Unlocking the C&I rooftop market with Sunman’s lightweight solar applications
Unlocking the C&I Rooftop Market with Sunman's Lightweight Solar Applications

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Annual PV capacity to exceed 500 GW in 2024, estimated >40% annual capacity will come from rooftops

- BNEF: Newly added PV capacity will surpass the 500 GWp mark in 2024.
- Earlier forecast by SolarPower Europe: Rooftop solar will make up >40% of added global capacity each year.
An estimated 40% of C&I rooftops cannot install glass modules because of structural limitations…

- When buildings fall under the 15 kg/square meter load-bearing threshold, roof reinforcements are required to install solar, which is expensive and disruptive to on-site activities…
Demand for lightweight solar is Real

Customer Request #1:

Many thanks for your email. Let me present our project:

1. Our Company is planning to construct solar power plant on our shed roof of the factory (photo attached). Due to the low static bearing capacity we will install ultralight PV modules:

Customer Request #2:

Overall, the site assessment confirms that the site can accommodate solar PV well in the outlined 4 key areas. The overall infrastructure can accommodate 1,500kW+ Solar PV system with the only limitations being the roof areas, and the structural strength of the roof. There are structural challenges on two of the key roof areas that are limited by roof load. This is due to the complexity in design, and span of these main

Customer Request #3:

我下午去看这种厂房就是承重不足的
Can’t install glass modules?
Uncover the potential of lightweight solar
Sunman at a Glance

• Founded in 2014, Sunman is an Australian Solar Company.

• Successfully commercialized the world’s first ultra-light solar module “eArc”.

• eArc is based on market-proven crystalline silicon cell technologies and innovative in its patented encapsulation system.

• Capacity: 1 GWp in Jiangsu, China (3 GW planned).

• Delivered 600 MWp shipments since inception.
eArc at a Glance

- Ultra-Light
- Flexible
- Higher Safety
- Durable
- Fast-Installation
- Aesthetic
- High packing density for transportation
A high-level comparison with glass modules

<table>
<thead>
<tr>
<th>Glass</th>
<th>eArc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy and rigid - 15 kg/m²</td>
<td>Ultra-light 2.8 kg/m²</td>
</tr>
<tr>
<td>Labor and equipment intensive installation process</td>
<td>Fast Installation c.50% savings in labor costs</td>
</tr>
<tr>
<td>Significant usage of glass, steel, aluminum exposes to commodity price inflation</td>
<td>Lower commodity usage in module and sub-structure c.33% savings in structure costs</td>
</tr>
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</table>
eArc shares the same supply chain as glass modules

- **Cell-agnostic**: insulated from upstream technology swings, such as PERC replacing Al-BSF and TOPCon replacing PERC.

- **Highly scalable** with similar CapEx intensity as glass modules.

- **Shorter supply chain for non-silicon BOM**: Does not require localized supply of solar grade glass and metal, facilitates supply chain re-shoring.

Huge beneficiary of large supply chain Investments. (~$130 Billion in 2023)
Sunman’s “3M” operational model

- **Material**: R&D and mass-production capability for proprietary composite materials (front and back sheet).
- **Module**: Automated GW-scale lightweight module manufacturing lines with state-of-the-art equipment and intelligence systems.
- **Mounting**: Ability to develop and provide total mounting solutions around lightweight solar modules for various application scenarios.
Complete Certifications for Global Deployment

eArc is the first module of its kind to pass the IEC 61215:2016, IEC61730:2016, UL61730 (USA) and CGC (China).
Further Durability Testing

- Dust Testing
- Salt Mist Corrosion Testing level 8
- Ammonia Testing
- PID Testing
- Straightforward Module Bankability Testing
High performance modules built for the C&I Market

- 520W 144 half-cut cell
- 182 mm PERC cells
- SMF (frameless) or SMH (pre-integrated with mounting brackets)
- 2.8 kg/m² or 4.1 kg/m²
- New TOPCon product TBA (2024)

SMF520J-12X12UW
7.7 KG (2.8 KG/m²)

SMH520J-12X12UW
11.1 KG (4.1KG/m²)
How to install lightweight solar modules?
What is “Quick-Bonding”?  

**Quick-Bonding** is a mature construction technique, proven in the building and automotive industry for over 60 years. (Similarly, Sunman modules can be glued or “bonded” onto various roof substrates)

- Silicone has the same chemical base as “sand” and “quartz”, thus highly resistant to weathering and UV radiation.
- The global structural silicone market size was valued at $38.1 billion in 2021, projected to reach $81.6 billion. (2031)
- All silicones undergo rigorous testing based on mature standards before being introduced into the construction industry.
- Tests focus on adhesion, cohesion, and durability, including weather-resistance, UV, temperature extremes, and chemicals.
Typical fixing methodology

Taken from “Sunman Lightweight PV Solar Module Installation: Desk-study - Structural application guideline for the German market”

Joint study conducted by global structural engineering firm partner: ARUP
Structural Benefits:
Sunman Modules VS Traditional Modules

In contrast, Sunman panels offer a distinct advantage. Their design ensures a more even distribution of load across the panel due to the evenly dispersed glue lines. This characteristic minimises the risk of localised stress on the roof, particularly in critical areas like edges and corners. Consequently, Sunman panels are a preferred choice for installations in such regions, eliminating potential concerns associated with traditional panel installations.

“Sunman Structure process assessment and methodology”: Technical white paper conducted by Australian Structural Engineering Partner gamcorp
System Level Durability: 160 km/h wind-tunnel test

- Module glued on substrate at 45 degree slope.
- Build up of windspeed from 25 m/s to 45 m/s.
- Wind tunnel test peak at 45 m/s for continuous 10 minutes.
- No failure or detachment of glue and module from substrate.
Market Applications
Evenly apply glue to the peaks of metal roof profile (>10mm width).

Ensure that the ends of aluminum tubes lay between panels.

The spacing between lines of glue is ≤520mm, and when the overhanging part of the module is >50mm, use aluminum square tube.

Aluminum square tube is required to be aluminum profile 6063-T5/T6, anodized AA10 or above.
C&I Applications
Metal Roofs – Quick-Bonding

China | 30 MW
C&I Applications
Metal Roofs – Quick-Bonding

Netherlands | 3.2 MW
C&I Applications
Metal Roofs – Quick-Bonding

Germany | 3.9 MW

Germany | 1.8 MW

Australia | 235 kW

China | 6.7 MW
C&I Applications
Membranes and Flat Roofs – Quick-Bonding

1. Clean the roof with the cleaning agent specified by Sunman. Apply the recommended glue that is appropriate for the roofing material.

2. Place tube onto the glue lines and put another layer of glue on the top side of the tube.

3. Place panels in the manner displayed in the diagram. (430W correspond to 5 tubes, 520W correspond to 7 tubes)

4. Ensure a single panel is not mounted on two tubes – expansion and contraction of the tubes may cause issues, such as deformation of the panels.
C&I Applications
Membranes and Flat Roofs – Quick-Bonding
C&I Applications
Membranes and Flat Roofs – Quick-Bonding

France | 1 MW
Switzerland | 4 MW
China | 3 MW
Greece | 450 kW
C&I Applications (SMH)
Metal / Membrane Roofs – Mechanical Fixation

1. Structure of bracket
   1. Base
   2. Hex bolt
   3. Clamp

Assemble the bracket.

2. Install the bracket onto the prefabricated panel.

3. Apply glue to the base.

4. Paste the modules.
C&I Applications (SMH)

Metal / Membrane Roofs – Mechanical Fixation

China | 9.9 MW
Other Applications

EV Charging Infrastructure and PV Carports

World's First Retractable Solar Carport
Switzerland | 420 kW

PV Carport
China | 143 kW
Other Applications

Facades

- China | 1 MW
- Norway | 200 kW
- Germany | 30 kW
Other Applications

Vehicle Integrated Photovoltaics

Hong Kong, China  
Netherlands  
Switzerland
How to install “PV Everywhere?”

40% of the built environment in C&I cannot install glass panels due to structural limitations. Lightweight solar offers an opportunity to target new applications in a homogenous market.

Lightweight solar modules can be differentiated product in your portfolio to expand your business....
Thank You

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www.sunman-energy.com
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