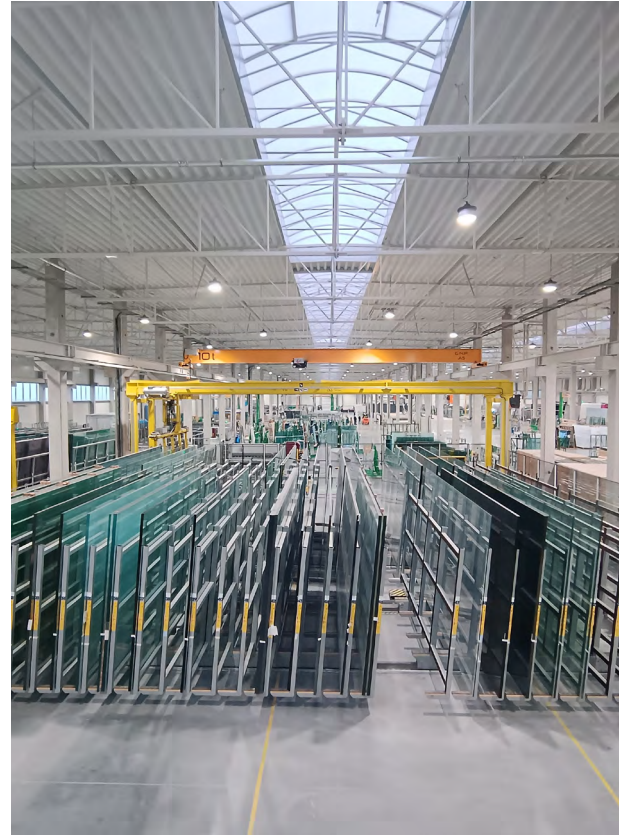
Our products have been successfully implemented in thousands of buildings worldwide, demonstrating their reliability across diverse climatic and architectural conditions.

In-House Research Facilities

Our technologies are developed and tested at our Research and Development Centre. This means we do not experiment on buildings — we deliver proven, thoroughly tested and fully safe products that meet the most stringent standards.

Innovation

The company holds 22 granted patents. Its in-house laboratory is equipped with research facilities unique on a global scale, demonstrating our unwavering commitment to excellence.

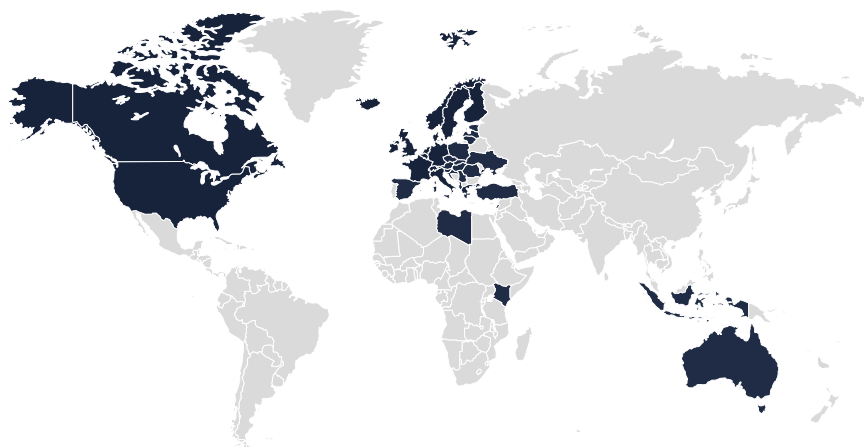


Warehouse and Production Hall



Siedziba GK ML System

ML System's Global Reach





Visualisation of PhotonRoof tiles applied to the church building in Górzanka, created using the PhotonRoof AI Visualiser.



visual.photonroof.eu



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