SOTTILE, a Novel PV Roofing System for BIPV

Integrated Photovoltaic Conference

SOTTILE
SOLAR TECHNOLOGICAL TILE

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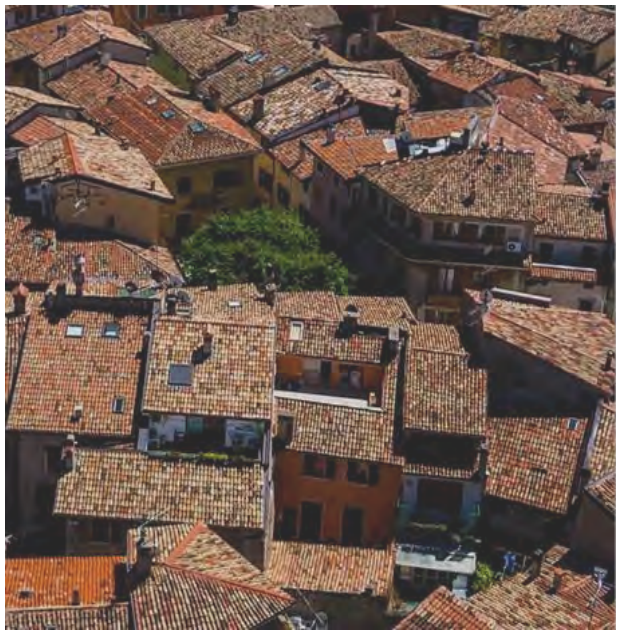
POLITECNICO
MILANO 1863

Framework



The decarbonization of the building sector requires a massive use of PV systems:

- A relevant part of existing buildings has **a pitched tile roof**
  - About 30% of the Italian building stock (12.5 million buildings) was constructed before 1945 (i.e. they are historical buildings)
- To achieve the decarbonization goal, the solar potential on the **new constructions** must be maximized
  - New constructions grow rate is 2.5% and will have mainly pitched roofs

Problem

Currently the PV modules are **not designed for building integration**, especially on tile roofs

They require mounting structures for installation, **are not cost-effective** and can **hardly adapt** to existing tile roofs.

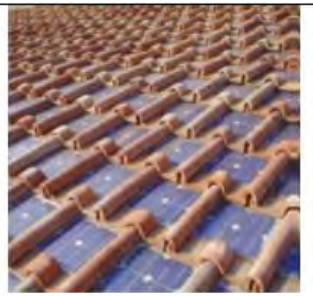
Existing solutions

Solutions based on photovoltaic modules

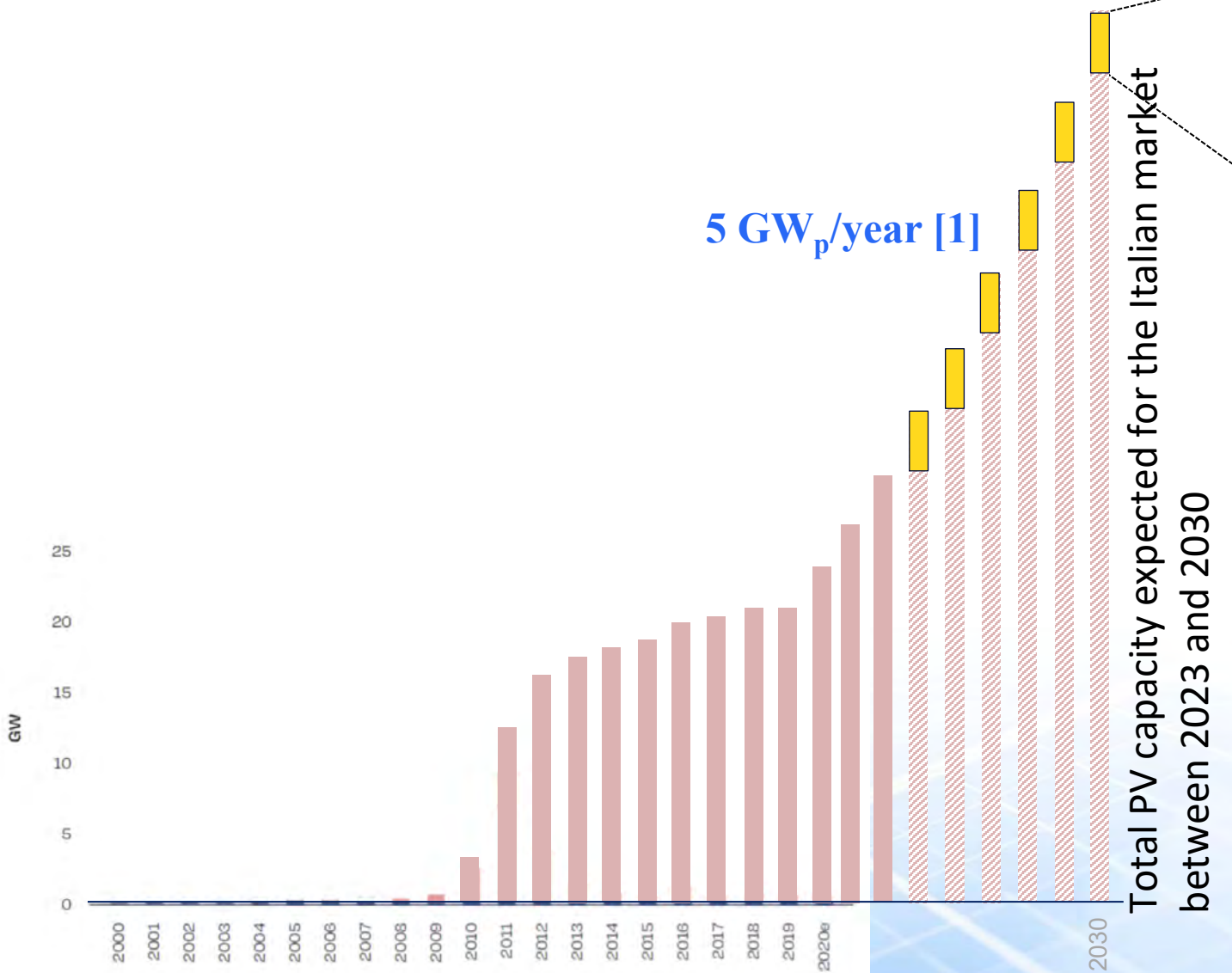
 Brandoni Solare, Aeternum Crystalline	 Wienerberger, Wevot x-Roof	 Met Solar, Laume	 Solarstone	 Solinso, Mystiek-1500
 Sangsolar, Flat tile	 Edilians, Tegola fotovoltaica Max	 Metsolar, Egle	 Romag, RI 6(32)	 Solarcentury, C21e

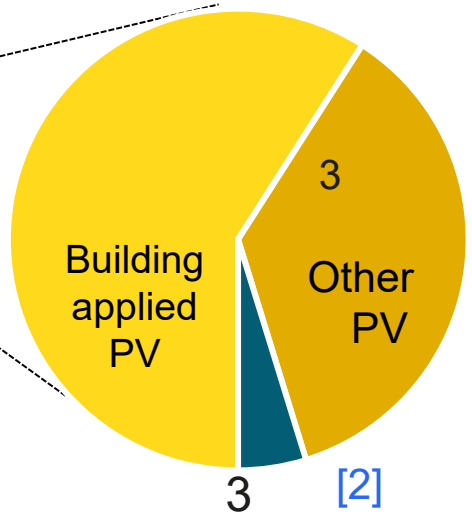
Existing solutions

Solutions based on photovoltaic tiles or shingles

 Solus, Solus Zonnedakpan SE_F.B.S.	 Star Unity, Sunny Tile	 ZEP BV, Ceramic Solar Rooftile	 SolteQ Group, SolteQ Quad38	 Fornace Fonti, Tegole DF2-DF3 Crystalline
 Industrie Cotto Possagno, E-Tegola	 Smartroof, Neosolpan	 Panotron, Panotron Solar-F	 Industrie Cotto, Possagno, E-Coppo	 Giellenergy-Tile, Crystalline

Market potential





Conservative scenario!

Building integrated PV (BIPV)

100,000
250,000
kW_p/year

BIPV market share

~3.000.000 tiles/year

[1] SolarPowerEurope, EU Market Outlook 2020.

[2] IEA PVPS, National Survey Report of PV Power Applications in Italy 2021.

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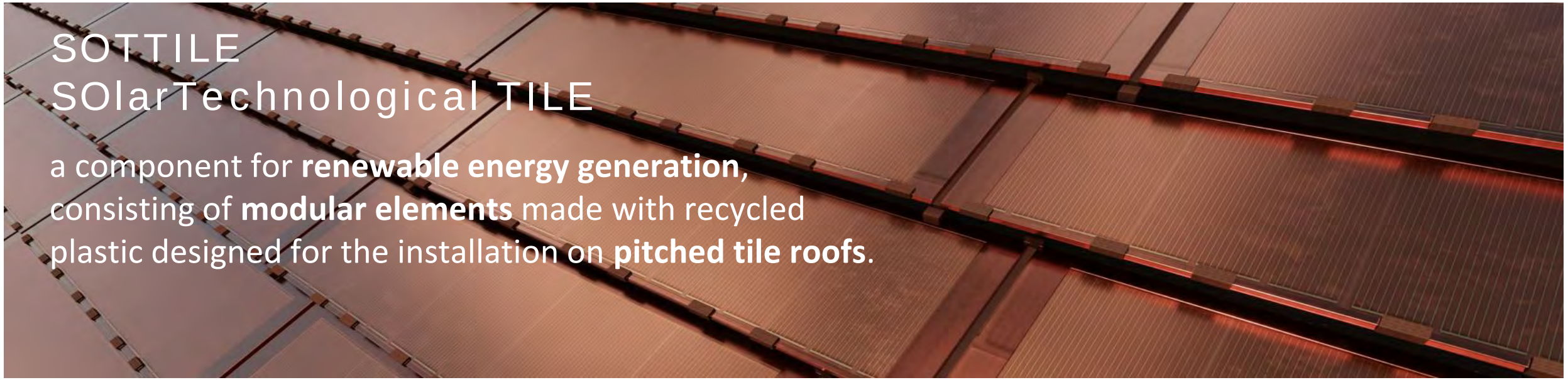


SOTTILE
SOlarTechnological TILE

a component for **renewable energy generation**, consisting of **modular elements** made with recycled plastic designed for the installation on **pitched tile roofs**.

Flexible

SOTTILE can be installed on existing roofs, even if not perfectly coplanar

Easy to install

SOTTILE can be installed by just one worker

Affordable

The solution is cost-effective

Waterproofing

The component is watertight

Wind proofing

The component avoid the air infiltration

Efficient

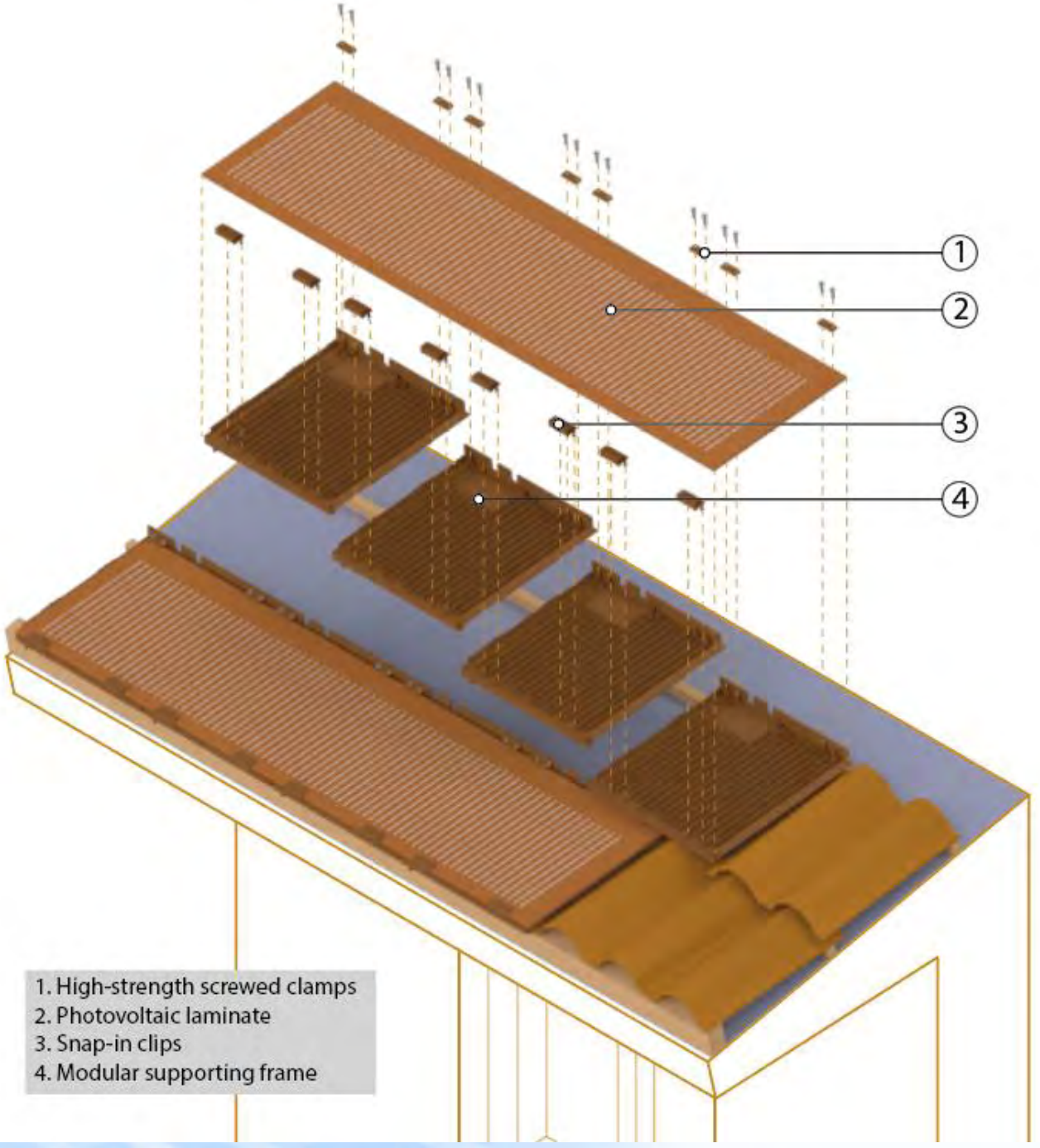
Up to 20%

Sustainable

Up to 70% of recycled plastic

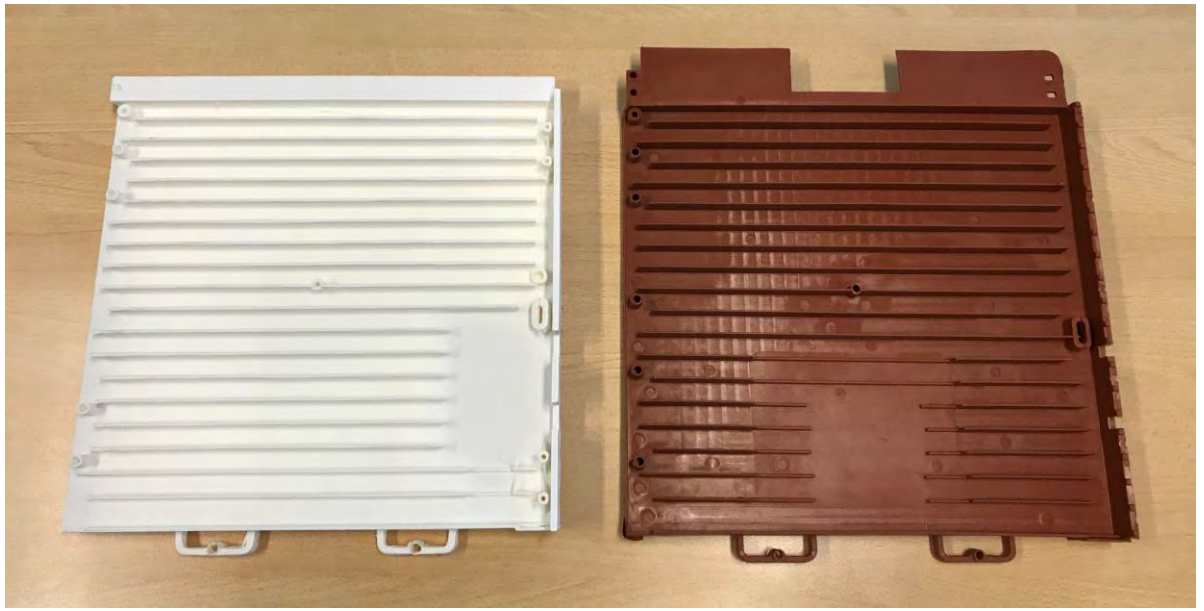
Key components

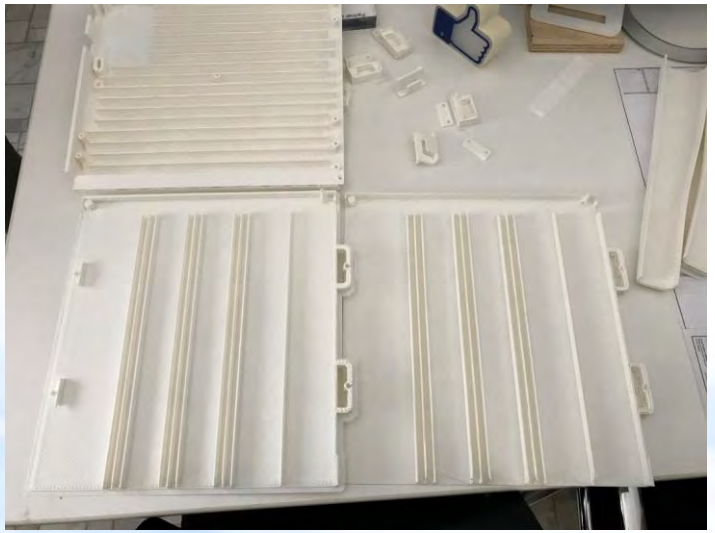
The component was designed with a **modular size** compared to traditional standard tiles, split in two main elements: the **photovoltaic laminate** and the **supporting frame**. The latter represents the interface between the photovoltaic laminate and the building's roof and therefore needs to perfectly match the traditional tiles in the middle of which it is inserted.



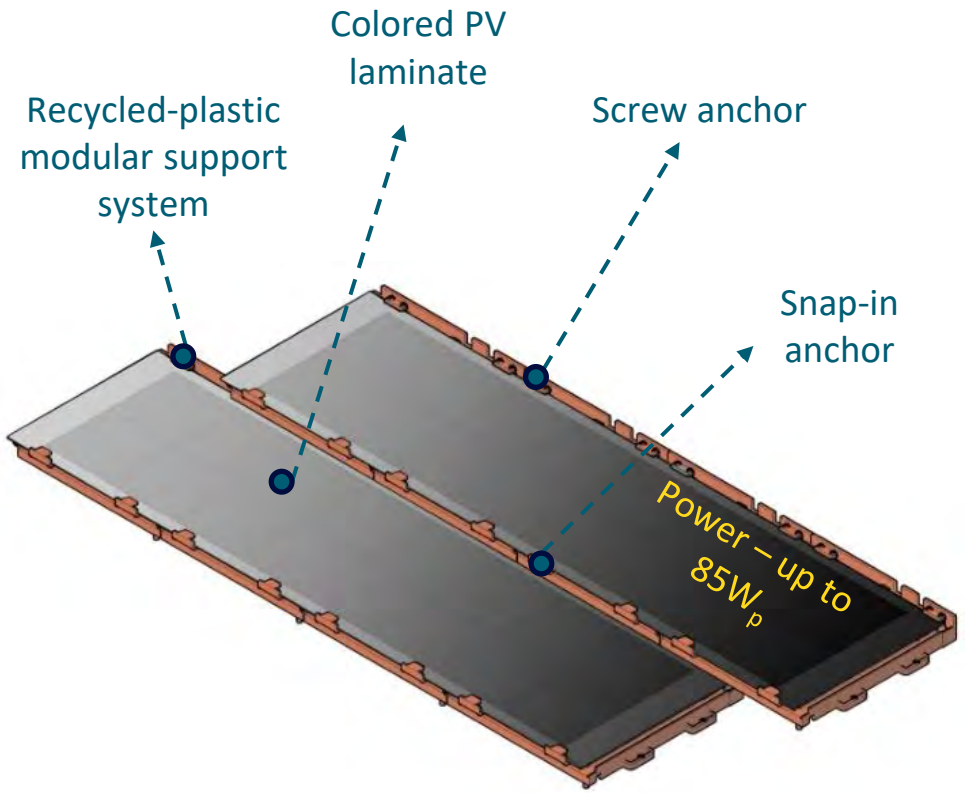
Key features

In order to meet expected requirements in terms of flexibility and lightness but also to minimize the embodied carbon, it was decided to manufacture the supporting frame with a specific plastic blend made from **up to 80% of recycled material**, able to be UV-resistant and self-extinguishing (classified as V2-UL 94).
The adopted plastic material consists of a mixture of Linear and Low Density Poly-ethylene (LLDPE/LDPE - 30%), High-Density Polyethylene (HDPE - 30%) and Polypro-pylene (PP - 40%). The latter provides a certain stiffness and strength, while LDPE and LLDPE guarantee a good





Key features

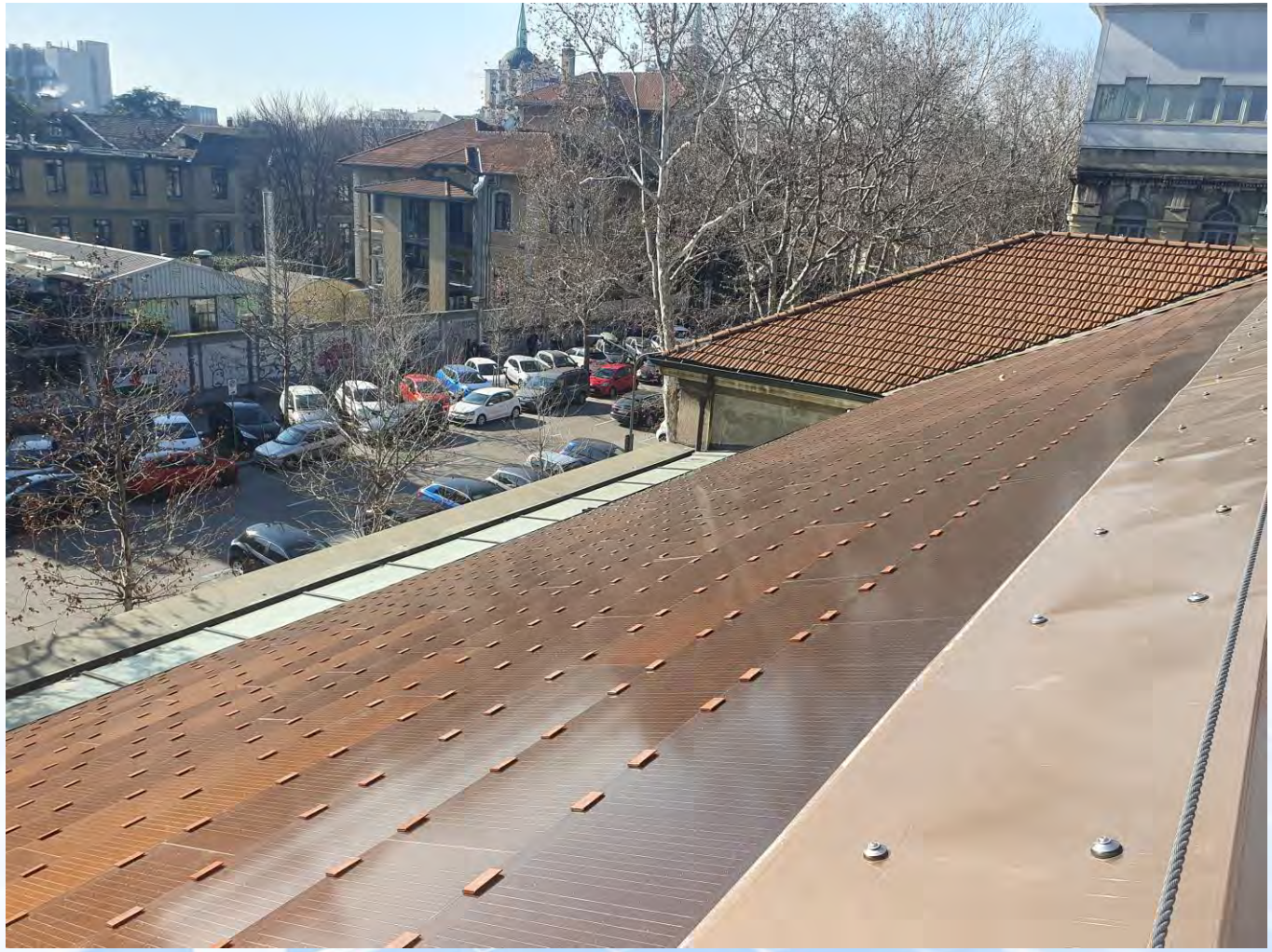


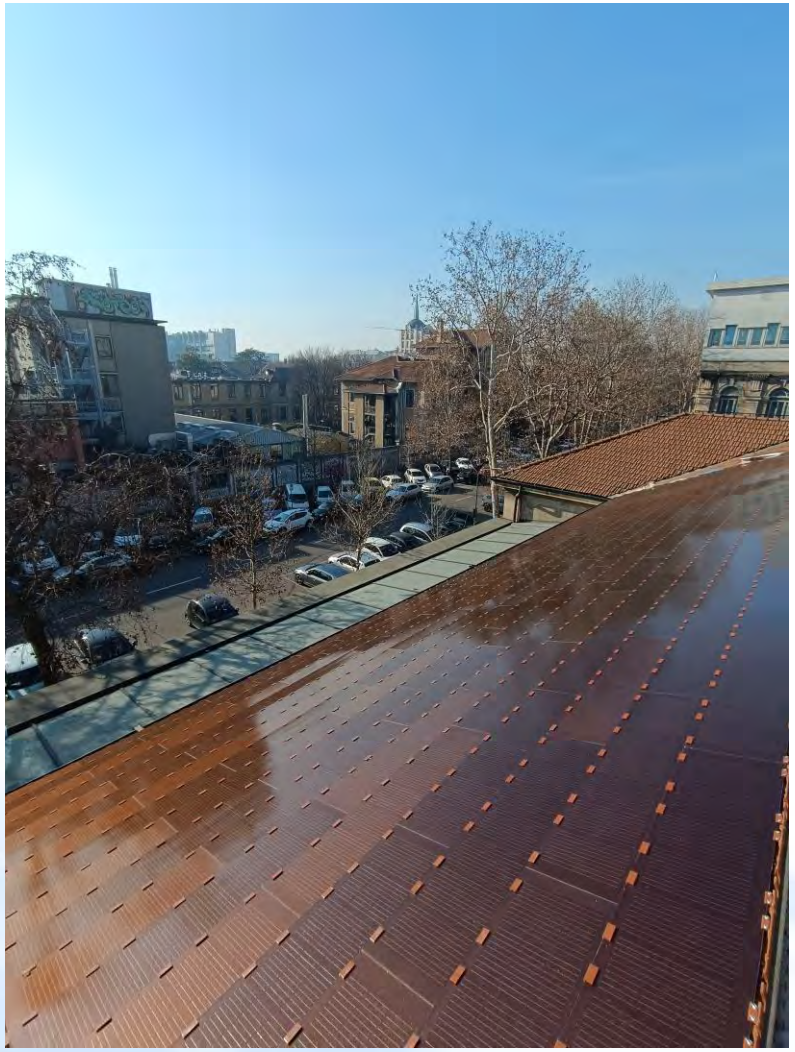
The waterproofing in ensured by the overlapping both of laminates, which create a main water flow plane, and of modular plastic elements, which constitute the waterproofing layer.

Circular economy compliance

- Use of **recycled plastic as a substrate** (around 55 $kgCO_2/kW$ - Data from LCA analysis carried out according to UNI EN ISO 14040:2021).
- Total **absence of aluminium** in the component (e.g. for frames or support structures).
- Use of a state-of-the-art manufacturing process for the PV laminate, in order to unsure the classification as "**Low Carbon Solar Module**" according to the latest EPEAT (Electronic Product Environmental Assessment Tool) ecolabel (< 630 $kgCO_2/kW$).
- The entire system is mechanically assembled and **no glue/sealants are needed**. In the dismounting phase the PV laminate, the plastic layers and the metal screws can be easily separated at the building site, without the use of special tools, and then sent to recycling/reusing processes.

Installations





Installations

Installations

The company includes **experts, technicians and researchers**. Moreover, **two industrial partners** and **a university spin-off** are also involved in order to o ensure competitiveness on the PV market.

ZH guarantees the perfect design for PV building integration and continuous research update

The industrial partners ensure a robust, efficient and cost-effective value chain

PROS

Short time to market

Robust and efficient supply chain

Cost effective delivery

Continuous research update

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Thank you!

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