PVSITES Catalogue of products and applications:

BIPV Modules based on crystalline silicon.

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Online webminar with Onyx Solar
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Learning Objectives

After attending this session, attendees should be able to:

- Understand what a PV Glass is and its main characteristics.
- Understand the architecture of the product and its types.

Table of Contents

- Onyx Solar in a nutshell.
- Types of PV Glass: amorphous Silicon and crystalline Silicon glass
- Photovoltaic Glass Characteristics
  - PVSITES developments
- How to choose from the different PV Glass options
- Market release: how can I be supported to order/install?
- Q&A

Presentation

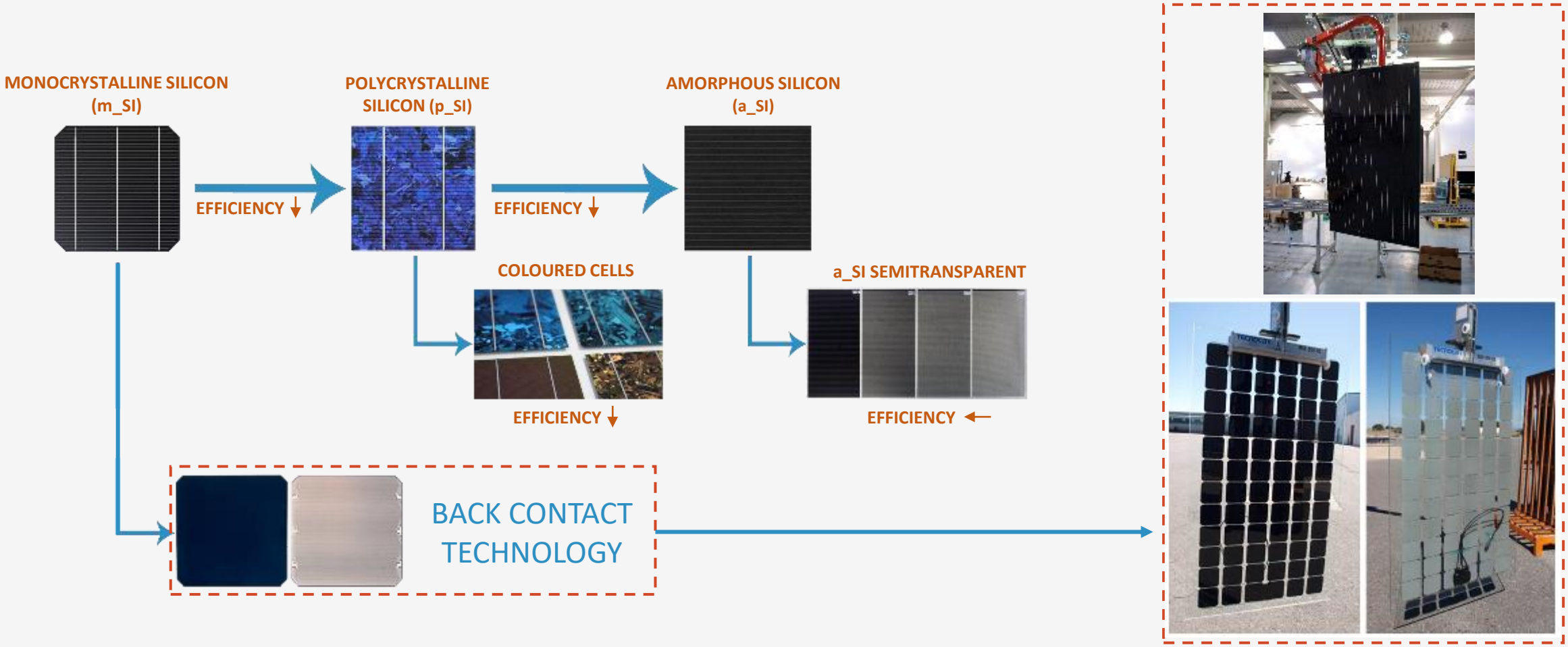
Onyx Solar in a nutshell

- Privately held company
- In business since 2009
- HQ and factory in Spain
- Offices in Madrid, New York and Shanghai
- 60 direct employees (120 at full capacity)
- 400+ accredited installers
- 300+ projects completed worldwide
- 1M – 2.5M Sqft annual fab. capacity
- 70+ domestic and intl. awards

What we do.

- We design and manufacture Photovoltaic (PV) Glass for buildings
- We support the A/E/C industry with design assistance for PV Glass applications
- We assist RE companies and final clients understanding ROI, Payback and environmental benefits
- We innovate
- We innovate again
- We innovate again and again

Types of Photovoltaic Glass by solar cell technology



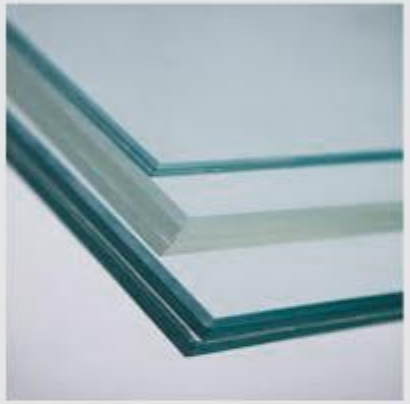
There are other solar cell technologies available in the market with potential use for building-integrated photovoltaic applications; however, they are still under development stages. Efficiencies should increase, as well as long-term stability, and fabricated dimensions. (I.e. Organic PVs/3rd generation).

Basic concepts of building glass

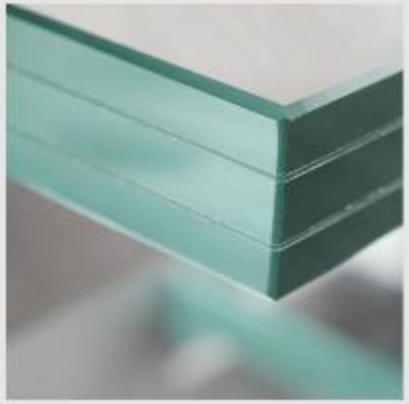
Monolithic glass:

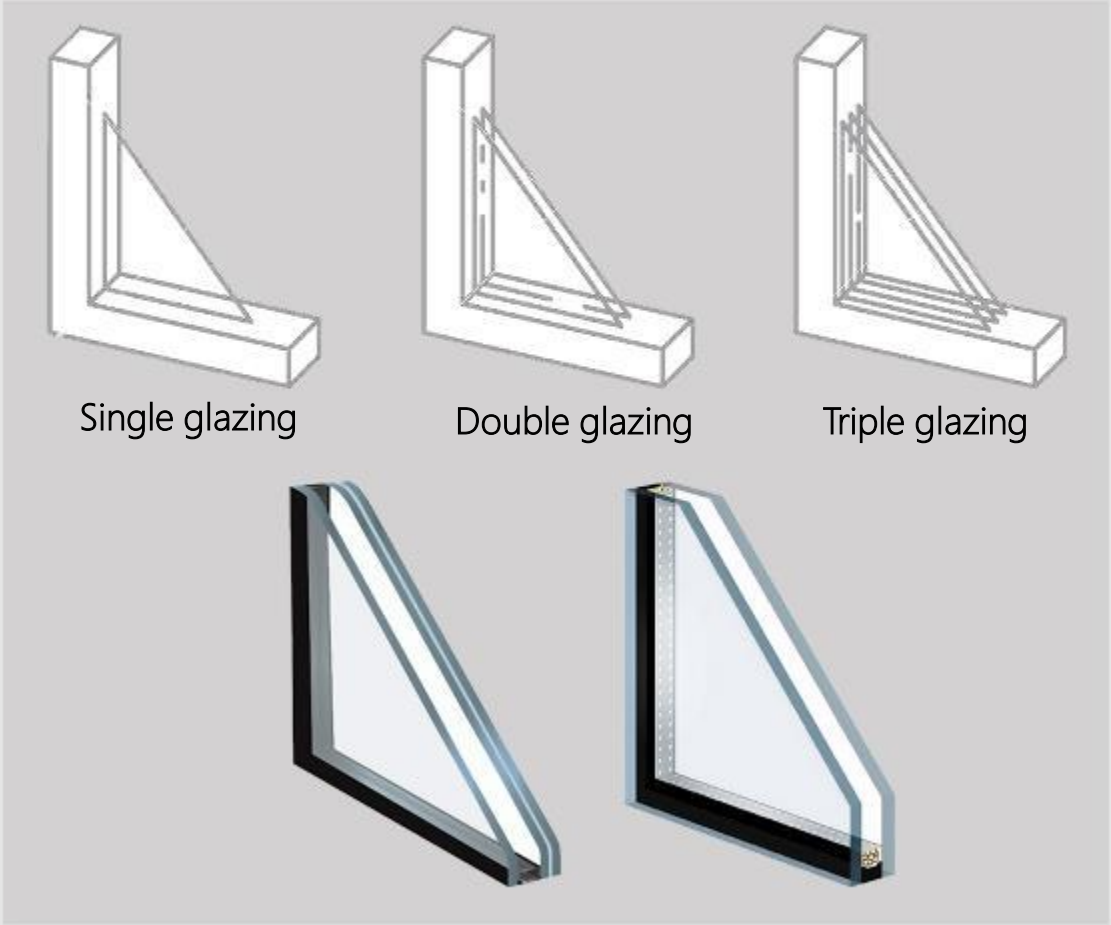
- **Fully Tempered**
- **Heat Strengthened**
- **Heat Soak Tested**
- **Colored glass in mass**
- **Low-e coatings**
- **Glass with selective layers**
- **Anti-reflective**
- **Hydrophobic coat**

Double lamination



Triple lamination





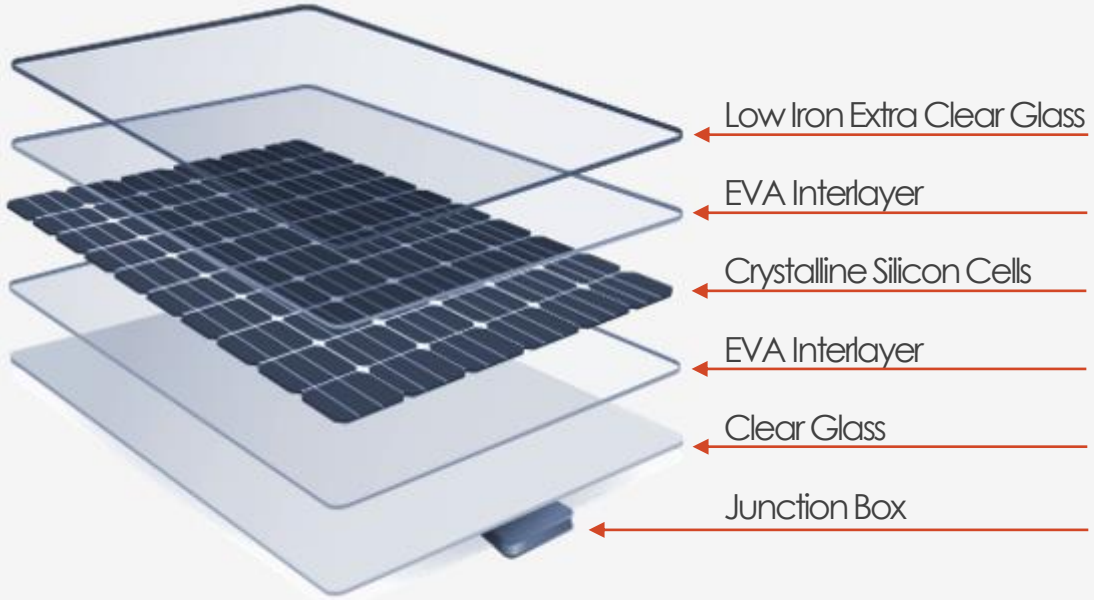
FIRST LEVEL

SECOND LEVEL

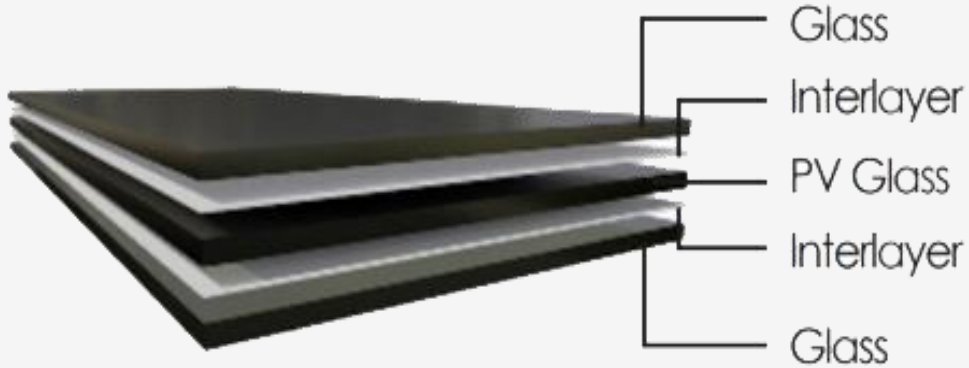
THIRD LEVEL

Photovoltaic Glass Construction (Laminated, Safety Glass)

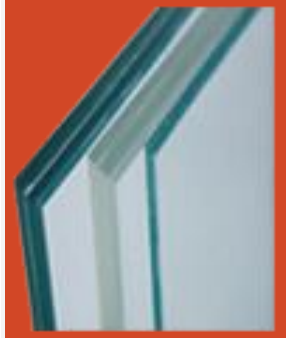
CRYSTALLINE SILICION GLASS (MONO AND POLY)



AMORPHOUS SILICION GLASS (THIN FILM TECHNOLOGY)

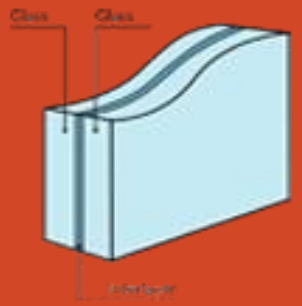


Glass Treatments & Coatings



Fully Tempered
Heat Strengthened
Heat Soak Tested
Low-e coatings
Anti-reflective
Hydrophobic coat

Interlayers (encapsulants)



PVB
EVA
Vanceva Color
SentryGlass
UV Curable Resins

Junction box / connectors

Monopolar
Bipolar
Edge-mounted

Glass back-end

Double Glazing (IGU)
Triple Glazing (2xIGU)
Air/Argon Fills

Photovoltaic Glass: essential characteristics

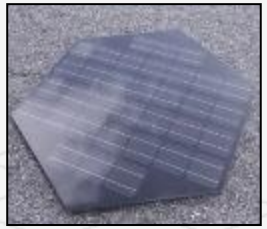
1. It is a **building material**; it is an architectural glass product → Natural Light (LT as required)
   Thermal & Sound Insulation
   99% UV & up to 95% IR Filter
   Aesthetics aligned with architecture
2. It is also a solar **photovoltaic collector**
3. It **offsets** the cost of that other conventional building material that would have to be installed otherwise.
4. It generates a **new revenue stream** for the owner → Free and clean electricity from the sun
   Locks the €/kWh cost of the energy for 35 years

Onyx Solar is committed to delivering high-quality products only, which meet international standards, codes, and safety guidelines. Both the production process and materials have been verified by independent certifying associations.

IEC CERTIFICATION
UL CERTIFICATION
SAFETY STANDARDS AS ARCHITECTURAL GLASS
INTEGRATED MANAGEMENT SYSTEM

Crystalline Silicon Glass

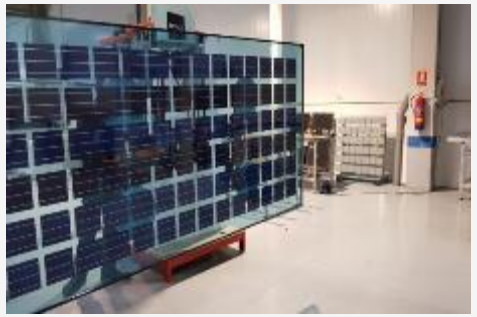
1. Two types of crystalline Silicon cells: Mono and Poly c-Si.
   6″ solid (156x156 mm), square cells.
2. Efficiency from 10 to 17% at module level
3. High kWp installed per m^2
4. Dependence on direct sunlight
5. Flexibility in shape: functional trapezoidal glass units



EFFICIENCY RANGE (BASED ON SOLAR CELL DENSITY)

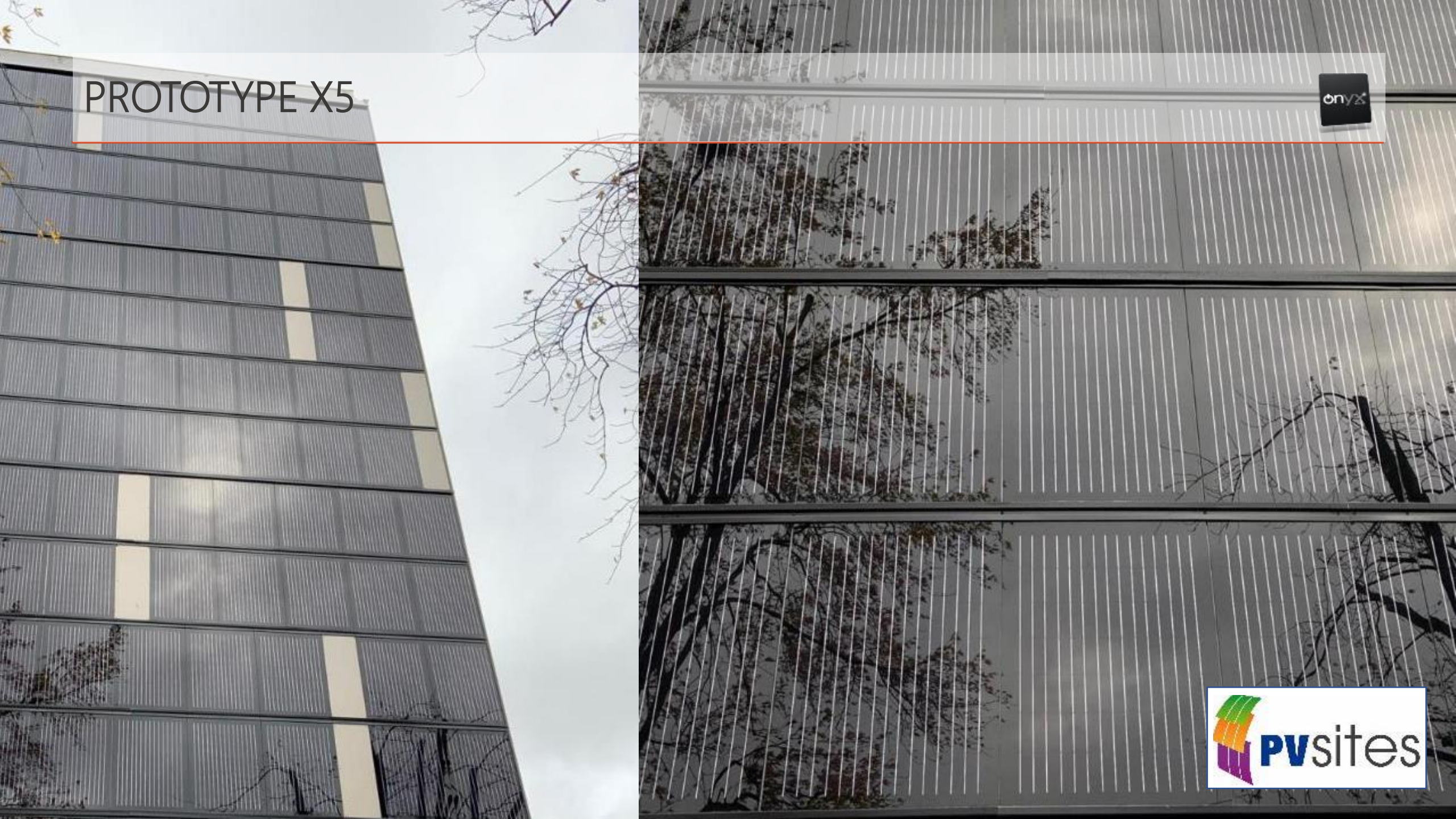
17%

14%



10%

PROTOTYPE X5



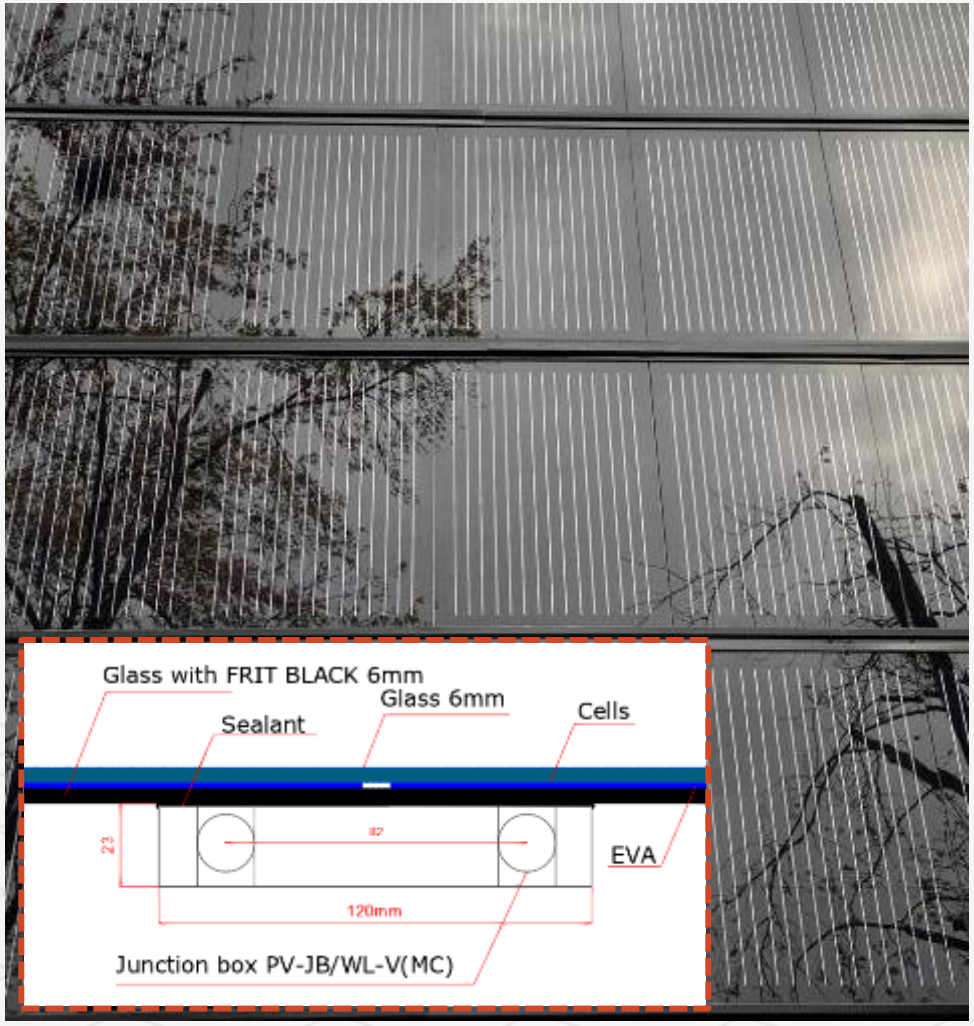
PROTOTYPE X5

Main features:

- Dimensions:
  - **1280 x 910 mm**
- **35 cell 6" Mono Crystalline**
- Power: **151 Wp unit** (134,5 Wp/ m^2)
- Weight: **30 kg/m^2**
- Transparency degree: **0%**
- **Hidden interconnections**
- **Full opaque units**

Advantages:

- Depending on the specific application and additional treatments on the glazing:
  - ***shading effect***
  - ***reduction of cooling / heating needs***
- Due to photovoltaic technology:
  - ***on-site generation of energy,***
  - ***Improved aesthetics on the building***
  - ***increase in added value and revaluation of the building***
  - ***Return of the investment***



Outer face **Inner face**

PROTOTYPE X6

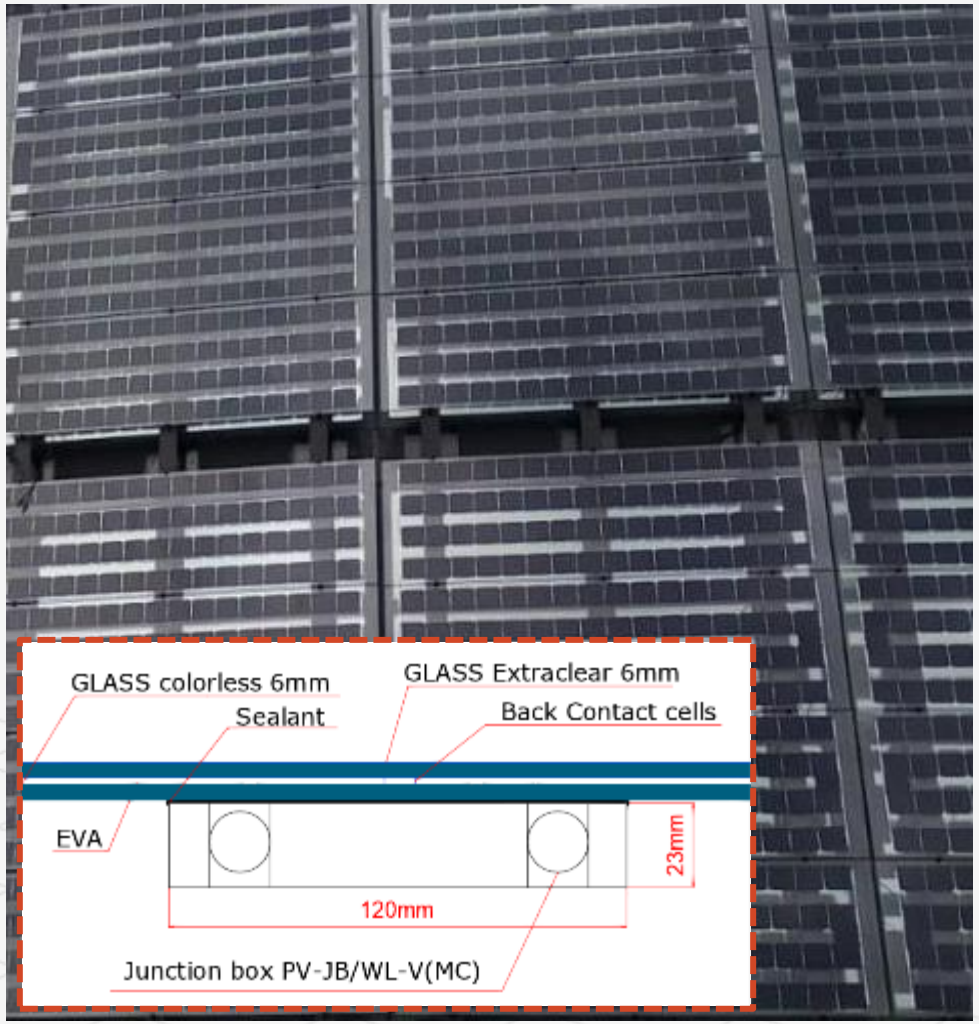
PROTOTYPE X6

Main features:

- Two dimensions:
  - **2215x 765 mm**
  - **2250x765mm**
- **64 Crystalline Back-contact cells**
- Power: **192 Wp unit** (113 Wp/ m^2)
- Weight: **30 kg/m^2**
- Transparency degree: **40%**
- **Hidden interconnections**
- **Could be use in a double/triple glazing**

Advantages:

- Depending on the specific application and additional treatments on the glazing:
  - ***Shading effect***
  - ***Reduction of cooling / heating needs***.
- Due to photovoltaic technology:
  - ***On-site generation of energy,***
  - ***Improved aesthetics on the building***
  - ***Increase in added value and revaluation of the building***
  - ***Return of the investment***



Outer face

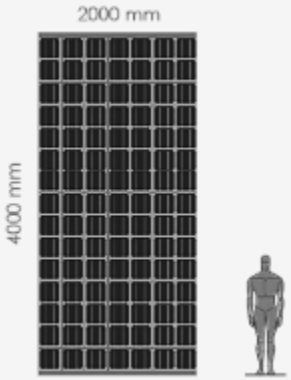
Inner face

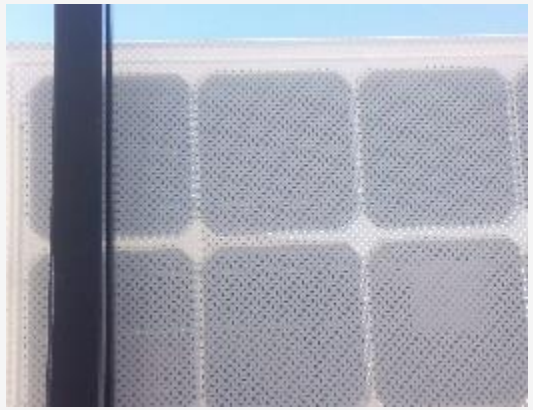
Crystalline Silicon Glass

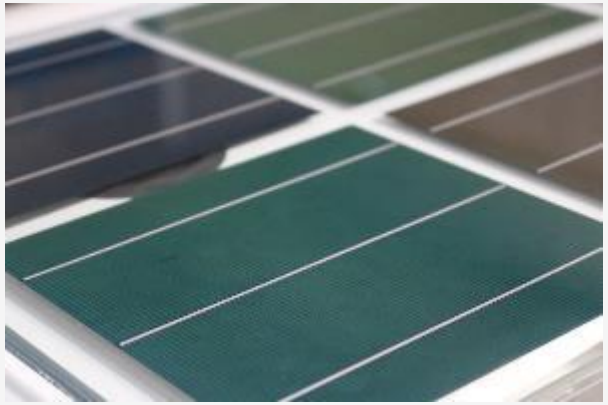
CRYSTALLINE SILICON GLASS DIMENSIONS

Stock Dimensions (most cost-effective options)

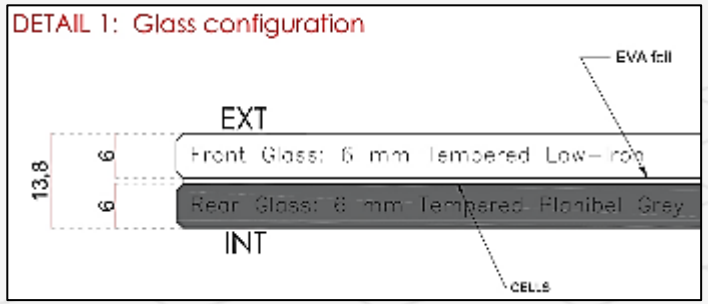
- 1641 x 989 mm
- 1475 x 480 mm
- 1650 x 850 mm
- 1700 x 1000 mm







CRYSTALLINE SILICON GLASS SECTION



GLASS THICKNESS

- 4 mm
- 5 mm
- 6 mm
- 10 mm
- 12 mm

PV Glass Type Selection – key questions

- ✓ Where is the project located and what is the orientation?
- ✓ What is the average solar radiation? Diffuse Component?
- ✓ What type of application am I interested in?
  - PV Curtain Wall / Rainscreen Cladding
  - PV Skylight / Canopy
  - PV Railing / PV raised-access floor system
  - PV fins…
- ✓ How many m^2 do I have for PV Glass?
- ✓ What does my glass take-off look like? Is it uniform, or do I have multiple dimensions and shapes?

Performance-driven

- ✓ What type of aesthetic look do I prefer for my building?
- ✓ Does the project require unobstructed views, or just some natural light?

Aesthetics-driven

- ✓ What is my budget?
- ✓ What ROI and payback time are acceptable for me?

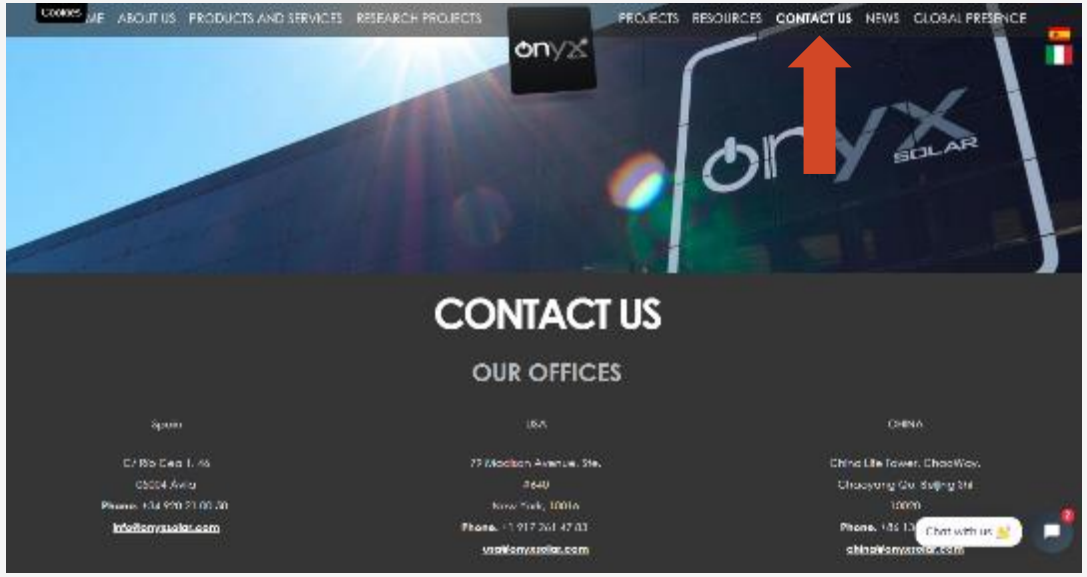
Finance-driven

Weigh + Project Goals by DMU

Market release / how can I be supported to order/install?

1. The products showed are ready to the market.

2. You can contact us through our contact form on the web: https://www.onyxsolar.com/



3. Onyx Solar have global presence, in our web site you can find info about of our distribution net and accredited partners and installers.

Questions?

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THANK YOU AND STAY SAFE!