

GENERAL[®]
MEMBRANE



GENERAL SOLAR PV[®]

WATERPROOF PHOTOVOLTAIC SYSTEM

**STOPPING THE WATER
CATCHING THE SUN**

Nola, the biggest BIPV plant in the world.



25 MWp



9 KWp



7 KWp



580 KWp



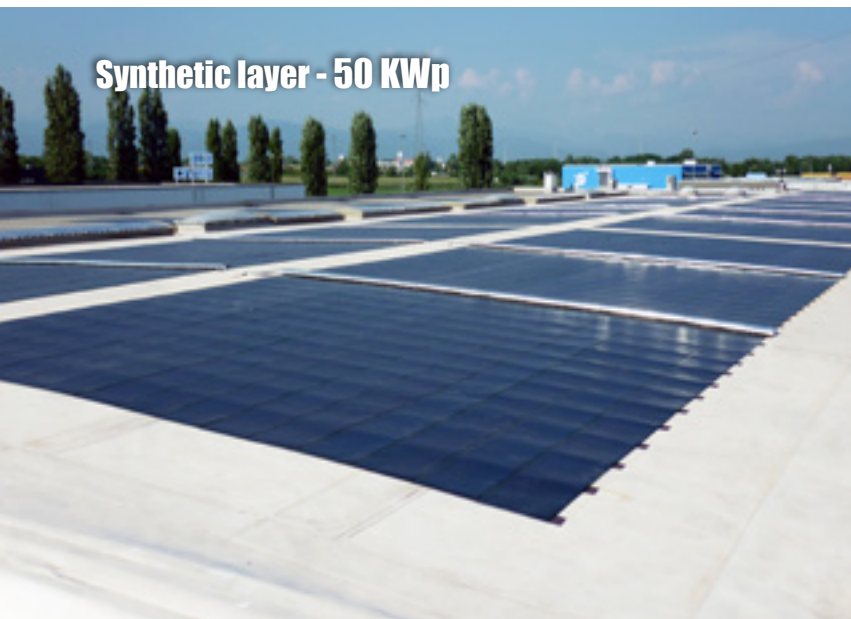
110 KWp



20 KWp



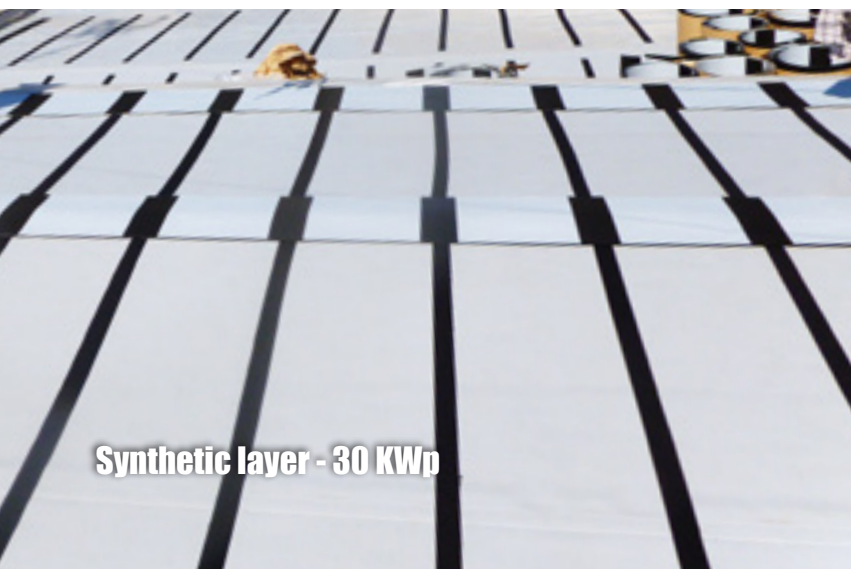
430 KWp



Synthetic layer - 50 KWp



Synthetic layer - 9 KWp



Synthetic layer - 30 KWp



GENERAL SOLAR PV®

STOPPING THE WATER, CATCHING THE SUN is the mission of General Solar PV, General Membrane's System.

General SOLAR PV is a flexible photovoltaic module conforming to European Standards EN 61646 and EN 61730.

General Membrane has developed General Solar PV taking care of the **integrity of the roof and all its components ensuring durability of the waterproofing.**

The system comprises a CIGS (copper indium gallium diselenide) flexible photovoltaic panels bonded to a bituminous waterproofing layer.

On top of existing waterproofing systems consisting on smooth or mineral membranes, it is important to install PHOENIX SOLAR TECH membrane where the photovoltaic laminate is to be bonded. **This membrane needs to be fully bonded to the existing waterproofing system.**

An awarded path

General Solar PV was designed in 2007 to take advantage of the clean energy incentives offered by the Italian Government. Since the beginning General Solar PV stood as the only solution able to combine the production of sustainable energy together with the waterproofing of the roof.

General Solar PV has emerged as an innovative building-integrated photovoltaic solution, and its features allowed the system to access to higher incentives in comparison with traditional systems.

Since 2007 more than 41Mwp have been installed together with 2.000.000 square meters of Phoenix Solar, for an annual outcome of clean energy of more than 50 MWh. This waterproof photovoltaic system has enabled the company to install photovoltaic systems on all different type of roof.



With the 20-20-20 plan, the European Union has set to achieve within 2020 the objective of:

- Reducing the emissions of greenhouse gases by 20%
- The 20% of energy production should come from renewable sources.
- Increase by 20% the overall energy savings

The target is to counteract climate changes. The waterproofing and insulating systems offered by General Membrane are designed to achieve these targets by allowing the easy and safe use of the space (roofs), so far unused for the improving of energy efficiency, for the production of clean energy.

Waterproof photovoltaic module

General SOLAR PV FLEX uses CIGS solar cells (Copper indium gallium diselenide), which has the highest absorption coefficient than any other existing semiconductor and it has a diffusion length of 1 micron. Just 1 micron of this material absorb more than 90% of sunlight. Furthermore, the thin-film solar cells have a relatively small temperature coefficient (-0.24%), every 1% increase of temperature will cause 0.24% decrease of conversion efficiency. When the ambient temperature is 28°C, the operating temperature of the solar panel will goes up to 75°C.

As confirmed by important technical research, when the operating temperature is 60-75°C, having equal nominal power of the system, the thin film solar cells have a production of 10-12% more than the traditional crystal solar cells.



These are the reasons of higher annual productivity of General SOLAR PV FLEX in comparison with the traditional PV modules.

Grid parity and energy efficiency

Grid Parity is reached when you have the parity between the cost of electricity production of the PV system during all its life cycle and the cost of buying traditional electricity.

With the installation of General Solar PV it is possible to reach Grid Parity for 70% of Italy, and this means that photovoltaic systems are important and necessary to improve the energy efficiency of buildings.

In this way buildings become tools to reduce consumption, waste and costs by increasing living comfort, respecting the environment and the conservation of natural resources.

General Solar PV FLEX can be installed directly on top of the roof avoiding possible damages caused by the support structures of standard rigid panels. This solution is also suitable for old buildings and light roofing structures because its low weight. The technical office of General Membrane design customized technical specifications according to these energy improvements.



The study of the waterproofing insulating system

The waterproofing system is evaluated by General Membrane's Technicians for every single project: new, refurbishment, warm roof, cold roof, with neutralization of asbestos cement etc., considering also the specific needs of thermal insulation for energy saving in compliance with regulations.

General SOLAR PV For bituminous roof, new or existing

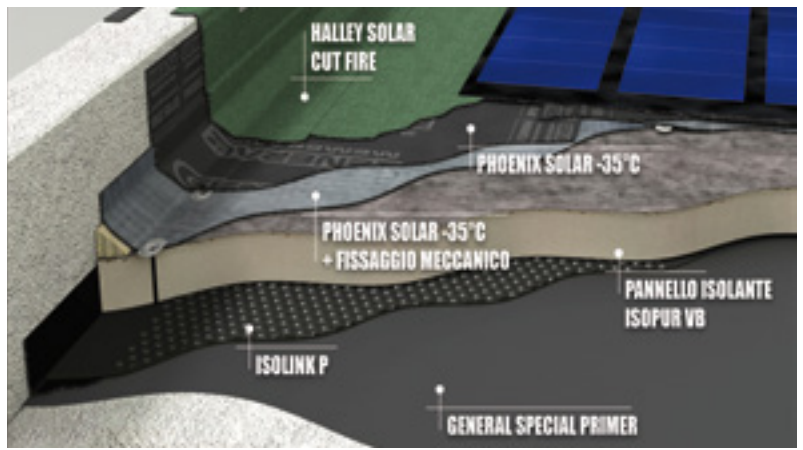
General Solar PV system can be installed on bituminous roofs for refurbishment, new or existing roofs. The waterproofing layer of the system is the membrane PHOENIX SOLAR APAO -35°C (DVT 007), employing high quality APAO polymers which gives longevity to the membrane and resistance to high temperatures on the roof. The system is bonded to the bearing surface through mechanical fixing of the intermediate layers by fully bonded system the final layer, in order to allow a long term high resistance to wind uplift. The photovoltaic module is totally adhered to the waterproofing membrane previously laid in order to ensure the waterproofing features of the system.

For further information watch the video "Fotovoltaico: Posa del sistema General Solar PV - BIPV" on



The possible solutions are:

- Two-layers waterproofing system on the whole roof with Phoenix Solar membranes. The first layer is installed with mechanical fasteners. (20 years warranty)
- Single-layer waterproofing on the whole roof with Phoenix Solar.
- Single-layer Waterproofing just on the surface below the photovoltaic modules with Phoenix Solar Tech.



NEW ROOF OR RENOVATION

BEFORE



NEW ROOF BEAM Y, CRUCIABLE: WATERPROOFING WITH THERMAL INSULATION

AFTER



GENERAL SOLAR PV SYSTEM PLACED ON COPPELLA AND SHED

EXISTING ROOF

BEFORE



EXISTING ROOF WITH MINERAL WATERPROOFING MEMBRANE

AFTER



APPLICATION OF GENERAL SOLAR PV ON AN EXISTING ROOF WITHOUT DRILLING THE WATERPROOFING LAYER.



Advantages and benefits for the roof



Light: 6,2 kg per module, to which must be added the weight of the waterproofing membranes.



No roof penetrations: the installation of General SOLAR PV FLEX avoids any kind of damage to the waterproofing system.



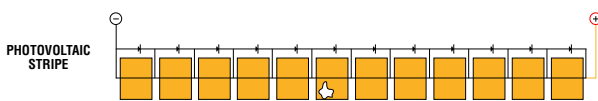
INSTALLATION OF THE SCREW FOR THE FIXING OF THE ELECTRICAL CONDUIT BRACKET WITH TORCH ON APPLICATION.



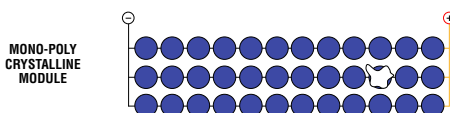
Flexible: the high flexibility of the modules makes them adaptable to every kind of roof, from vaulted roof to ones with more complex geometries.



Tolerance to shading: CIGS technology has the highest absorption coefficient than any other existing semiconductor and it has a diffusion length of 1 micron. Just 1 micron of this material absorb more than 90% of sunlight.



Bypass diodes between cells allow energy production even if the cell is dirty or covered by shadow.



In traditional modules even if one single cell is dirty or covered by shadow, the whole stripe loses its power.



BIPV: General SOLAR PV is a Building-Integrated waterproofing photovoltaic solution ideal for areas with restrictive buildings regulations.



Hail resistance: the test requires PV modules to be impacted with ice spheres (of various diameter, from 12mm to 75mm, and weight from 0.9g to 203g) at different speeds (from 16 to 40m / s). The modules are then inspected to evaluate the presence of possible damages. The General Solar PV FLEX modules have passed the test and no visible damage or deterioration in performance were found. This test is conducted according to the IEC 61646 standard (clause 10.17) for which we have the certification.



No external structures: the absence of supporting structures for the photovoltaic modules reduces weight on the roofs and affords greater resistance to wind extraction.



Self-cleaning: the special coating enables self-cleaning of the module with just the simple flow of rain water over it.

Fast installation: General Membrane's system allows a much faster installation than traditional systems.



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Without glass: General SOLAR PV FLEX modules don't have glass finishing, this is an indispensable feature for roofing installations, furthermore the advantage of the special coating is to ensure excellent anti-reflection behavior.



Ecologic: the CIGS technology allows an Energy Payback Time of less than 2 years, in relation of energy employed for its production, thanks to low small quantity of raw material required.



Safety against theft: General SOLAR PV FLEX cannot be stolen because is fully bonded to the other layers of the waterproofing.



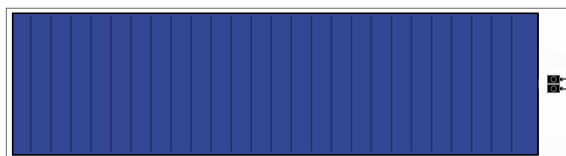
Walkable: the high resistance to walkability is a fundamental requirement both during the application and the maintenance of the photovoltaic roof.

The module

General SOLAR PV FLEX waterproofing photovoltaic modules is available with size 2598 x 1000 mm and 1kWp requires 7,1 mq of roofing area.

The updated technical data sheet are available on the website www.generalsolarpv.com.

PV 340/350/360/370 Wp per module - Production Tolerance: ± 5 %
Length: 2598 mm, Width: 1000 mm, Thickness: 2,5 mm



Certification, warranties, manuals and documents of General SOLAR PV®

GENERAL SOLAR PV CERTIFICATION

General SOLAR PV systems comply with European regulations EN 61646 and EN61730. Certification by TUV InterCert is also available.

COMPANY CERTIFICATION

General Membrane is a company that fully respects product quality, environment and workers, in fact in compliance with ISO standards it has been awarded three prestigious international certifications:

- **OHSAS 18001 (Occupational Health and Safety Management System)** attests General Membrane's commitment to safety protection related to the work-activity of the personnel in agreement with current health regulation

- **ISO 14001 (Environmental Management System)** attests the sustainability of General Membrane's headquarter in Ceggia, result obtained because of the considerable Environmental investment

- **ISO 9001 (Certification of the Quality Management System)** attests that General Membrane considers product quality at the top for the design and production of bitumen waterproofing membranes.



WARRANTIES AND DOCUMENTS

General Membrane guarantees for 20 years the waterproof photovoltaic system General SOLAR PV.

After releasing the "Declaration of conformity" related to the application (according to the guidelines of the Fixing Directions) and the regular maintenance check (according to General Solar Life specifications), General Membrane offers a 10 year insurance backed warranty and a further 10 years of company product warranty against product defects and adhesion of General SOLAR PV FLEX module to the waterproofing system.

USGBC - GREEN BUILDING COUNCIL

General Membrane is member of U.S Green Building Council a no-profit association with the purpose of enhanced technical, scientific and operating skills to promote the construction of sustainable buildings through the development of LEED rating system.



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