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Advanced Strategies for PV Integration: Semi-final Results from Pilot Demonstrators across Europe

GIULIO POGGIARONI
ETA Florence Renewable Energies

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Trusted Energy & Sustainability Partner

30 years expanding impact across energy systems, policy, and collaboration

PV Integration Expertise



We support research and design to make PV technologies, including BIPV and Agrivoltaics an integral part of built environments.



Technical Consulting & Project Development

We provide research screening, feasibility studies, and performance evaluation for PV systems in Italy and internationally.



Science Communication

We lead outreach, knowledge dissemination, and results valorization for EU-funded and international projects.



Spearheading Partnerships

We align architects, engineers, researchers, policymakers and industries to bridge energy efficiency and aesthetics in solar integration, through highly targeted platforms.

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Seamless?

You don't realize
that there are
PV modules

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Seamless-PV



- 1 Installation of approximately **150 m²** of colored glass-glass modules on the upper part of the south-facing facade. Capacity: **26 kW**
- 2 Implementation of the e-PIZ 54 multifunctional system, which integrates thermal and acoustic insulation with grey photovoltaic modules. **135 m²** distributed over four orientations for **20 kWp**



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Seamless-PV



- 3** Utilization of 3S products, which combine customizable dimensions and colors (green) with a low-reflection surface treatment. Area of **150 m²** across three orientation, capacity of **19 kWp**
- 4** A versatile testing platform managed by CEA-INES to evaluate innovative solutions. **60 m²** of "full black" glass-glass modules, **12 kWp** on the south facade



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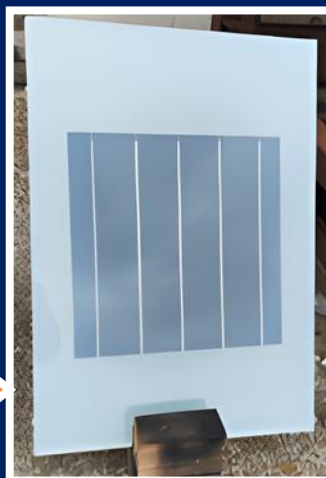
Demo 1



Retrofit of a residential building **150 m²** of colored glass-glass modules

Capacity: **26 kW**, consumption of **12** apartments

Sample module produced with an ad-hoc tabber stringer. Grey film applied for aesthetic requirements at the cost of **22%** power loss.



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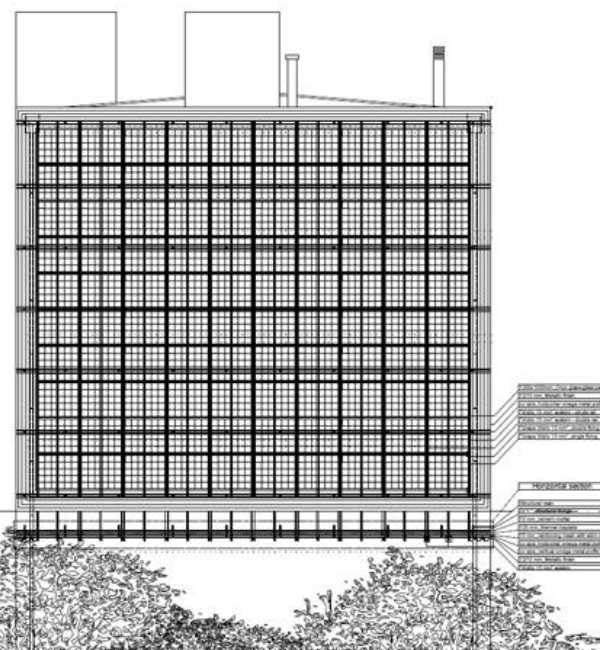


Demo 1



South elevation

Layers global view



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Demo 2



Before

Implementation of the e-PIZ 54 multifunctional system, with grey photovoltaic modules.

135 m² in four orientations - 20 kWp

Pre-fabricated element ensuring:

- Acoustic and thermal insulation
- Aesthetic refinements
- Energy production



After



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Demo 2



Before

Pre-fabricated element ensuring:

- Acoustic and thermal insulation
- Aesthetic refinements
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Implementation of the e-PIZ 54 multifunctional system, with grey photovoltaic modules.

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After



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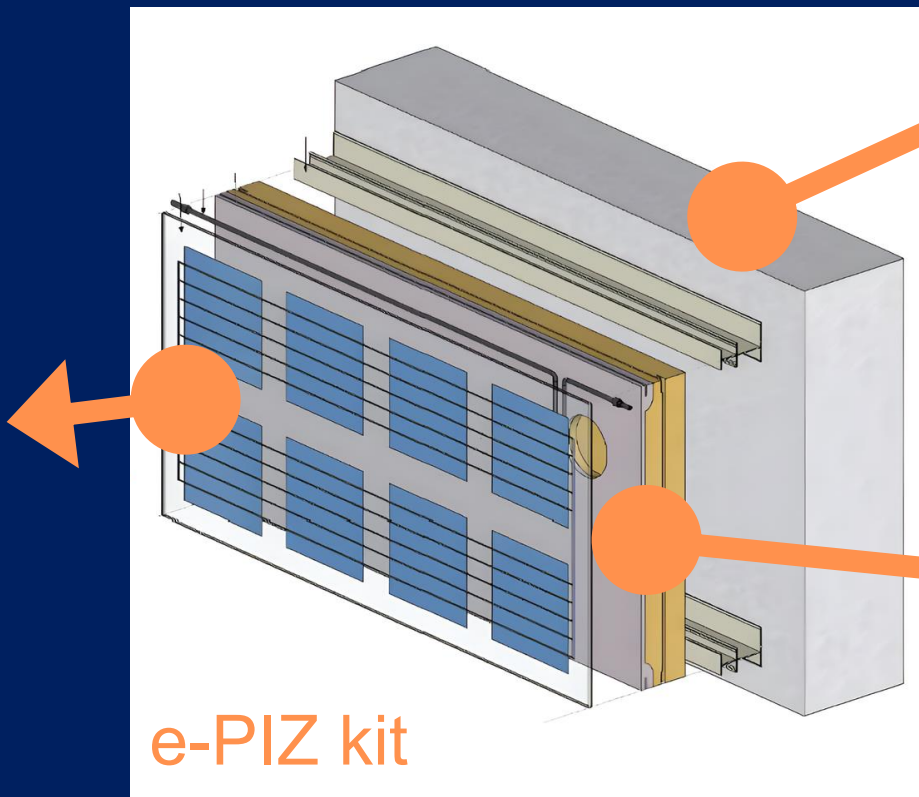
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Demo 2

PV module



Facade

Stone wool
panel

e-PIZ kit



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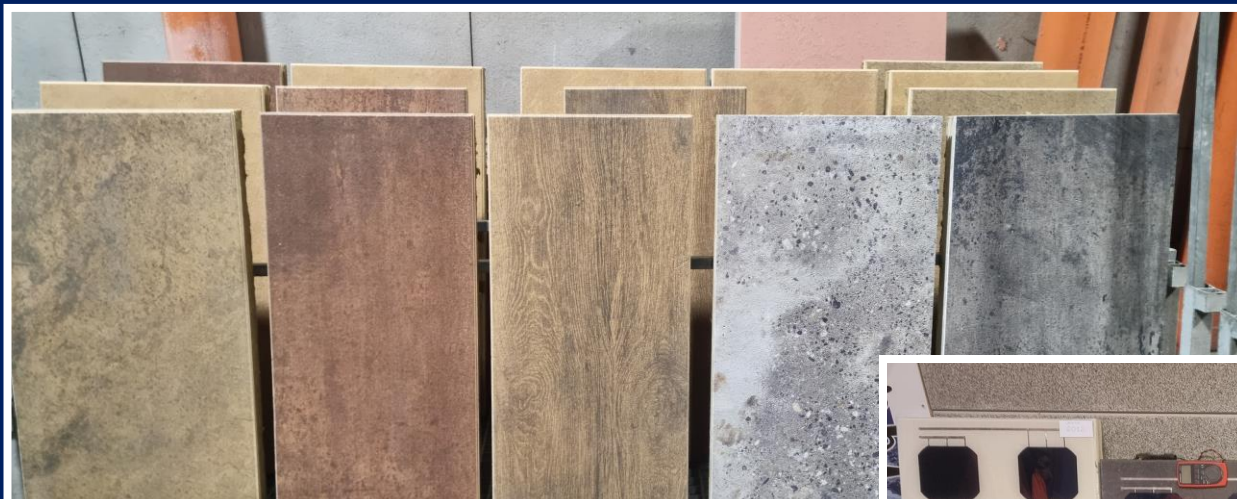
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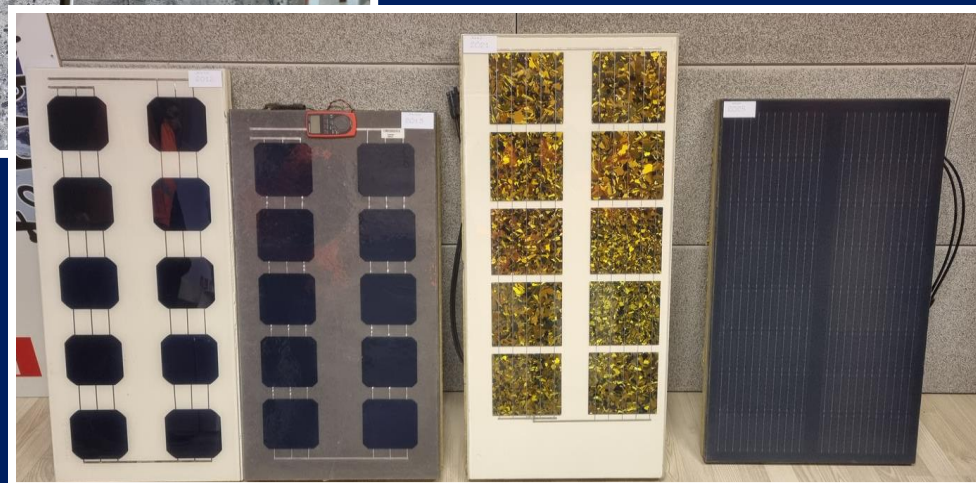
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Demo 2



High degree of
customization



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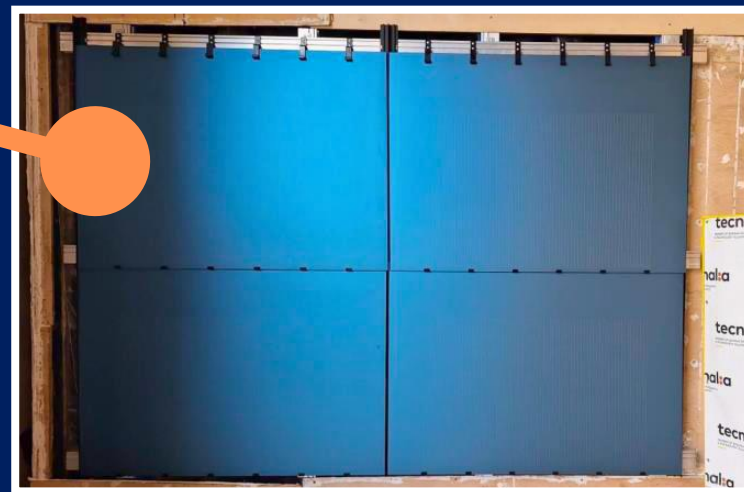


3S Demo 3



Utilization of 3S products (Colored PV modules instead of films) with a low-reflection surface treatment.

150 m², three orientation, capacity 19 kWp



Focus on the production chain, automation and bussing of the electrical interconnections

Objective: BIPV mass production and cost decrease



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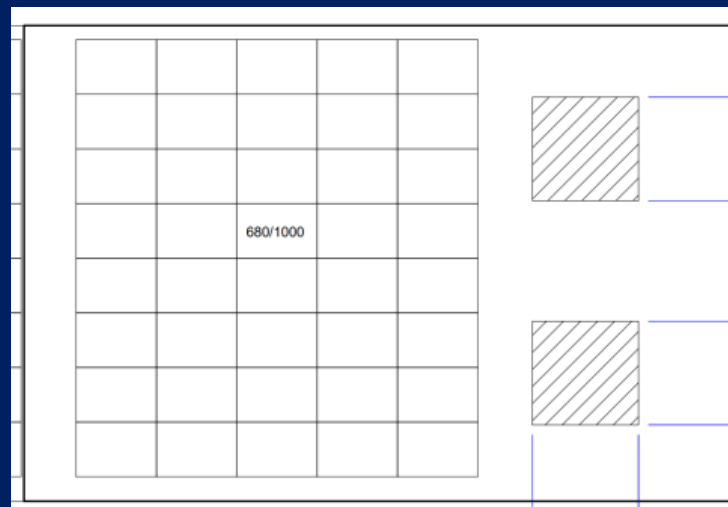
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3S Demo 3

Preview of the module installation



Blue modules selected, choice by building owner



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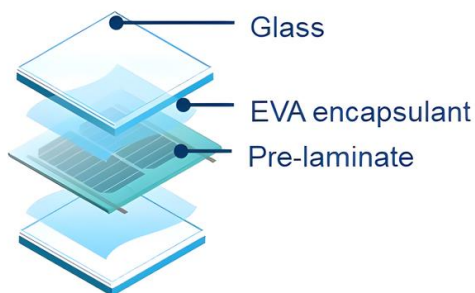
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Demo 4

Pre-laminate



Module



Focus on the use of pre-laminates and full-black glass

60 m² of "full black" glass-glass modules

12 kWp - south facade

Utilizing “pre-laminates” (intermediate products) facilitates storage and the assembly of customizable BIPV modules by putting together different pre-laminates. CSEM tested **iPO**, an innovative encapsulant with higher thermal performances





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Demo 4

Utilizing black glass, allows the usage of different types of modules over the same surface; the black colour is masking the differences.

This technique allows for the creation of 'Full Black' **modules or complex designs** starting from high-precision pre-assembled components.

The use of **all-black glass-glass modules** creates a homogeneous and refined facade, where the photovoltaic technology is not perceived as an add-on, but rather as an **architectural element**.



Early prototype



FACT experimental building



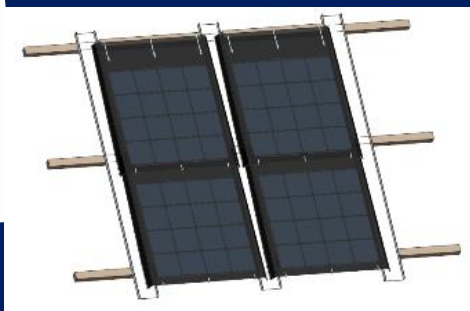
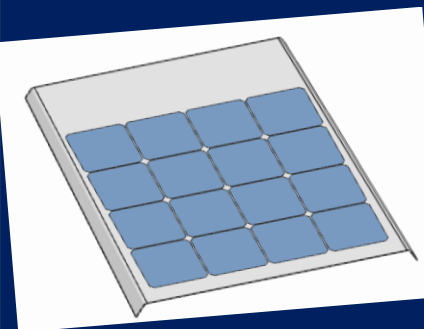
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EXTRA



600x700mm shingle with a flat part containing the cells (IBC)

Black colour for improved aesthetics

Two additional vertical parts, one on each side, that fit into a vertical gutter to collect water

Flat part has a trapezoidal shape so that the consecutive rows of shingles can overlap

Metal hooks for roofing shingles

4 strigs of 4 cells, resulting in a nominal peak power of 52Wp

- **Handling Obstacles:** such as chimneys or surfaces that do not align perfectly with standard tile dimensions.
- **Guaranteed Waterproofing:** ensuring the watertight integrity of the entire building envelope.
- **Simplified Maintenance:** A standout feature is the ability to remove individual tiles, facilitating replacements without having to dismantle large sections of the roof.



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EXTRA



Testing site - Spain



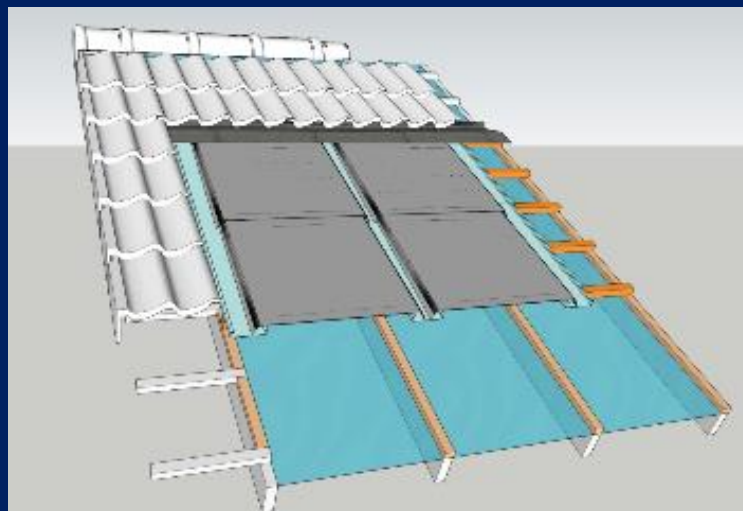
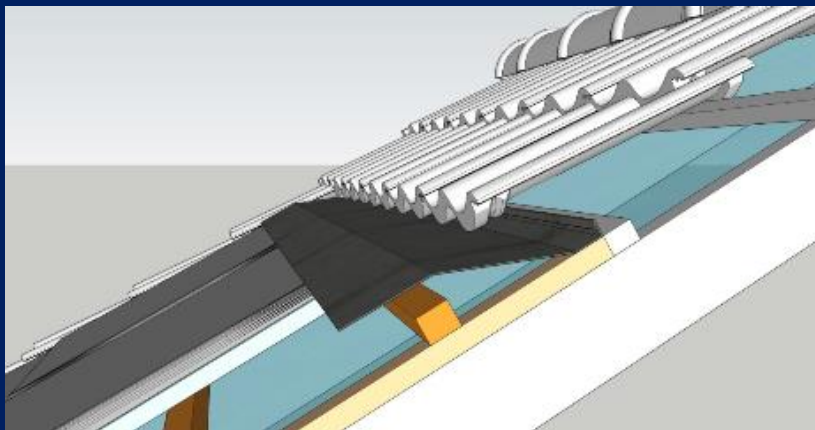
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EXTRA



Rendering of the installation
on the demo site

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Thank you for the attention!