



25 years innovation in power

# Leading Architecture Integrated Photovoltaics

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BIPV

▼ Stavros Niarchos Foundation Cultural Center (SNFCC) | Architect: Renzo Piano





# Overview

## Building-integrated photovoltaics

<b>Impressions</b>	<b>4</b>
<hr/>	
It is surprising how harmoniously sustainable energy generation follows the lead of architecture. Technology has cast off adolescence and achieved maturity and flexibility.	
<b>Design</b>	<b>11</b>
<hr/>	
New methods have enabled accents and nuances. Subtle playing with invisibility is achieved just as successfully as an uncompromising display of technology as a design element.	
<b>Profitability</b>	<b>15</b>
<hr/>	
The prescience of Perpetuum Mobile manifests itself in the building when integrated photovoltaics transform costs into returns.	
<b>Safety</b>	<b>16</b>
<hr/>	
Integrated systems form the framework of the design. The top priorities are safety and adaptability.	
<b>Cooperation</b>	<b>29</b>
<hr/>	
Individual consulting services are embedded into a project road map that ranges from a draft all the way to realisation and operation. The interfaces are open.	
<b>Responsibility</b>	<b>31</b>
<hr/>	
Shaping the future comprises all areas of a living environment. In daily work, responsibility becomes the foundation of entrepreneurship.	
<b>Company</b>	<b>35</b>
<hr/>	
The vision of one man has been inspiring and shaping the company for 25 years.	

# Facade integration

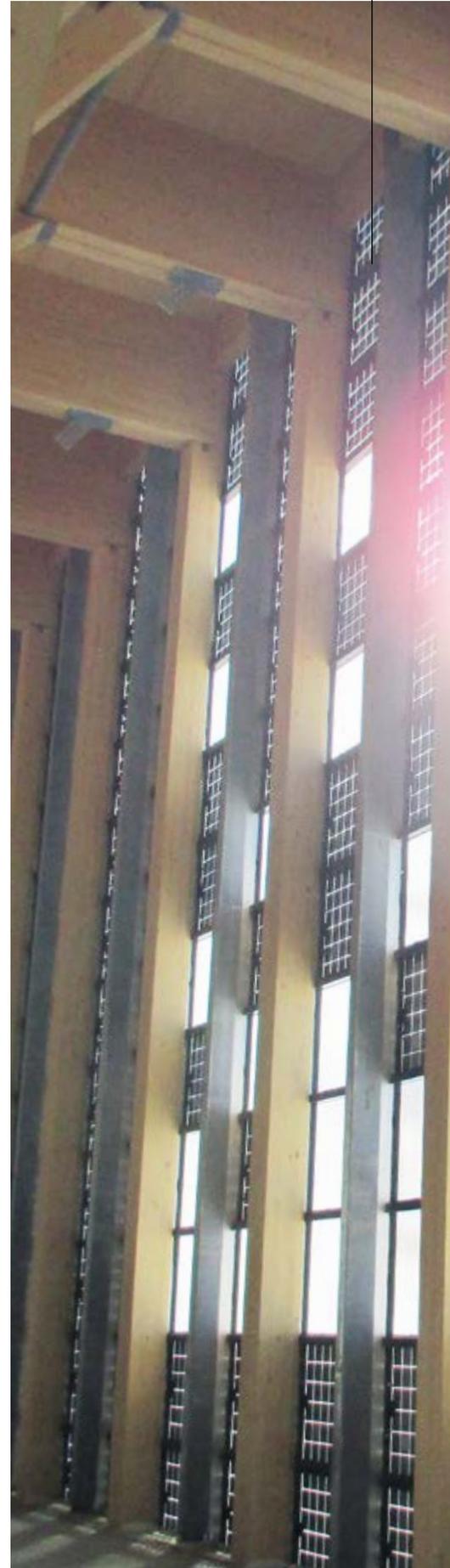
FAST facade system | 20

Individual colours | 12

NICER integrated system | 24



▲ Apartment building in Ostermundigen



▲ Valley station Klein Matterhorn



# Roof integration

Uniform appearance | 12

LEVEL integrated system | 22

NICER integrated system | 24



▲ Residential building in Pfäffikon ZH



▲ Schüwo Park | Ice rink Wohlen

Customized shapes | 11



Border modules | 25



Snow guard | 25

# Open structures

Carport | 24



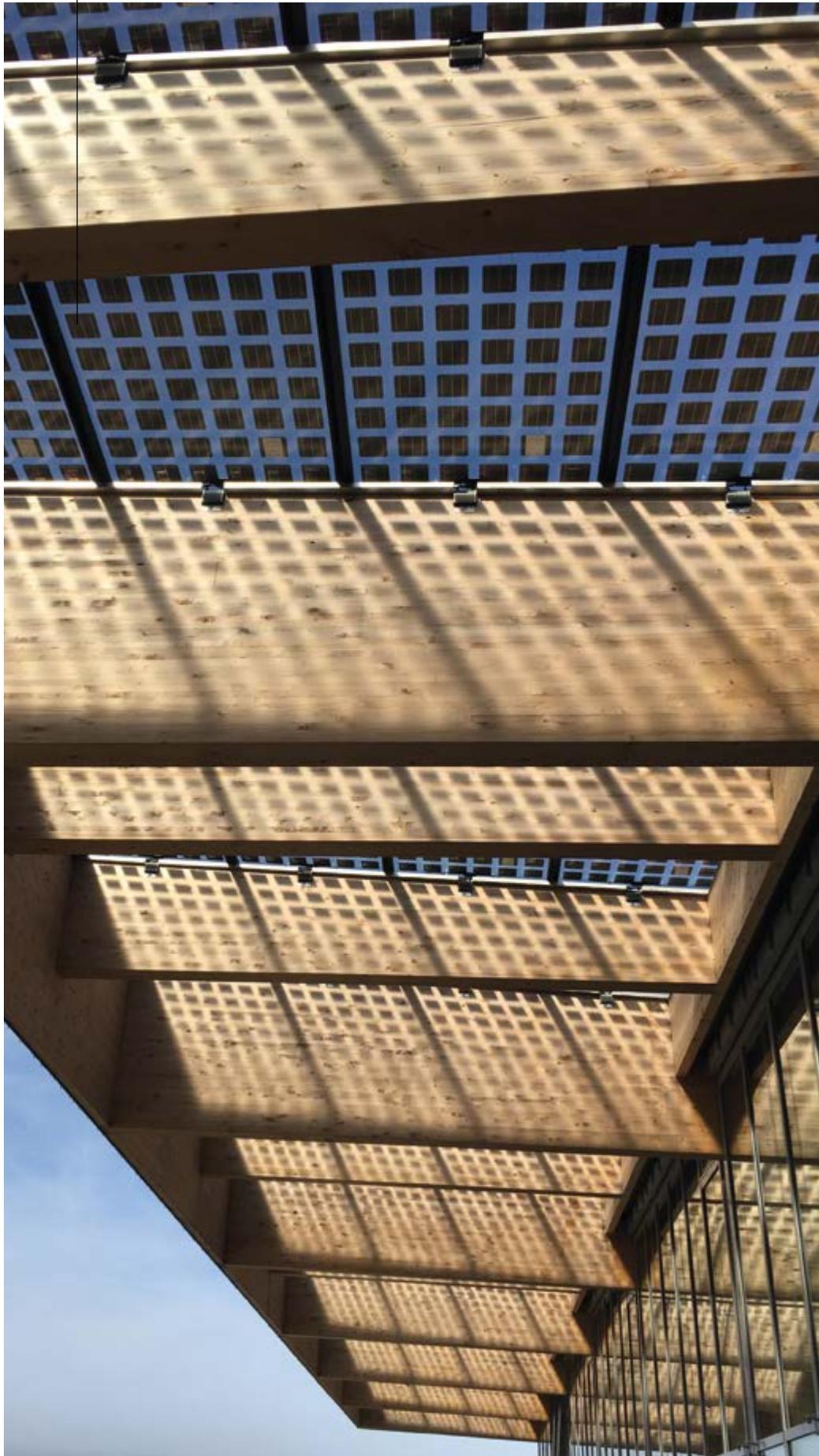
▲ Weidenbach Storen AG | Deitingen

Pergola | 24



▲ Private house in Wattwil

Hangar | 24





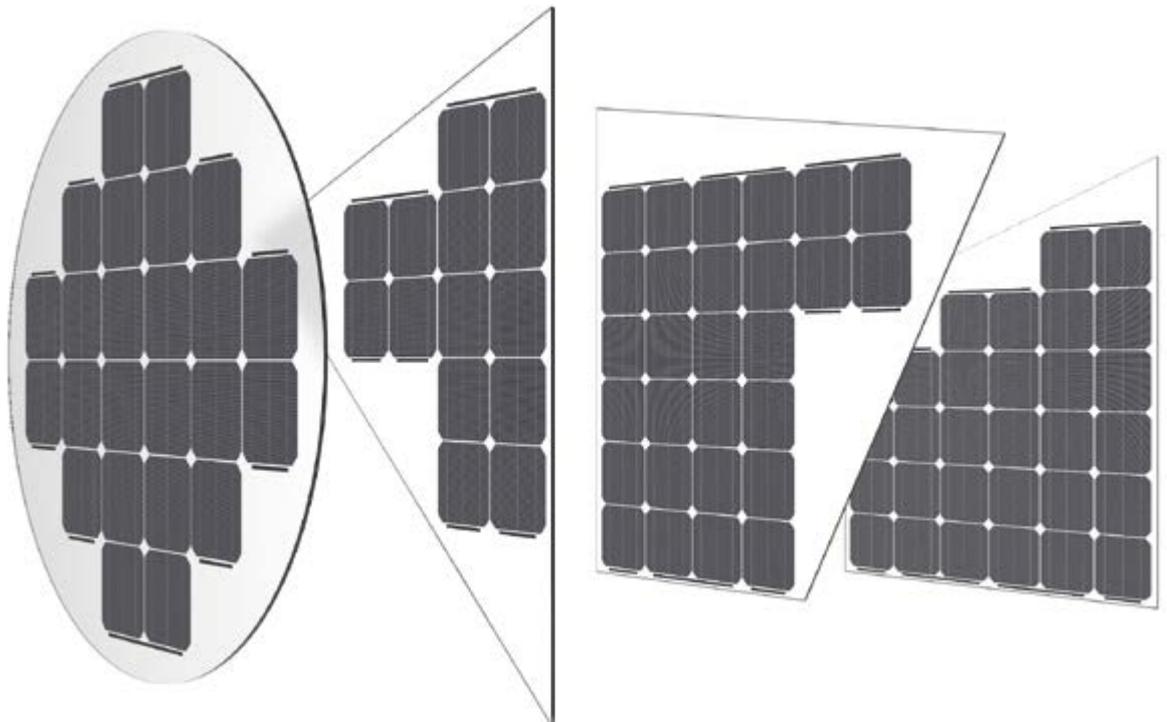
# Completed metamorphosis

Solar modules are concluding their development towards a freely designable building material. The design of this building material starts with the vision of the overall project. Three steps lead from the central idea to the solar module.

# 1

## **The grid defines the shape, size and power of the solar modules**

Rectangles, triangles, polygons, circles, curves, cut-outs: the free choice of the solar modules' geometries is the starting point for the design. The measurements range from 300 x 500 mm to 2500 x 4200 mm. Glass thicknesses of 2-12 mm per pane can be processed. Cost advantages are achieved by using the standard size of 1634 x 986 x 8 mm. The degree of hardening (TVG, ESG) can be chosen freely.



Special shapes

## 2

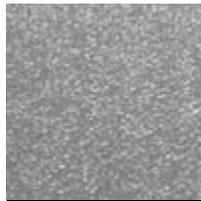
### The appearance determines the surface of the solar modules

The full spectrum of the material «glass» is available for the design. Structures and finishes of surfaces are possible, along with the targeted use of reflections. Solar glass is the basis of most integrated solar modules, due to its subtle structuring and highest efficiency. This structuring ensures a high light absorption and minimal glare.

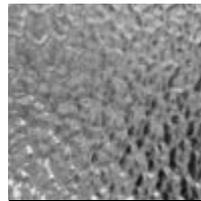
Glass structures



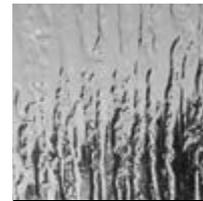
Standard solar glass



Satinated glass



Deeply structured (1)



Deeply structured (2)

Colour structures



## 3

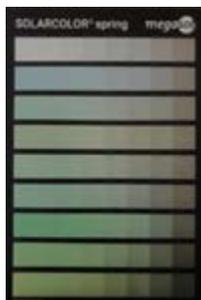
### The character results from the colours and their intensity

**Colour:** The colour of the solar modules is open. It is possible to design with light pastel tones, as well as with rich earthy tones. Three sources can be used for the choice of colour:

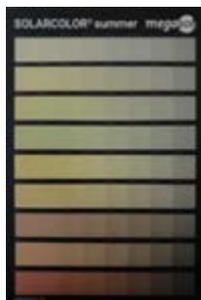
- > Megasol colour chart (time and cost-efficient)
- > NCS colour chart (wide colour spectrum)
- > Individual colour development (completely open)

High colour intensities (opacity) make the cell structure disappear, keeping the solar secret of the building envelope. Light intensities, on the other hand, allow a technoid impression and performance up to 95% of a conventional solar module (up to 175 Wp/m<sup>2</sup>).

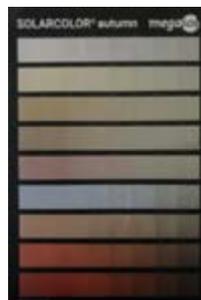
**Black:** The classical pinstriped look allows accents with the help of technology. This design option is the most efficient both in terms of performance and costs. By concealing the busbars (cell contacts), discretion can be increased, so that the technology is only visible at second glance. This design option is known by the name of «Full Black»



Palette «Spring»



Palette «Summer»



Palette «Autumn»



Palette «Winter»



Full Black



▲ Coop Letzipark Zurich | Solar facade with individually coloured modules



# From costs to yields

Solar integrations are profitable investments. The reasons for this are, firstly, that the additional investments compared to conventional building envelopes represent a fraction of the total project costs. Secondly, solar building envelopes generate yields and amortise within a few years. In the period after that, they generate earnings and become profitable power plants. Two examples.

## Workshop with 10 employees

Location: Lausanne
Orientation: west
System: NICER roof-integrated system
Module type: glass-film, with frame
Colour: deep black
Surface: 300 m <sup>2</sup>
Power: 52.8 kWp
Annual yield: 51'000 kWh
Gross investment incl. VAT: CHF 108'000
Substitution conventional roof: CHF 23'000
Net investment: CHF 85'000
One-off grant <sup>1</sup> : CHF 19'552
Return <sup>2</sup> : 6.2%
Break even: 15 years
Profit over lifespan: CHF 111'000

## Office building with 20 employees

Location: Zurich
Orientation: east
System: FAST facade system
Module type: glass-glass, frameless
Colour: slate grey
Surface: 500 m <sup>2</sup>
Power: 75.0 kWp
Annual yield: 40'000 kWh
Gross investment incl. VAT: CHF 371'000
Substitution glass facade: CHF 297'000
Net investment: CHF 74'000
One-off grant <sup>1</sup> : CHF 27'100
Return <sup>2</sup> : 11.5%
Break even: 8 years
Profit over lifespan: CHF 231'000

### <sup>1</sup>One-off grant

The one-off grant is a subsidy model for solar systems by the Swiss federal government. It covers around a third of the investment. Additional contributions from the buildings programme for energy-efficient renovation are not yet included.

### <sup>2</sup>Rate of return

Yields and returns are project-specific and depend on factors such as irradiance values, project design and development of electricity prices. They take into account inflation, capital costs, discounting, tax benefits and reinvestments. Customized profitability studies can be provided upon request.

# Glass-glass solar modules

There is a distinction between two solar module types: glass-film and glass-glass modules. In the glass-glass type, two panes are combined into one solar module. They become laminated safety glass and therefore have unique properties.

## Areas of application

The use ranges from facades and railings to roof-integrated and rooftop applications.

## Properties

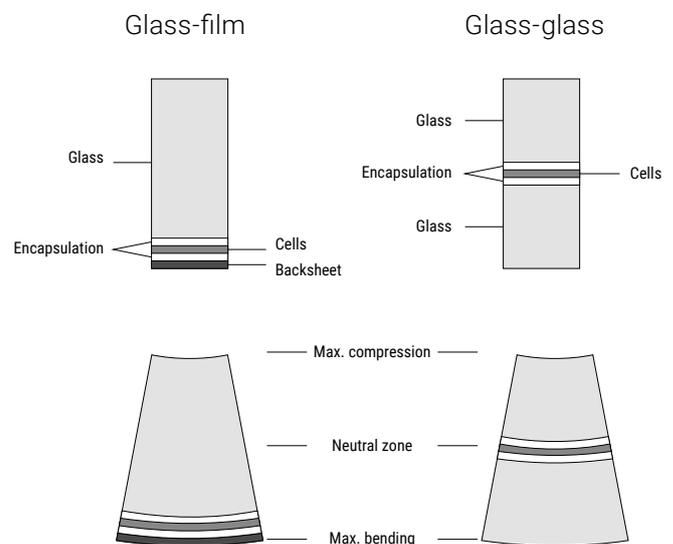
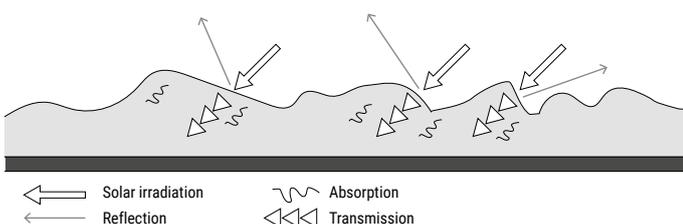
Front and back glass in combination with durable encapsulation material protect the components from vapour penetration. In the «neutral zone» between the panes, the cells remain stress-free (no compression or bending) which reduces the occurrence of so-called micro cracks. This results in a potential lifespan of over 50 years. Free design scope, high durability and stability characterise this solar building material. All glass-glass modules can be designed freely. Glass-glass modules are manufactured in Deitingen SO, Switzerland.

## Type of installation

Glass-glass solar modules can be installed both with or without frames. The mounting systems FAST, LEVEL and NICER are especially suitable for the integration of glass-glass solar modules.

## Non-glare solar glass

Particularly anti-glare surface structures are used.



## Technical specifications

Cell type: Mono / Mono PERC / Poly

Cell size: 156.75 x 156.75 mm

Typical power (Full Black)\*: 185 Wp / m<sup>2</sup>

Typical power (colour)\*: 140-175 Wp / m<sup>2</sup>

Encapsulation material: EVA or PVB

Glass thickness per pane: 2 - 12 mm

Hail resistance: Hail protection class 4 or 5

Fire protection: Top and back layer are made of heat-resistant glass. The component is considered to be non-combustible material as defined by the Cantonal Fire Insurances.

\* The square-metre performance of the module depends on the specific format.





▲ Football stadium LIPO Park Schaffhausen | 1.4 MWp | 8'707 m<sup>2</sup> NICER solar modules (roof and facade)



# FAST facade system

## Curtain facade structure for solar modules

### Areas of application

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FAST is suitable for all areas where curtain wall systems are used. This includes single-family houses, apartment buildings, high-rises, etc.

### How it works

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The solar modules with backrails are placed into the horizontal profiles and folded up like a tilting window. They are fixed by a slide safety catch. Later dismantling is possible without restrictions.

### Flexibility

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Glass-glass modules used on the facade are usually custom made. Their shape, colour, size and surface can be individually designed. Price advantages can be achieved when using the standard measurement (1634 x 986 mm).

### Compatibility

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The FAST facade system is compatible with vertical structures in all standard materials (wood, aluminium, steel).

### System interface

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The adhesion of the backrails on the rear side of the module takes place in-house.

### Type of installation

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The mounting is concealed by means of backrails on the rear side.

### Installation time

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10 m<sup>2</sup> / man-hour (experienced installation personnel)

### Components

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- > Glass-glass solar modules with SSG adhered backrails and mechanical support
- > Horizontal rail, slide safety catch
- > Vertical structure as well as consoles/spacer screws are often provided on site. If required, they are part of the package.

### Technical specifications

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Solar module type: glass-glass (colours, shapes, thicknesses, surfaces can be freely defined)

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Vertical adjustment: +/- 3 mm, on the front  
also possible after mounting

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Typical span width of the horizontal profile: 800 mm

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Fire protection: structure consists of aluminium. The component is considered to be non-combustible material as defined by the Cantonal Fire Insurances.

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Vertical support: mechanical (lower edge of solar module)

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Video and technical documentation:  
[megasol.ch/en/fast](https://megasol.ch/en/fast)



1 Apply transverse profiles to the vertical structure of the building.



2 Place module, inclination is possible for cabling.



3 Secure module temporarily and adjust, +/- 3mm also possible after mounting.



4 Secure module and place next module.



**Option:** Concealed mounting



**Option:** Lateral adjusting screws for concealed mounting

# LEVEL roof-integrated system

## Overlapping solar roof coverage

### Areas of application

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LEVEL is used for pitched roofs, challenging roof geometries, individual roof integrations, as well as facades.

### How it works

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The holding hooks are screwed onto the roof battens. The sealing rails are fitted onto them. The solar modules are laid in. Later dismantling is possible without restrictions.

### Flexibility

---

Half and quarter modules with identical appearance are among the standard components of the system. The basic palette contains three colour versions. More complex design requirements (colour, surface) can be realised with individually designed solar modules.

### Compatibility

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The LEVEL roof-integrated system can easily be combined with all standard roof coverings such as roof tiles, shingles or aluminium composite panels. A skylight (Wenger Fenster) specially developed for the LEVEL roof-integrated system enables seamless integration. LEVEL can be equipped with an integrated snow guard.

### Type of installation

---

The system is laid overlapping, using the conventional or English method (horizontal offset).

### Installation time

---

10 m<sup>2</sup> / man-hour (experienced installation personnel)

### Components

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- > LEVEL solar modules
- > Holding hooks
- > Sealing rails
- > *Snow guard (optional)*
- > *Wenger skylight (optional)*
- > *Anchoring devices for personal protection (optional)*

### Sub-roof requirements

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- > Roof pitch above 25°: sub-roof for normal demands
- > 14° - 25°: sub-roof for increased demands
- > 6° - 13°: sub-roof for extraordinary demands
- > 0° - 5°: sub-roof with flat roof quality

### Technical specifications

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Solar module type: frameless glass-glass modules

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Modular dimensions: 1700 x 1016 mm

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Fire protection: Top and back layer are made of heat-resistant glass. The component is considered to be non-combustible material as defined by the Cantonal Fire Insurances.

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Rear ventilation: by means of wooden slats

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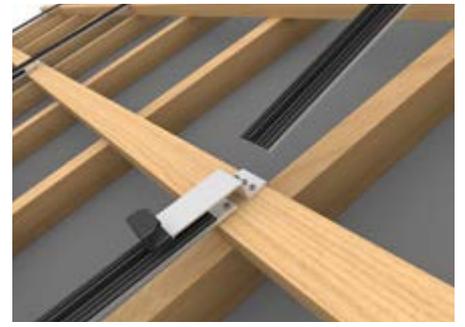
Video and technical documentation:  
[megasol.ch/en/level](https://megasol.ch/en/level)



**1** Roof battens 80 x 40 and 50 x 50 are fitted alternately in the grid.



**2** The rail hooks are mounted directly on the roof battens.



**3** The support rails can be pushed easily into the rail hooks.



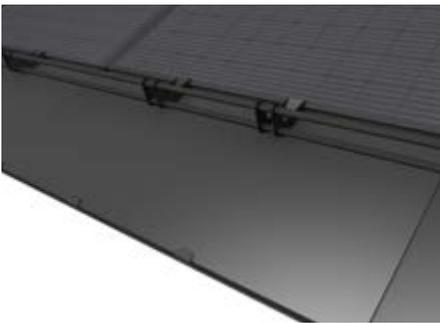
**4** Central hooks provide additional stability.



**5** The solar modules can be pushed up from below and laid in.



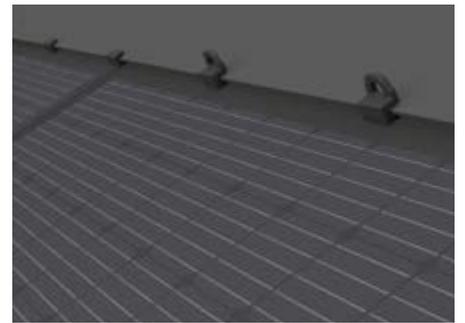
**6** The solar tile system allows individual layouts.



**Option:** Snow guard

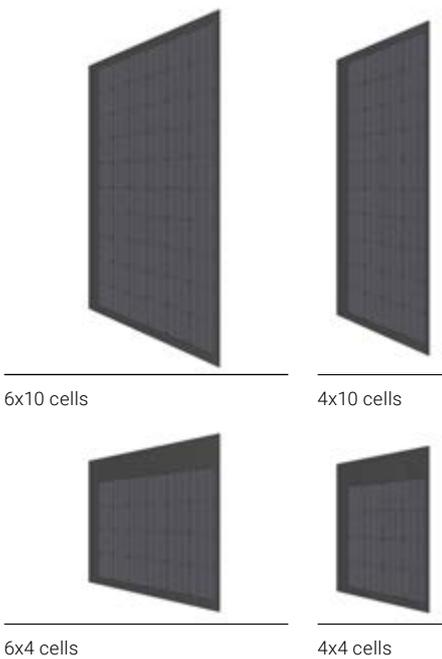


**Option:** Skylight



**Option:** Anchoring devices for personal protection

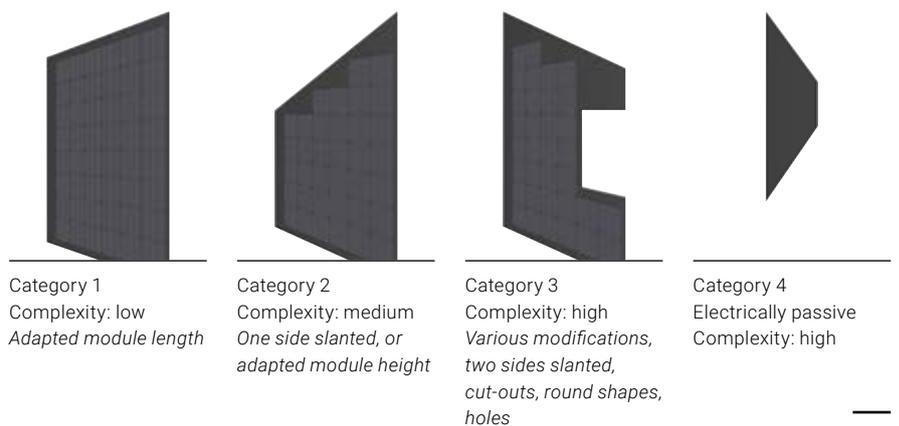
### Basic modules



### Colour variations



### Special solar modules



# NICER roof-integrated system

## Flush-mounted solar roof coverage

### Areas of application

---

Typical areas of use for NICER are pitched roofs, roofings of any kind, wood and steel constructions. The most frequently used roof-integrated system in Switzerland is especially suitable for flat inclinations up to 3°.

### How it works

---

Vertical supports are applied to the roofing battens. The modules are placed into the vertical supports and closed similarly to a car boot door. The modules are fixed with a snap lock. Later dismantling is possible without restrictions.

### Flexibility

---

NICER solar modules are available as black, white and translucent versions. Half and quarter modules with a comparable appearance are among the standard components of the system. Translucent NICER systems are particularly suitable for carports, hangars, stadium roofs or pergolas and provide targeted shading and sun protection with simultaneous use of residual light.

### Compatibility

---

A skylight (Wenger Fenster) specially developed for the NICER roof-integrated system enables seamless integration. NICER can be equipped with an integrated snow guard.

### Type of installation

---

NICER modules are installed flush-mounted and floating (horizontally and vertically).

### Installation time

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20 m<sup>2</sup> / man-hour (experienced installation personnel)

### Components

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- > NICER solar modules
- > Vertical rail
- > Roof ridge profile
- > Covering panel and ventilation grid
- > *Snow guard (optional)*
- > *Wenger skylight (optional)*

### Sub-roof requirements

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Canopy, carport, open warehouse, etc.

(buildings that do not have to be completely water-proof in practice)

- > No sub-roof necessary

Residential buildings, office buildings, closed halls, etc.

- > Roof pitch below 3°: sub-roof for increased demands
- > Roof pitch above 3°: sub-roof for normal demands

### Technical specifications

---

Solar module type: glass-film or glass-glass modules with frame

Modular dimensions: 1016 x 1653 mm

Fire protection: Top layer is made of heat-resistant glass.

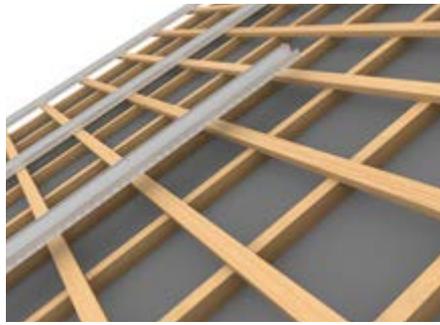
The component is considered to be non-combustible material as defined by the Cantonal Fire Insurances.



Video and technical documentation:  
[megasol.ch/en/nicer](https://megasol.ch/en/nicer)



**1** A steel or wood construction serves as the basis.



**2** The NICER rails are laid out and screwed onto the roof battens.



**3** The roof ridge profiles are then installed.



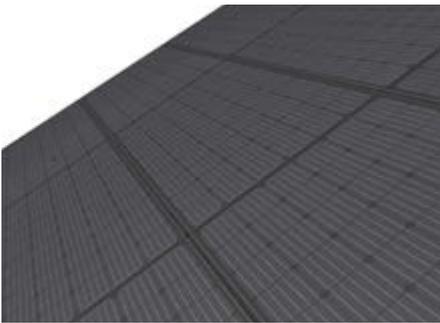
**4** The individual solar modules can simply be clicked in...



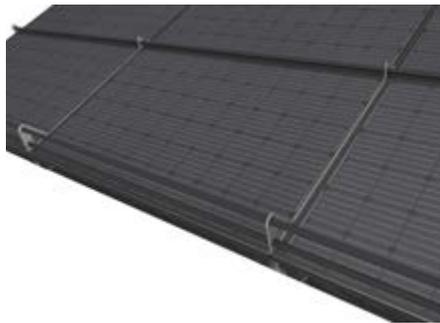
**5** ... and fastened.



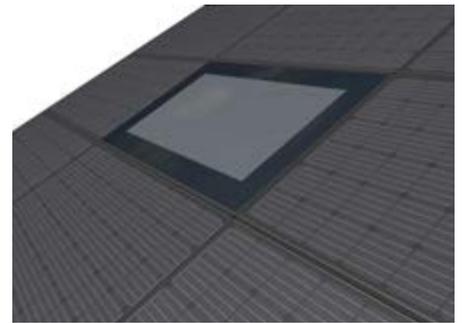
**6** Install the covering plate and ventilation grid.



**7** Completely installed, NICER is a water-proof roof covering.



**Option:** Snow guard



**Option:** Skylight

### Colour variations



Black



White



Translucent

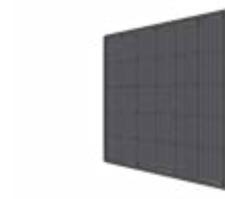
### Basic modules



6x10 cells



3x10 cells



6x5 cells



3x5 cells

# Solar tile

## Solar roof coverage for tiled roofs

### Areas of application

---

Solar tiles are ideally suited for small and medium-sized systems – both for new buildings and roof renovations. Typical areas of application are challenging roofscapes and locations with special requirements for historical site protection.

### How it works

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Modules and tiles are laid out on a conventional roof battens and fit seamlessly into each other. The absence of sheet metal flashing saves installation and material costs.

### Flexibility

---

This solar roofing system meets particularly high aesthetic requirements and is modularly expandable. Thanks to its horizontal and vertical flexibility, the system is also suitable for roof surfaces with obstacles such as chimneys, skylights or dormers.

### Compatibility

---

Solar tiles are compatible with the flat sliding tile FS 03 (ZR) and the hollow sliding tile MS 95 (ZR). They are available in the colour variations Full Black and Terracotta.

### Type of installation

---

Solar tiles are installed like normal roof tiles. One solar tile replaces four roof tiles.

### Installation time

---

The installation time corresponds to that of classic roof tiles.

### Components

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- > Solar tile (10 cells)
- > Alu clip for 24 mm / 30 mm battens
- > End rail for FS 03 / MS 95 tiles

### Technical specifications

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Solar module type: glass-glass modules with frame

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Modular dimensions: 890(-900) x 350(-380) mm

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Fire protection: Top and back layer are made of heat-resistant glass. The component is considered to be non-combustible material as defined by the Cantonal Fire Insurances.

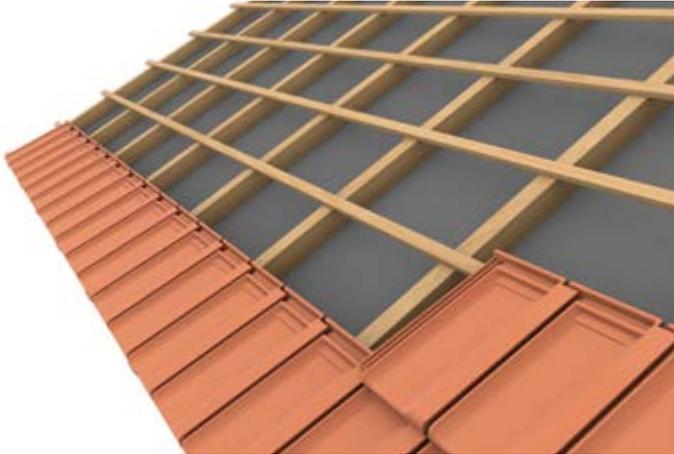
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Rear ventilation: by means of wooden slats

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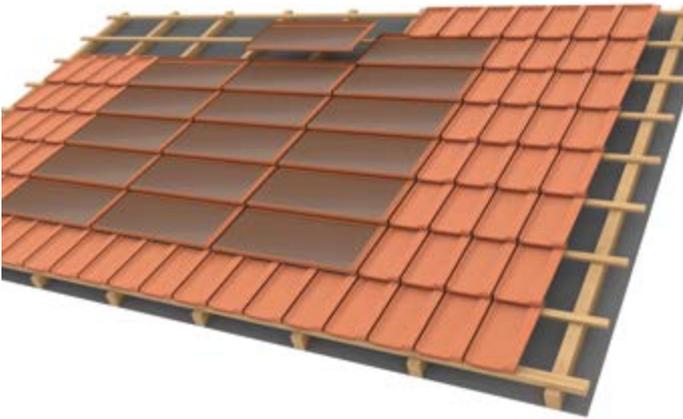
Technical documentation:  
[megasol.ch/en/solar-tile](https://megasol.ch/en/solar-tile)



1 Lay out the first roof tiles on a conventional roof batten.



2 Place one solar tile instead of four roof tiles.



3 Secure the module and place the next module.



4 Place the roof tiles over the solar tiles.

### Colour variations



Full Black



Terracotta



▲ Schlössli Wohlen | Cultural monument | LEVEL roof-integrated system with customized modules

# Expert consultation

Solar projects involve specific topics that required specific attention. A road map from the vision to implementation can contain the following milestones:

## 1

### **Gaining a shared understanding**

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The focus is on the vision and the planned appearance of the overall project. The first technical approaches are outlined. Preferences regarding interfaces and consultation services are discussed.

## 2

### **In-depth introduction**

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The doors of Megasol are open for partners. A production tour in Deitingen shows how the company works and where the integrated solar modules come from.

## 3

### **Rough concept**

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Guiding ideas flow into a rough concept and are formalized as system principles. It is possible to make substantiated statements about investment and profitability. The first samples follow.

## 4

### **Detailed concept**

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The design and the systems are worked out in detail and specified. Developments and formalities are carried out. Further samples follow and are approved.

## 5

### **Implementation**

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The solar modules are manufactured according to the agreed plans and designs. Support is ensured during the building phase and operation.

### **Support services**

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#### **Consultation:**

- > Detailed design options
- > Grid layout
- > Connection details / interfaces
- > String / inverter dimensioning
- > Specifications

#### **Formalities:**

- > EIV, ESTI, EEA

#### **Development:**

- > Colour development
- > Samples / mock-ups
- > Product development (special solar modules / substructure)



# Values as a solid foundation

Responsible actions form the cornerstone of the company. The aim is to create opportunities for others and therefore give back some of the success.

## Society

### **Social commitment**

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Megasol is committed to ecological and social sustainability projects in economically disadvantaged regions – for example Solafrica's *Solar Learning* initiative and the Women's Solar Project Nicaragua. The commitment includes material supplies for specific projects or financial support, which benefit local vocational training and build up competent young talent in the solar sector.

### **Manufacturing and research site**

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Forward-looking and regular investments in the production site in Deitingen as well as close cooperations with universities and technology partners set the relevant signals and help to strengthen Switzerland as a centre of research and industry.

### **Corporate culture**

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The corporate culture is based on a high degree of trust in the employees. Room for creativity and self-responsibility are the sources of its innovative strength and the continual development of the company. In China, the remuneration exceeds the local standard in terms of benefit-oriented promotion. All employees are provided with further training and language courses. The implementation of Swiss safety and health standards at both sites is a question of entrepreneurial conscience.

## Environment

### **Material and manufacturing**

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From the sourcing of raw materials to the completed solar module, manufacturing exclusively uses renewable energies. In Deitingen SO, the electricity necessary for the production is produced on site by means of a solar plant. The applied high-performance solar cells consist of high-purity silicon – free of cadmium, rare earths and heavy metals.

### **Recycling**

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The involvement with the Swiss foundation SENS and the European PV Cycle enables the reuse of almost 100% of the used material.

### **Electromobility**

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An own fleet of electric vehicles and free solar charging stations at the Deitingen production site reinforces the investment in future-orientated environmental technologies.

# Quality

## **Awards**

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Megasol is an award-winning company. 2018, it was awarded the *Top Brand PV* label by the independent market research institute EuPD. Many Swiss and European solar prizes testify to the trust that is placed in Megasol.

## **Certifications**

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The manufacturing processes are TÜV-tested and run in accordance with EN/IEC and ANSI/UL standards.

## **Traceability**

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Based on the individual serial number, all materials used for each solar module can be traced back to the raw material batch without any gaps.

## **Testing steps**

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Each individual solar module undergoes a multitude of test steps. These include electroluminescence tests, flash tests and visual controls. The company has its own test centre. Tests such as Damp Heat, Shockfreeze, UV Lifetime, Dynamic Load and Thermocycle ensure the durability of the solar modules.

# Politics

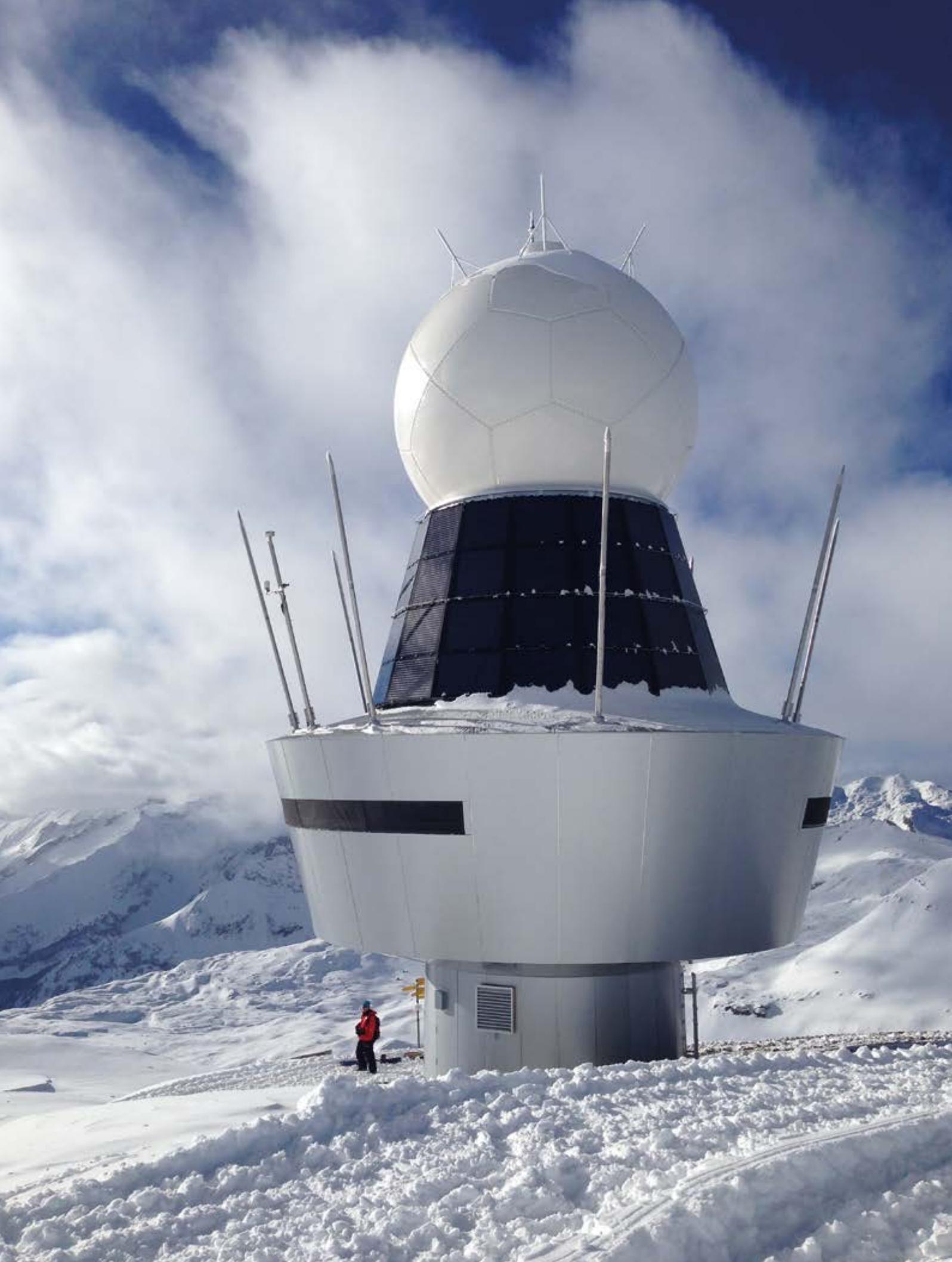
## **Involvement**

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Despite enormous potential, photovoltaics require strong voices in politics. Through memberships in industry associations and interest groups, Megasol is involved in sustainable progress. The focus in everyday life is on concrete steps: appearances at conferences, provision of comprehensive information material for voting and guided tours for schools and political parties – also for those who are traditionally critical of environmental issues.



▲ Single family house in Oberwil-Lieli | FAST facade modules on stone wall | LEVEL roof-integrated system



▲ Weather radar station Owarna | Pointe de la Plaine Morte VS | 2'922 m.a.s.l.

# Vision and vigour

## Founder

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Markus Gisler founded Megasol in 1993 in his youth. He directs the company as CEO and president of the administrative board. His vision led to the organic and continual development of Megasol Energy Ltd. The vision remains the driving force in everyday company life.

## Vision

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Solar modules by Megasol are intended as design material from which structures and pictures can be created. The integration of solar technology not only into buildings, but also into the living environment and consciousness of people, is the maxim.

## Locations

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The company consistently focuses on two locations. Development, administration and production are anchored in Deitingen SO, Switzerland. With a strong focus on customer proximity, individual design requirements can be met. 70 employees work in Deitingen. 120 employees work at the site in Ningbo, China, which specializes in large series and standard solutions.

## Partnerships

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The company has a wide network of architects, planning offices, investors, installers and operators. The company also fosters close partnerships with universities and both national and international research institutes.



Markus Gisler, Founder and CEO

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