



PROJECTS & REFERENCES

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Onyx Solar® is the world leader in the manufacture of photovoltaic glass for buildings. A transparent or coloured glass capable of generating clean, free energy from the sun, for installation on façades, in windows, skylights or even floors, enabling the buildings of our cities to generate their own energy for a minimal outlay.

Our aim is to enable the buildings of the future to be self-sufficient from an energetic point of view, a key factor in the struggle against climate change, as buildings are responsible for 70% of the consumption of electrical energy on our planet.

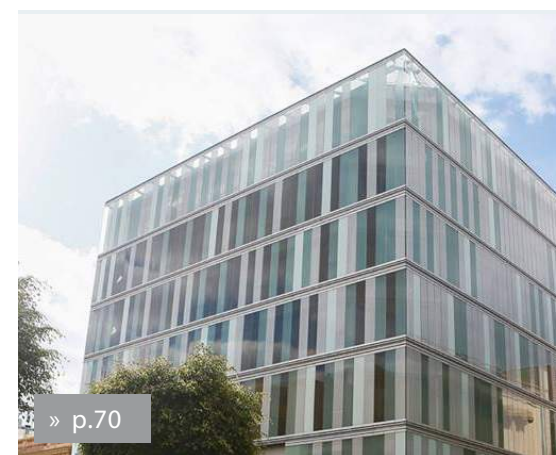
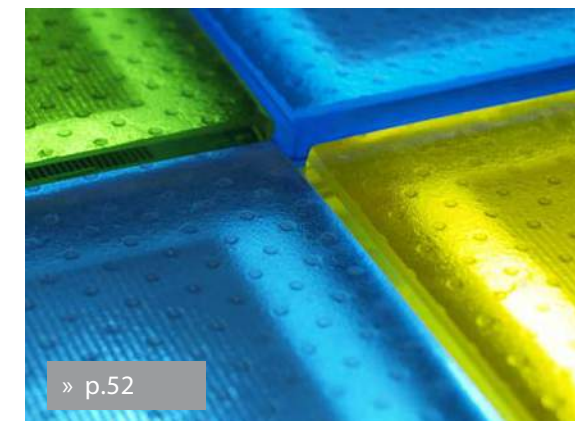
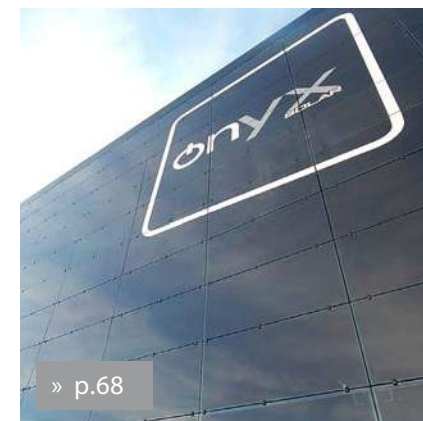
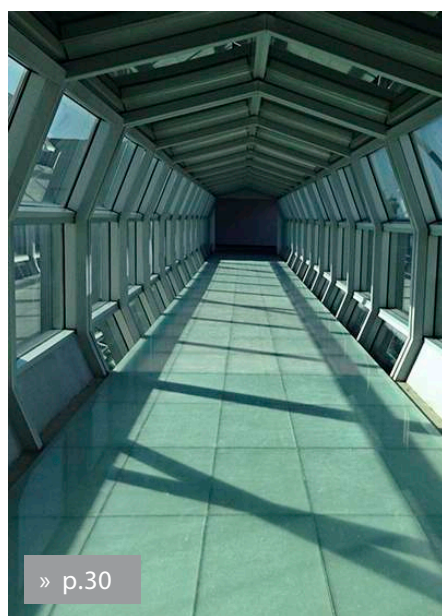
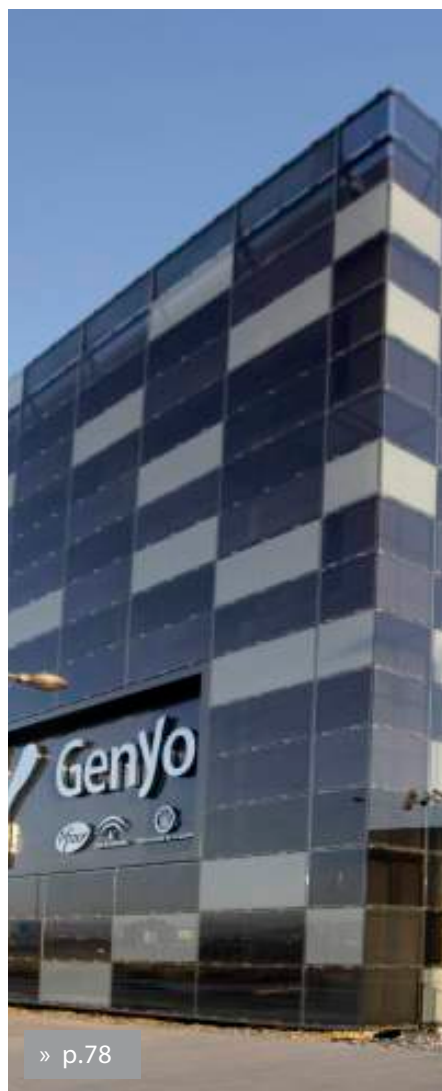
Thus, our photovoltaic glass achieves an average reduction of 48% in the energy consumption of buildings, attaining an electrical cost of less than one cent. This investment is not only a huge step towards sustainability, but it is also highly worthwhile financially, as the outlay is recovered in a matter of months, and it provides an average Internal Rate of Return of 70%.

With over 60 projects executed in the five continents, we have taken part in large-scale projects for leading companies such as Apple, Samsung, Coca-Cola, Pfizer or Novartis, who are already enjoying the benefits of our glass in their buildings. We provide advice to preeminent architects worldwide, such as Norman Foster, Frank Gehry, SOM, KPF, ASGG or Rafael Vinoly, and we have worked for the most important construction companies in the world, such as ACS, Skanska, Turner, Jacobs or Ferrovial.

This catalogue shows some of the projects of which we are most proud. We hope you enjoy reading it as much as we enjoyed executing each one.

Welcome to the revolution **onyx**,
Álvaro Beltrán
Founder of Onyx Solar®





TANJONG PAGAR

PHOTOVOLTAIC CANOPY

Located in the midst of Singapore's financial centre, **this 64-storey tower is the tallest building in the country**. Designed by **SOM**, the New York-based architecture firm, its construction was realised by the Korean multi-national company Samsung.

Onyx Solar® is taking part in this project with the integration of a large photovoltaic pergola of over **2,600 m²** located at the entrance to the building, with an installed power capacity of **125 kWp**. The pergola features **850 amorphous silicon photovoltaic glass modules** measuring **2,456 x 1,245 mm**, with a **semi-transparency degree of 10%**, which will enable the building to supply over **7,000 lights** per day thanks to the sun (**125,810 kWh** per year).

This energetic efficiency measure contributes to the building obtaining the **Greenmark** and the **Platinum LEED certification**. Furthermore, the building has already been granted a **2015 WAN AWARD** in the "Future Projects" category.



"At **SOM** we are committed to excellence, which translates to high-value innovative designs. We have the opportunity to influence positively the fundamental problems currently facing humanity. Promoting renewable energy and increasing the levels of energetic efficiency, at **SOM** we are able to collaborate effectively with diverse solutions in the struggle against climate change".

"We believe that sustainability inspires great architectural works. New, spectacular designs are emerging which have a minimal impact on the environment".



“ At Samsung, we undertake the responsibility of carrying out our activity with the aim of enriching our planet.

Our sustainability policy is based on the continued improvement of the environment throughout our activities, naturally including the efficient use of energy at our facilities”.

Samsung sustainability report, 2015

TOTAL AREA
2.624 M2

ELECTRICITY GENERATED PER YEAR
125.810 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
7.169 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
84.290 CO₂

BARRELS OF OIL SAVED PER YEAR
76 Barrels

>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN SINGAPORE

< 0,01€
Energy cost

28%
Reduction in HVAC energy demand

86%
Internal Rate of Return

<1 year
Payback

(*) Download the complete study [here](#).



ASIA PACIFIC PROPERTY AWARDS
WINNER 2015-2016

15 **WAN AWARDS**

General contractor: Samsung
Architect: SOM
Client: Tanjong Pagar



Best of What's New 2015

Onyx Solar®'s glass has been

rewarded by the centenarian scientific dissemination journal "Popular Science" as the **most innovative product of the year**, together with Tesla's Powerball batteries.

SOM

SOM is the architecture firm entrusted with the design of the Tanjong Pagar.

Located in the midst of Wall Street, SOM has designed buildings as prominent as the **Burj Khalifa** in Dubai, which at 828 metres is currently the tallest building in the world, or the **One World Trade Center** in New York.

Over 15,000 buildings located in 50 countries bear witness to the awesome experience of this emblematic architecture studio.

APPLE STORE

PHOTOVOLTAIC FLOORING ON THE ROOFTOP



Apple stands out in particular due to its firm commitment to **forefront technology, innovation and design**. In this context, the multi-national company from California has decided to commit itself to Onyx Solar®'s designer photovoltaic technology for its new stores. The first of these is located in the heart of San Francisco, the company's home town.

The project, designed by the renowned architecture firm **Foster+Partners**, has a minimalistic, modern, innovative and of course, sustainable focus fitting perfectly into the environmental objectives of Apple. In fact, 87% of Apple's activities on an international level are performed using **renewable energy**, and the new stores are not an exception in the firm commitment of the most-respected multi-national company on the planet in

favour of renewable energy and energetic efficiency.

In the case of Apple's emblematic store in San Francisco, the rooftop walkway, incorporating a large-sized crystalline silicon floor, is of particular note. This rooftop walkway floor is comprised of **130 glass modules measuring 4.5 m²** with a peak power capacity of 487 Wp per unit, **generating over 90,000 kWh of power each year**. This is sufficient power to supply over **5,000 lights cleanly and cost-free, thanks to the sun**. Furthermore, the use of this photovoltaic roof will **prevent the release of over 60 tons of CO₂ into the atmosphere**, avoiding the consumption of 56 barrels of oil.

“

Whatever it is we are doing, we always bear in mind our carbon footprint and how we can reduce it. We develop some of the most energy-efficient electronic products, but that is not all; we also use renewable energy sources and high energy-efficiency materials in our facilities”.

Apple.



Foster + Partners.

Founded by Sir Norman Foster in 1967, this is doubtless one of the best-known architecture firms worldwide. Awarded the Pritzker Prize in 1999, among their most emblematic projects, those which stand out most are the largest airport in the world, in Beijing, the Gherkin Tower in London, the Hermitage Plaza in Paris and the transparent glass dome of the Reichstag, the German Parliament.

“

Sustainability has been a fundamental aspect of our work for over 40 years. In our projects we provide pioneering solutions with regard to renewable energy, which enable spectacular reductions in pollution and carbon emissions. In cooperation with the sector, we have created new cladding systems which improve the building envelope thanks to solar energy.

Sir Norman Foster

DUBAI FRAME

PHOTOVOLTAIC FAÇADE



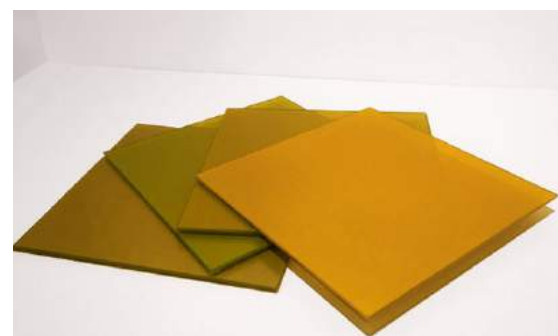
The **Dubai Frame** is an impressive rectangular picture-frame-shaped building, **150 metres tall and 105 metres wide**, located in the Zabeel Park in Dubai. Its strategic location provides over 2 million visitors with spectacular views of the city's other architectural jewels, framed on the horizon. It has therefore been considered one of the world's new attractions in 2015, and one of the most original skyscrapers.

Onyx Solar® has participated in this project with the integration in the façade of **1,200 m²** of amorphous silicon photovoltaic glass. Approximately 2,500 modules measuring **485 x 985 mm** of a **triple safety laminate** have been manufactured in a yellow-gold colour with a **semi-transparency degree of 20%**. The total installed power capacity reaches 38 kWp and will enable the building to generate a large proportion of the energy it needs for its operation.

This multi-functional glass, besides contributing to the creation of a sustainable building fed to a considerable extent by solar energy, provides the frame with undeniable aesthetic value due to its yellow colour. It also filters out ultraviolet and infrared radiation, thus preventing the greenhouse effect so common in cities with hot climates and improving the comfort of its occupants. Thanks to the integration of Onyx Solar®'s photovoltaic glass in the envelope of the building, considerable energy savings may be achieved in the air handling of the same.

“*The choice of using photovoltaic glass, which produces clean energy from the sun, is witness to a change of attitude in the government and to Dubai's approach to sustainability*”.

Abdullah Raffia, Dubai government engineering and planning.



Onyx Solar® has developed a new generation of coloured semi-transparent photovoltaic glass, encompassing a wide spectrum of shades, while maintaining the same efficiency as colourless photovoltaic glass.

Dubai Frame - 1st prize, ThyssenKrupp Elevator Architecture Award 2009.

ONYX SOLAR® ENERGY

>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN DUBAI

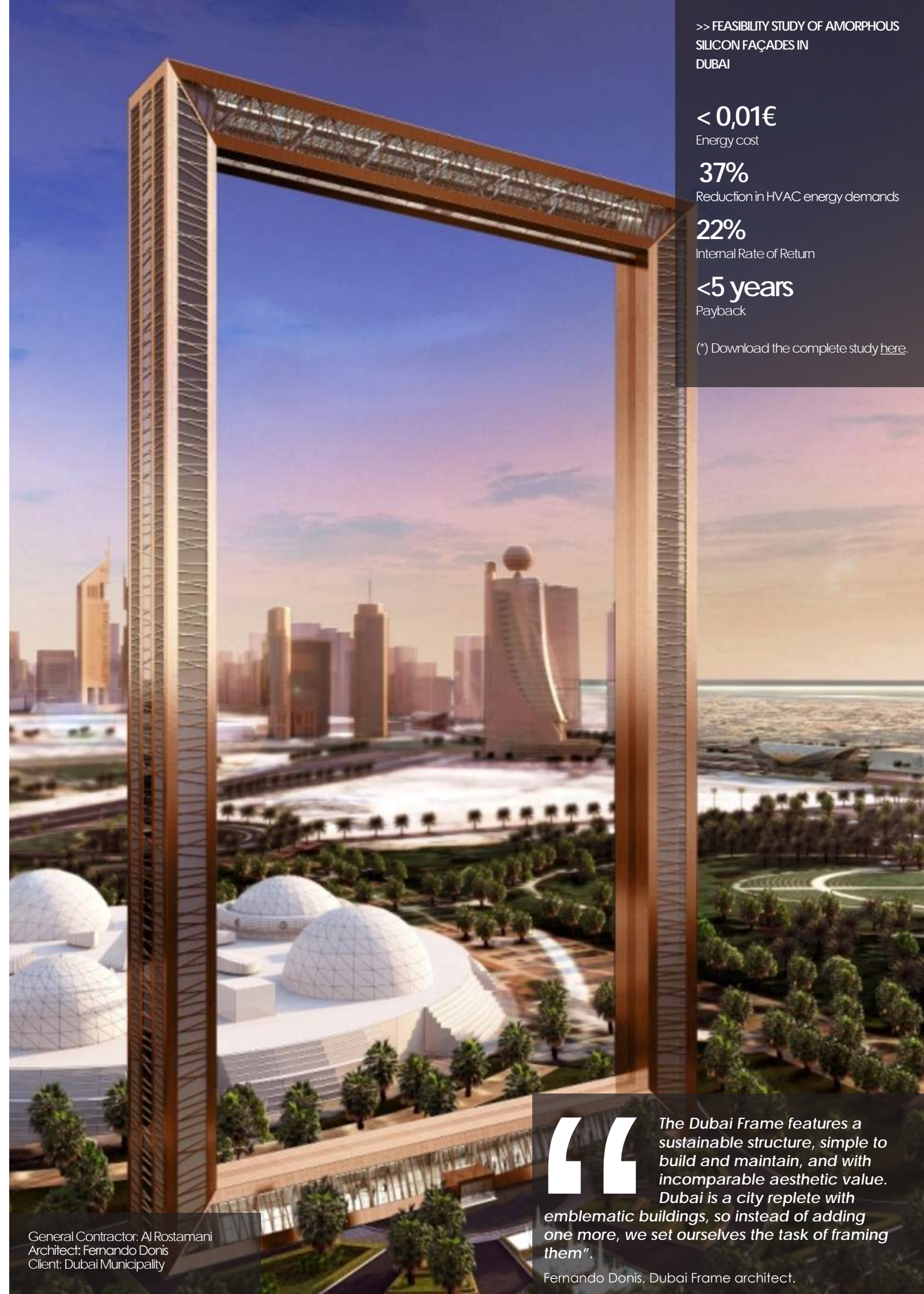
< 0,01€
Energy cost

37%
Reduction in HVAC energy demands

22%
Internal Rate of Return

<5 years
Payback

(*) Download the complete study [here](#).



“*The Dubai Frame features a sustainable structure, simple to build and maintain, and with incomparable aesthetic value. Dubai is a city replete with emblematic buildings, so instead of adding one more, we set ourselves the task of framing them*”.

Fernando Donis, Dubai Frame architect.

General Contractor: Al Rostamani
Architect: Fernando Donis
Client: Dubai Municipality

SCIENCE PYRAMID

HEXAGONAL PHOTOVOLTAIC GLASS



The Science Pyramid, located in the Denver Botanic Gardens, is a pyramid-shaped building. Here, Onyx Solar® has integrated hexagonal crystalline silicon photovoltaic glass modules with a 100% custom-made design.

This pyramid shows visitors the principal ecosystems of Colorado and explores similar environments around the world. The illumination and vibrations within the pyramid are determined by the current weather conditions.



“It has been great to work with Onyx Solar®. It was the only company capable of making the hexagonal photovoltaic glass we needed and of helping us with the design”.

Adam Tormohlen, Project Manager at GH Phipps.

ONYX SOLAR® ENERGY

ENR REGIONAL
Engineering News-Record **BEST 2015 PROJECTS**

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN DENVER

< 0,01€

Energy cost

30%

Reduction in HVAC energy demands

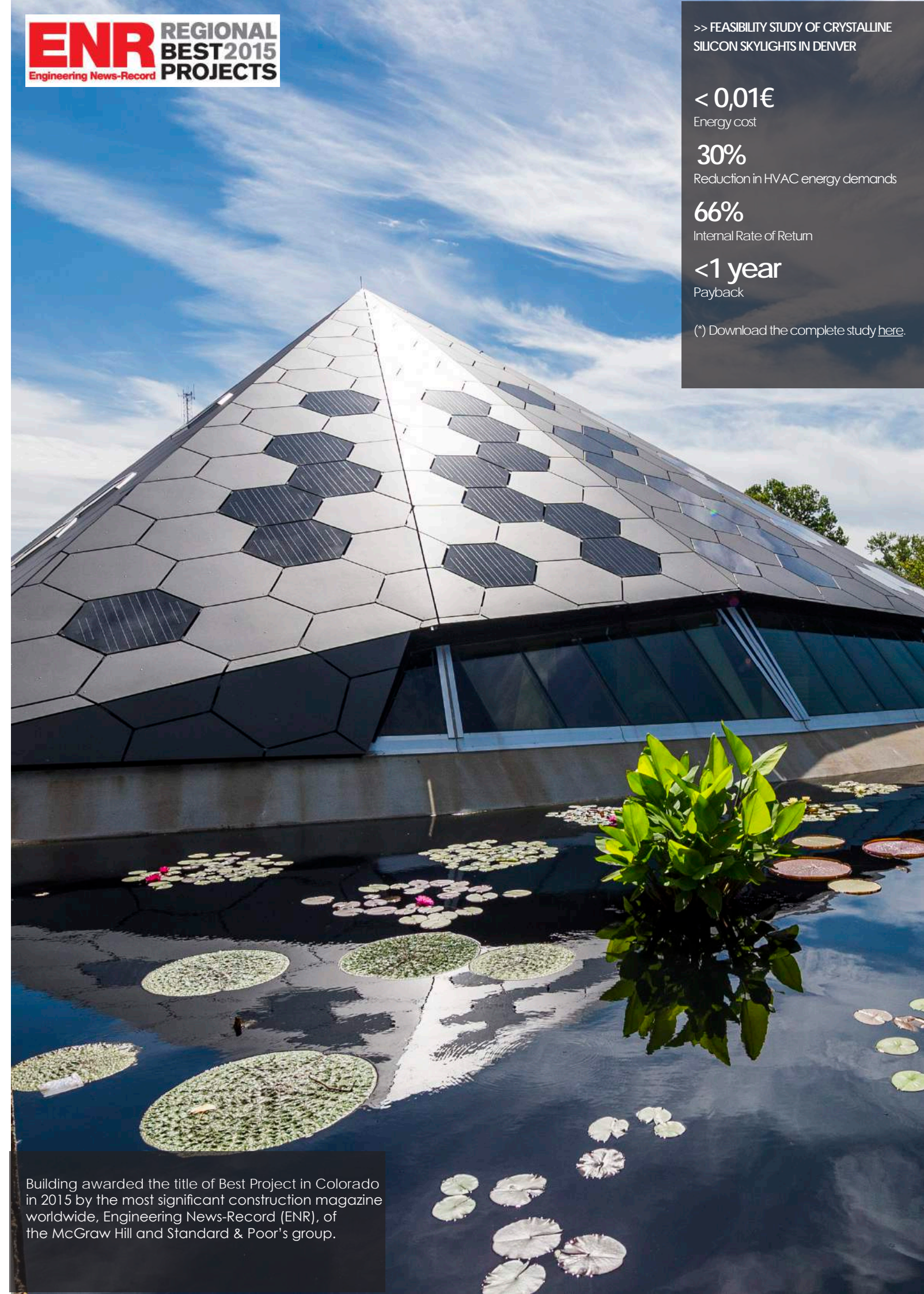
66%

Internal Rate of Return

<1 year

Payback

(*) Download the complete study [here](#).



Building awarded the title of Best Project in Colorado in 2015 by the most significant construction magazine worldwide, Engineering News-Record (ENR), of the McGraw Hill and Standard & Poor's group.



Brian Vogt

Brian Vogt, CEO, Denver Botanic Gardens

"The pyramid's façade features photovoltaic glass, which generates clean, free energy from the sun. This is perfect for two of our fundamental values: sustainability and transformation. We wanted to include photovoltaic glass efficiently, and at the same time attractively, and the result has been absolutely amazing".

DIEGO CUEVAS

Diego Cuevas – Business Development VP at Onyx Solar®

"At Onyx Solar® we are fascinated by projects which represent a challenge. They give us the opportunity to design and manufacture unique photovoltaic glass items".

"The design and construction work executed have set these Botanic Gardens at the forefront of the most innovative gardens to visit in the country".



William P. Babbington

Will Babbington – AIA, PE | Façade Performance Design Director at Studio NYL

"The fascination and appeal of Onyx Solar®'s photovoltaic solutions is generally due to their ability to perform three main functions: - Environmental resistance; they can withstand damp and UV rays; - Renewable energy / Energetic balance, the key goal for using photovoltaic technology in buildings; - Aesthetics; the façade is the face, the appearance, and the eyes of the building's soul".

Barton Harris

Barton Harris, Project Manager at Burkett Design

"So as to completely integrate the photovoltaic modules in the aesthetics of the ventilated façade, not only was the colour of the glass carefully chosen to match the colour of the surrounding modules, but its surface was coated with a similar sheen".



MIAMI HEAT STADIUM

PHOTOVOLTAIC SKYLIGHT



SKANSKA

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN MIAMI

< 0,01€
Energy cost

44%
Reduction in HVAC energy demands

77%
Internal Rate of Return

<1 year
Payback

(*) Download the complete study [here](#).

General Contractor: Skanska
Architect: DLR Group
Client: NRG





“The HEAT group is proud to be a leader in the sustainability movement, both in our industry and in our beloved city”.

Eric Woolworth, HEAT Group Business Operations President

“Achieving the LEED Gold is a fantastic climax to our efforts over the last five years to act in an environmentally responsible manner, which has a positive effect on our community and on our planet”, Eric adds.

At the entrance to the **NBA Miami Heat stadium**, also known as the “American Airlines Arena”, **several circular skylights** may be seen, bearing the stamp of Onyx Solar®.

To complete the many circular skylights, approximately **300 crystalline silicon photovoltaic glass units**, made entirely to measure for the occasion, were used. These modules enable the stadium to generate **34,500 kWh** yearly, to be used for the building's self-consumption, leading to the prevention of the release of **20 tons of CO₂** into the atmosphere. Onyx Solar®'s technology has contributed to this stadium being the **first sports and entertainment centre to obtain the LEED Gold recertification**.



UP TO 6 LEED POINTS FOR IN-HOUSE RENEWABLE ENERGY GENERATION

In order to reduce the environmental and economic impact associated with the use of fossil fuels, the LEED certification system offers up to 6 points for the in-house generation of 12% of renewable energy.

On-site renewable energy generation	Points
3%	1
4,5%	2
6%	3
7,5%	4
9%	5
12%	6



VIRACOPOS-CAMPINAS AIRPORT

PHOTOVOLTAIC SKYLIGHT



TOTAL AREA	3.331 M2
ELECTRICITY GENERATED PER YEAR	178.690 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	10.182 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	119.718 CO ₂
BARRELS OF OIL SAVED PER YEAR	108 Barrels

General Contractor: Consorcio Constructor Viracopos
Architect: NACO (Netherlands Airport Consultants B.V.)
Client: Viracopos - Campinas International Airport

The new terminal at Viracopos-Campinas International Airport features 33 amorphous silicon photovoltaic skylights integrated in the roof. The **4,100 photovoltaic glass units** employed form a surface area of over **3,340 m²** and a total installed power capacity of **154 kWp**, which will enable the generation of sufficient energy from the sun to feed approximately **10,200 lights** cleanly and without cost, preventing the release of nearly 120 tons of CO₂ into the atmosphere each year.

Low-e Photovoltaic Glass

Onyx Solar® has developed the first low-e photovoltaic glass on the market. A glass which has been rewarded by the American Glass Association as **the best glass in 2015**.

This glass, in addition to generating clean, free energy from the sun, is capable of **filtering out 99% of ultraviolet radiation** and **up to 95% of infrared radiation** while permitting the entry of daylight. These properties make this glass the ideal candidate when

designing a building with high standards of energy efficiency and thermal comfort.

This is a glass with a **g value (SHGC) of between 10% and 40%**, depending on its degree of transparency, which prevents the interior temperature from rising too high due to the greenhouse effect, particularly in locations with a hot climate, such as Sao Paulo.

All the above caused **NACO**, a company at the forefront of airport design, to choose Onyx Solar®'s low-e photovoltaic glass.

"Our mission is to contribute to the sustainable development of the airport. We are committed to the development of sustainable solutions for a wide range of airport-related matters and we work ceaselessly to sharpen our sustainable, innovative approach". NACO

ONYX SOLAR® ENERGY



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHT IN SAO PAULO

< 0,01€
Energy cost

49%
Reduction in HVAC energy demands

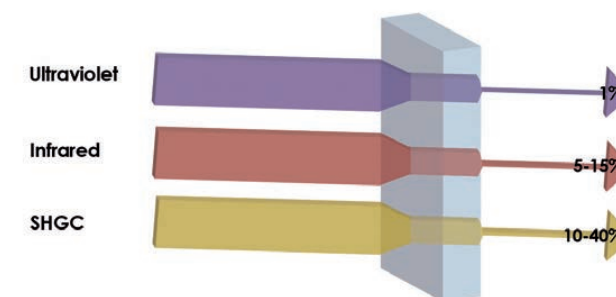
58%
Internal Rate of Return

< 2 years
Payback

(*) Download the complete study [here](#).



OPTICAL PROPERTIES OF ONYX SOLAR®'S GLASS



AZURMENDI RESTAURANT

■ PHOTOVOLTAIC SKYLIGHT AND CURTAIN WALL



The Azurmendi Restaurant has not only obtained the **LEED Gold** certification but was also declared the **Most Sustainable Restaurant in the World in 2014**.

The project, with over 200 m² of photovoltaic glass integrated in the curtain wall and skylight, is considered to be one of the most outstanding photovoltaic integration solutions in the whole of Europe.

The **low-emissivity (or low-e) glass** used is made of amorphous silicon and features a **semi-transparency degree of 20%**. This type of glass enables the passage of daylight into the interior **while it filters out as much as 99% of the ultraviolet radiation and 95% of infrared light**, thus preventing harm to the interior furniture, to persons or to plants, and the greenhouse effect which is so common in glass-covered buildings.

The skylight and the curtain wall total an installed power capacity of **21 kWp** and generate approximately **16,500 kWh** per year, while preventing the release of **11 tons of CO₂** into the atmosphere.

Located in the Biscayan town of Larrabetzu, this restaurant with **three Michelin stars** and headed by Eneko Atxa, has won, in only two years, the 19th place in the ranking of "The World's 50 Best Restaurants".



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN BISCAY

< 0,02€

Energy cost

34%

Reduction in HVAC energy demands

55%

Internal Rate of Return

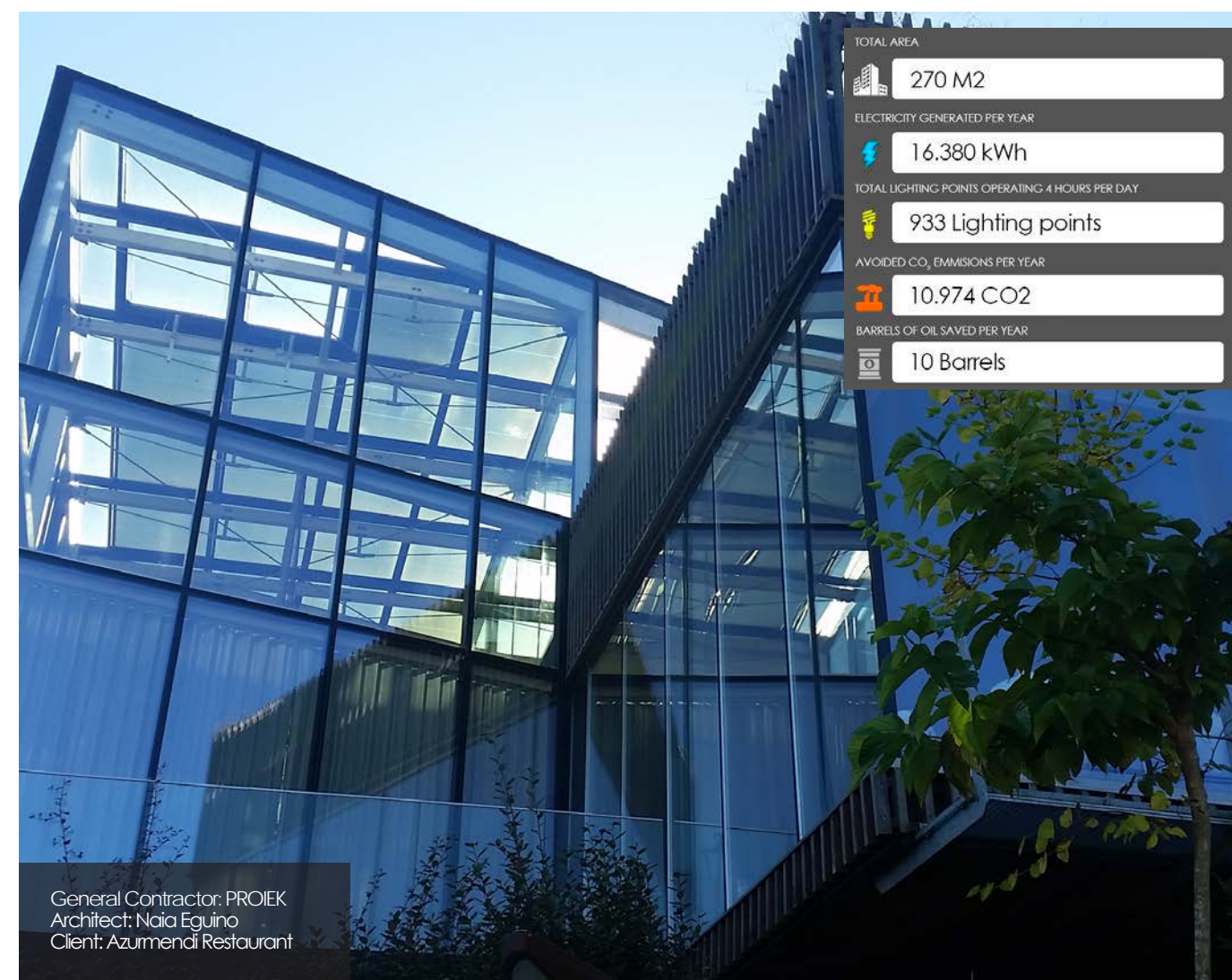
<5 years

Payback

(*) Download the complete study [here](#).

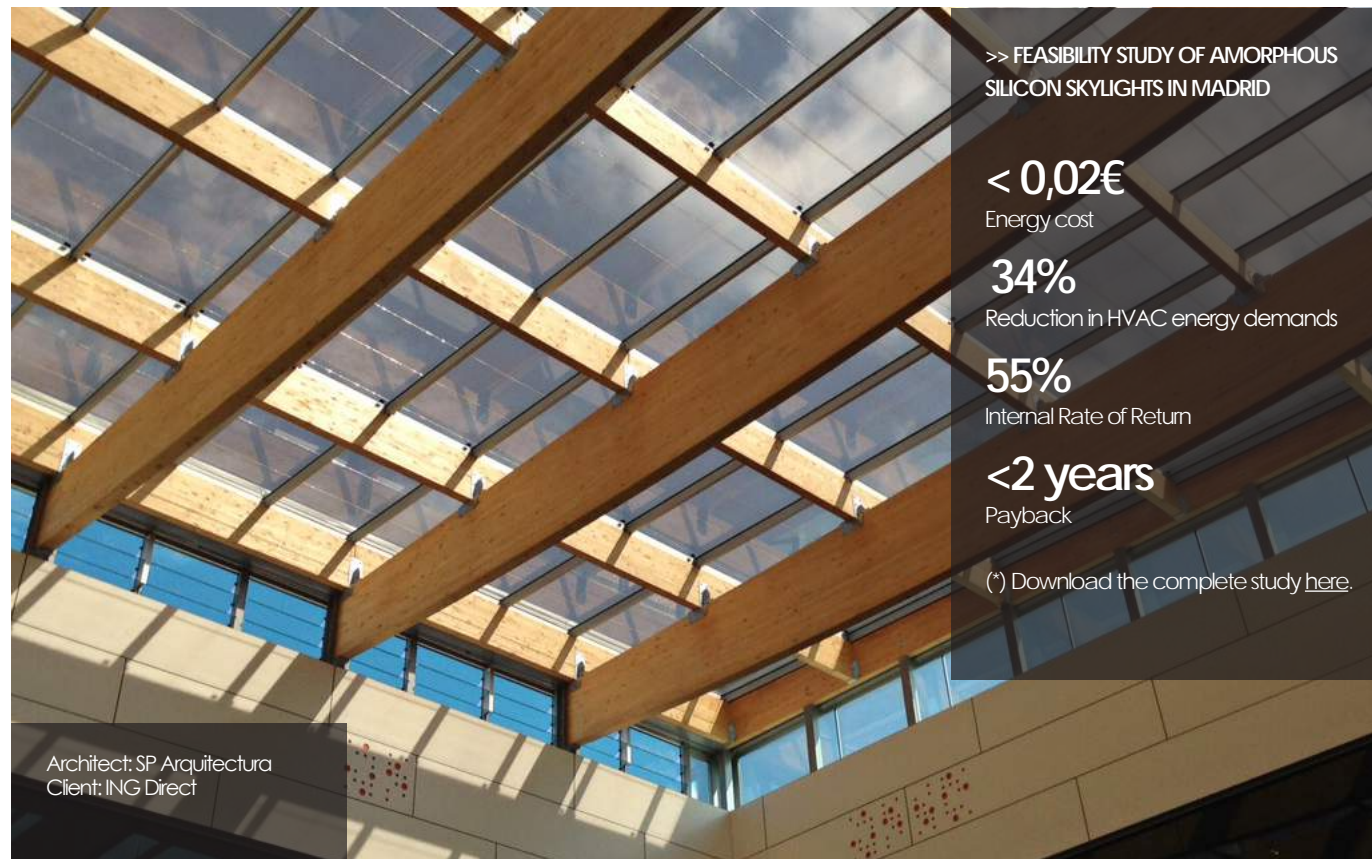


“ **Most Sustainable Restaurant in the World in 2014.** ”



ING DIRECT BANK

PHOTOVOLTAIC SKYLIGHT



ING, the largest online bank in the world, pledged their commitment to Onyx Solar®'s technology with the integration of a photovoltaic glass skylight in the central garden of their headquarters in Las Rozas, Madrid.

The skylight, with a surface area of over **200 m²**, is comprised of **80** amorphous silicon glass modules with a **semi-transparency degree of 20%** and dimensions of **2,560 x 1,176 mm**.

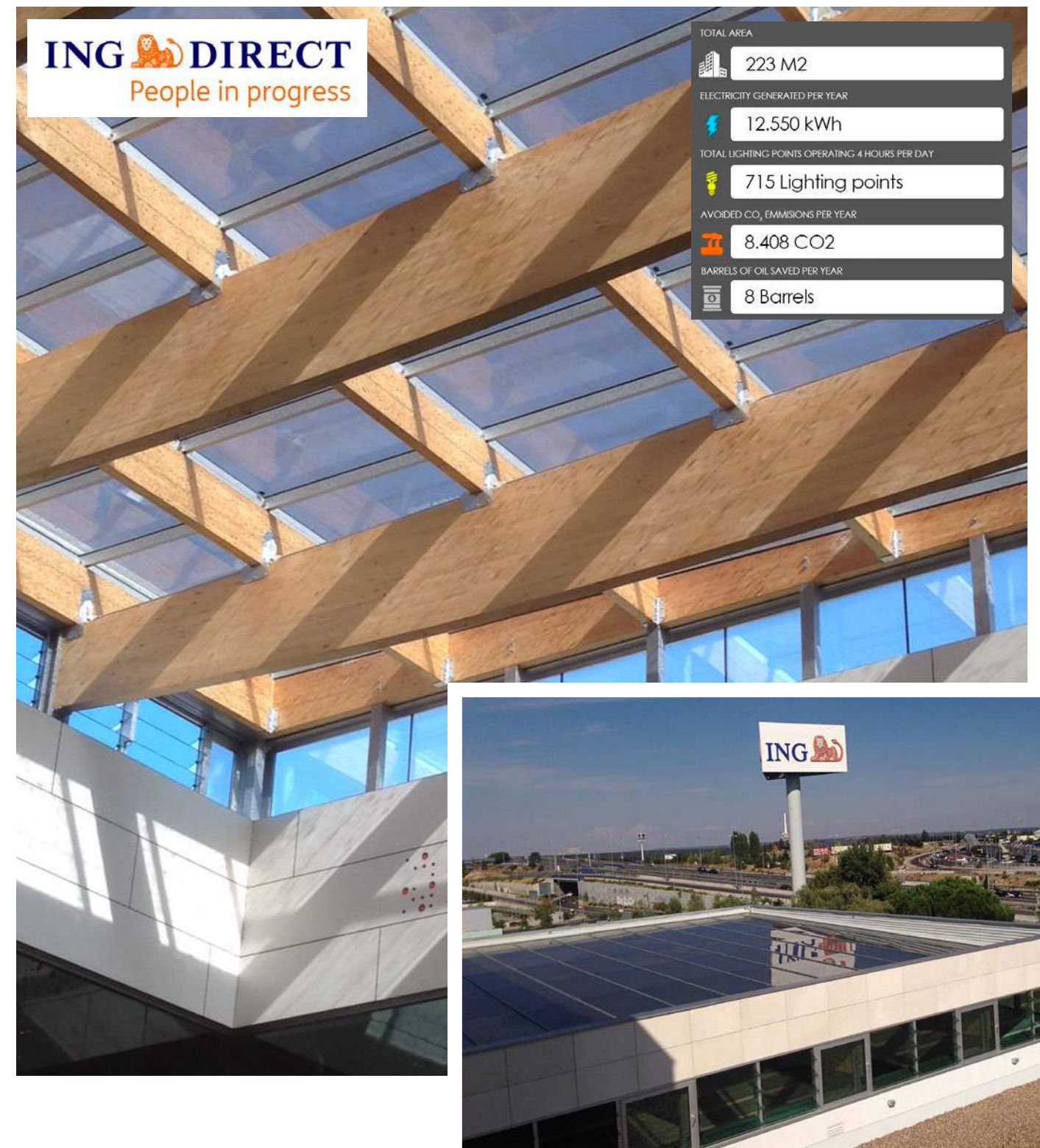
This skylight has a power capacity of **7 kWp** and is capable of generating nearly **13,000 kWh** of clean, free energy yearly, thus preventing the release of almost **9 tons** of CO₂ into the atmosphere while supplying over **700 lights** throughout the building.

In addition to generating power, the glass modules employed filter up to **99% of ultraviolet radiation** and **95% of infrared light**. These modules also have an **optimal Solar Factor** which enables the entry of daylight while preventing the greenhouse effect, enhancing considerably the comfort of its occupants. The g value is between **20% and 40%**, depending on the degree of semi-transparency.



“With the photovoltaic glass modules in the skylight, we managed to exploit all the energetic potential of this area, while providing our garden with a pleasant atmosphere”.
“In this way, this area represents a further example of our commitment to the environment; we achieve considerable energy savings, we use resources responsibly, we promote sustainable architecture and we gain a different, innovative workplace”.

Juan Carlos Castillo, ING Bank General Services and Security Director.



LE PETIT ÉCHO DE LA MODE

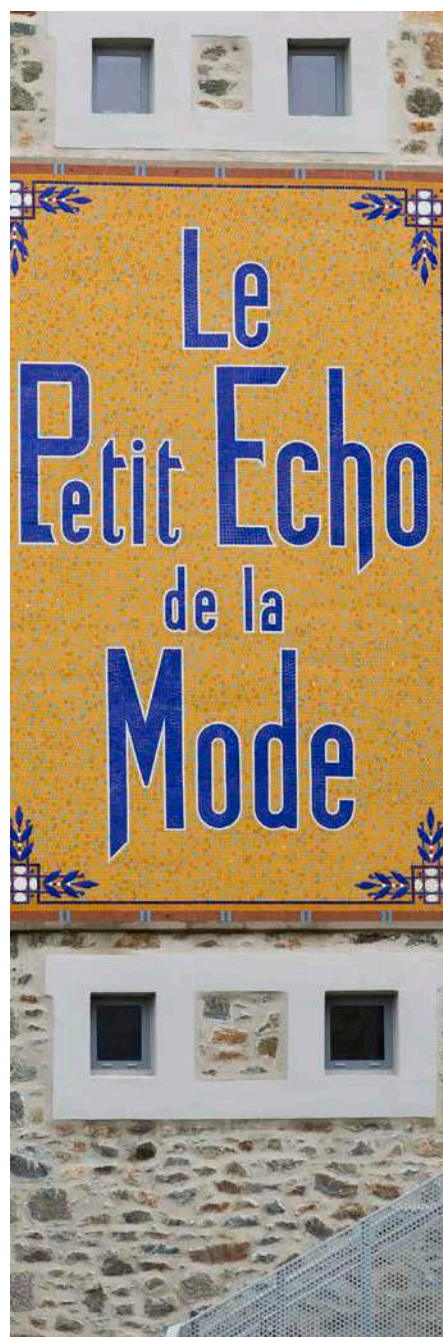
PHOTOVOLTAIC SKYLIGHT

Onyx Solar® has taken part in the refurbishment of the historic building Le Petit Écho de la Mode in cooperation with **SPIE**, a French company devoted to the design, construction, operation and maintenance of energy facilities.

Located in the picturesque town of Châtelaudren, in Brittany (France), the building **preserves the spirit of Eiffel with its metal structure, and is considered to be a national heritage**. The refurbishment of this building, a Tourism Development

and Culture Centre of the locality, has followed a sustainable approach.

A photovoltaic skylight, comprised of low-emissivity (or low-e) glass with a **semi-transparency degree of 10%**, enables this facility to generate over **42 kWh** per square metre per year. This solution enables the entry of daylight and improves energetic efficiency, while reducing the Culture Centre's electricity bill and HVAC energy demands.



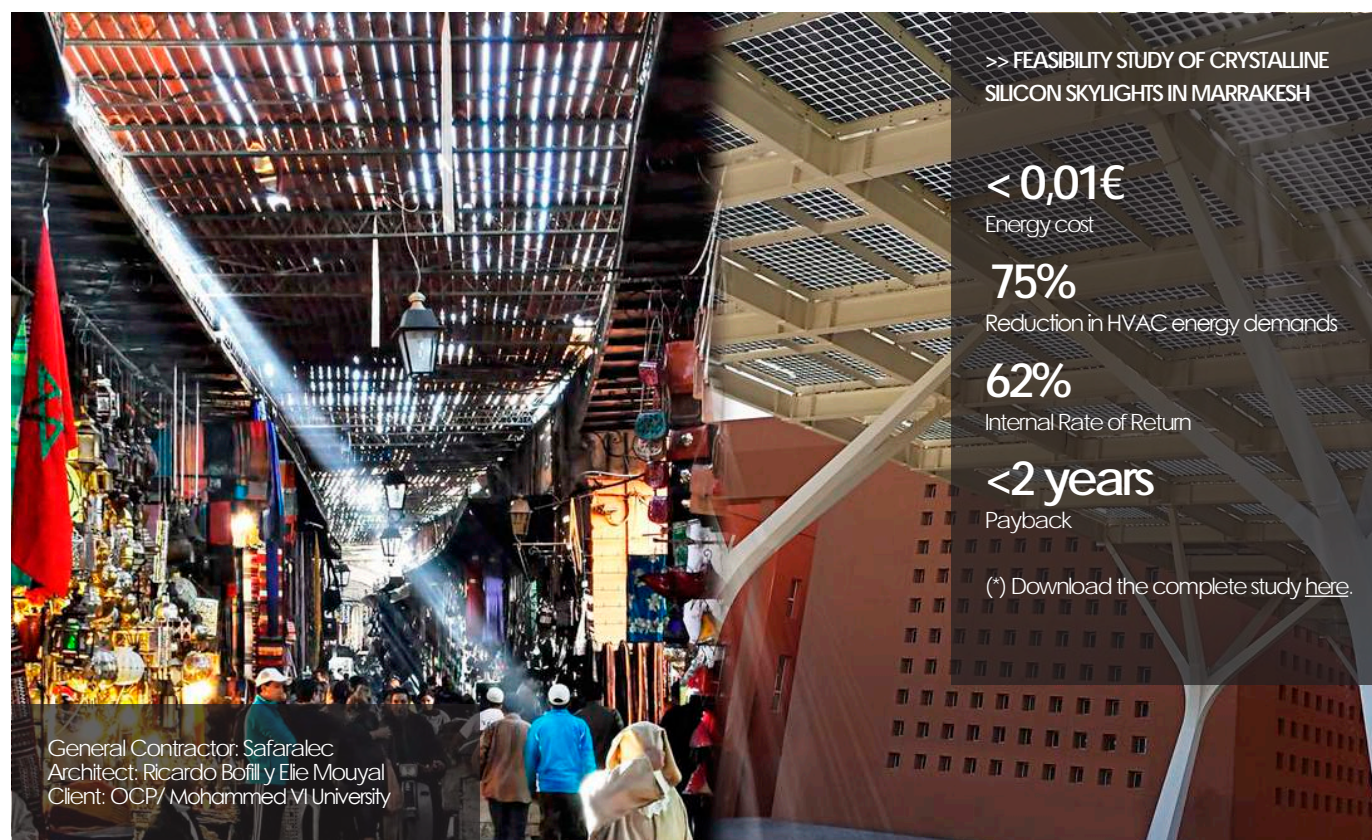
The old Le Petit Écho de la Mode printing house

Le Petit Écho de la Mode was a famous women's fashion magazine which for decades printed over a million copies per week. It had as many as 200 employees working in the printing process and in the manufacture of sewing patterns until it closed in 1983.



MOHAMMED VI UNIVERSITY

PHOTOVOLTAIC CANOPY



>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN MARRAKESH

< 0,01€

Energy cost

75%

Reduction in HVAC energy demands

62%

Internal Rate of Return

< 2 years

Payback

(*) Download the complete study [here](#).

General Contractor: Safaralec
Architect: Ricardo Bofill y Elie Mouyal
Client: OCP/ Mohammed VI University

This photovoltaic pergola of nearly **600 m²** was installed at the entrance to the Mohammed VI Polytechnic University. The pergola endows the complex with an area where users may walk between buildings while enjoying a pleasant, refreshing shade, this being necessary in locations such as Morocco where high temperatures are reached and people are exposed to solar radiation.

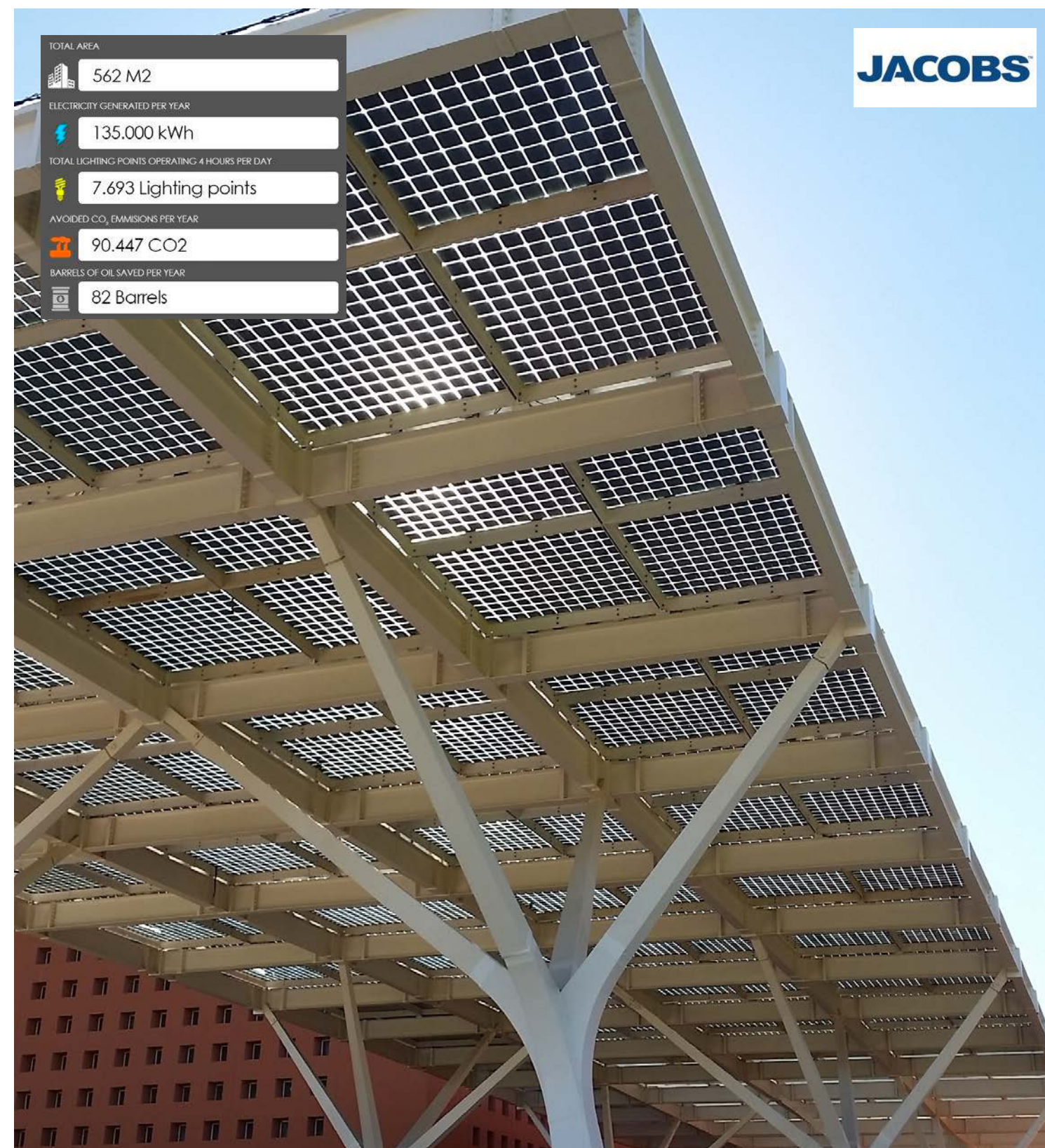
For Onyx Solar®, this project entailed a challenge and an important record due to the high efficiency of the glass modules manufactured from crystalline silicon. These modules are of a large size and were designed especially to satisfy the client's needs. It is of particular note that a single module contains **144 photovoltaic cells** and achieves a power capacity of **626 Wp**, that is, **160 Wp per m²**, enabling the pergola to generate **160,000 kWh** and to prevent the release of over **100 tons of CO₂** into the atmosphere each year.

ONYX SOLAR® ENERGY



The exploitation of daylight by means of glass modules such as those of Onyx Solar® enables the illumination of the various public areas, creating a subtle light favouring savings in energy consumption" "We undertake our works taking energetic efficiency and sustainability very seriously".

Ricardo Bofill.



JACOBS

TOTAL AREA	562 M2
ELECTRICITY GENERATED PER YEAR	135.000 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	7.693 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	90.447 CO ₂
BARRELS OF OIL SAVED PER YEAR	82 Barrels

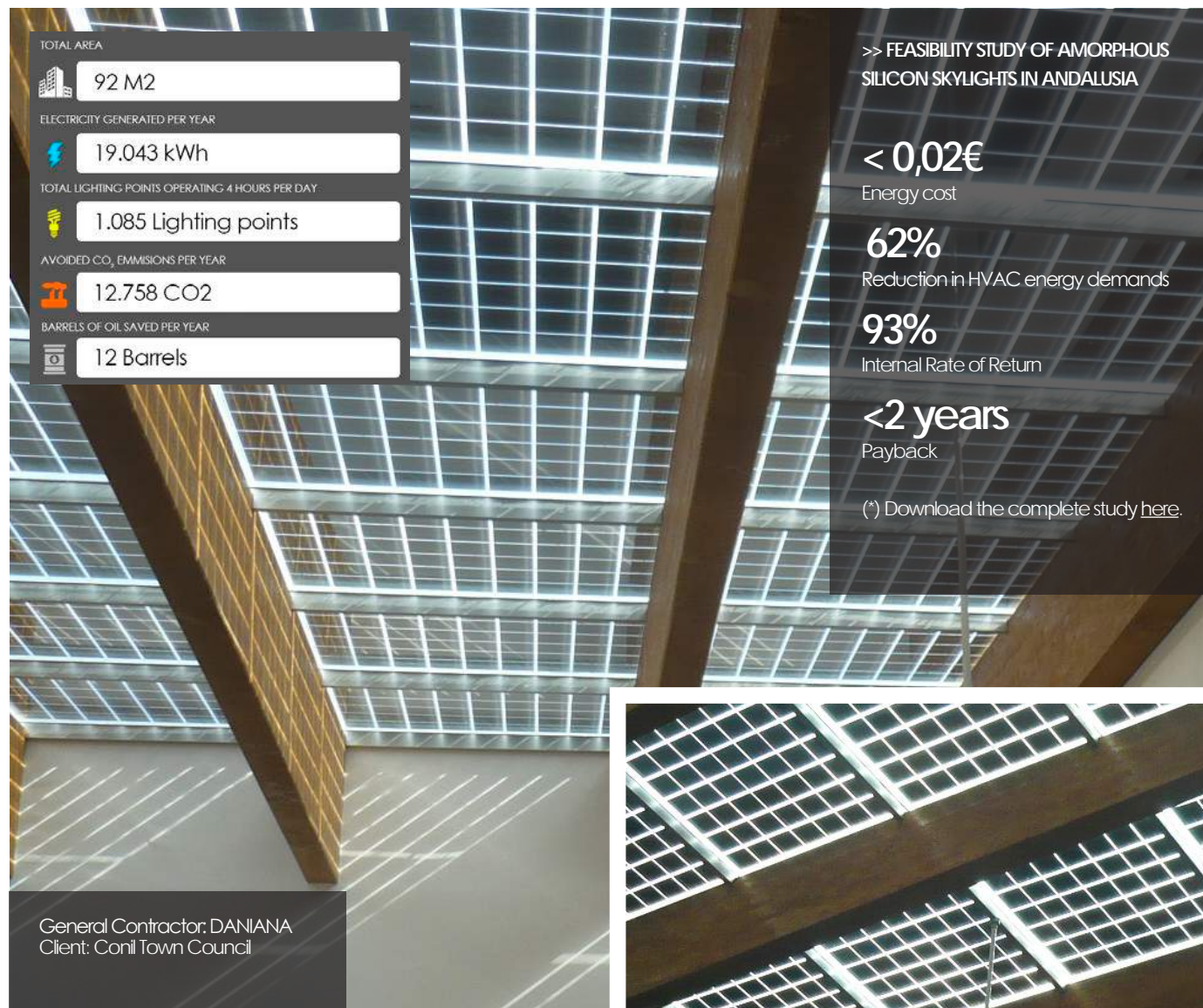
This project was penned by two architects of worldwide renown, **Ricardo Bofill** and Elie Mouyal, who preserved the spirit of Arab latticework in their design. **Jacobs**, a world leader in the provision of engineering and construction services, was entrusted with the construction of the pergola.

The Mohammed VI Polytechnic University is located at half an hour's distance from Marrakesh. This initiative was Onyx Solar®'s first project in Morocco and is included in the "Green Cities" development plan by the Moroccan state group OCP, the largest phosphate exporter worldwide. The new city has a surface area of 1,000 hectares and features a ratio of 20 m² of greenspace per capita.

ONYX SOLAR® ENERGY

CONIL TOWN HALL

PHOTOVOLTAIC SKYLIGHT



This photovoltaic skylight, executed by Onyx Solar® for the Town Hall of Conil, in Cadiz (Spain) has a surface area of 90 m².

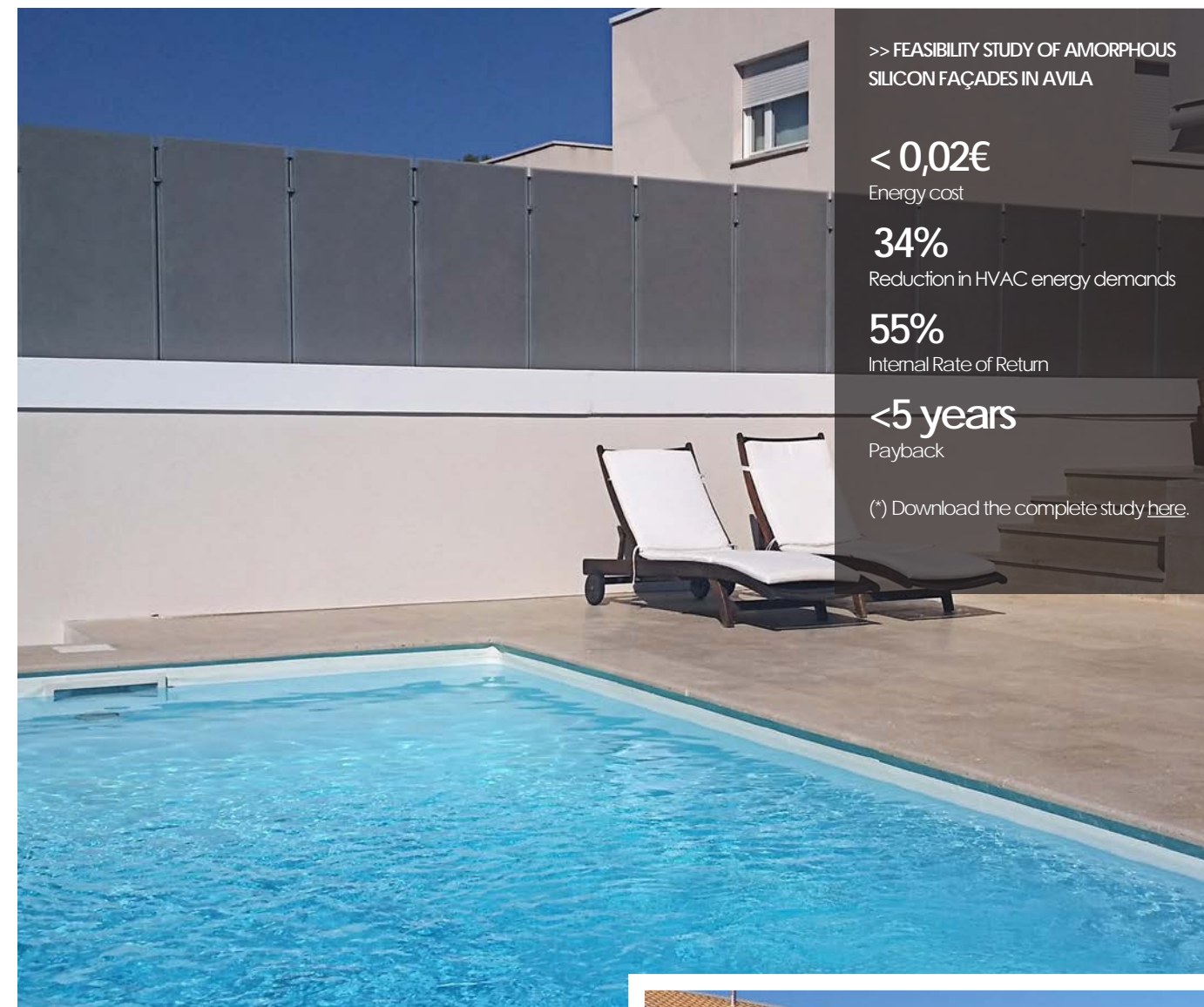
For this project, a **low-e (low-emissivity) photovoltaic glass** was chosen, whose air chamber endows the building with a high degree of both thermal and acoustic insulation.

The glass, made of crystalline silicon, has a **semi-transparency degree of 25%**, which enables the entry of daylight into the building. The installed power capacity is **12.2 kWp** and it generates the **19,000 kWh** per year needed to supply 1,100 lights.



PRIVATE RESIDENCE

PHOTOVOLTAIC BACKYARD WALL



Onyx Solar® has installed its first photovoltaic perimeter fence in a private residence located in Avila, Spain.

The glass employed is one of the greatest innovations. It is a **satín-finish anti-glare glass which maintains its photovoltaic properties and at the same time diffuses the passage of the light**, providing privacy and comfort for users.

This fence generates clean, free energy from the sun, reaching **425 kWh per year**, with a total peak installed power of **820 Wp**.



TERINA MEDITERRANEAN FOUNDATION

PHOTOVOLTAIC SOLUTION PACKAGE

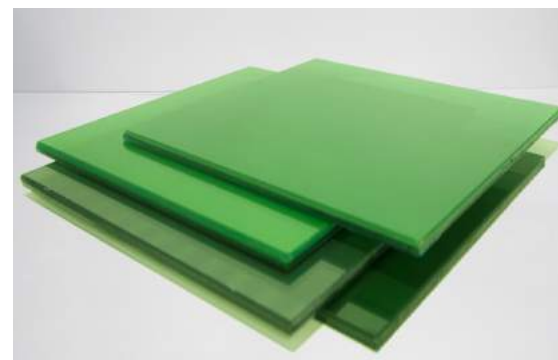


General Contractor:
Architect: Architecture Studio Pontoriero
Client: Terina Mediterranean Foundation



The refurbishment of the buildings of the Terina Mediterranean Foundation in Calabria (Italy) has a unique character and represents an important milestone for Onyx Solar®, as a single building complex houses **3,000 m²** of photovoltaic glass. The glass, made of **green amorphous silicon** and with various degrees of transparency, has been integrated in skylights, floors, walkway, parking lots and even in an elevator with panoramic views.

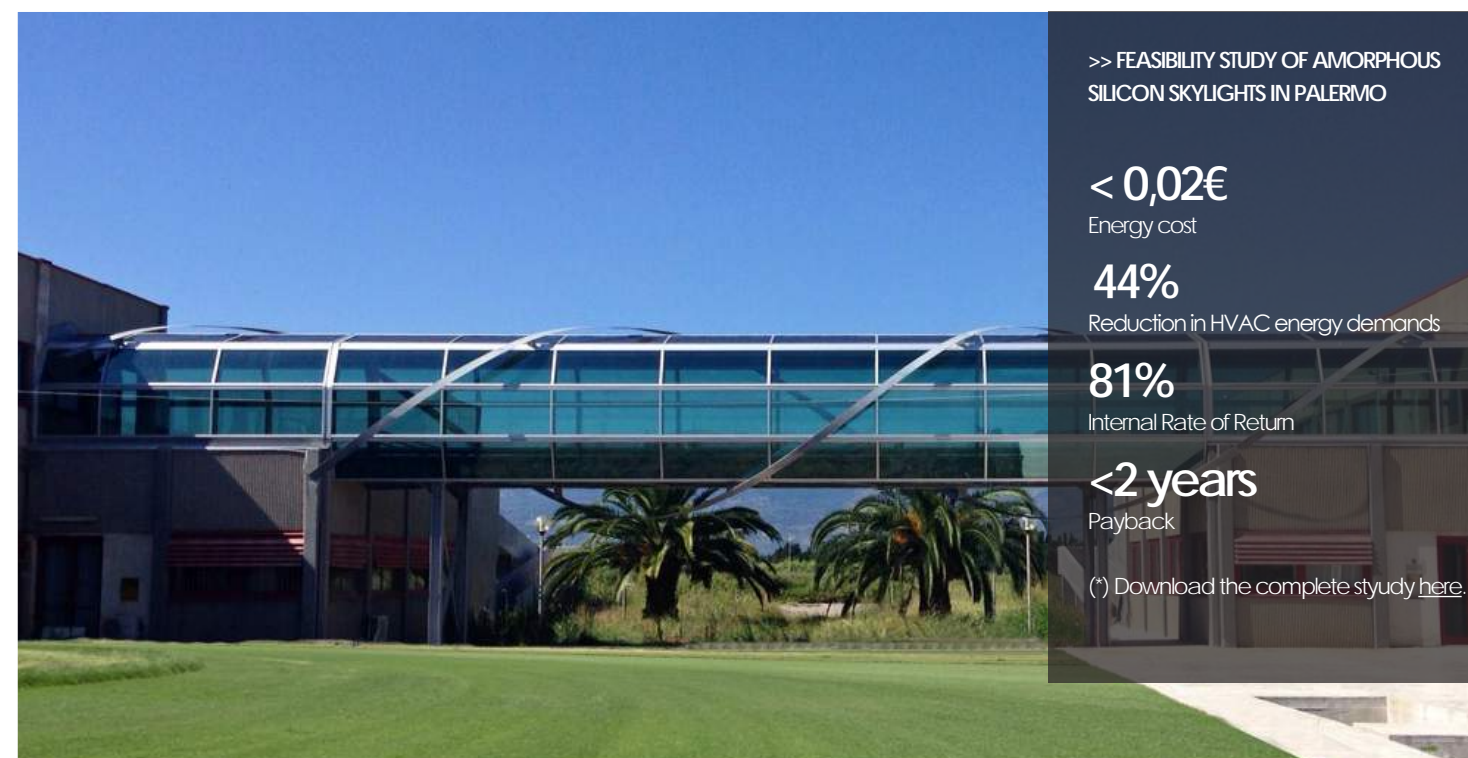
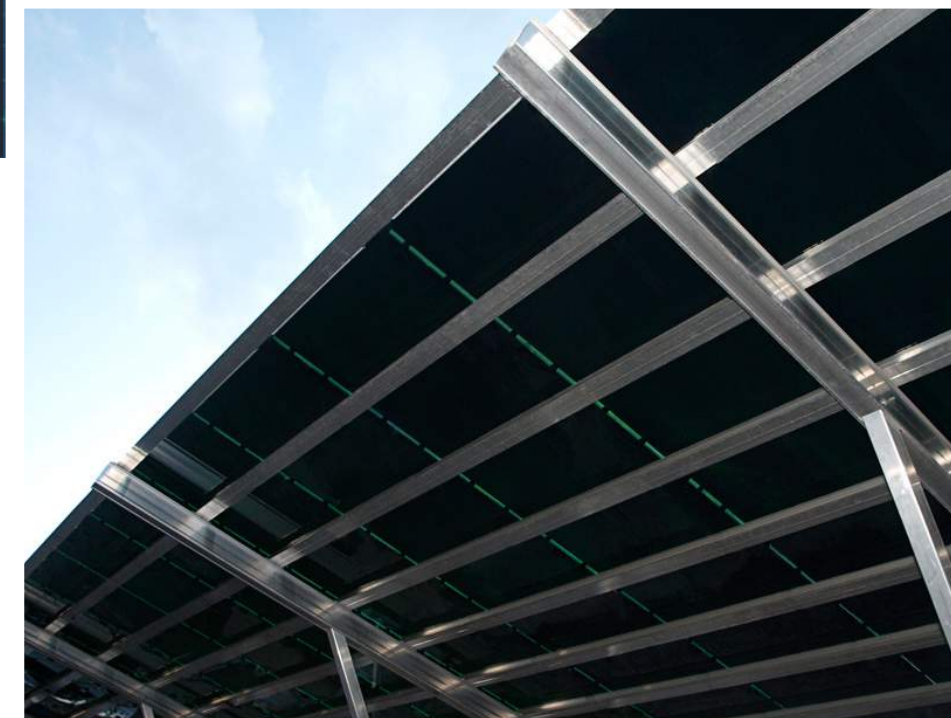
The Terina Mediterranean Foundation is a centre of excellence devoted, among other activities, to research and knowledge of the agro-food industry via a network of relationships with Italian and foreign universities.



The photovoltaic glass installed at Lamezia Terme is green in colour, one of the colours typical of this region.

“The “Terina Mediterranean Foundation” research centre has entrusted Onyx Solar® with the refurbishment of its buildings, with an optimal integration of amorphous silicon photovoltaic glass with different degrees of transparency and shades of green.”

Juan Luis Lechón, Engineer at Onyx Solar®.



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN PALERMO

< 0,02€

Energy cost

44%

Reduction in HVAC energy demands

81%

Internal Rate of Return

<2 years

Payback

(*) Download the complete study [here](#).

CABINET HOUSE

PHOTOVOLTAIC SKYLIGHT AND FAÇADE

>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN ROME

< 0,04€

Energy cost

29%

Reduction in HVAC energy demands

27%

Internal Rate of Return

<4 years

Payback

(*) Download the complete study [here](#).

Zaha Hadid Architects



The architect **Zaha Hadid** was the first woman to win the Pritzker Prize (2004). Among her projects, the Maxxi Museum in Rome or the BMW headquarters in Germany are of note.



Onyx Solar® designed and developed the photovoltaic skylight and façade for the **Cabinet House**, installed in the **MAAXI Museum in Rome**, one of the most emblematic creations of the Iraqi architect **Zaha Hadid**, and selected in **2010 as the best building in the world**.

The **Cabinet House** is a prototype of a sustainable residence based on a new form of dividing spaces, bearing in mind contemporary urban lifestyle. Both solutions are comprised of amorphous silicon glass and total an installed power capacity of **645 Wp**, generating approximately **900 kWh** of clean, sun-derived energy per year.

Architect: Sami Rintala
Client: MAXXI Museum in Rome

PANAMA PACIFICO

PHOTOVOLTAIC CANOPY

>> FEASIBILITY STUDY OF AMORPHOUS SILICON FULL ENVELOPES IN PANAMA

< 0,02€

Energy cost

80%

Reduction in HVAC energy demands

52%

Internal Rate of Return

<2 years

Payback

(*) Download the complete study [here](#).

General Contractor: London & Regional Properties
Client: Wakefield Beasley & Associates

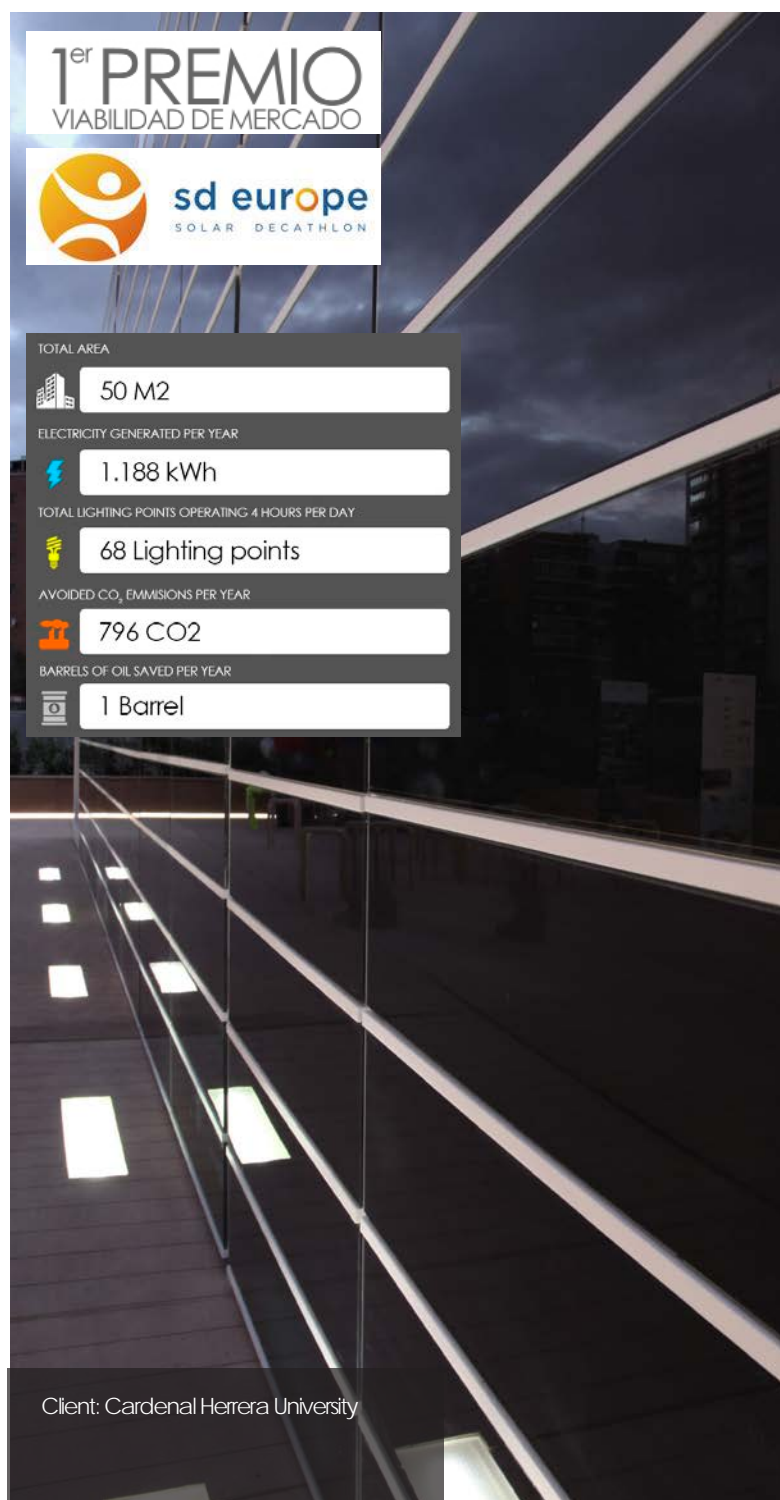
London & Regional, one of the largest private real estate companies in Europe, is the developer of "Panama Pacific". This immense multi-use complex is a recreational, residential and business community located to the west of Panama, on the former Howard Air Base.

Onyx Solar®'s contribution to this project has been the construction of an amorphous silicon photovoltaic pergola for one of the buildings. The glass has a **semi-transparency degree of 10%** and generates **7,300 kWh** yearly, with a total installed power capacity of **5.1 kWp**.



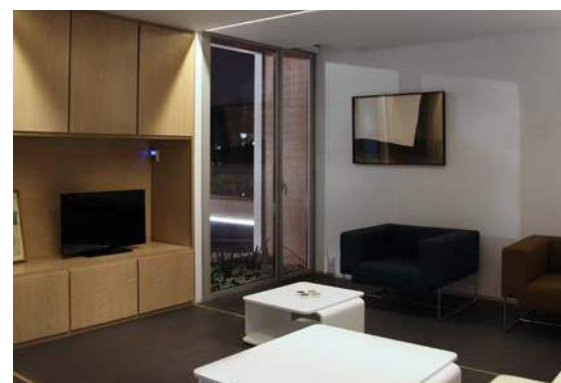
SOLAR DECATHLON SML HOUSE 2010

PHOTOVOLTAIC FAÇADE



The **European Solar Decathlon** is an international university competition to boost research into the development of energy-efficient residences. The goal of the teams taking part is the design and construction of houses which consume a minimum quantity of natural resources and produce minimal waste during their life cycle. Special emphasis is given to reducing energy consumption and obtaining all the energy required from the sun.

Originally created by the U.S. Department of Energy, it has had a European counterpart since 2010.



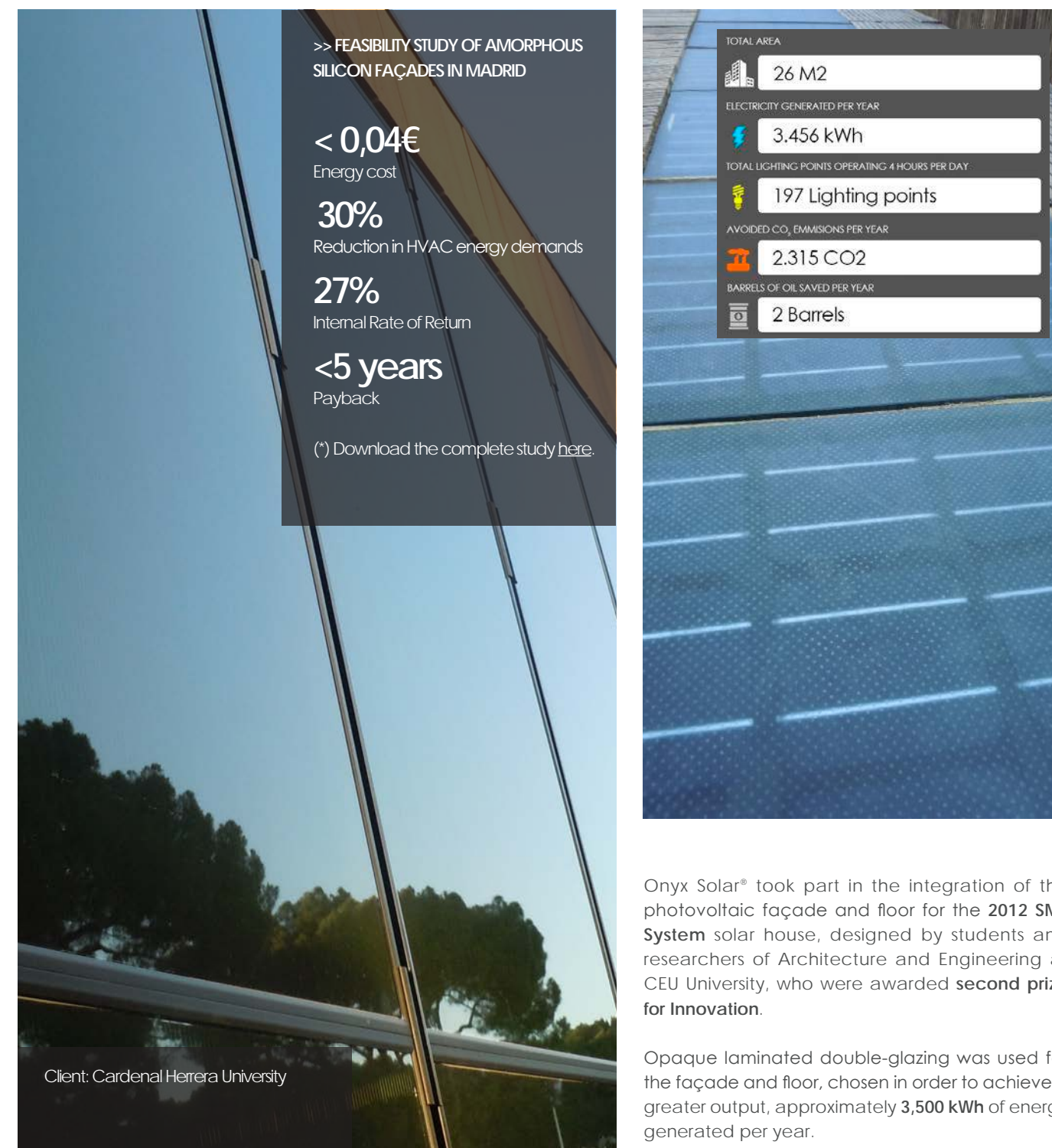
The **2010 SML House**, executed by the CEU Cardenal Herrera University, won **first prize in the Market Feasibility and Industrialisation category**.

Onyx Solar®'s participation in the project consisted of the integration of opaque amorphous silicon glass into the façade with a wooden lath substructure. The façade generates **nearly 1,200 kWh** of energy per year, sufficient to supply **70 lights** cleanly and free of cost, thanks to the sun.

This house, fed solely by solar energy, was the best rated of those presented by Spanish universities and was the most voted by the 190,000 visitors to the competition held in Madrid.

SOLAR DECATHLON SML HOUSE 2012

PHOTOVOLTAIC FAÇADE AND FLOOR

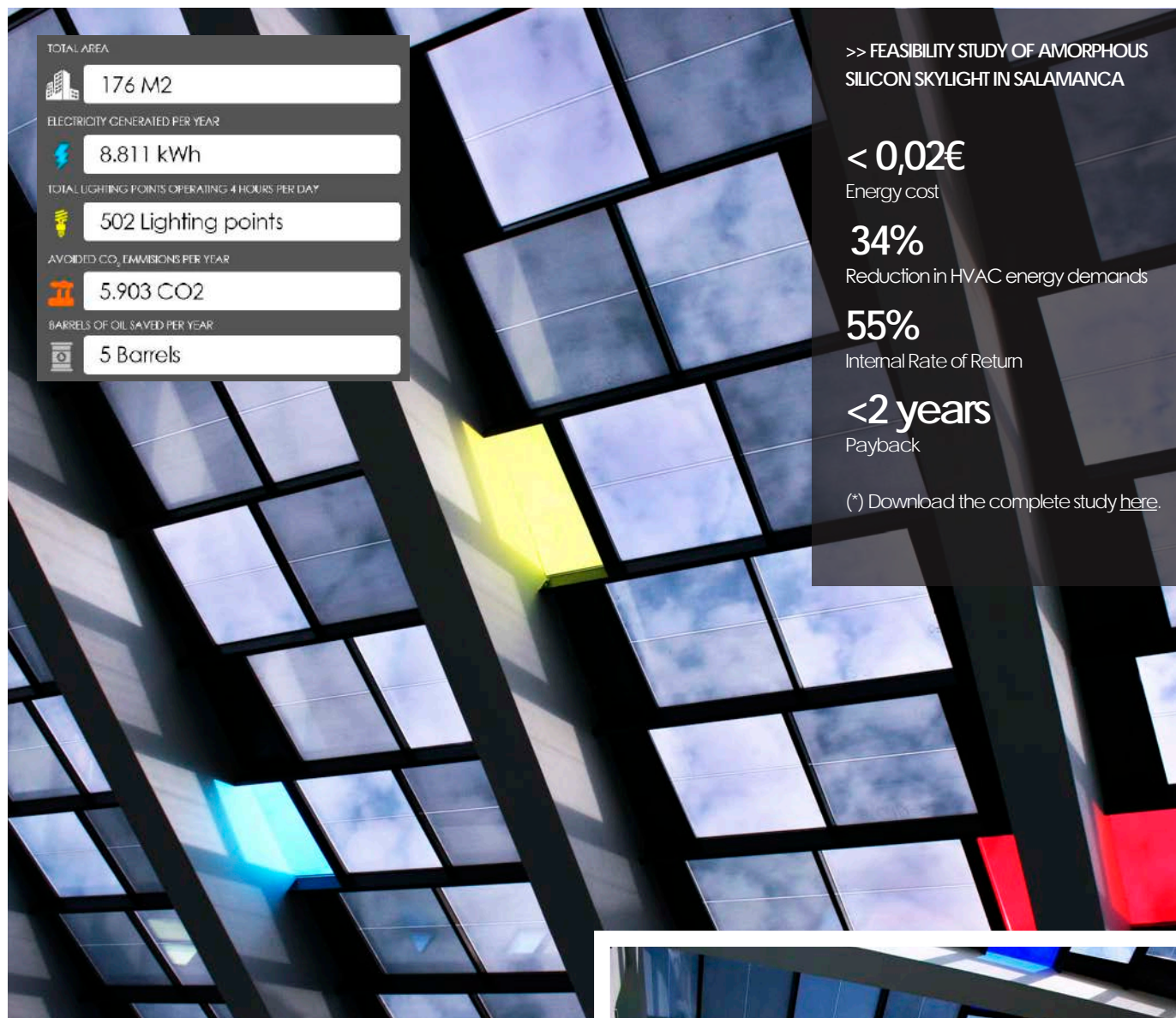


Onyx Solar® took part in the integration of the photovoltaic façade and floor for the **2012 SML System** solar house, designed by students and researchers of Architecture and Engineering at CEU University, who were awarded **second prize for Innovation**.

Opaque laminated double-glazing was used for the façade and floor, chosen in order to achieve a greater output, approximately **3,500 kWh** of energy generated per year.

BEJAR MARKET

PHOTOVOLTAIC SKYLIGHT



Refurbishment of the historic Food Market of Bejar, Salamanca (Spain), with the installation of a **176 m²** photovoltaic skylight. This skylight combines amorphous silicon modules of varying degrees of transparency and colours which form a mosaic inspired by the neoplasticism of Piet Mondrian. Besides, due to an installed power capacity of **6.7 kWp** it can generate almost **9,000 kWh** of energy per year, and prevent the release of **6 tons of CO₂**.

Part of the power generated is sent to be stored in batteries, and the rest is sent to the grid for the building's own consumption.



SENIORS RESIDENCE

PHOTOVOLTAIC CANOPY

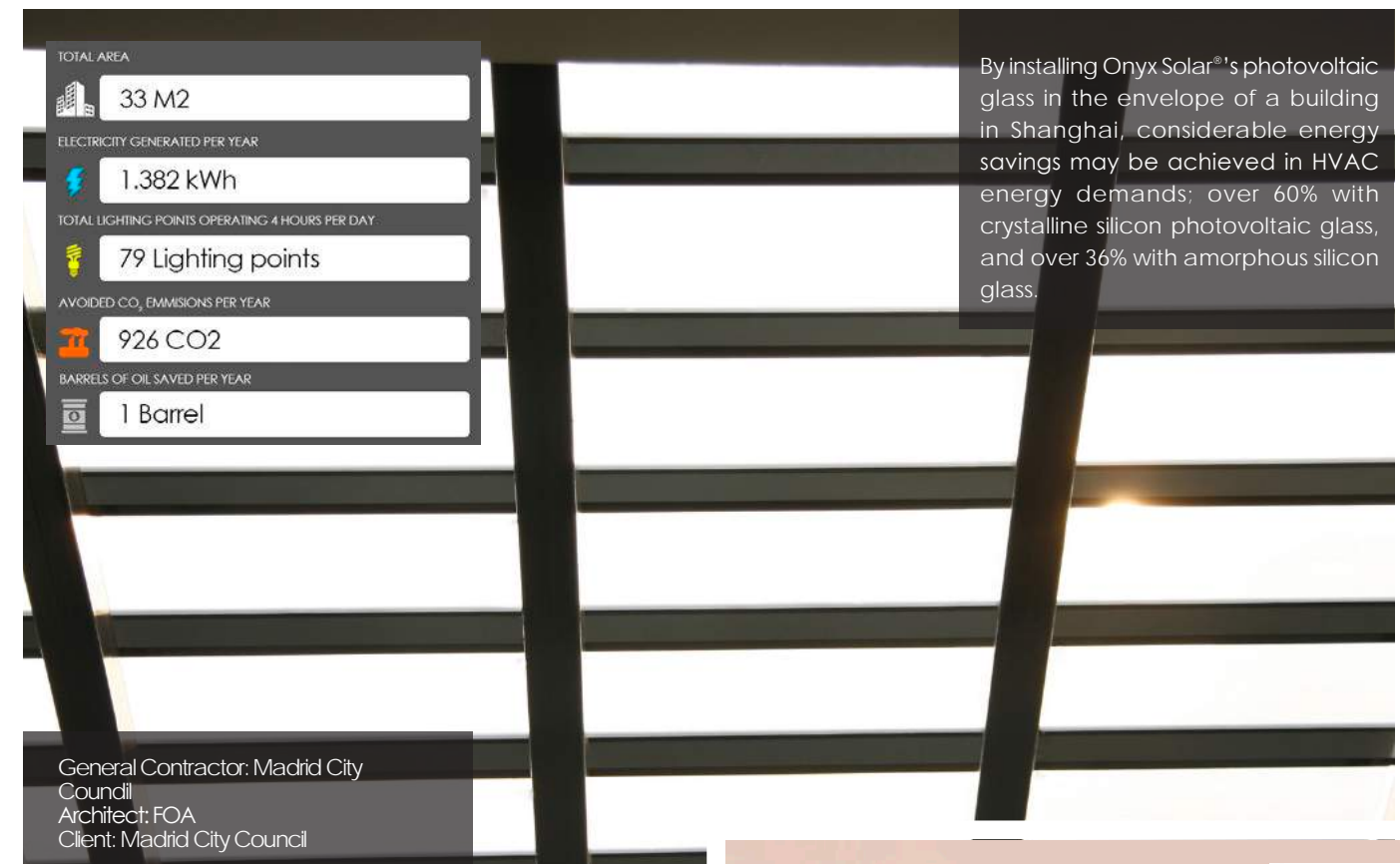


Installation of a photovoltaic pergola at the "Primavera" Seniors Residence in Coslada, Madrid.

The installation covers an area of **70 m²**, with 48 opaque amorphous silicon photovoltaic glass modules. This pergola generates over **5,000 kWh** yearly, preventing the release of **4 tons of CO₂** into the atmosphere per year. The installed power capacity is **4.3 kWp**.

THE BAMBOO HOUSE

PHOTOVOLTAIC SKYLIGHT



During the 2010 Shanghai Expo, the Bamboo House was the headquarters of the Madrid pavilion. This building was given a **RIBA (Royal Institute of British Architects) European Award**. It was also awarded a prize for the **best urban practice in 2010** due to its revolutionary bioclimatic concept.

The house features a **low-e photovoltaic skylight** with a **semi-transparency degree of 20%**. This glass, in addition to producing power, is capable of filtering out **99% of ultraviolet radiation** and up to **95% of infrared radiation** while enabling the entry of daylight.

A glass with a **g value** of between **10% and 40%**, depending on the degree of semi-transparency selected, and which is optimal for the **prevention of the greenhouse effect** within the building, thus enhancing the comfort of the occupants. Thanks to the photovoltaic properties of the glass, this skylight generates **1,400 kWh** per year.

Alejandro Zaera, the architect who penned this project, is also the creator of projects such as the Yokohama International Port Terminal in Japan.



HEADQUARTERS OF NOVARTIS

PHOTOVOLTAIC SKYLIGHT



General Contractor: Turner Construction
 Architect: Rafael Vinoly
 Client: Novartis Pharmaceutical

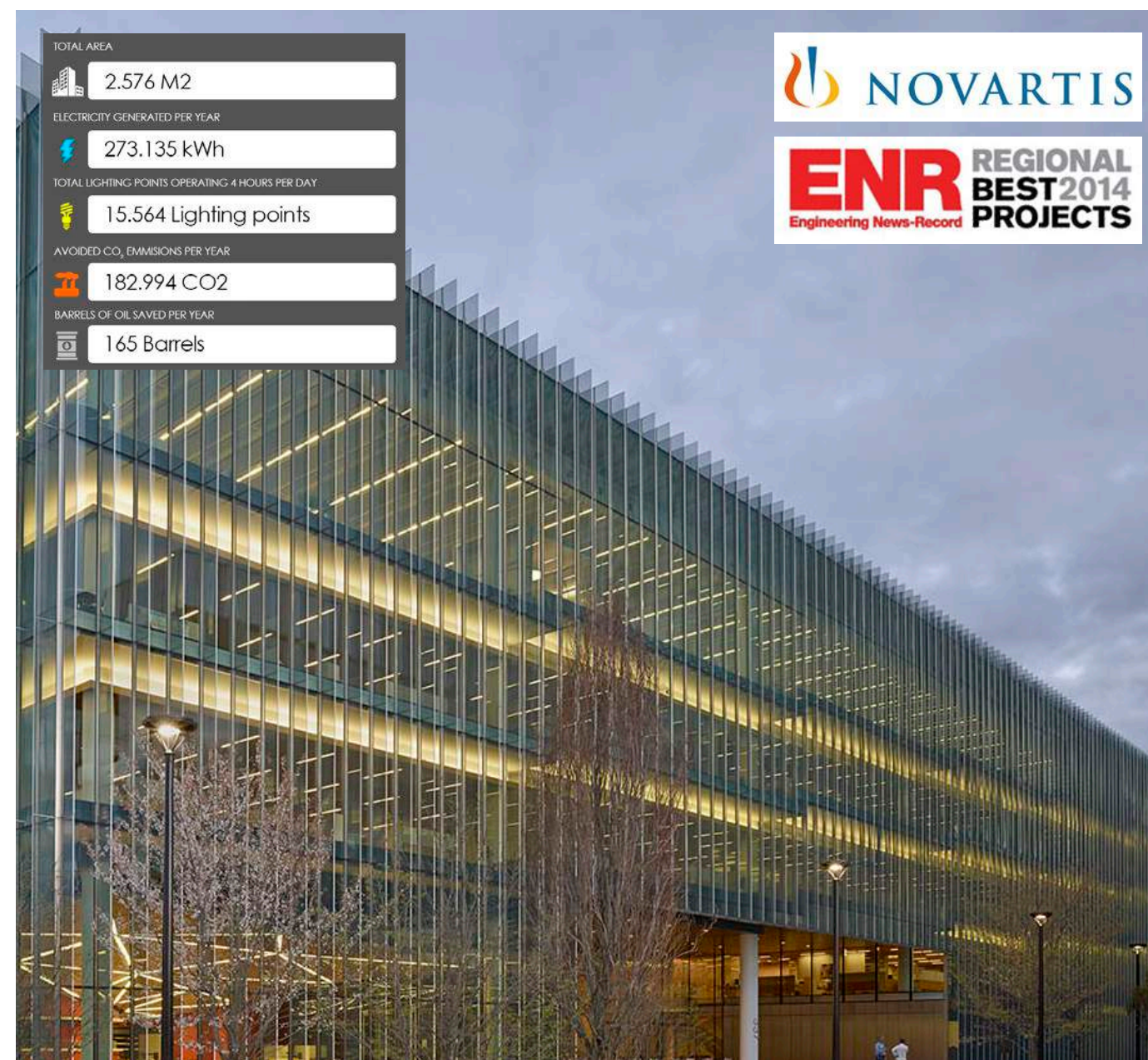
This innovative photovoltaic skylight, measuring **2,500 m²**, was installed by way of a second skin at the new headquarters of the **Novartis** Pharmaceutical Company in New Jersey, USA.

The skylight is comprised of **820** modules of photovoltaic glass measuring **1,511 x 1,931 mm**, with a power capacity of **340 Wp**. It was manufactured with **perforated crystalline** cells, which enable the passage of daylight. The design of the skylight enables the modules to be opened and closed, making the skylight totally operable.

The incorporation of this innovative technology enables the building to generate over **273,000 kWh** per year, equivalent to lighting over **600 homes** yearly, and entailing a reduction of nearly **185 tons of CO₂** released into the atmosphere, and avoiding the consumption of **165 barrels of oil per year**.

Novartis, with over 120,000 employees, is a worldwide referent due to its sustainable practices and occupies the leading position among pharmaceutical companies in the Dow Jones European and World Sustainability Indices.

The New Jersey campus promotes research, and is doubtless one of the greatest referents on an architectural level due to the efficiency of its buildings.



“ Building awarded the title of Best Sustainable Project in New York in 2014 by the most significant construction magazine worldwide, Engineering News-Record (ENR), of the McGraw Hill and Standard&Poor’s group”.

Turner: construction, leadership and safety.

The influential magazine Engineering News Record (ENR) has once again awarded the U.S. company Turner Construction first place in the ranking of American general contractors due to its sales volume within the country.

In addition to the excellence of its work, Turner stands out due to its commitment to safety, having received the award for excellence in this field.

“The role played by Turner throughout the project has been decisive for its success, ensuring high-quality work, coordinating the many teams and being at the forefront of communications between all the parties”, says Teodosio del Caño, Chief Technical Officer of Onyx Solar®.



Rafael Vinoly: a commitment to cutting-edge architecture.

Vinoly designed a project which stands out due to its sustainable, energy-efficient, innovative practices. His commitment to photovoltaic integration in buildings, and the inclusion of the largest photovoltaic skylight in the world in his design, make him the undisputed leader in his sector.

Rafael Vinoly is one of the architects who are most committed to sustainability and innovation in the international sphere. In 2013 he was awarded the Prize for Excellence in Civil Architecture by the American Society of Architects. Among his most emblematic projects, the Tokyo International Forum and Carrasco International Airport in Uruguay, which aims to become the first self-sufficient airport in the world, are of note.



“ *The technical competence displayed by our team when faced by a highly complex project was decisive for the awarding of this contract.*

Teodosio del Caño, CTO at Onyx Solar®.

SAN ANTON MARKET

■ PHOTOVOLTAIC SKYLIGHT

>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN MADRID

< 0,02€

Energy cost

34%

Reduction in HVAC energy demands

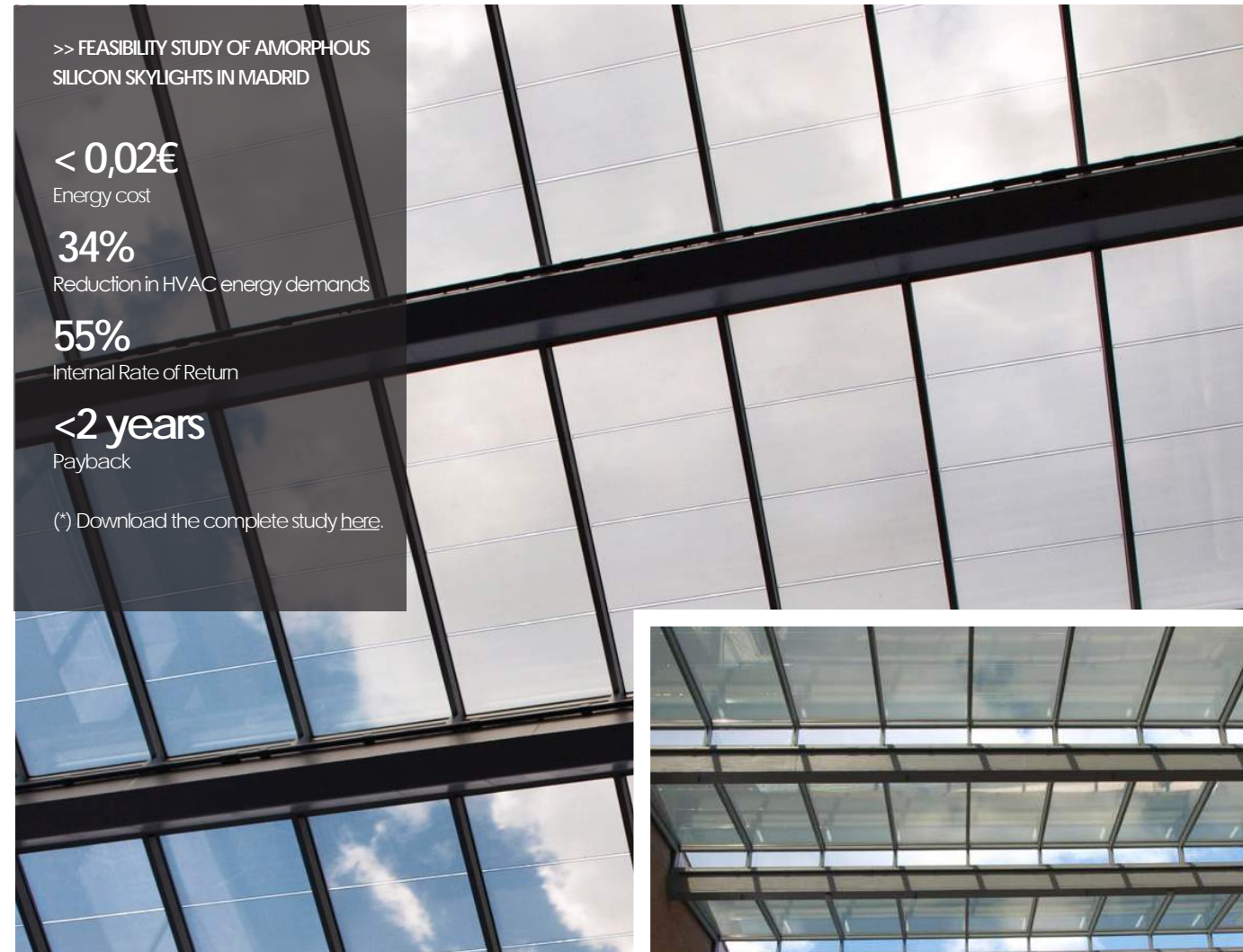
55%

Internal Rate of Return

<2 years

Payback

(*) Download the complete study [here](#).



This project is part of the refurbishment of San Anton Market, located in the centre of Madrid, where a **168 m²** skylight, comprised of transparent low-e photovoltaic glass, has been entirely integrated in the building.

The system enables the generation of electricity in situ, while providing multi-functional bioclimatic properties such as the filtration of solar radiation, and at the same time enhancing interior light and providing thermal and acoustic insulation thanks to its double-glazing.

The glass employed is made of amorphous silicon, with a **semi-transparency degree of 20%**, and the total installed power capacity is **6.5 kWp**. This photovoltaic skylight generates over **7,700 kWh** per year and prevents the release of **5 tons of CO₂**. For this reason it has been selected as a **sustainable project of reference by the European Commission**.

OFFICIAL PARTNER OF THE EUROPEAN COMMISSION 2010



Official Partner

Onyx Solar® was selected as an Official Partner of the European Commission for "Sustainable Power for Europe" for the installation of the photovoltaic skylight at the San Anton Market.

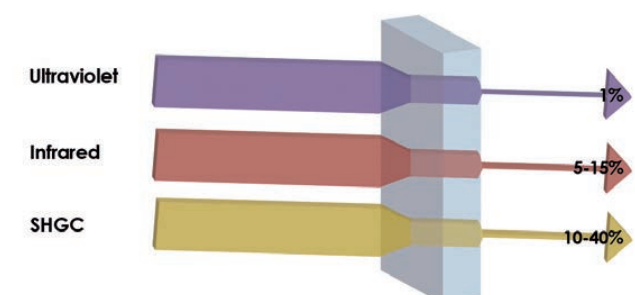
ONYX SOLAR® ENERGY

TOTAL AREA	168 M2
ELECTRICITY GENERATED PER YEAR	7.748 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	424 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	4.990 CO ₂
BARRELS OF OIL SAVED PER YEAR	4 Barrels

ACS
ACTIVIDADES DE CONSTRUCCIÓN Y SERVICIOS

DRAGADOS

OPTICAL PROPERTIES OF ONYX SOLAR® THINFILM



General Contractor: Geocisa/
Dragados
Architect: QVE
Client: Madrid City Council

PILGRIM'S HOSTEL

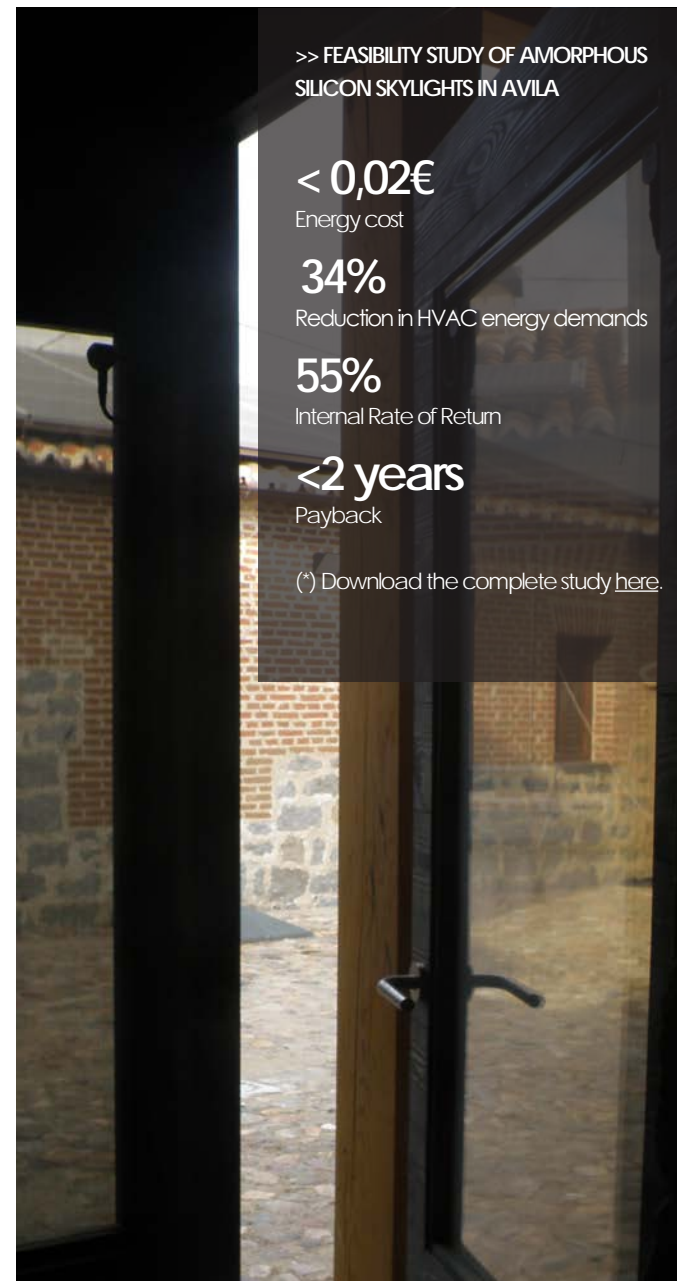
PHOTOVOLTAIC WINDOWS AND DOOR



Client: Gotarrendura Town Council

The refurbishment of this small Hostel at Gotarrendura, Spain, includes the integration of low-e amorphous silicon photovoltaic glass in the windows and door. This is the only glass capable of filtering out **99% of ultraviolet radiation** and up to **95% of infrared radiation**, depending on the degree of semi-transparency selected.

Thanks to this installation, this town in Avila was awarded the **Livcom prize** in Seoul. This prize commenced in 1997 to encourage innovation and leadership in the creation of



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN AVILA

< 0,02€

Energy cost

34%

Reduction in HVAC energy demands

55%

Internal Rate of Return

<2 years

Payback

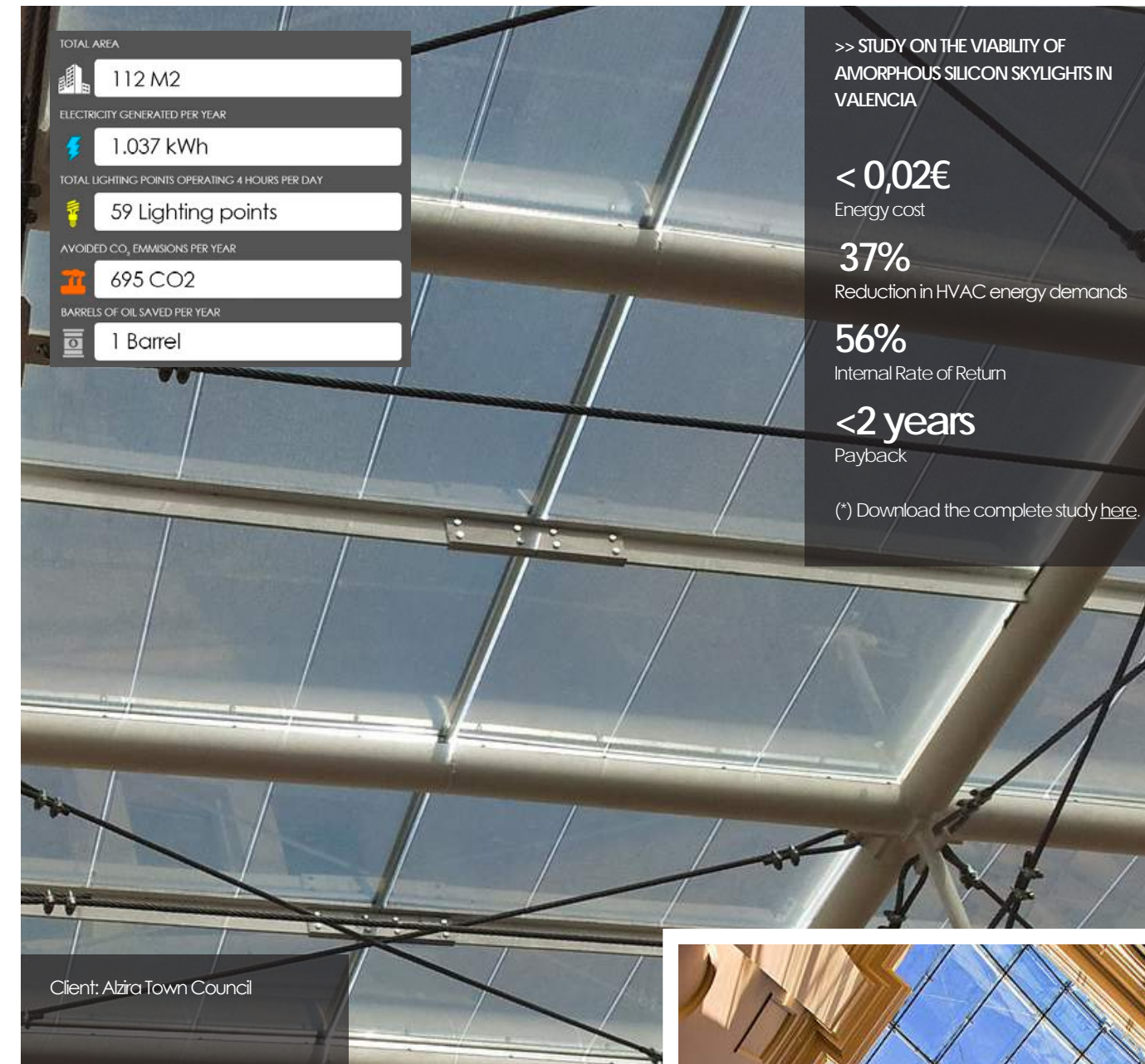
(*) Download the complete study [here](#).

sustainable environments.

"This award represents a great success for the town, warranting the Town Council's commitment to the environment, to development and to well-being", says Fernando Martin, mayor of Gotarrendura, who received the award in Seoul, accompanied by Luis Arias-Romero, Spanish Ambassador in this Asian country.

ALZIRA TOWN HALL

PHOTOVOLTAIC SKYLIGHT



Client: Alzira Town Council

>> STUDY ON THE VIABILITY OF AMORPHOUS SILICON SKYLIGHTS IN VALENCIA

< 0,02€

Energy cost

37%

Reduction in HVAC energy demands

56%

Internal Rate of Return

<2 years

Payback

(*) Download the complete study [here](#).


This photovoltaic skylight, integrated into the Town Hall of Alzira in Valencia, is comprised of **low-e amorphous silicon photovoltaic glass** modules with a semi-transparency degree of 10%.

The skylight enables the passage of daylight, facilitating the natural illumination of the courtyard while preventing the overheating of the building due to its **solar (g) factor of between 10% and 40%**, this making it an optimal choice for the prevention of the greenhouse effect, particularly in warm climates such as that of Valencia. Furthermore, due to its photovoltaic properties it generates over **1,000 kWh** yearly and prevents the release of almost **1 ton of CO₂** each year. The total installed power capacity is **5.1 kWp**.



GDR HEADQUARTERS

PHOTOVOLTAIC CURTAIN WALL



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN ANDALUSIA

< 0,02€
Energy cost

41%
Reduction in HVAC energy demands

44%
Internal Rate of Return

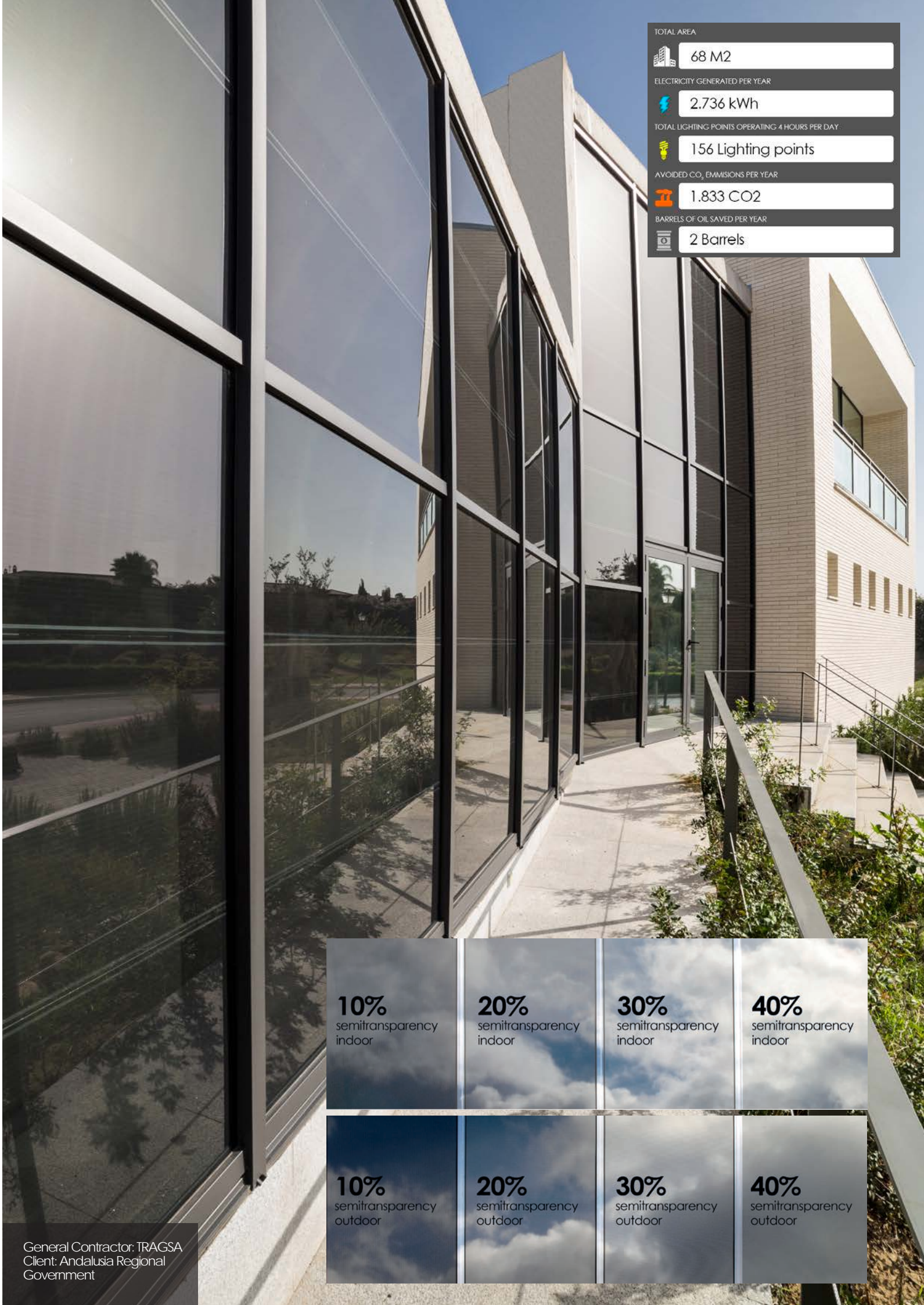
<3 years
Payback

(*) Download the complete study [here](#).

Installation of a photovoltaic curtain wall at the new headquarters of the Guadalhorce Valley Rural Development Group, reducing the energy consumption of the building. This enclave, located in the province of Malaga, was born to be a Social, Economic and Environmental Innovation Centre to house the bodies and associations currently working in the region on the development, promotion and innovation of the valley.

This time, Onyx Solar®'s photovoltaic glass was installed on the façade of the building, forming a remarkable curtain wall capable of generating over **2,700 kWh** per year, with a peak installed power capacity of **2.5 kWp**.

The glass modules, made from amorphous silicon, are large-sized and were made to measure to satisfy the requirements of the client, the Andalusian regional government. It is of note that the photovoltaic glass employed is of the **low-emissivity (low-e)** type, which improves the thermal and acoustic insulation of the building and enhances energy savings in the same. It further features a **semi-transparency degree of 20%**, which enables the uniform passage of light into the interior, reducing the need for artificial light while preventing the ingress of heat and the undesired greenhouse effect due to its **Solar (g) Factor of between 10% and 40%, depending on the degree of semi-transparency**. All the above is conducive to an improvement in the comfort of those inside, in addition to being in keeping with the natural surroundings of the location of these headquarters by preserving the aesthetics of the building.



TOTAL AREA
68 M2

ELECTRICITY GENERATED PER YEAR
2.736 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
156 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
1.833 CO₂

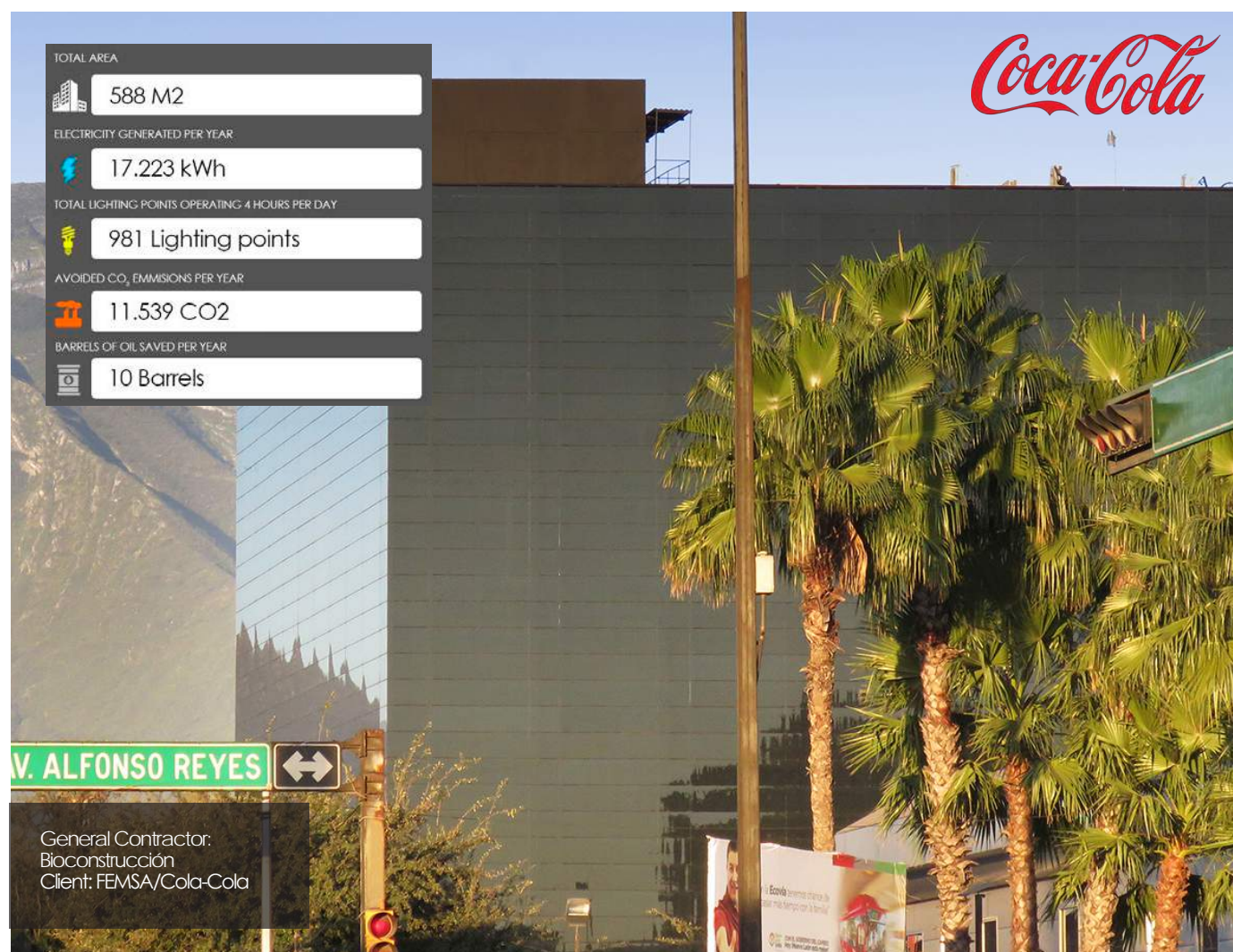
BARRELS OF OIL SAVED PER YEAR
2 Barrels

10% semitransparency indoor	20% semitransparency indoor	30% semitransparency indoor	40% semitransparency indoor
10% semitransparency outdoor	20% semitransparency outdoor	30% semitransparency outdoor	40% semitransparency outdoor

General Contractor: TRAGSA
Client: Andalusia Regional Government

COCA-COLA/FEMSA HEADQUARTERS

PHOTOVOLTAIC FAÇADE



Onyx Solar® executed the modernisation of the façade of Femsa's headquarters in Monterrey, Coca-Cola's main bottling plant worldwide.

This ventilated façade solution consists of integrating a double skin of photovoltaic glass whose mounting structure is not visible from inside the building.

To this end, **400 large-sized grey amorphous silicon glass modules**, with a **semi-transparency degree of 20%**, were designed to measure.

The photovoltaic glass of the façade generates approximately **17,200 kWh** and prevents the release of over **11 tons of CO₂** into the atmosphere.

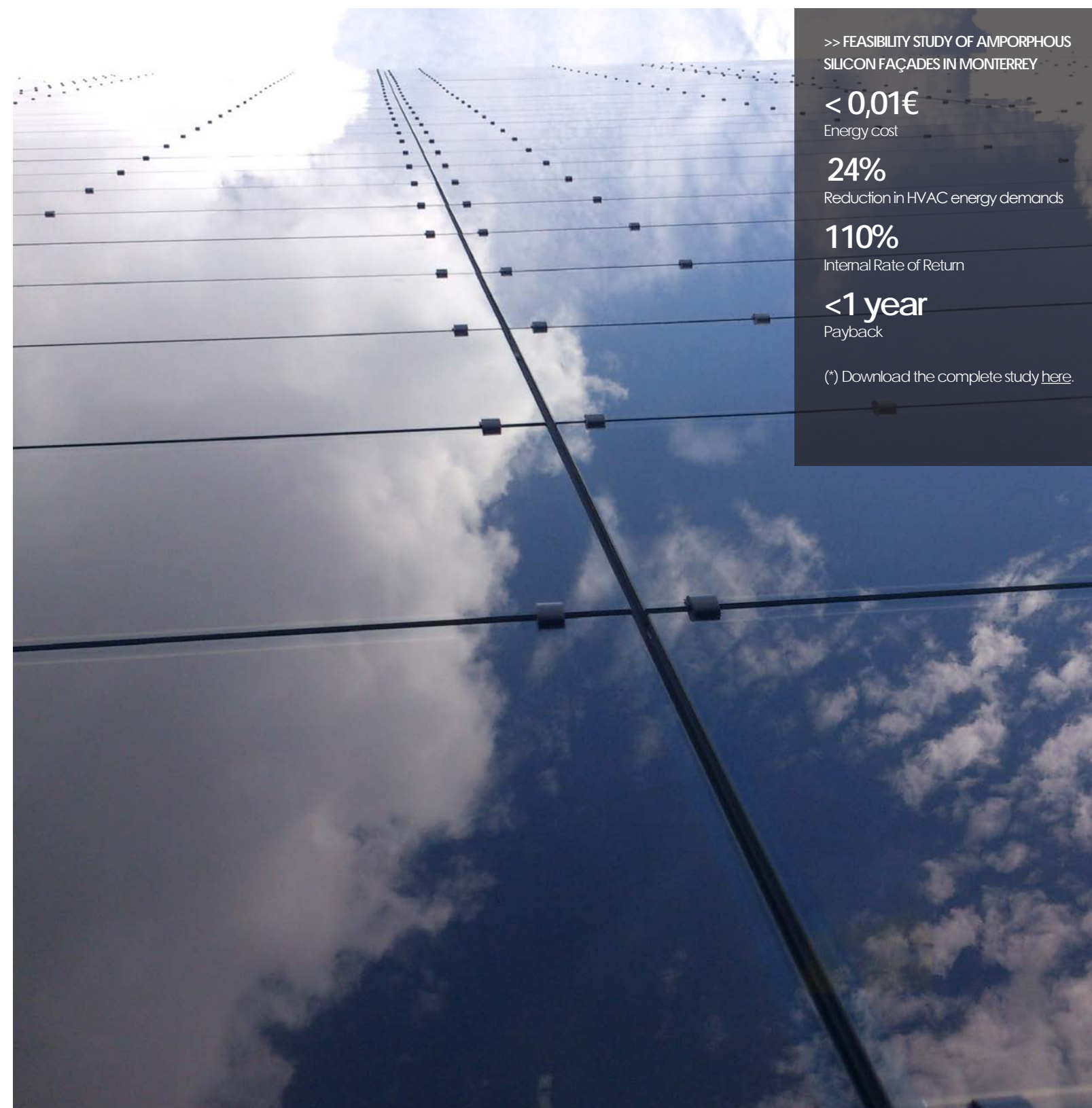
Furthermore, the ventilated façade is doubtless an optimal construction solution from an energy-efficient viewpoint. In fact, it has been estimated that the energy savings derived from the remarkable insulation produced by this construction solution may reach as much as **40%** of the energy requirements of the building. If we add to these savings the possibility of generating clean, free energy from the sun by means of the use of photovoltaic glass, we are doubtless looking at one of the most effective construction solutions on the market.

This project is included in the many initiatives directed and developed by Coca-Cola Femsa in their quest for sustainability and corporate responsibility.



“Working on this project with Onyx Solar® has been a rewarding experience. Both companies took on the challenge to execute Mexico's first photovoltaic glass façade in record time, and the result has been most satisfactory. Like in all projects, working with top-notch specialised companies is a guarantee of success”.

Alfredo de la Rosa, Manager of Internal Civil Works at FEMSA.



>> FEASIBILITY STUDY OF AMPORPHOUS SILICON FAÇADES IN MONTERREY

< 0,01€

Energy cost

24%

Reduction in HVAC energy demands

110%

Internal Rate of Return

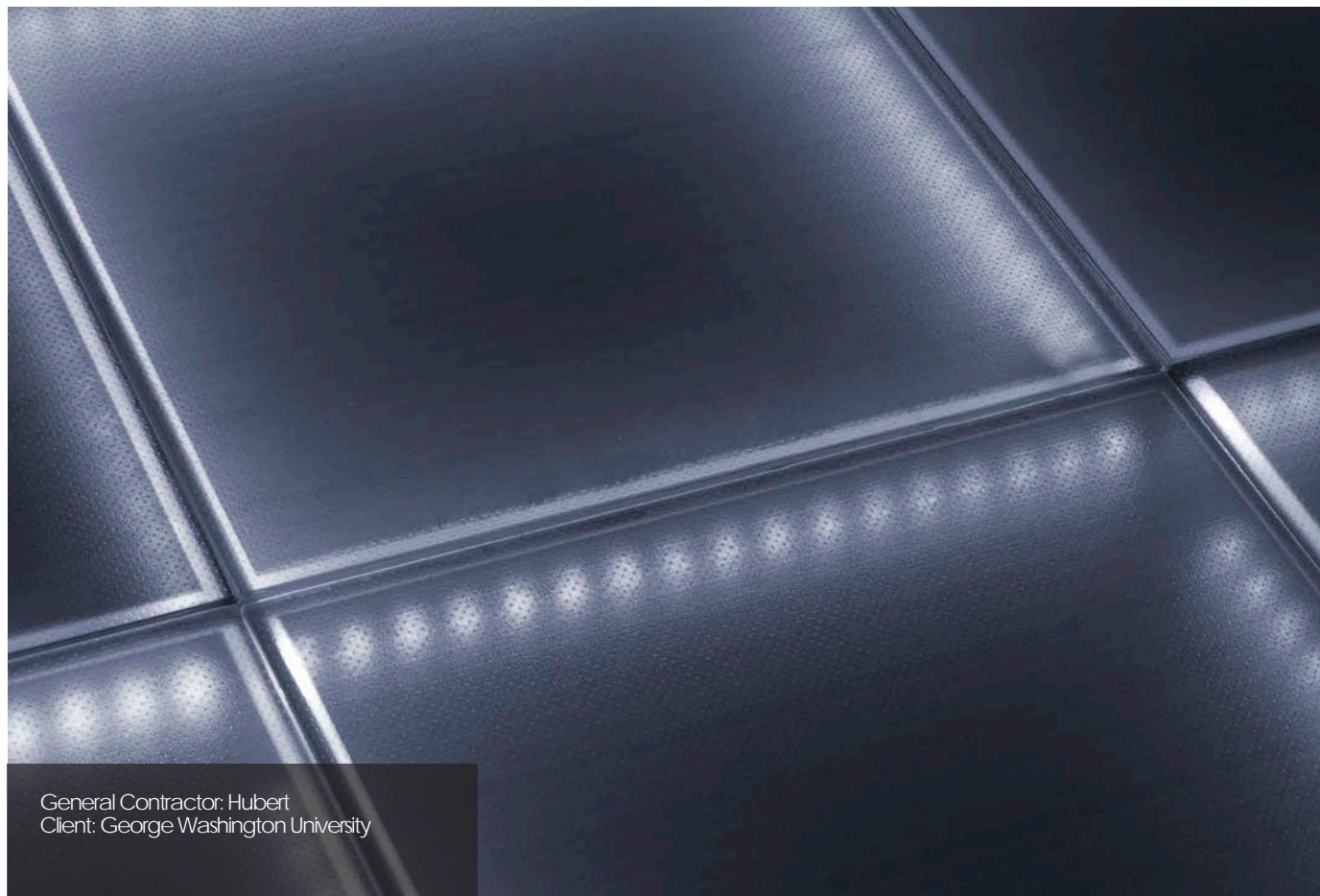
<1 year

Payback

(*) Download the complete study [here](#).

GEORGE WASHINGTON UNIVERSITY

PHOTOVOLTAIC FLOOR



General Contractor: Hubert
Client: George Washington University

George Washington University (GWU) has cooperated with Onyx Solar® in the installation of the first walkable photovoltaic floor in the world, located in the Science and Technology Campus in Ashburn, Virginia (USA).

The non-slip semi-transparent tiles forming the floor convert the solar radiation into energy by means of semiconductors. The total installed power capacity is **405 Wp**, sufficient to power the **450 LED lights** backlighting the walkway.

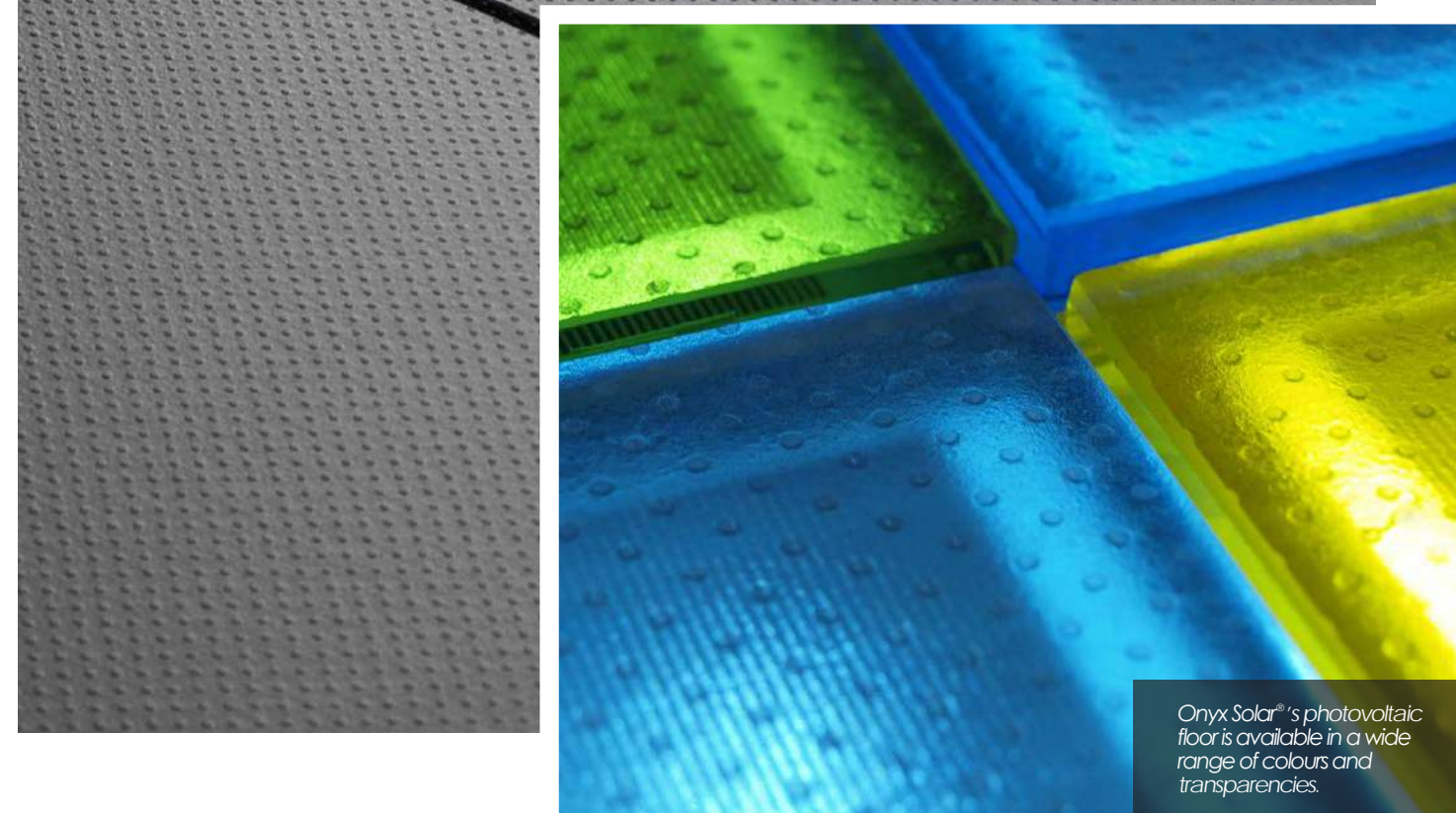
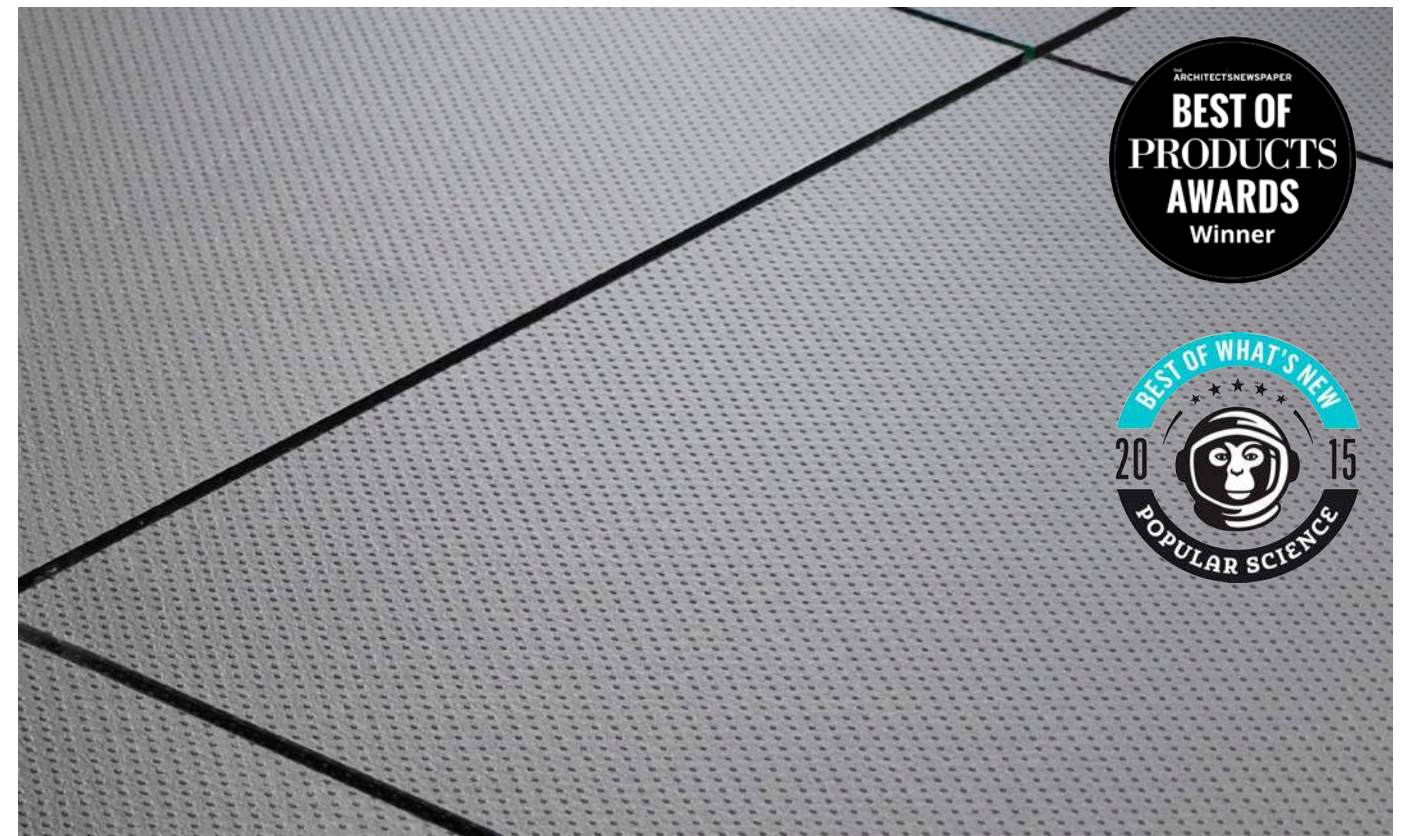
Thanks to the breakthroughs achieved by the company's R&D&i Department, this solution fulfils the highest technical standards; it complies with non-slip regulations and withstands 400 kg in the momentary load tests, and its installation is very simple, as it is laid like a raised floor, with plots.

Onyx Solar® has received awards on many occasions for developing and patenting the first non-slip photovoltaic glass floor in the world.



This installation is a good example of the University's commitment to sustainability and a reflection of the organisation's mentality, always with a clear view of the future".

Eric Selbst, Senior Land Use Planner at GWU.



Onyx Solar®'s photovoltaic floor is available in a wide range of colours and transparencies.

BOAT ON THE LAKE OF SANABRIA

PHOTOVOLTAIC SOLAR BOAT



The "Helios-Sanabria" is the **first wind- and solar-powered catamaran** in the world, and features the latest technology to perform didactic and pleasure excursions on the Lake of Sanabria in Zamora, Spain.

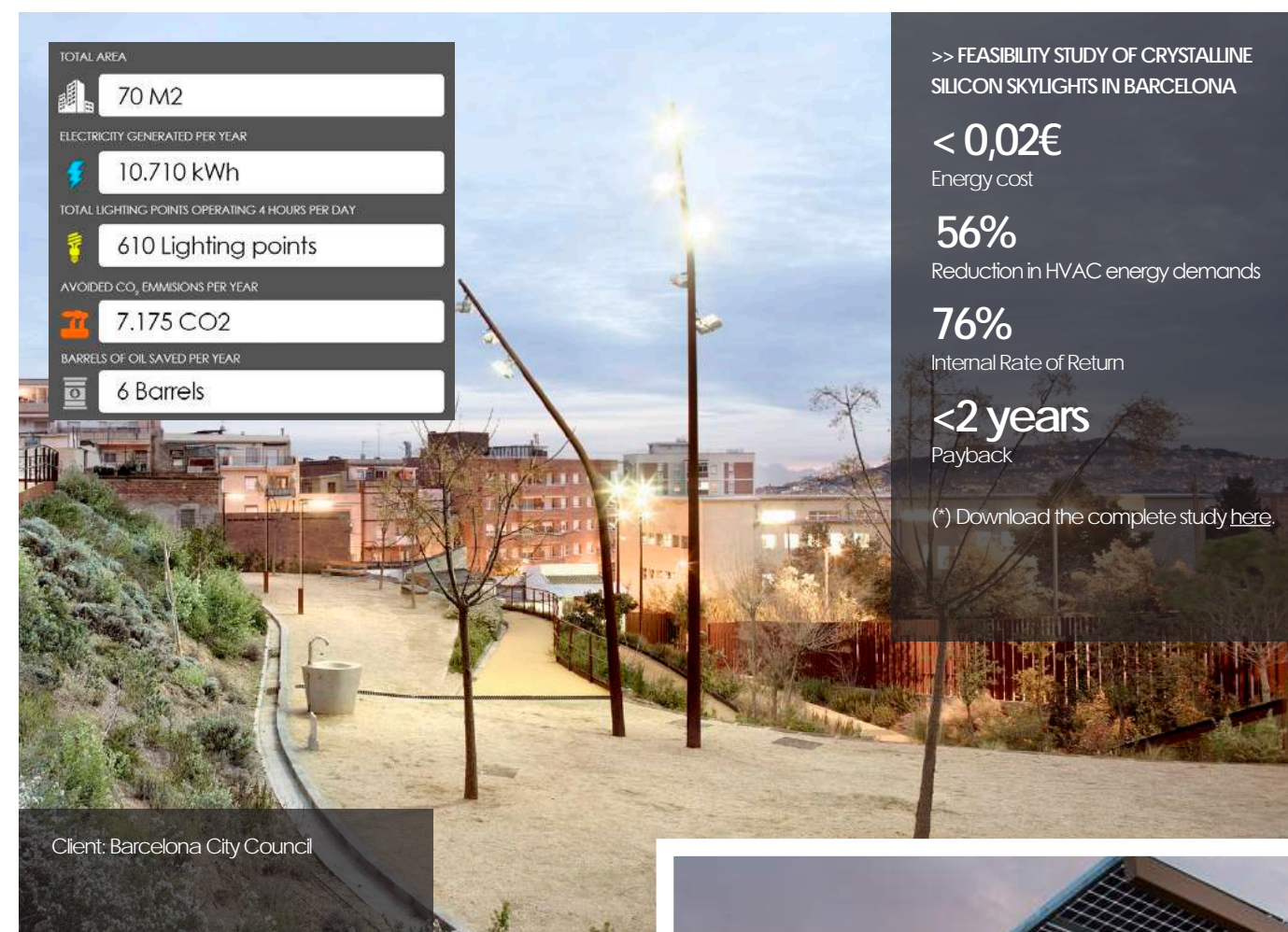
The catamaran features several green crystalline silicon photovoltaic glass modules by Onyx Solar®, with a **semi-transparency degree of 38%**.

This vessel is **100% environmentally-friendly**, with zero emissions, waste, effluents and zero decibels in the environmental noise rating.

ONYX SOLAR® ENERGY

RODRIGO CARO GARDENS

PHOTOVOLTAIC CANOPY



TOTAL AREA	70 M2
ELECTRICITY GENERATED PER YEAR	10.710 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	610 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	7.175 CO ₂
BARRELS OF OIL SAVED PER YEAR	6 Barrels

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN BARCELONA

< 0,02€
Energy cost

56%
Reduction in HVAC energy demands

76%
Internal Rate of Return

<2 years
Payback

(*) Download the complete study [here](#).

How is it possible to power **600 lights** in a public park efficiently, economically and sustainably? The Barcelona City Council, following its commitment to sustainability and efficiency, has no doubt at all: by installing photovoltaic glass.

For this reason, the Rodrigo Caro Gardens in Barcelona feature three magnificent photovoltaic glass pergolas. Glass modules which, in addition to providing shade for the citizens who enjoy this well-known park, generate nearly **11,000 kWh** per year cleanly and without cost, thanks to the sun.

Sufficient to power the **600 lights** throughout the park. Size of the modules: **1,255 x 1,240 mm**. Power: **183 Wp**.



ONYX SOLAR® ENERGY

PUNTA ARENAS HOSPITAL

■ PHOTOVOLTAIC CURTAIN WALL



Our photovoltaic glass has reached the southernmost city of the planet.

The high efficiency of our photovoltaic glass enables it to generate nearly **5,000 kWh** of clean, free energy from the sun, with a peak installed power capacity of **8.6 kWp**, even in the city nearest the South Pole, in the Chilean Antarctic.

This is a photovoltaic glass whose cell density was totally customised, in accordance with the client's design, to allow the entry of daylight. In this way, the glass, which incorporates

monocrystalline silicon cells, features a **degree of transparency of 70%**, enabling the passage of a large amount of light into the building while generating sufficient energy to supply **300 lights** for 4 hours each day.



EASTERN BANK

PHOTOVOLTAIC FAÇADE



>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN KOLKATA

< 0,01€

Energy cost

24%

Reduction in HVAC energy demands

57%

Internal Rate of Return

<2 years

Payback

(*) Download the complete study [here](#).

Client: Eastern Bank



The new corporate headquarters of the Eastern Bank in Dhaka, Bangladesh, features a slatted amorphous silicon photovoltaic glass façade which makes it more efficient and sustainable.

The façade, of over **500 m²**, is comprised of low-emissivity (low-e) amorphous silicon glass modules with a **semi-transparency degree of 30%**, fitted by means of a system of slats. This enables the uniform passage of daylight into the building, while providing thermal insulation, preventing the undesired greenhouse effect within.

This glass is capable of filtering out **99% of ultraviolet radiation** and **95% of infrared radiation**, and features a **Solar (g) Factor of between 10% and 40%**, depending on the degree of transparency. A glass which enables the passage of daylight while also allowing the entry of heat, a critical factor in cities such as Dhaka, where temperatures of up to 40° are reached. The façade is capable of generating **22,600 kWh** per year, which makes it possible to power **1,300 lights** while preventing the release of **15 tons of CO₂** into the atmosphere. Its total installed power capacity is **12.5 kWp**.

OFFICE BUILDING

PHOTOVOLTAIC SKYLIGHT



General Contractor: Coveris
Architect: Jean Louis Montagnier
Client: Bordeaux Métropole Aménagement (BMA)

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN PARIS

< 0,02€

Energy cost

33%

Reduction in HVAC energy demands

41%

Internal Rate of Return

<3 years

Payback

(*) Download the complete study [here](#).



As part of the refurbishment of a historic building located by the River Garonne in Bordeaux (France), the complex has been equipped with a photovoltaic skylight measuring **48 m²**.

For this project, safety-laminated glass modules with an air gap were chosen; these improve the thermal and acoustic insulation of the building and generate a total of **2,500 kWh** per year, preventing the release of **1.6 tons of CO₂** into the atmosphere. The energy generated enables the powering of **141 lights** for the 4 hours per day required by the client.

The glass modules measure **2,954 x 1,240 mm** and feature a

degree of transparency of 10%. The glass has a **Solar (g) Factor of between 10% and 40%**, and is capable of filtering out **99%** of ultraviolet radiation and **95%** of infrared radiation, making it an optimal choice in the prevention of overheating of the building and thus enhancing the thermal comfort of its occupants.

The refurbishment of the building was managed by the town planning authority of the city, the Bordeaux Métropole Aménagement (BMA), and was designed by the architect Jean Louis Montagnier.

VALDECILLA HOSPITAL

PHOTOVOLTAIC CURTAIN WALL



High efficiency for the refurbishment of the Marques de Valdecilla Hospital in Santander.

Among the energy efficiency measures incorporated in the new hospital facilities are the works executed on the three façades, where high-efficiency opaque monocrystalline silicon photovoltaic glass modules have been integrated. To this end, **69** safety laminated glass modules measuring **1,870 x 1,399 mm**, with a power capacity of **383 Wp** each and an efficiency of **15%** were installed. The total installed power capacity is **26.5 kWp**.

Our client, **Ferrovial**, is a worldwide referent in the infrastructure and services sector, a field in which it develops solutions characterised by their innovative nature and their sustainability.

The company has over 69,000 employees and is present in over 25 countries, belonging to prestigious sustainability indices such as the Dow Jones Sustainability Index: *"At Ferrovial we are totally committed to reducing the environmental impact of all our activities; we therefore use the best technologies developed for this purpose"*.

EFFICIENCY
15 %

TORRE BASSANO HOTEL

PHOTOVOLTAIC BALAUSTRADE



A Photovoltaic Balustrade at the foot of Vesuvius in the Gulf of Naples.

This photovoltaic balustrade is comprised of **342** amorphous silicon photovoltaic glass modules, designed to measure for the client (**1,128 x 950 mm**). These modules feature a **degree of semi-transparency of 30%**, enabling the hotel guests to enjoy a wonderful view of the Mediterranean.

The glass is a triple safety tempered laminate of **8mm + 3mm + 8mm**, and has withstood the strict tests required to guarantee the safety of the guests of this five-star hotel.

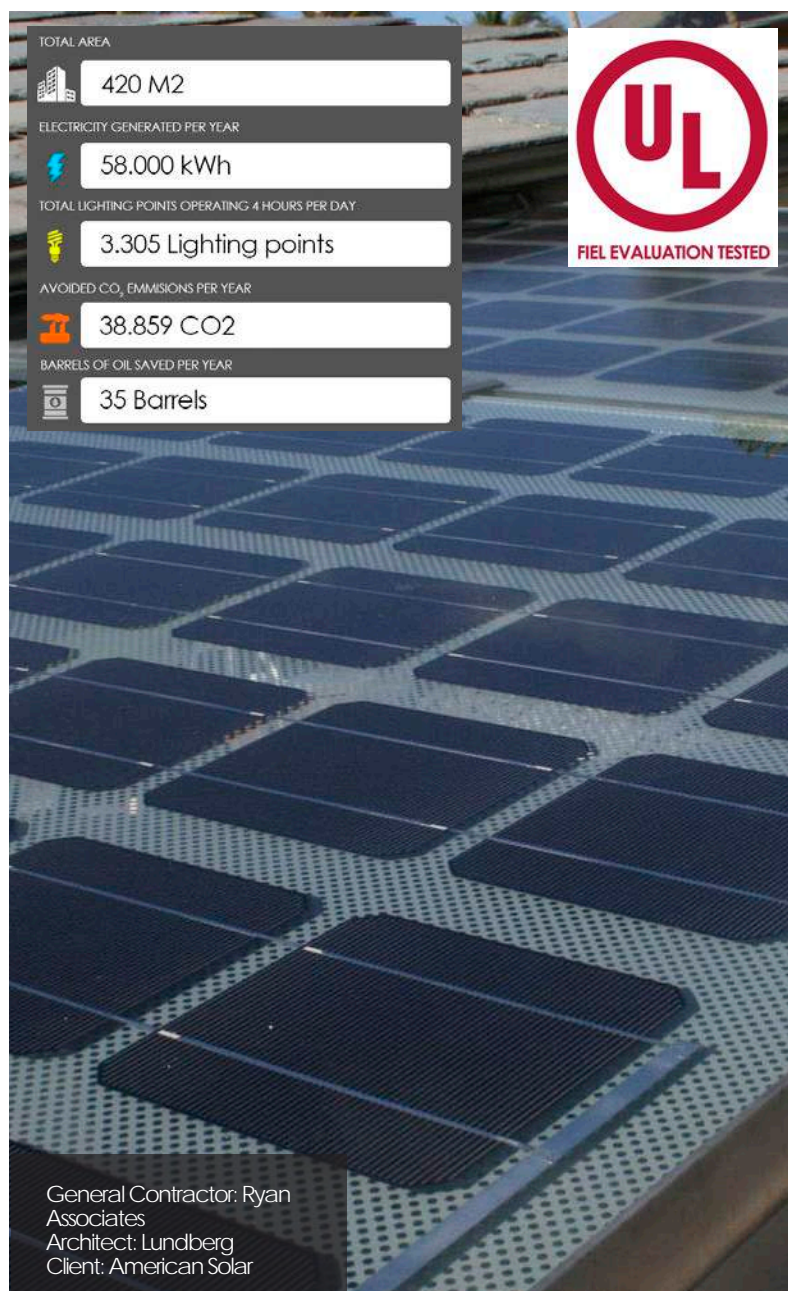
With a total installed power capacity of **11 kWp**, the balustrade generates **11,000 kWh** of power per year, sufficient to supply over **600 lights** for 4 hours each day and to prevent the release of **7 tons of CO₂** into the atmosphere.

The installation of the balustrade was executed in cooperation with **Enel**, the largest electricity company in Italy and the second largest in Europe.

"At Enel we are totally committed to energetic efficiency, the reduction of the environmental footprint, protection of the surroundings, and technological innovation" - Enel.

YAHOO

PHOTOVOLTAIC CANOPY



>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN HAWAII

< 0,01€

Energy cost

41%

Reduction in HVAC energy demands

137%

Internal Rate of Return

<1 year

Payback

(*) Download the complete study [here](#).

This photovoltaic canopy, comprised of crystalline silicon glass, is located in Hawaii. Specifically in a building belonging to **Yahoo**, the Silicon Valley technology company.

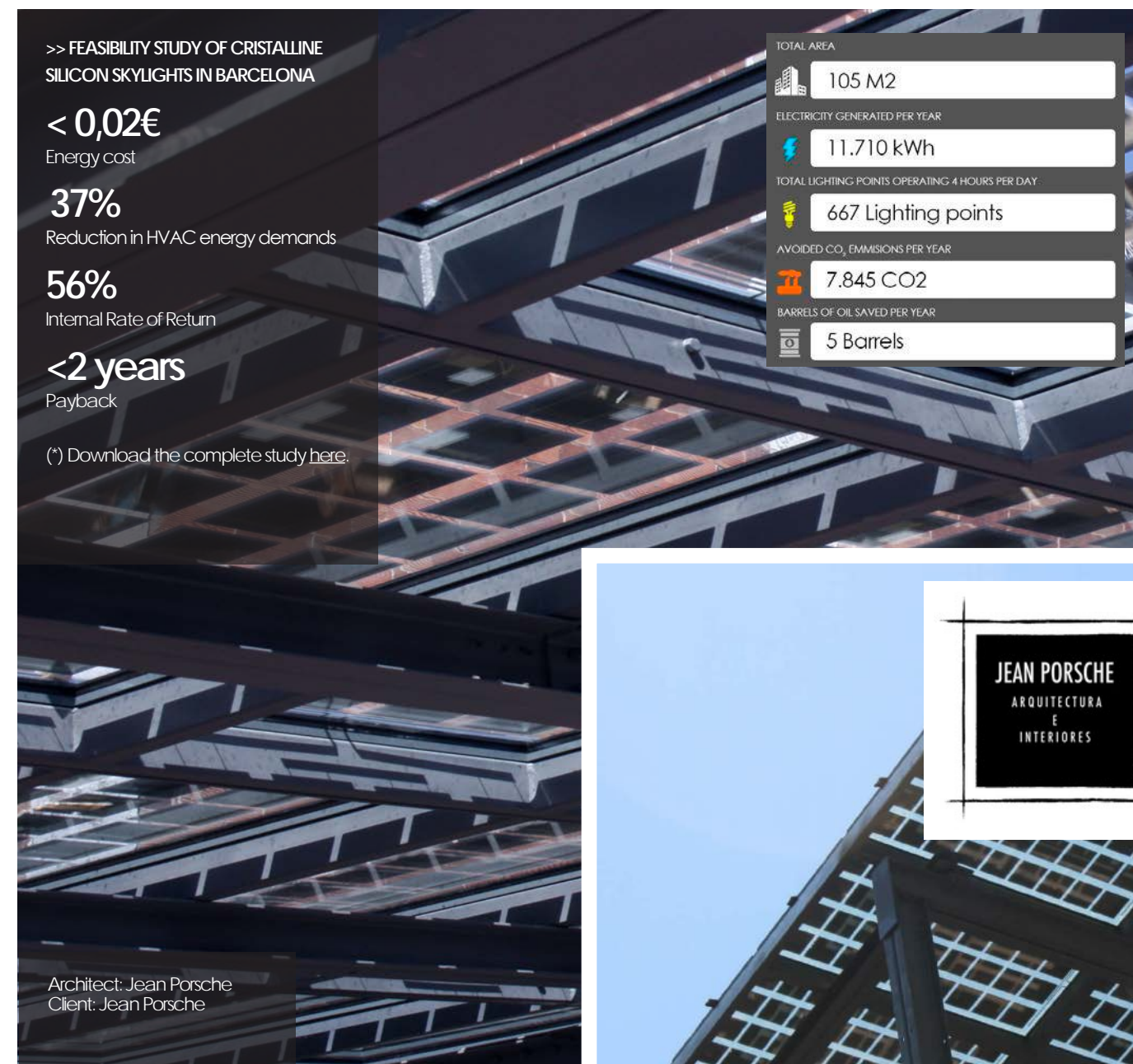
The canopy is made up of **320 glass modules** made entirely to measure for the project. Said modules are of safety **8 mm + 8 mm** laminated glass measuring **1,943 mm x 1,016 mm**, and are perfectly integrated into the building, in accordance with the aesthetics specified by the client.

The total installed power capacity is **34 kWp**, and it is capable of generating **58,000 kWh** per year, sufficient power to feed the **3,300 lights** in the building and to prevent the release of **38 tons of CO₂** into the atmosphere.

The glass also features a ceramic screen print on its reverse side, which filters out the harmful solar radiation while providing the glass with a uniform design.

XSCHE HOUSE

PHOTOVOLTAIC CANOPY



This photovoltaic pergola has been installed in Barcelona to provide shade and comfort for the occupants of this residence, located in the midst of the Paseo de Gracia, and comprised of **70 crystalline silicon glass modules** measuring **1,650 mm x 850 mm**.

The safety photovoltaic glass modules, with a power capacity of **140 Wp**, generate **11,710 kWh** per year, enabling this residence to feed over **600 lights** and to prevent the release of over **7 tons of CO₂** into the atmosphere.

BOOTS PHARMACY

PHOTOVOLTAIC CURTAIN WALL



>> FEASIBILITY STUDY OF AMORPHOUS SILICON FULL ENVELOPE IN LONDON

< 0,09€

Energy cost

36%

Reduction in HVAC energy demands

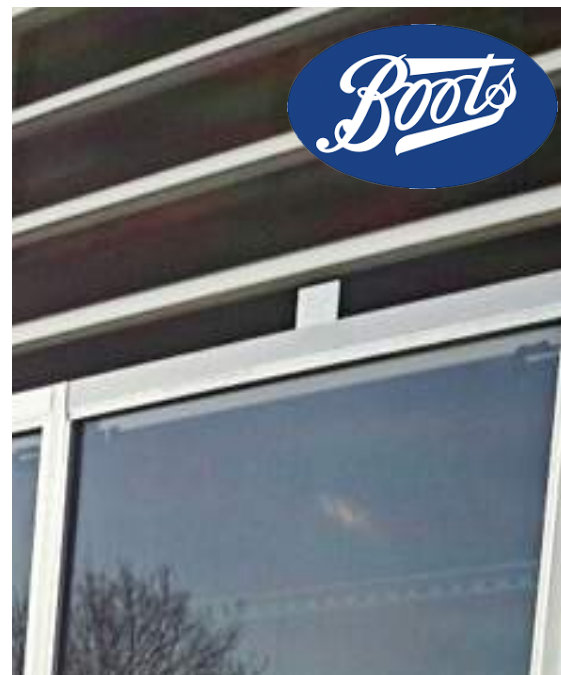
10%

Internal Rate of Return

< 8 years

Payback

(*) Download the complete study [here](#).



Boots, the largest pharmacy chain in Great Britain and Ireland, now has a photovoltaic glass curtain wall at its offices in London, UK.

This curtain wall, designed especially for Boots by way of a showroom, is comprised of **low-emissivity (low-e) amorphous silicon glass modules**.

Each module has three different degrees of semi-transparency (10, 20 and 30%). This will enable the company to study in situ the reduction in its electrical power consumption thanks to an innovative construction material which is also aesthetically attractive.

Boots pharmacy is a company committed to innovation and sustainability and which, like so many others, endeavours to improve the energetic efficiency of its stores and offices. It has approximately 2,500 stores in the United Kingdom, and since its merger with the American company Walgreens in 2012, it has become the largest purchaser of pharmaceutical products worldwide.

Client: Boots

PORT AUTHORITY

PHOTOVOLTAIC SKYLIGHT



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN BALEARIC ISLANDS

< 0,02€

Energy cost

37%

Reduction in HVAC energy demands

56%

Internal Rate of Return

< 2 years

Payback

(*) Download the complete study [here](#).



Installation of a photovoltaic skylight as part of the refurbishment of the Balearic Port Authority building in the Port of Majorca.

For this **180 m²** skylight, a **low-emissivity (low-e)** amorphous silicon glass was chosen, which also features an air gap to improve the insulation of the building even further and thus to prevent the undesirable greenhouse effect within.

The glass modules measure **2,200 mm x 1,300 mm** and feature a **degree of semi-transparency of 20%**. Thus, the glass is able to permit the ingress of daylight while filtering out the harmful UV and IR radiation, which prevents the overheating of the building interior and significantly improves the comfort of its occupants.

With an installed power capacity of **6 kWp**, this skylight is capable of generating **8,700 kWh** per year and of powering **500 lights** for 4 hours each day, while it prevents the release of nearly **6 tons of CO₂** into the atmosphere.

Acciona is one of the primary Spanish business corporations, a leader in the development and management of renewable energies and infrastructures.

General Contractor: Acciona
Client: Port Authority of Majorca

ROTA NAVAL BASE

PHOTOVOLTAIC SKYLIGHT

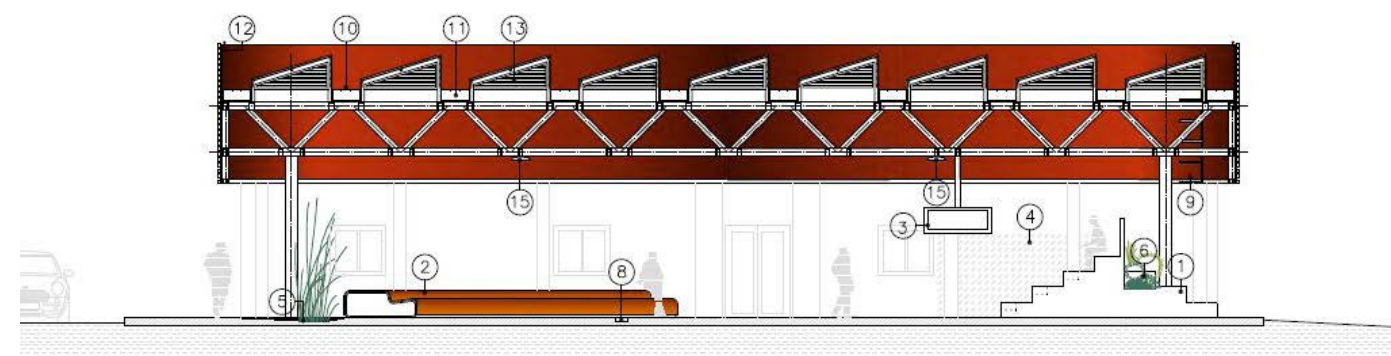


The project at the Rota Naval Base in Cadiz consists of the installation of photovoltaic glass modules in a structure executed with the aim of providing shade and generating renewable energy at this military base. 12% of the vast amount of power consumed by the American Navy is of renewable origin, and their aim is that this percentage should continue to grow.

In this case, they decided on the integration of **high-efficiency** (15.20%) crystalline silicon laminated (6 + 6) photovoltaic glass modules, measuring 1,550 x 1,000 mm and with a power

capacity of **235 Wp**. To complete this **121 m²** structure **78 modules** were required, capable of generating nearly **33,000 kWh**, preventing the release of over **21 tons of CO₂** into the atmosphere and saving **19 barrels of oil** per year.

EFFICIENCY
15,20 %



THE BLACK BOX

PHOTOVOLTAIC FAÇADE



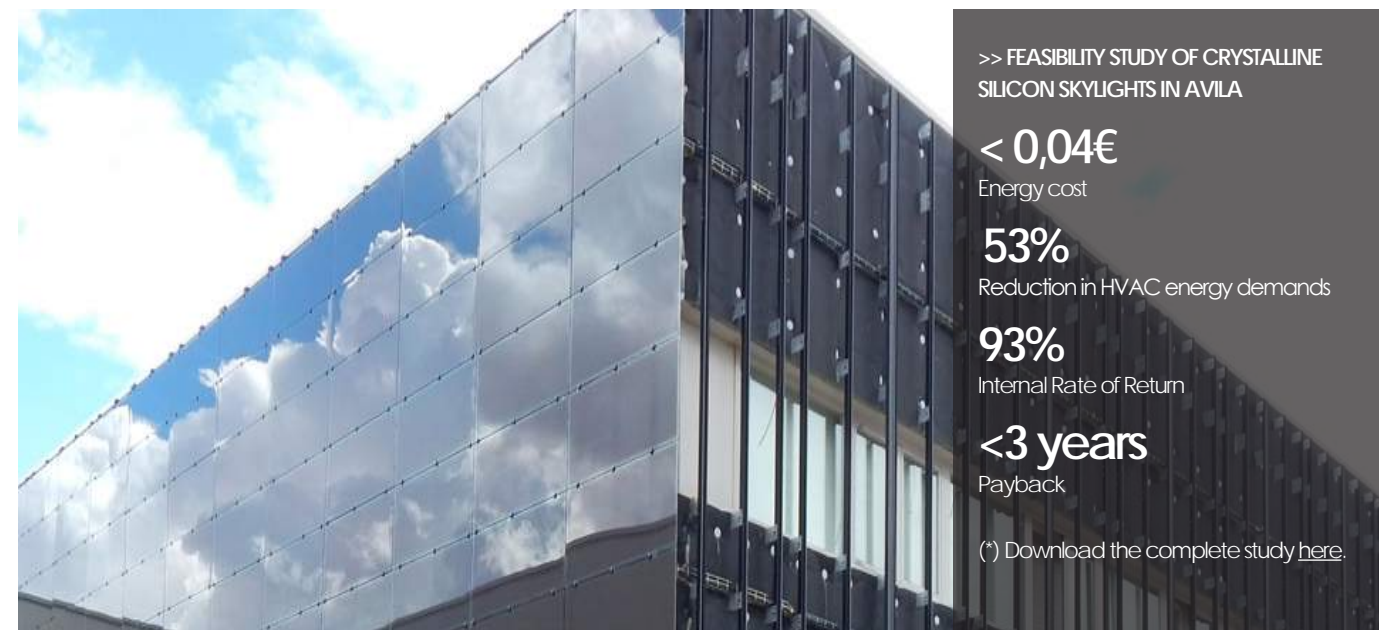
The Black Box.

This is the name we have given to the building where we, the people who form part of Onyx Solar®, come each day to enjoy ourselves, to innovate and to develop 21st-century construction solutions. The building features a ventilated amorphous silicon photovoltaic glass façade.

The façade, generating **4.3 kWp**, is comprised of **310** laminated photovoltaic glass modules capable of generating **12,685 kWh** per year, thanks to which we prevent the release of nearly **9 tons of CO₂** into the atmosphere.

This represents an optimal construction solution which enables us to **save 53%** of our electricity bill.

ONYX SOLAR® ENERGY



>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN AVILA

< 0,04€

Energy cost

53%

Reduction in HVAC energy demands

93%

Internal Rate of Return

<3 years

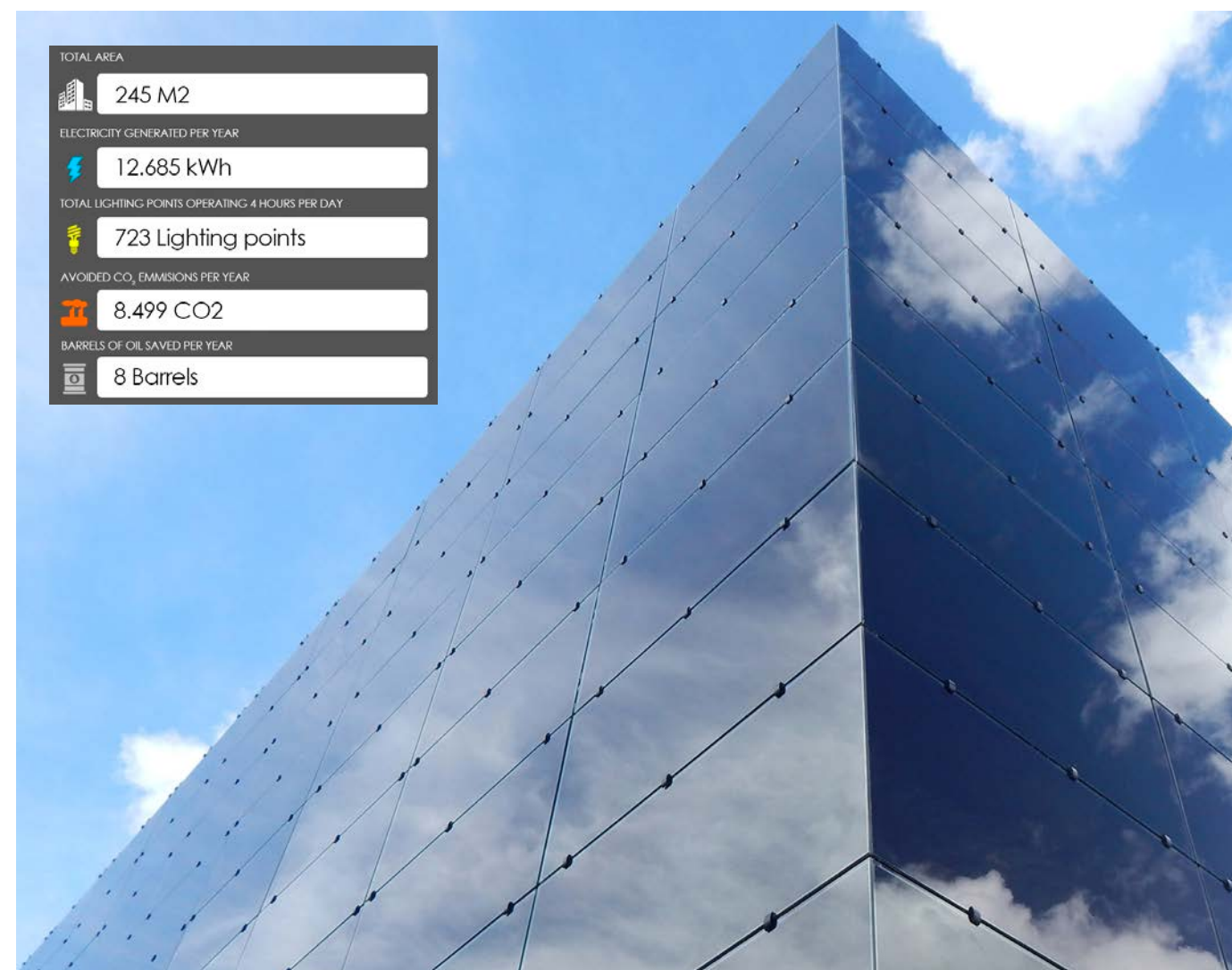
Payback

(*) Download the complete study [here](#).

“

There is no better way to study and make known our product than to install and monitor it in our own offices. In addition to generating energy, it confers a great aesthetic value on the building and the heating and cooling requirements have decreased, thanks to the thermal insulation provided by our façade in comparison with the traditional type”.

Ángel Gallego, Onyx Solar® architect entrusted with the façade design and works.



TOTAL AREA	245 M2
ELECTRICITY GENERATED PER YEAR	12.685 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	723 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	8.499 CO2
BARRELS OF OIL SAVED PER YEAR	8 Barrels

ONYX SOLAR® ENERGY

ICSE

PHOTOVOLTAIC FAÇADE



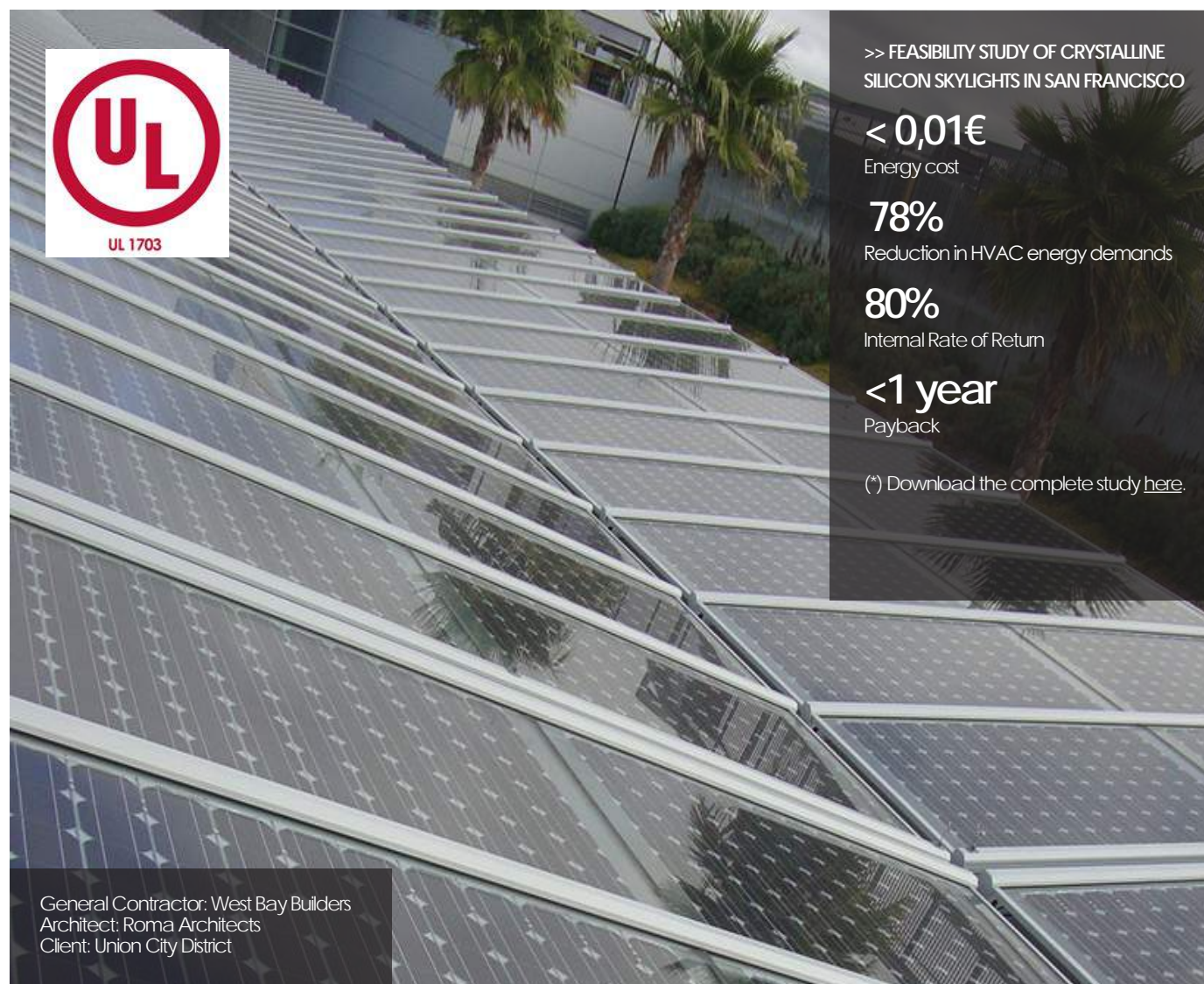
The new headquarters of the Canary Islands Higher Education Institution, located in Las Palmas de Gran Canaria, possesses a forefront technology which will make it the first **LEED Platinum** building in the Canary archipelago.

Onyx Solar® has contributed to this project with a system consisting of amorphous silicon photovoltaic glass slats integrated vertically into the façade. This is a triple-laminated glass, nearly **three metres long and half a metre wide**, with a degree of **semi-transparency of 20%**, and combined with inactive glass modules to give the building a remarkable mosaic-like appearance. In addition to generating clean, free energy from the sun, these modules filter out the harmful radiation (UV & IR) and prevent the overheating of the interior, due to a Solar (g) Factor which is optimal for this type of warm climates.



BART STATION

PHOTOVOLTAIC CANOPY



Onyx Solar® has taken part in the refurbishment of the high-speed Union City station in San Francisco, supplying the safety laminated (8 + 8) photovoltaic glass included in the immense canopy of the new building.

The canopy is comprised of **800 crystalline silicon photovoltaic glass** modules measuring **1,805 mm x 1,137 mm**, totalling a power capacity of **172 kWp** (215 Wp per module). These modules are capable of generating **174,280 kWh** per year, sufficient to power **10,000 lights** and to prevent the release of almost **120 tons of CO₂** into the atmosphere and the consumption of **105 barrels of oil**.

The glass features a ceramic screen print on its reverse side, endowing the interior of the canopy with an elegant, uniform design.

This glass was designed especially for this project, which achieved **UL 1703** certification, a guarantee of its optimal efficiency and quality, ensuring compliance with the highest quality and safety standards in the case of mechanical or electrical issues, and also its resistance to fire.



“ Onyx Solar® was the only company capable of meeting all the requirements for the design of the project, and providing a solution of exceptional quality while working under difficult conditions, with a tight budget and short delivery schedules”.

Ivana Micic, ROMA Design Group.

This photovoltaic canopy was Onyx Solar®'s first project in the United States and it is considered to be one of the largest photovoltaic integration operations executed in the country. For this reason, it was leading news in many of the most significant journals of the sector, such as “Glass Magazine”, belonging to the National Glass Association.

The station, included in the Bay Area Rapid Transit (BART) system, operates five lines over 167 km, and has 43 stations in four counties. This system carries over 320,000 passengers daily, placing it in fifth position of those most used in the United States.

GOVERNMENT BUILDING

PHOTOVOLTAIC CURTAIN WALL



This curtain wall, installed in Malta, is made of low-e amorphous silicon photovoltaic glass modules with a degree of **semi-transparency of 20%**, enabling the passage of light into the interior and also enjoyment of the views. This type of glass filters out **99%** of the ultraviolet radiation and up to **95%** of infrared radiation. Its Solar (g) Factor is between **10% and 40%**, depending on the degree of semi-transparency, this being perfect for the prevention of the greenhouse effect within the buildings.

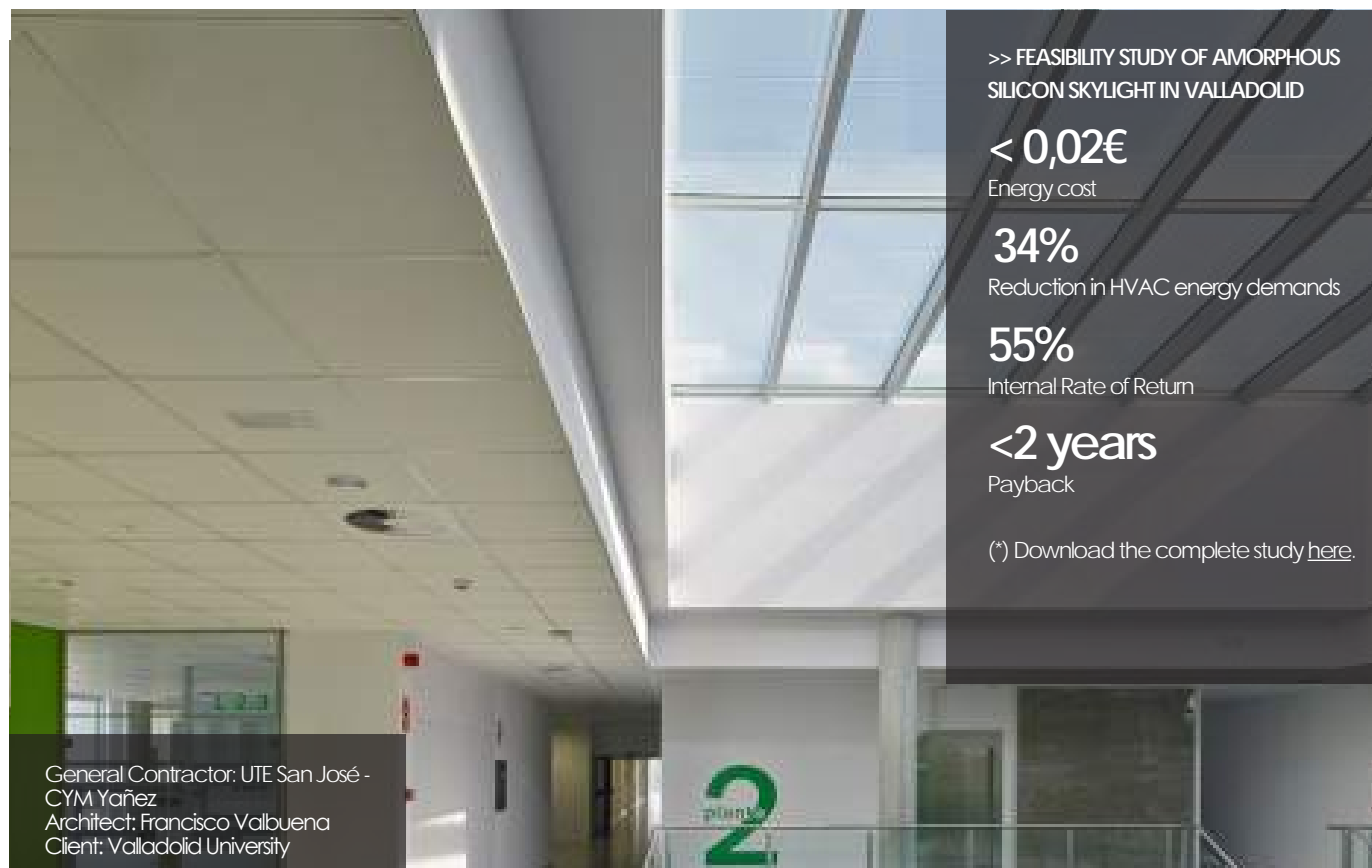
In this case, the glass also comprises an air gap to provide greater thermal insulation for the building.

The installation generates **3 kWp** and is comprised of **124 differently-sized and shaped glass** modules which were made to measure for this project.



VALLADOLID UNIVERSITY

PHOTOVOLTAIC SKYLIGHT



The LUCIA building (Spanish acronym of University Base for Applied Research Centres) at the University of Valladolid, has become the **most sustainable building in Europe and all the northern hemisphere**, due to aspects such as energy saving and respect for the environment.

Envisaged under principles of sustainable architecture, this building features various means for the generation of energy, among these the integration of two photovoltaic skylights and part of a curtain wall by Onyx Solar®. The low-emissivity glass employed, made of amorphous silicon, has a **semi-transparency degree of 10%**. With an installed power capacity of **6 kWh**, it generates **5,550 kWh** of power yearly and prevents the release of **3.7 tons of CO₂**.

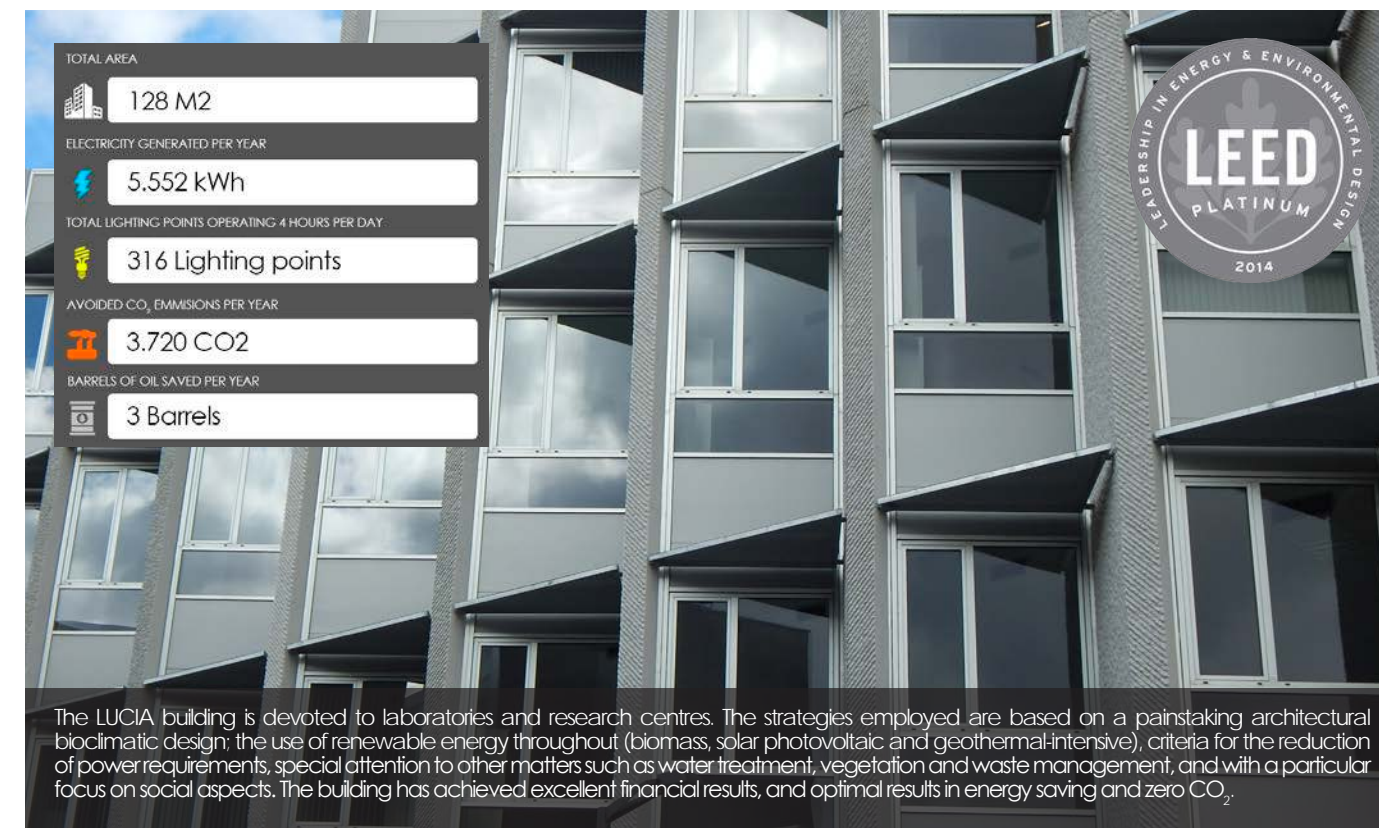
LUCIA stands out as a paradigm of energetic efficiency and sustainable architecture, as it **saves up to 60% of power consumption**. For this reason it has achieved the LEED Platinum Certificate, with 98 points, 5 leaves in Green Certification, the 2015 ENERAGEN Award in the Buildings category and third prize in 2013 from Mediterranean Sustainable Architecture, among others.

“The LUCIA building has been declared the most sustainable building in the northern hemisphere and the second worldwide, according to the LEED Platinum certification”

“

Onyx™ has been a preferential technological partner in the development of the project, executing a highly innovative solution in the form of photovoltaic skylights, highly attractive systems from the point of view of sustainable construction and LEED certification”.

Francisco Valbuena, Valladolid University Technical Architecture Unit Director.



GENYO BUILDING

■ PHOTOVOLTAIC FAÇADE



The installation of a double skin on the façade of this building belonging to the multi-national pharmaceutical company Pfizer creates a spectacular pixelated mosaic of glass of different shades and sizes especially created for this project.

The façade features an active surface area of **550 m²** of amorphous silicon glass modules with a **semi-transparency degree of 20%**.

This project has an installed power capacity of **19.3 kWp**, generating **32,000 kWh** of energy per year and preventing the consumption of **19 barrels of oil** yearly.

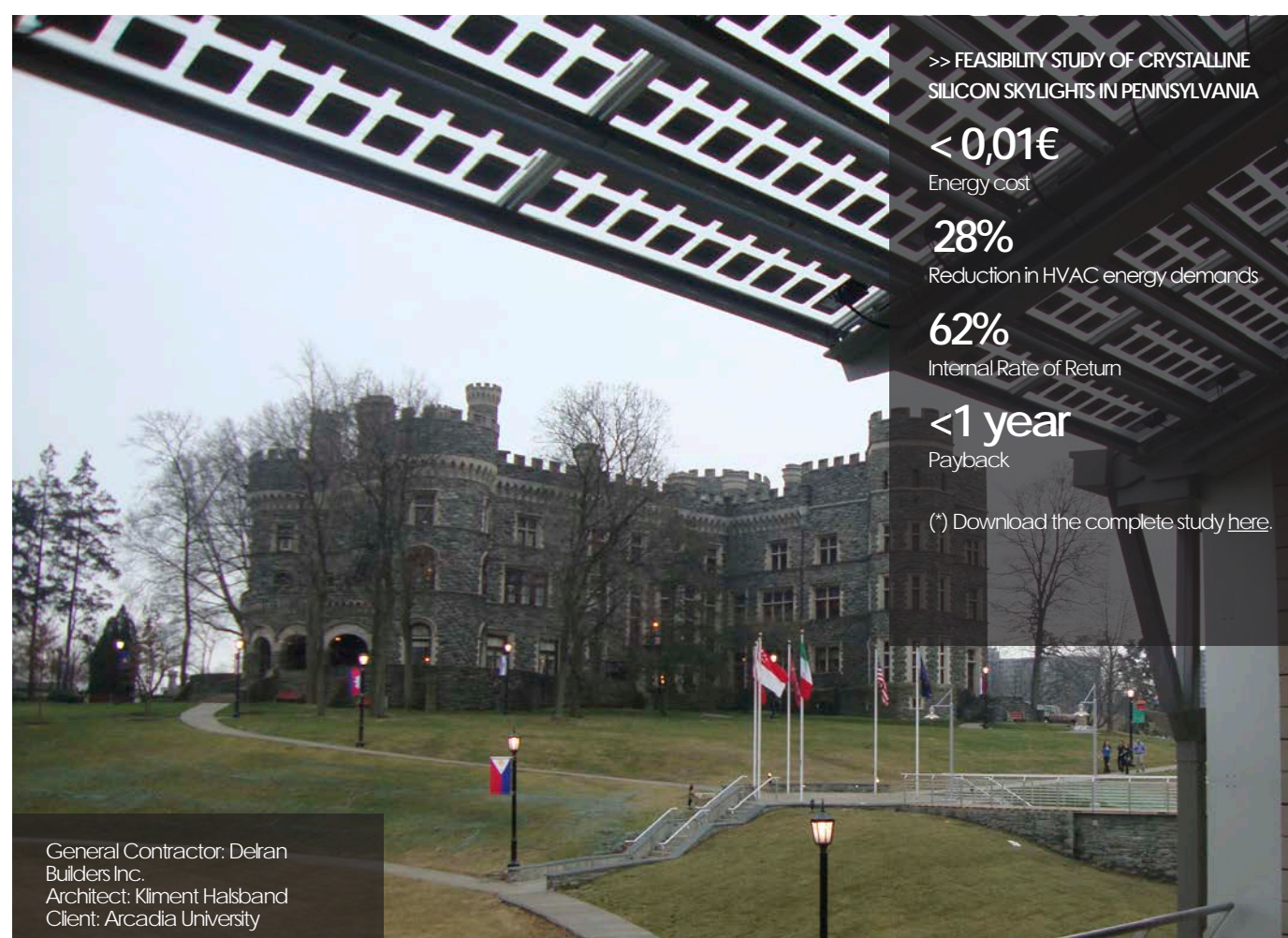
This building, envisaged as an area for research into the genetic basis of diseases, employs this photovoltaic double skin for the production of a large amount of the energy it consumes, specifically **1,823 lights** in the building itself.

Furthermore, the double skin thermally and acoustically insulates the building, providing significant savings in heating and air handling systems.



ARCADIA UNIVERSITY

PHOTOVOLTAIC FAÇADE



Integration of a photovoltaic sunshade in the new building of Arcadia University Campus, in the state of Pennsylvania (USA).

This solution provides a shaded area, totally integrated in the building and designed to measure, with a combination of monocrystalline silicon glass modules of two different sizes, giving the appearance of a mosaic. Furthermore, it generates **4.8 kWh** per year and prevents the release of **3.2 tons of CO₂** into the atmosphere and the consumption of **3 barrels of oil**.

The famed Arcadia University was founded in 1853 in Glenside (Pennsylvania) and has over 4,000 students.

“*Onyx Solar® has equipped Arcadia University with an integrated photovoltaic sunshade which has awoken a greater environmental conscience among the students. Onyx™ has done a great job and we recommend them for any project including innovative, high-quality solutions for photovoltaic integration.*”

Chris Chapman, of Delran Builders, and Site Manager at Arcadia.



BURSAGAZ

PHOTOVOLTAIC FAÇADE



Bursagaz, one of the principal companies in the natural gas sector in Turkey, has a new headquarters in the city of Bursa, which it is hoped will obtain the **LEED Gold Certification**.

Onyx Solar® has been entrusted to provide the building with a touch of originality by integrating a double skin of photovoltaic glass in the form of a mosaic, which is superimposed on the façade. The **315 amorphous silicon glass** modules, measuring **500 mm x 700 mm**, have a **degree of transparency of 20%**, enabling the uniform passage of light into the building and thus reducing the need for artificial lighting. This is a **4.1 kWp** installation, generating approximately **3,400 kWh** per year.

ONYX SOLAR® ENERGY



Bursagaz, the natural gas distributor in Bursa, the fourth largest city in Turkey, with 1.5 million inhabitants, was formed in 2008 and has grown considerably, now being the third largest company of the sector in the country. Among the pillars of Bursagaz's corporate strategy is the development of innovative projects contributing to a more sustainable future.

>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN TURKEY

< 0,03€

Energy cost

28%

Reduction in HVAC energy demands

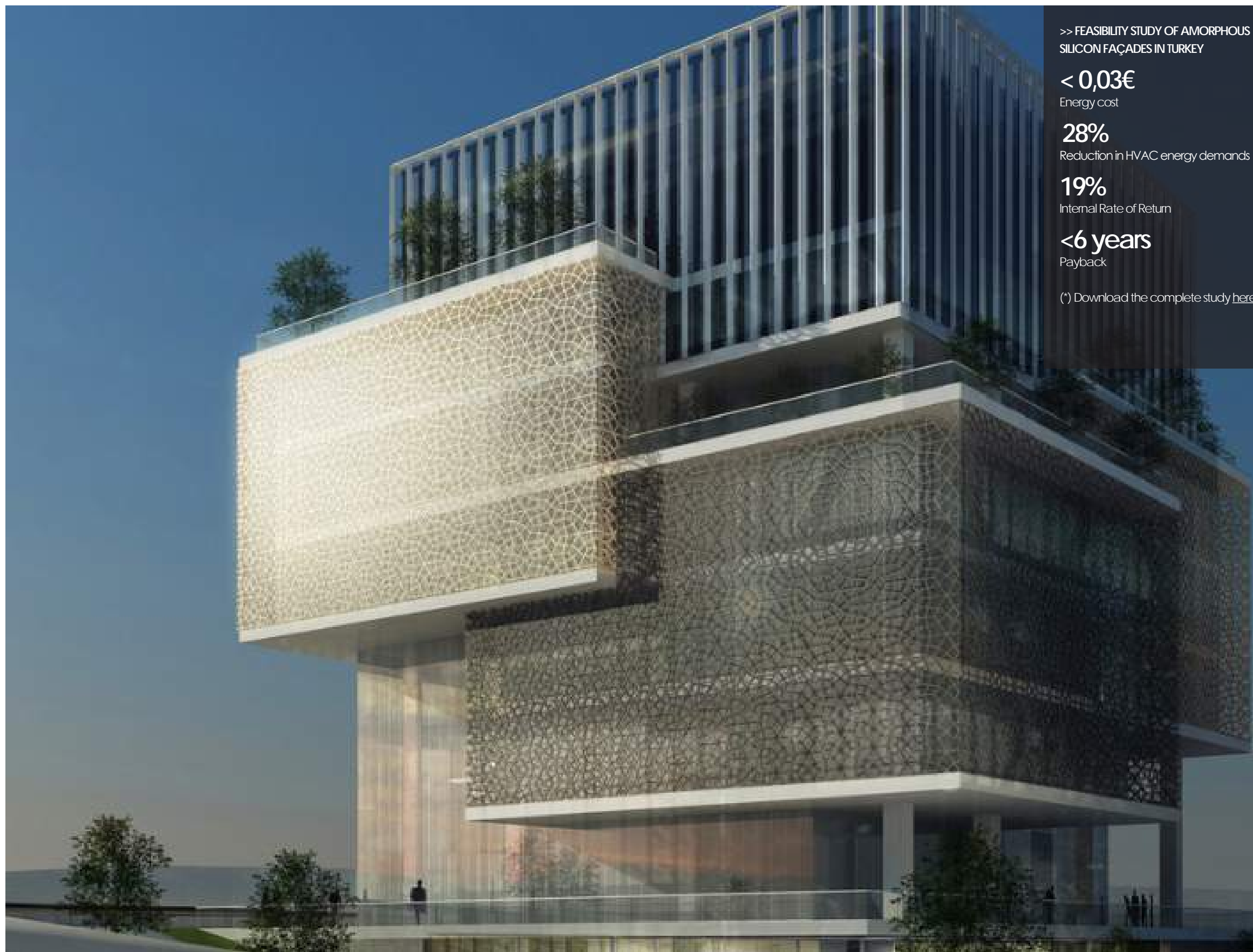
19%

Internal Rate of Return

<6 years

Payback

(*) Download the complete study [here](#).



TIBURON

PHOTOVOLTAIC SKYLIGHT

>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN SAN FRANCISCO

< 0,01€

Energy cost

53%

Reduction in HVAC energy demands

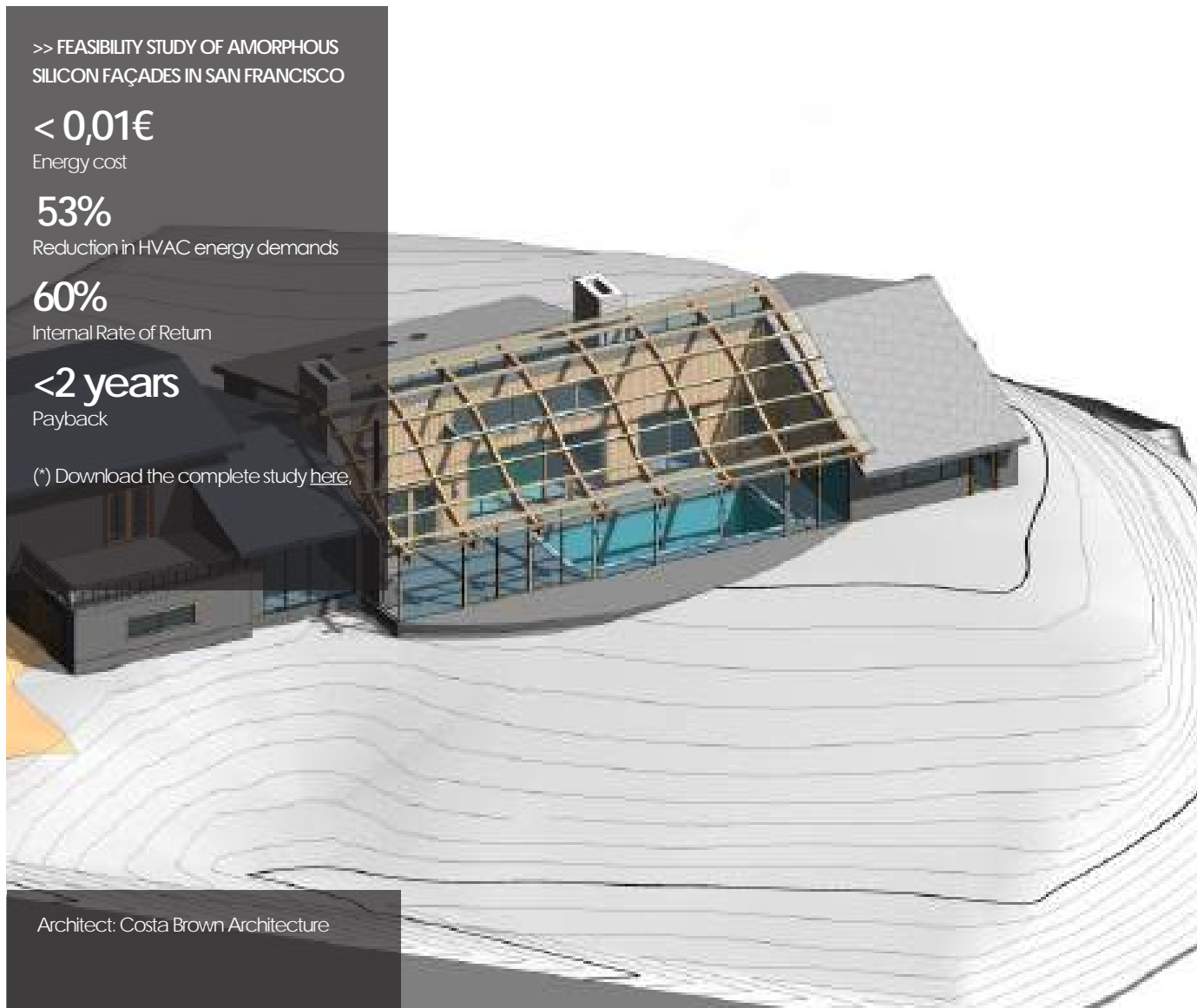
60%

Internal Rate of Return

<2 years

Payback

(*) Download the complete study [here](#).



Architect: Costa Brown Architecture

Tiburon is an exclusive town of 9,000 inhabitants in Marin County, beside the Bay of San Francisco, offering privileged views of the city and the iconic Golden Gate bridge.

Onyx Solar® has taken part in the modernisation of a luxury residence where innovation and sustainability are priority. The photovoltaic glass has been integrated in the form of a skylight, thus providing the building with an air-conditioned swimming pool. The skylight has an original fairground switchback-like shape, thanks to the curved wooden structure on which the nearly **60 photovoltaic glass modules** rest.

The glass employed is triple-laminated, made of amorphous silicon, with a **semi-transparency degree of 20%**. Due to this, the

thermal and acoustic comfort of the users of this pool has been increased, as the interior temperature is maintained constant. Furthermore, **it filters out up to 95% of the infrared radiation, an extra which protects those who enjoy this wonderful swimming pool with sea views from the sun's rays.**

This skylight has a total installed power capacity of **11.7 kWp**, and enables the residence to generate approximately **20,000 kWh** per year.

"The visual effect of the photovoltaic glass modules is surprising. The clients are delighted with this product". Ken Lin, architect at Costa Brown Architecture.

PATRAS SCIENTIFIC PARK

PHOTOVOLTAIC SKYLIGHT AND PARKING LOT

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN ATHENS

< 0,01€

Energy cost

59%

Reduction in HVAC energy demands

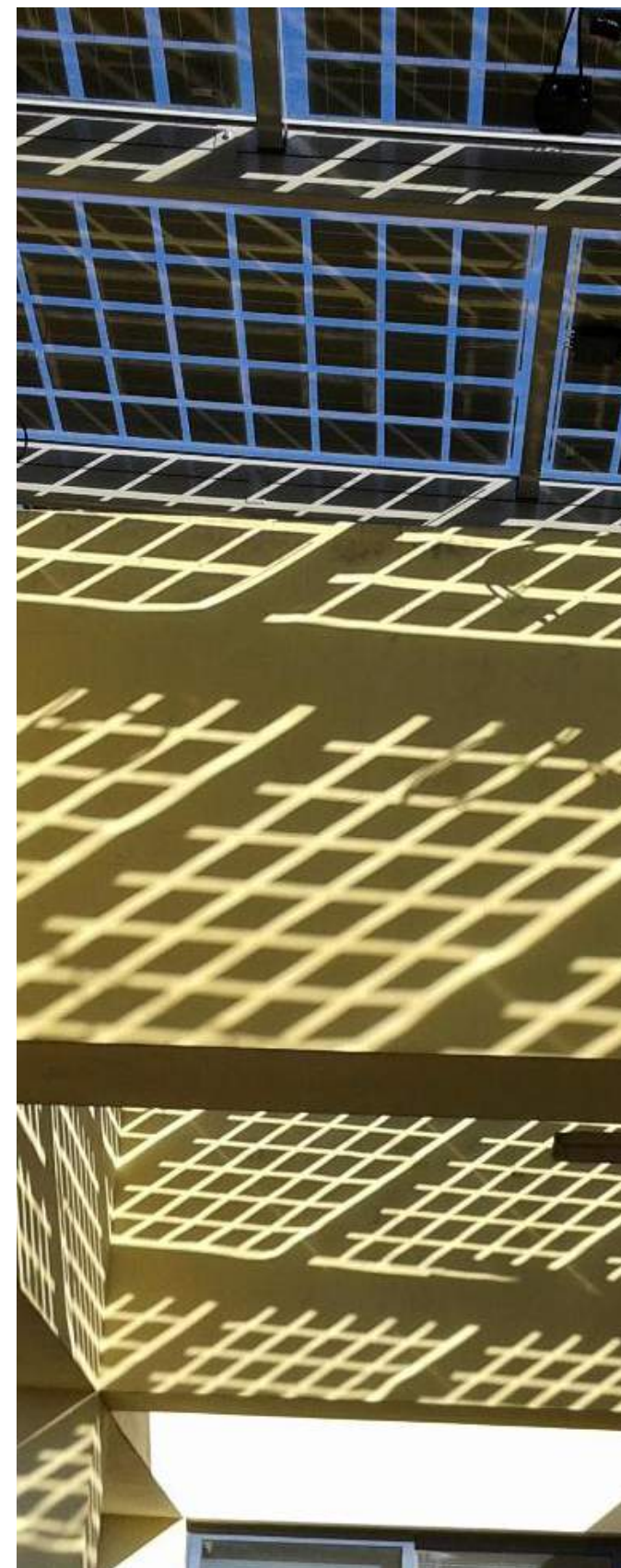
71%

Internal Rate of Return

<2 years

Payback

(*) Download the complete study [here](#).



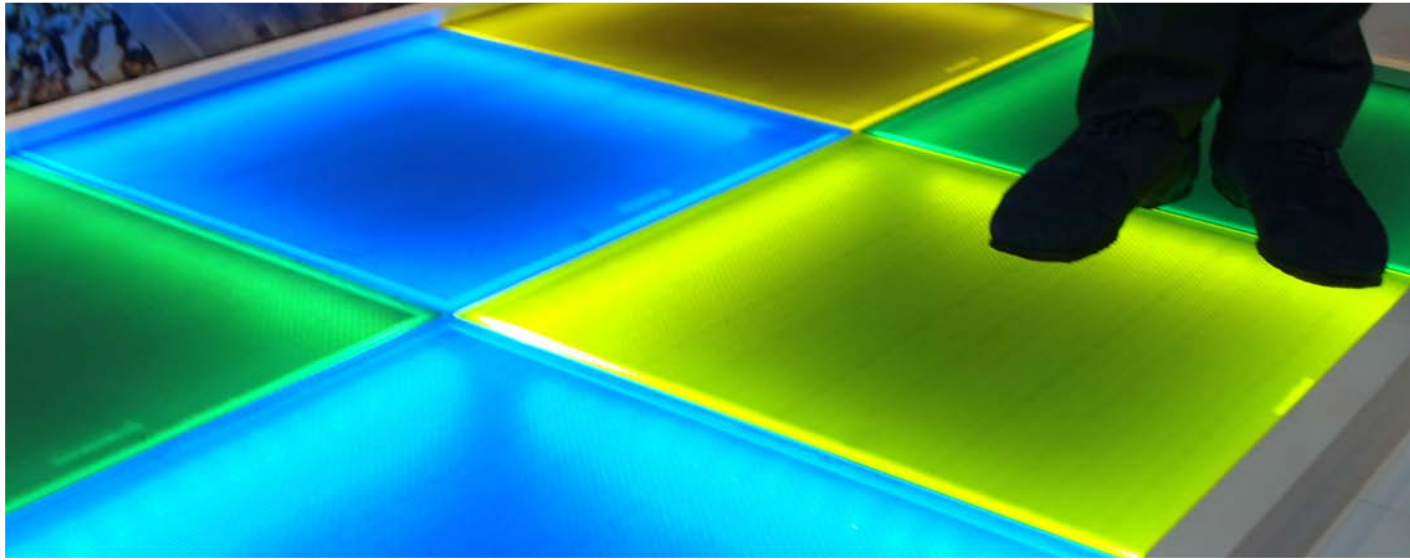
Among the many works executed in this science and technology park belonging to the Greek government, Onyx Solar® was entrusted with the supply of the **88 photovoltaic glass modules** integrated both in a pergola, located in the car park, and in a skylight located in one of the buildings.

The crystalline silicon glass modules measure **1,850 mm x 1,200 mm** and have a power capacity of **233 Wp**. The cell density was executed in accordance with the client's specifications, to enable the passage of daylight.

The total installed power capacity is **20 kWp**, enabling the park to generate approximately **33,500 kWh** per year.

Sufficient power to feed **199 lights** and to prevent the release of over **3 tons of CO₂**.

FURNITURE



Onyx Solar® is a pioneer in the development of a photovoltaic kit to enable outdoor furniture to generate clean, free energy from the sun. In this way, tables, canopies, benches, lamp-posts, floors and other items of outdoor furniture enable the recharging of electronic devices while saving the users' time and money, and preventing the release of CO₂ and other greenhouse gases into the atmosphere.

The photovoltaic kit developed by Onyx Solar® **consists of a photovoltaic glass module and the electrical material necessary for the connection of electronic devices** (mobile telephones, laptop computers, tablets, etc.) **via a USB port**. It further comprises a battery to store the power generated during the day for its use at night. This simple system enables the convenient and environmentally sustainable recharging of electronic devices, meeting an ever more important need nowadays.

The photovoltaic glass employed in the kit may be integrated in the furniture itself, or a walkway made of photovoltaic tiles may be used to generate the energy. In both cases, **the glass may be either amorphous or crystalline silicon**. If made of amorphous silicon, it is ideal for shaded areas, as diffused light can be captured, while crystalline silicon enables the generation of more power per m². Both feature a modern, technological appearance.

This kit is available in different sizes of module and in a wide range of colours, enabling the designers to integrate it in the most aesthetically suited manner in all types of furniture.



Onyx Solar® collaborates in projects designed by the most renowned architect's studios worldwide, who know full well the exceptional value that photovoltaic glass contributes to their projects.

Onyx Solar® has gained the confidence of these firms, to whom it gives guidance regarding the inclusion of this innovative product in their exceptional designs.

In the words of Norman Foster, "Building-integrated photovoltaics is not a question of fashion, but of survival".

Welcome to the Revolutionyx.



Eckersley O'Callaghan: this United Kingdom firm is a leader in structural design and in glass-covered structures. They are famous for their work for Apple, where they took their work with glass to the limit, such as their first circular staircase in the store in Osaka or the cylindrical entrance to Apple IFC in Shanghai.



AECOM has been awarded first place in the "Top 500 design firms" for the sixth year running, and the top desing company, by the influential ENR magazine. Besides, according to the magazine Fortune, it is one of the most-admired companies worldwide in 2015. Its projects include the Millennium Park in Chicago and the International Airport and the Etihad Towers in Abu Dhabi.



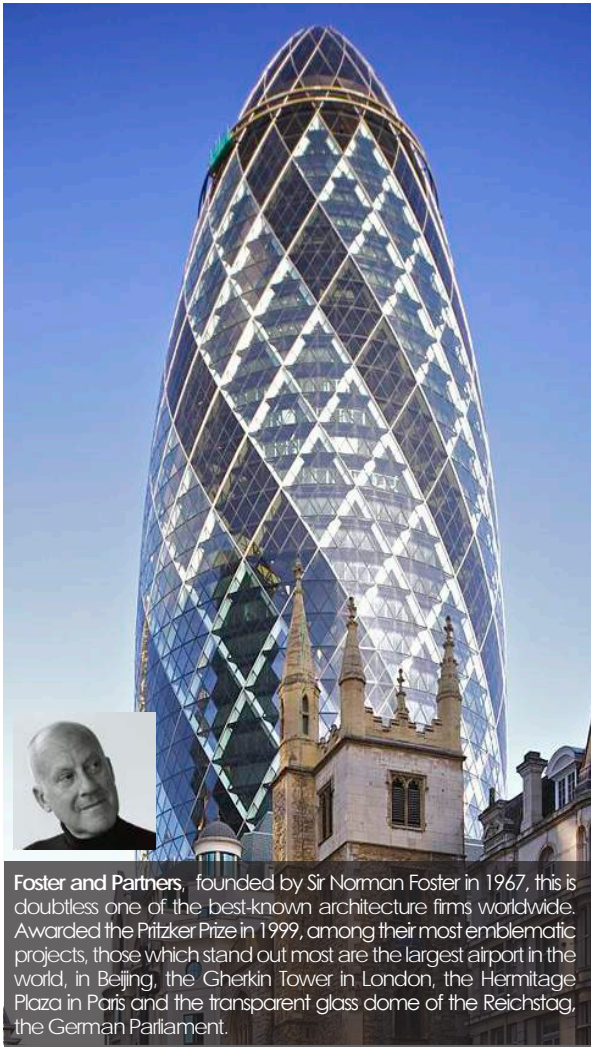
Bjarke Ingels Group (BIG) is the architecture firm founded by Bjarke Ingels, one of the most outstanding and prizewinning young architects worldwide due to his innovative projects. His outstanding prizes and projects include the ensemble of houses called "Mountain Dwellings" in Denmark (Best Residential Building in the World in 2008), the Denmark Maritime Museum (Honour Award for Architecture, AIA 2015) and 57 West in New York (Progressive Architecture Award 2015 and NYAIA Merit Future Award 2012).



Kohn Pedersen Fox Associates (KPF) is one of the principal architecture firms in the world, and is well-known for its design of skyscrapers such as the Lotte World Tower in Seoul, the tallest building in South Korea. It is also known internationally for its work on the Centra Metropark in Iselin (USA).



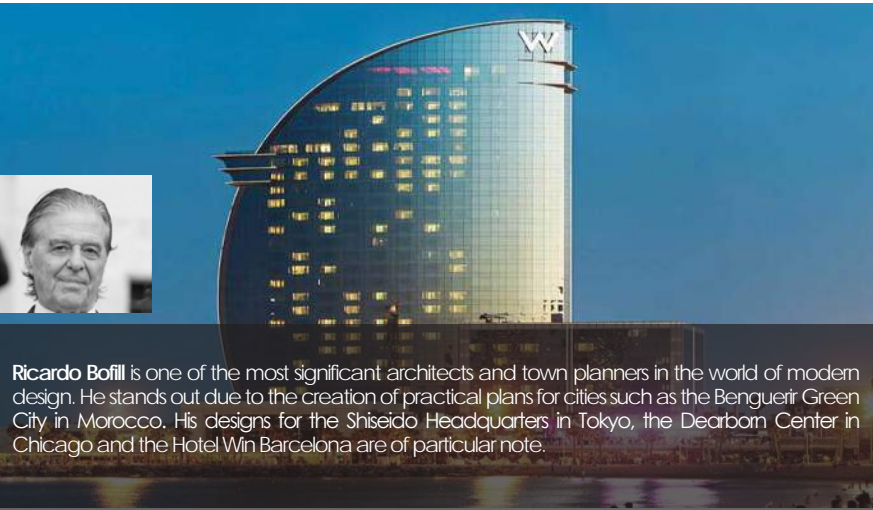
Gensler is the architecture firm which occupies first place worldwide with regard to cashflow, working in 112 countries for over 2,000 clients, such as Samsung, Yahoo, Wal-Mart, Inditex and Accenture. Furthermore, in 2014 it headed the ENR list of the "Top 100 green design firms". Among its most famous projects are the Shanghai Tower and the Roland Garros Stadium in Paris.



Foster and Partners, founded by Sir Norman Foster in 1967, this is doubtless one of the best-known architecture firms worldwide. Awarded the Pritzker Prize in 1999, among their most emblematic projects, those which stand out most are the largest airport in the world, in Beijing, the Gherkin Tower in London, the Hermitage Plaza in Paris and the transparent glass dome of the Reichstag, the German Parliament.



Gensler is the architecture firm which occupies first place worldwide with regard to cashflow, working in 112 countries for over 2,000 clients, such as Samsung, Yahoo, Wal-Mart, Inditex and Accenture. Furthermore, in 2014 it headed the ENR list of the "Top 100 green design firms". Among its most famous projects are the Shanghai Tower and the Roland Garros Stadium in Paris.



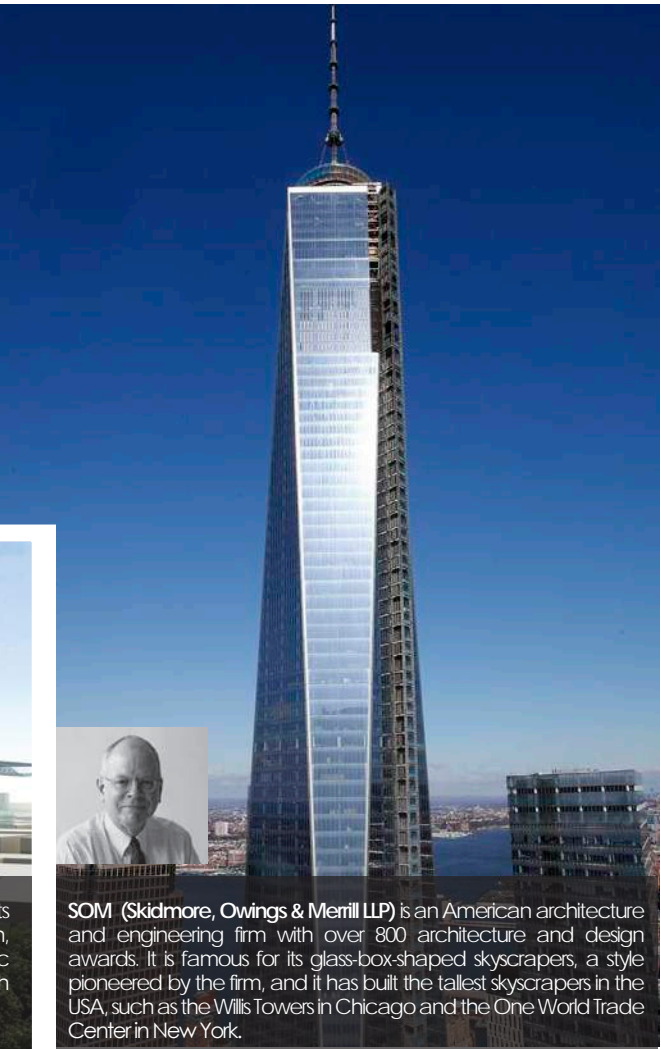
Ricardo Bofill is one of the most significant architects and town planners in the world of modern design. He stands out due to the creation of practical plans for cities such as the Benguerir Green City in Morocco. His designs for the Shiseido Headquarters in Tokyo, the Dearborn Center in Chicago and the Hotel Win Barcelona are of particular note.



HOK is an award winning international design firm, well-known for its projects for the sports and entertainment sector. It received the USGBC Award for Excellence in 2013 for designing the Project of the Year "Consolidated Forensic Laboratory" in Washington. It also designed the terminal of the new Doha International Airport, which received the "World Airport Skytrax" award for the Best Airport in the Middle East.



Adrian Smith + Gordon Gill (AS + GG). This well-known skyscraper firm is responsible for projects such as the Burj Khalifa in Dubai (the tallest building in the world), the Kingdom Tower in Jeddah, which will be the tallest tower on the planet, and the KR Tower in Seoul, known for its photovoltaic energy system, the central offices of Masdar, the first city in the world to be self-supplied with renewable energy, located in the United Arab Emirates.



SOM (Skidmore, Owings & Merrill LLP) is an American architecture and engineering firm with over 800 architecture and design awards. It is famous for its glass-box-shaped skyscrapers, a style pioneered by the firm, and it has built the tallest skyscrapers in the USA, such as the Willis Towers in Chicago and the One World Trade Center in New York.



Arup is a globally recognised firm formed by consultants, engineers, and designers where sustainability is the centrepont of their work. Their projects have won dozens of awards; the Nishi Building was declared "International Project of the Year 2015", and the Sydney Opera House, in which structural design they took part, is a World Heritage Site.



Grimshaw Architects is one of the design firms with greatest future insight. Its designs have been recognised worldwide, gaining awards such as the "Building of the Year 2015" from the Architects' Journal and "Cooperative Architecture of the Year" for its work in the Fulton Centre in Manhattan and its cooperation with J. Carpenter.

LOW-E PHOTOVOLTAIC GLASS

LOW-EMISSIVITY (LOW-E) PHOTOVOLTAIC GLASS



Why do Onyx Solar®'s products add value to any building?

Photovoltaic glass modules produce clean, free energy from the sun, enable the entry of daylight, filter out the harmful components of solar radiation, provide thermal and acoustic insulation, and contribute to a personalised, innovative design which integrates perfectly into any type of building.



Onyx Solar®'s low-e photovoltaic glass has been awarded the title of **"Most innovative glass in 2015"** by the National Glass Association of America.

Onyx Solar® has developed the first photovoltaic low-emissivity or low-e glass. In addition to generating clean energy from the sun, low-e photovoltaic glass surpasses the properties of a similar conventional glass:

- **U Value:** up to 0.74W/m²K (0.13 BTU/hft² °F).
- **Solar factor/SHGC:** between 10% and 40%, making it an ideal candidate to achieve appropriate temperature control within the building and considerable savings in its air handling.
- **Selective filter against harmful radiation:** up to 95% of infrared radiation and 99% of ultraviolet radiation.
- **Light transmission:** a degree of transparency of between 10% and 30%, enabling natural lighting.
- **Exterior reflectance:** Between 7% and 9%.

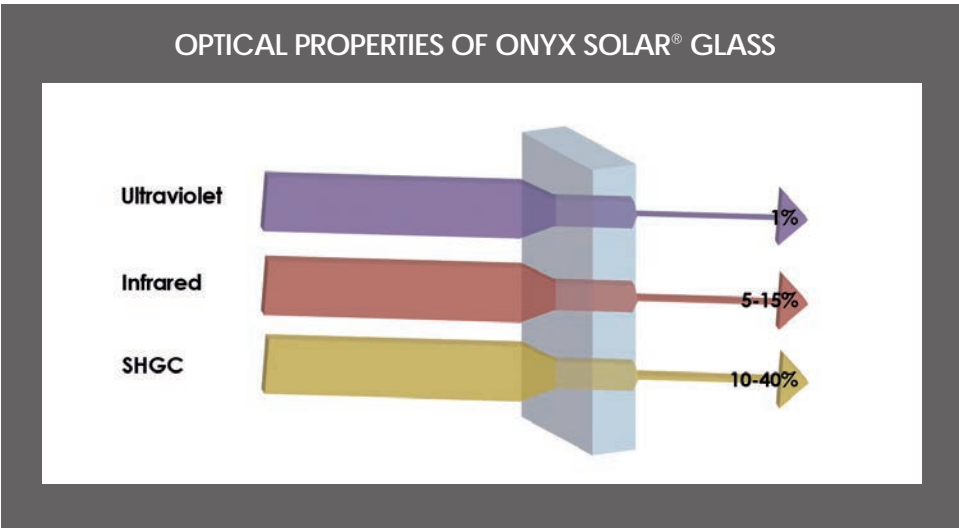
For further information on this innovative construction material, please download the **Low-e Photovoltaic Glass Technical Guide**.

BIOCLIMATIC PROPERTIES

MULTI-FUNCTIONAL BIOCLIMATIC SOLUTIONS

	ONYX SOLAR® GLAZING	CONVENTIONAL LOW-E GLASS	CONVENTIONAL GLASS	CONVENTIONAL PV ModuleL
Selective IR Filter	✓	✓	✗	✗
Selective UV filter	✓	✓	✗	✗
Solar factor/ SHGC	✓	✓	✗	✗
Natural lighting	✓	✓	✓	✗
Thermal performance U < 2 W/m²K U< 0,35 BTU/hft²F°	✓	✓	✗	✗
Acoustic performance	✓	✓	✓	✗
Electricity generation	✓	✗	✗	✓
Low-emissive properties	✓	✓	✗	✗
Aesthetic integration in buildings (customized sizes,colors and buildup)	✓	✓	✓	✗

* The UV filter can only be achieved by laminated glass.



1

ENERGY GENERATION

2

FILTRO UV & IR

3

THERMAL & ACOUSTIC INSULATION

4

NATURAL ILLUMINATION

5

INNOVATIVE DESIGN

6

REDUCE CO₂ EMISSIONS

CRYSTALLINE SILICON GLASS



Onyx Solar® is a company devoted to the design, manufacture and marketing of photovoltaic glass, made of both amorphous silicon and crystalline (mono- and polycrystalline) silicon. A glass which behaves, from a structural point of view, like the conventional glass used in construction, but it also generates clean, free electrical power from the sun while providing considerable thermal insulation.

The configurations possible are practically infinite in number, based on the type of glass, the size, thickness, the degree of semi-transparency and the colour, so as to adapt to the requirements of each project.



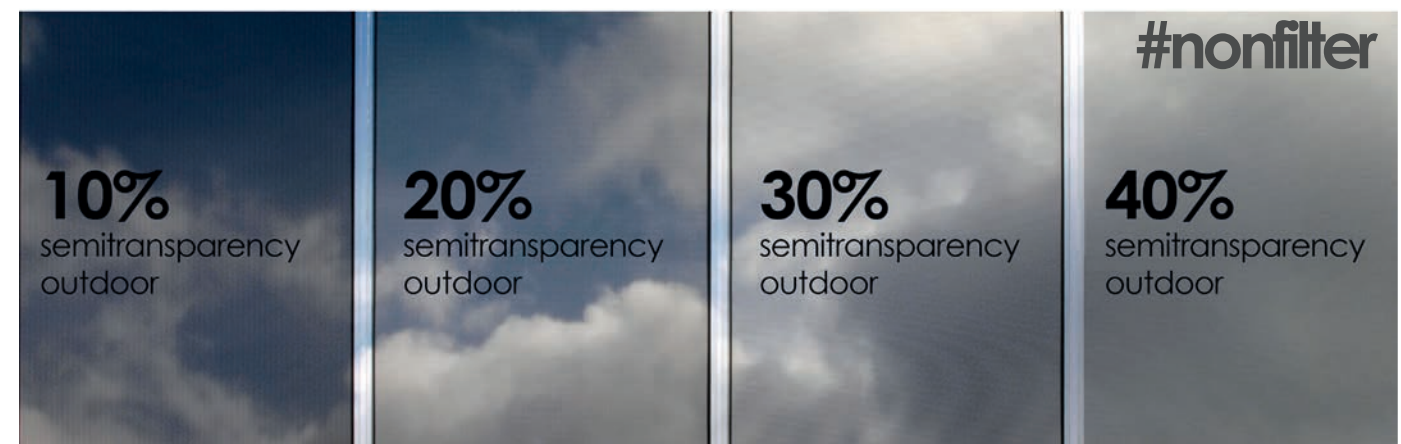
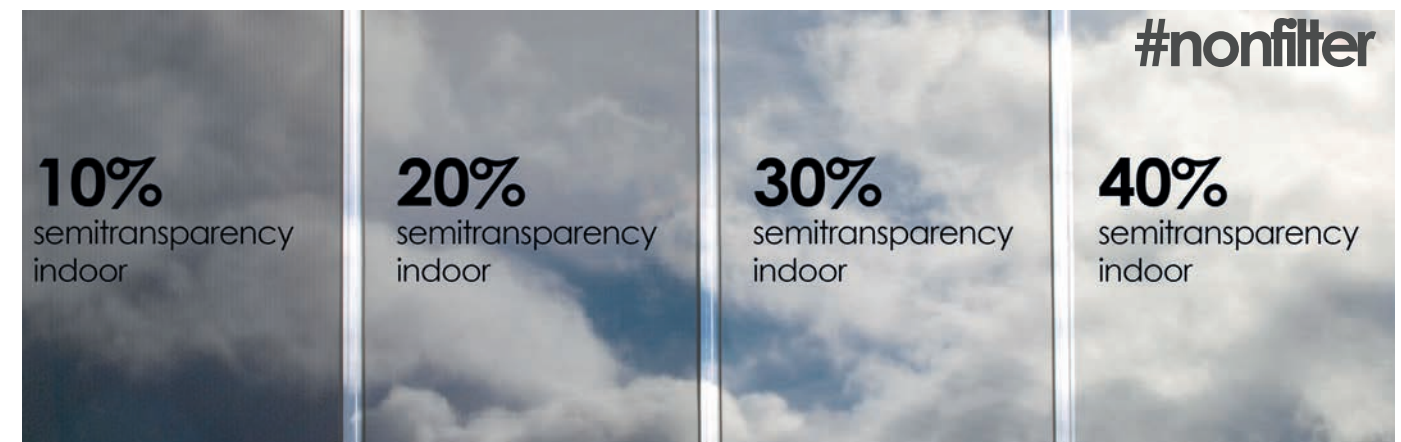
In construction solutions where the generation of the maximum quantity of energy per m² prevails, the choice of crystalline silicon glass is more common.

Its power capacity is defined fundamentally by the number of cells employed per module. **Each crystalline silicon glass module has a power capacity normally varying between 80 and 160 Wp/m²**, depending on the cell density required by the design, to enable the entry of more or less daylight.

Advantages:

- Greater nominal power capacity per square metre (Wp/m²).
- Less surface area of the installation for the same power capacity.
- Greater efficiency (up to 16%).

AMORPHOUS SILICON GLASS



Ávila, 10th February 2016

*Camera: Olympus Digital Camera E-450 · Exposure: 1/100 · Speed ISO: ISO - 200
Focal length: 25mm. Flash: No flash # Maximum aperture: 3.61328125

Amorphous silicon glass is ideal for conditions of diffuse radiation.

The glass is manufactured opaque or with various degrees of semi-transparency (10%, 20% or 30%), which enables the passage of daylight into the building while its occupants enjoy the view of the exterior.

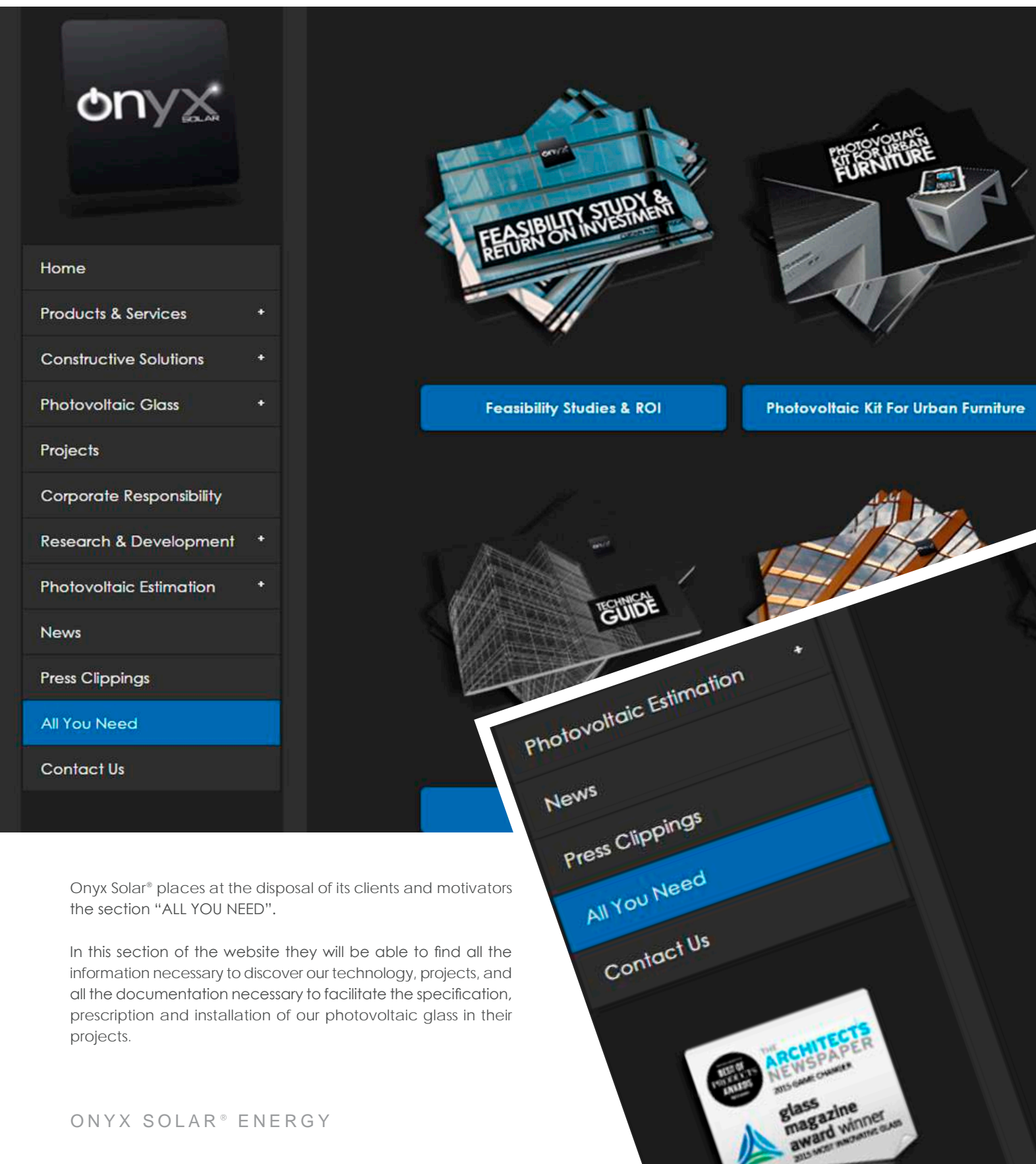
With Onyx Solar®'s transparent photovoltaic glass it is possible

to exploit the daylight to light a building while filtering out the majority of the harmful radiation (ultraviolet and infrared).

Advantages:

- Greater energy production (kWh) at the same installed power capacity (kWp) under conditions of diffused radiation and high temperatures.
- Enables a more uniform aesthetic integration.

ALL YOU NEED



Onyx Solar® places at the disposal of its clients and motivators the section "ALL YOU NEED".

In this section of the website they will be able to find all the information necessary to discover our technology, projects, and all the documentation necessary to facilitate the specification, prescription and installation of our photovoltaic glass in their projects.

RETURN ON INVESTMENT

RETURN ON INVESTMENT FOR A DEMO BUILDING



PAYBACK	(years)	2
ANNUAL IRR	(%)	70%
DECREASE IN AIR HANDLING REQUIREMENTS	(%)	48%
COST OF ENERGY WITH ONYX SOLAR GLASS	(Eur/kWh)	0,01 €
SAVINGS IN ENERGY COST	(%)	89%

* Average values for one of Onyx Solar's photovoltaic skylights using amorphous silicon technology

Now you can download the feasibility studies of several of our construction solutions in over 130 cities worldwide.

From San Francisco to Sydney via Copenhagen, the remarkable profitability of Onyx Solar®'s glass is far above what is considered acceptable for traditional photovoltaic modules, being estimated at 7.4%.

This is a useful tool with which to discover the economic advantages of integrating, in the average building, photovoltaic glass as compared to conventional glass. Advantages derived from the cost-free generation of power combined with improvements in the envelope which cause the energy requirements of the building to drop by an average of 48%, and occasionally by as much as 100%.

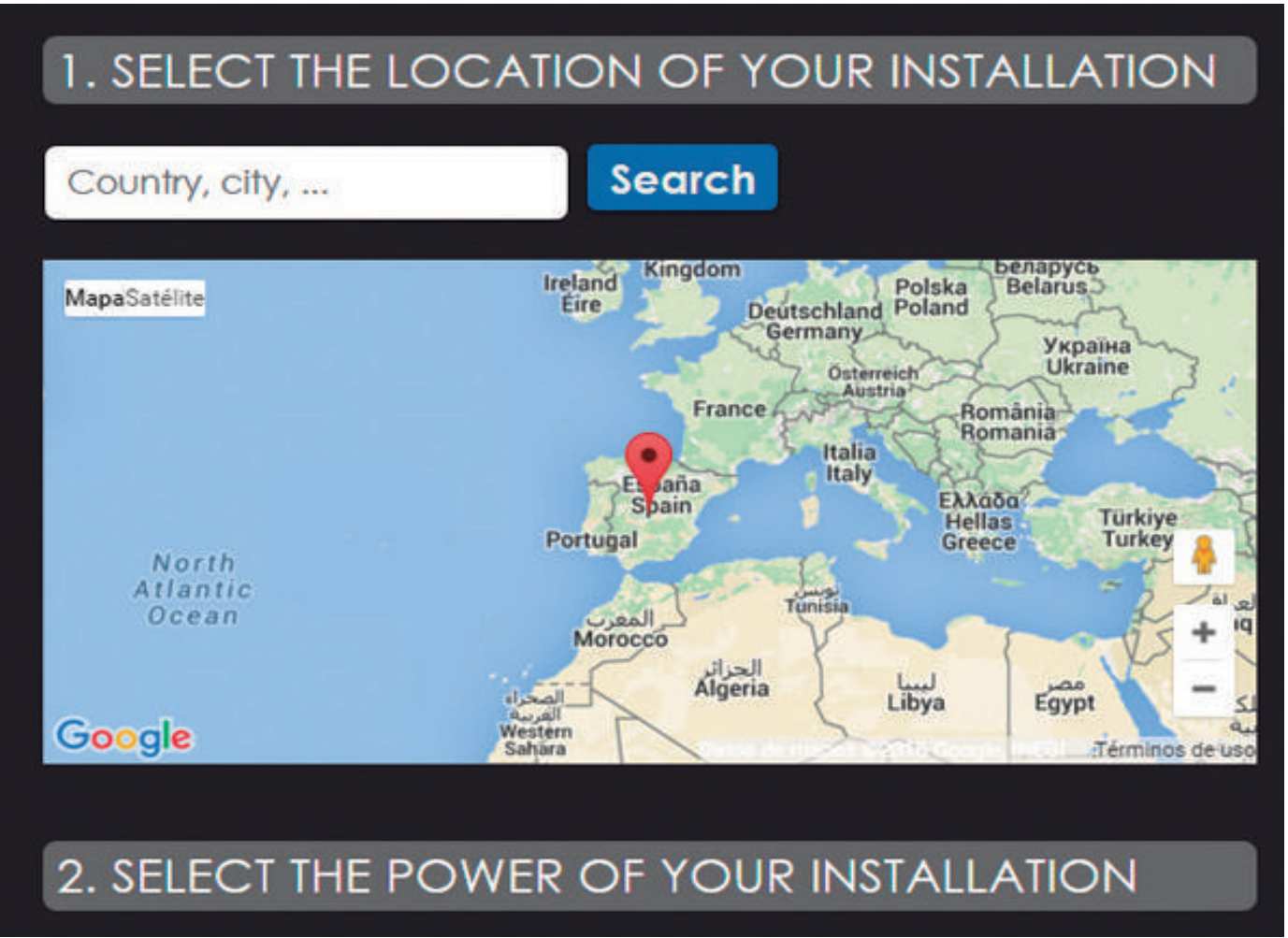
Due to these energy savings, the output of Onyx Solar®'s photovoltaic glass yields an awesome average Internal Rate of Return of 70%, and a payback time of less than 2 years over most of the planet, and in many cities of only a few months.

Consult the Feasibility Studies of your city and discover how to pay less than one cent per kWh, also avoiding increases in your electricity bill indefinitely.

The Feasibility Study of your city can be downloaded from Onyx Solar®'s website or via a mobile application, to discover all the advantages of integrating photovoltaic glass into your building.

PHOTOVOLTAIC ESTIMATION

PHOTOVOLTAIC ESTIMATION TOOL



Would you like to know how much power your installation will produce, thanks to Onyx Solar®'s photovoltaic glass?

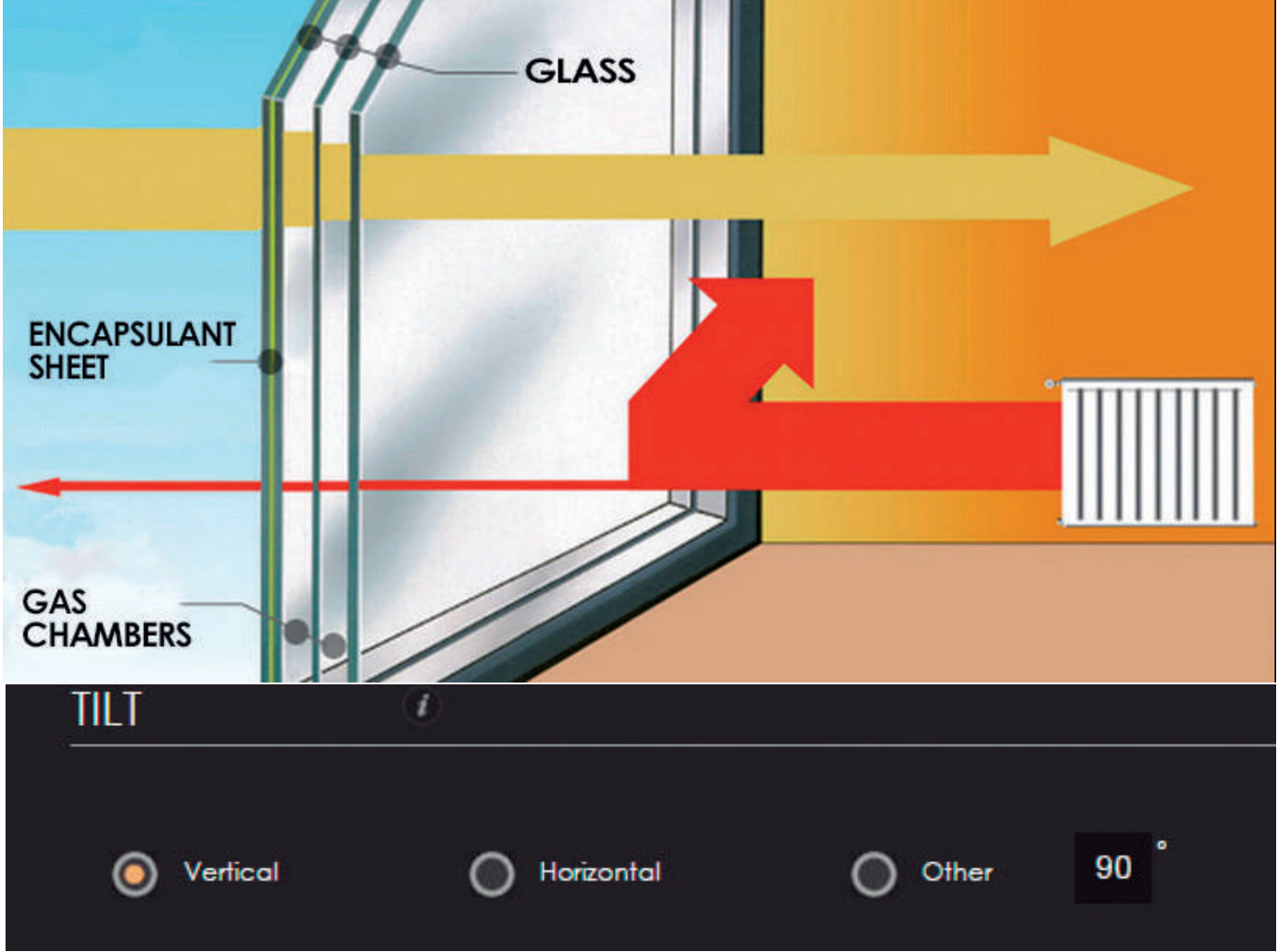
Onyx Solar®'s App will enable you to calculate the energy generated annually by a photovoltaic installation, the number of lights which could be run, the CO₂ emissions prevented, the barrels of oil that could be saved and even the equivalent distance covered by an electric car.

Simply by selecting your location, the peak power you wish to install, the orientation of the surface to be integrated, and pressing the "Calculate" button.

Download this simple application from Onyx Solar®'s website. Also available free at Apple Store and at Play Store. In this way, you will be able to perform the calculation anywhere in the world on your Smartphone.

THERMAL U-VALUE CALCULATION

THERMAL TRANSMITTANCE CALCULATION TOOL



Onyx Solar®'s photovoltaic glass reaches a U Value of up to 0.74W/m²K (0.13 BTU/hft² °F), making possible the optimal thermal insulation of buildings. In order to design the photovoltaic glass which best suits the needs of each project, Onyx Solar® has developed a simple tool to calculate the thermal U value (or thermal transmittance) of different configurations of photovoltaic glass.

The thermal U value is important because it indicates the amount of heat which can be transmitted through a glass module, and is therefore directly related to energetic efficiency: a lower thermal U value means greater insulation and thus greater efficiency.

To make this calculation, it is only necessary to know the number and thickness of the modules of glass which comprise the glazing, the characteristics of the gaps if there are any, and the polymer layers if there are any laminated glass units.

OUR FACTORY

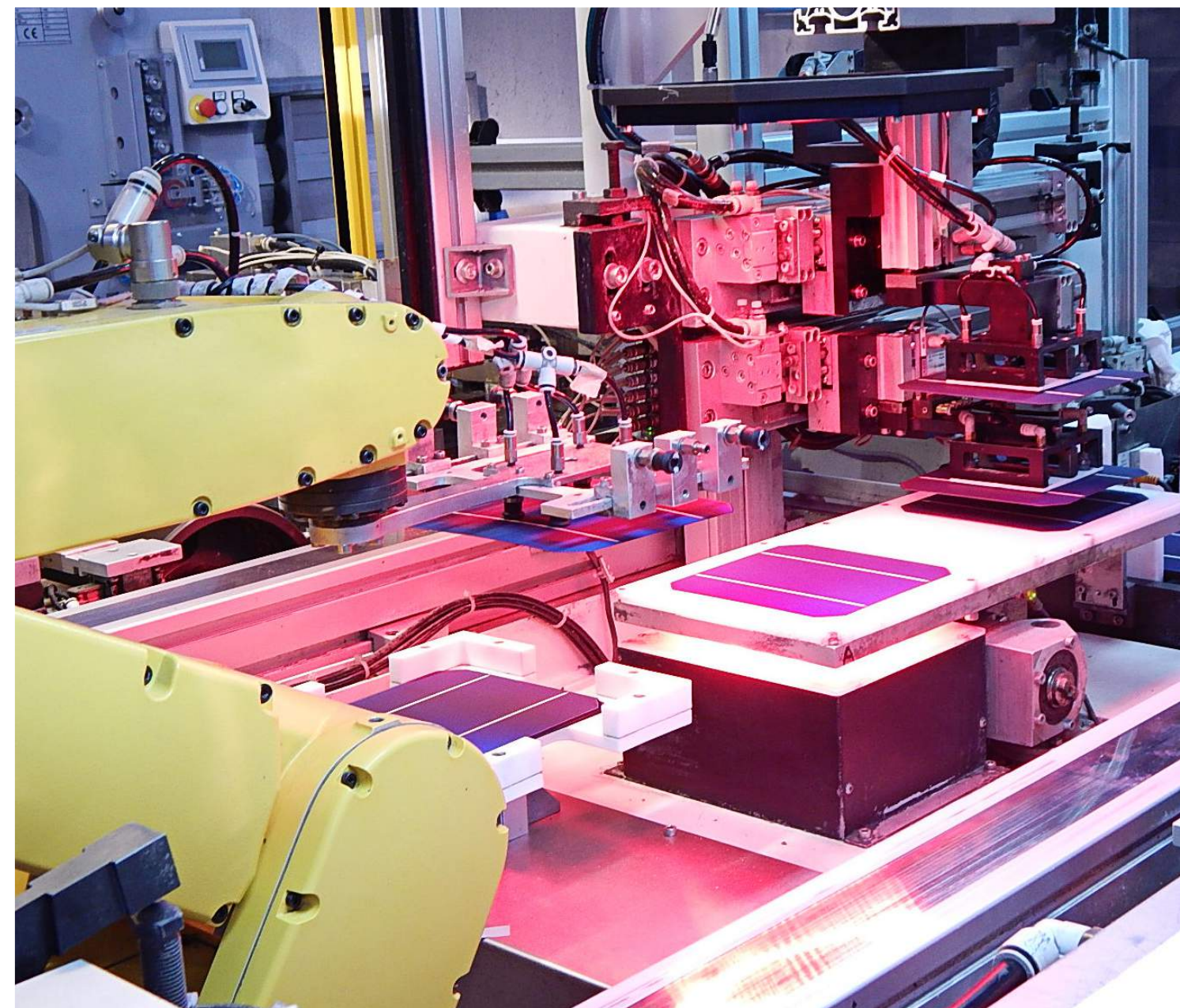


Onyx Solar® is a leading European company in the design and manufacture of photovoltaic glass capable of generating clean, free energy from the sun.

The factory, located in Avila (Spain), is a facility of 8,000 m² with cutting-edge technology and machinery, enabling the company to achieve a **production capacity of 500,000 m² of**

amorphous and crystalline silicon photovoltaic glass.

A glass which complies with the highest functionality, quality and safety standards, and which has already been installed in over 22 countries.



This range of photovoltaic solutions has been developed by a highly-qualified multidisciplinary team of physicists, architects and engineers, with a total of **over 15 years' experience** in engineering and the installation of photovoltaic technology.



RESEARCH AND DEVELOPMENT

R+D+i

Since its commencement, Onyx Solar® has been committed to investment in R&D+i as the key to the development of its innovative products, and has therefore participated in several R&D+i projects with renowned universities, research centres and leading companies.



PVSITES (Building-integrated photovoltaic technologies and systems for large-scale market deployment)

Programme: HORIZON 2020. European Commission.



ADVANCED BIPV (New Generation of BIPV glass with advanced integration properties)

Programme: HORIZON 2020 - SME Instrument Phase 2. European Commission.



REELCOOP (Research Cooperation in Renewable Energy Technologies for Electricity Generation)

Programme: 7 Framework Programme. European Commission.



HERB (Holistic Energy-Efficient Retrofitting of Residential Buildings)

Programme: 7 Framework Programme. European Commission.



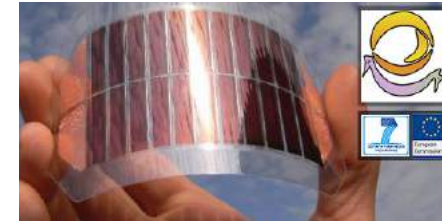
R2CITIES (Renovation of residential urban spaces: towards nearly zero energy cities)

Programme: 7 Framework Programme. European Commission.



REELCOOP (Research Cooperation in Renewable Energy Technologies for Electricity Generation)

Programme: 7 Framework Programme. European Commission.



ARTESUN (Efficient, large-area arbitrary shape solar energy)

Programme: 7 Framework Programme. European Commission.



The Autonomous Office

Programme: LIFE 2011. European Commission. Environment.



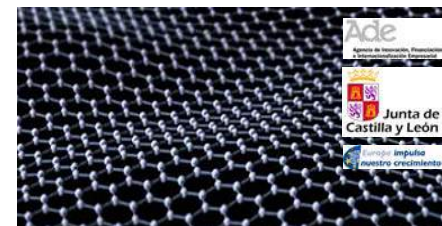
EUROPHIT (Improving the energy performance of step-by-step refurbishment and integration of renewable energies)

Programme: CIP Programme. Intelligent Energy Europe.



SOHIRE (Hybrid and Reactive Solution for Integration into Sustainable Building Envelopes)

Programme: Cooperative Research and Development Projects. CDTI - Centre for Industrial Technological Development.



Solid-state Dye-Sensitized Solar Cells: nanostructured layers forerunning photovoltaic paint in sustainable construction

Programme: R&D projects. Business Innovation, Financing and Internationalisation Agency. Regional Government of Castille and Leon.



INNDISOL (Innovation in Architectural Solar Integration and Photovoltaic Devices)

Programme: INNPACTO 2010. Spanish Ministry of Economy and Competitiveness.

AWARDS AND RECOGNITIONS



We must commit ourselves to innovation, technology and internationalisation as the driving force behind development and growth".

Álvaro Beltrán, President and founder of Onyx Solar®.

Best project in Colorado in 2015 awarded by the ENR magazine for the Denver Science Pyramid.

Kuwait award for Excellence in Sustainable Energy 2015 for "the most innovative sustainable technology".

Best of What's New award 2015 by the Popular Science magazine for the "best engineering product".

Best turnkey project 2015 in the Solar Industry International Awards in Hamburg.

Best outdoor product 2015 by The Architects' Newspaper magazine for the photovoltaic floor.

The most innovative glass 2015 awarded by the National Glass Association and Window & Door, for low-e photovoltaic glass.

Best innovative project 2015 by El Mundo for the photovoltaic floor.

Innovative company 2015 - 1st Promecal Awards.

We are sustainable 2015 - "We are a company" awards, by the Popular Bank.

Best project in the New York area 2014 awarded by the ENR magazine for the Novartis project.

Most innovative product 2014 in the VIII Castille and Leon Economic awards for innovation, for the photovoltaic floor.

Finalist for the **most innovative project 2014** in the European awards for Regional Innovation.

Best entrepreneurial project 2013 in the V Energen -National Energy Awards- "from the idea to the company".

Finalist for the **best construction material 2013** in the VII NAN Architecture and Construction Awards, in the Walkways and Façades category.

Best revelation enterprise in Castille and Leon 2012 by the magazine Actualidad Económica.

1st Red Empreverde Awards 2012, Biodiversity Foundation.

Best entrepreneurial company 2011 in the XXI Entrepreneur Awards, by La Caixa & ENISA.

'Sapere Aude' for innovation and sustainability 2010 awarded by the Avila City Council.

Commitment to innovation 2010 awarded by CONFAE.

Best start-up 2010 in the 1st Castille and Leon Awards for Innovation.

Award for market feasibility in the European Solar Decathlon 2020 for the SML House.

Finalist for innovation in the **European Venture Contest 2010**.

European Commission Official Partner 2010 for "Sustainable Energy for Europe" for the San Anton Market project.

Company with the greatest growth potential in Europe 2010 in the European Entrepreneurial Awards.

XI Young Entrepreneur Award 2010.

Nearly 30 awards distinguish Onyx Solar® as the world leader company in photovoltaic glass for buildings.



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**glass
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award winner**
2015 MOST INNOVATIVE GLASS



GAME CHANGER 2015
THE
**ARCHITECTS
NEWSPAPER**



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