

ABORA SOLAR

The world's most efficient solar panel

Press Kit

Innovation is our source of energy

10/03/2022



Words from Dr. Alejandro del Amo, CEO of ABORA SOLAR



When I finished my PhD thesis, the hybrid solar panel had an efficiency of 65% and little by little we improved it to 89%.

This is a world record!



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The world's most efficient solar panel

This file, intended exclusively for the press, presents the company and its technology, its values and mission, its references and its international influence.

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The world's most efficient solar panel

- Abora was **founded in 2017 by Dr Alejandro del Amo**, an international expert in the field of renewable energy. After several years of research into hybrid solar technology, he was able to set up an ambitious business project in just a few months: **to manufacture the most efficient solar panels on the market**. He surrounded himself with a reliable team and created the basis for Abora: an innovative company with a strong social and environmental responsibility.
- The idea of Abora was well received by many investment groups, thanks to which the company was able to grow rapidly and increase the number of its employees. In its early years, Abora increased its sales of hybrid solar panels with its aHTech® technology exponentially, having presented its innovation at trade fairs around the world and **won prestigious international awards and recognitions**.
- Its mission is **to maximise the profitability of environmental resources** through technological innovation and service, for the benefit of the planet and people. Its vision is to become the **world leader in solar technology**, recognised for its social responsibility, quality and constant innovation.



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Product sheet



Using solar energy, our hybrid solar panels (PVT photovoltaic-thermal) produce electricity and hot water simultaneously. Although the electrical and thermal efficiencies of a hybrid panel are lower than those offered by each of these technologies separately, PVT panels produce more energy per unit area. This is particularly important when the area available for installation is small.

Developed in 2017 by Abora Solar, hybrid solar panels with aHTech® technology not only minimise the thermal losses of a panel, but also increase the photovoltaic output due to the cooling achieved by the photovoltaic cells. The entire energy process comes exclusively from the sun and the amount of CO₂ released into the atmosphere is zero, thus protecting the environment and addressing the climate challenge we face.

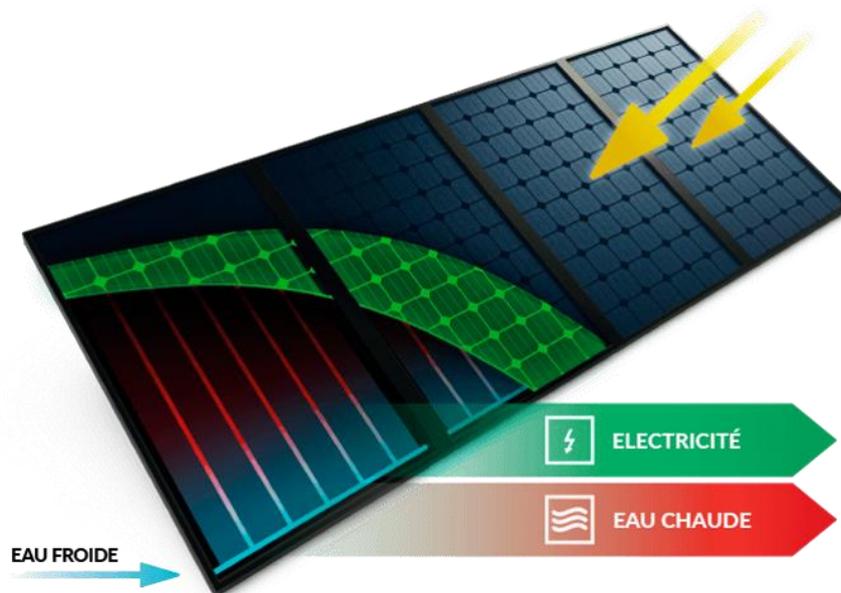
The aHTech® 72SK hybrid solar panel is a 2 metre high and 1 metre wide solar panel with an overall efficiency of 89%. It consists of an electrical and a thermal system. The electrical part consists of 72 high-efficiency monocrystalline solar cells that generate a power of 350W. The thermal system, which allows a nominal flow rate of 60 litres per hour, is capable of operating efficiently over a wide temperature range up to 80°C, making it ideal for residential heating and industrial processes. It is certified to European quality standards, and we like to say that every panel installed in the world is proof that we are indeed producing as much energy as we claim. Its installation is suitable for the following sectors: industry, hotels, farms, hospitals, old people's homes, educational centres, multiple dwellings, campsites, laundries and sports centres etc.

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Benefits of hybrid solar panels with aHTech® technology.

- ❖ **Higher production** per square metre with aHTech® technology.
- ❖ **Better performance.**
- ❖ **Higher output** per square metre of aHTech® technology. One aHTech® panel generates the same energy as 4 photovoltaic panels.
- ❖ **Greater energy savings** as more energy is produced, including the thermal energy output of the hybrid panel.
- ❖ **More savings with aHTech® technology.**
- ❖ **Lower return on investment** with aHTech® technology.
- ❖ **Higher IRR.** With aHTech® it is 22.52% compared to 19.48% for PV.
- ❖ **Cumulative cash flow is 2.6 times higher** with aHTech® technology than with PV.
- ❖ **Lower energy costs** (40% lower with aHTech®).
- ❖ **Greater reduction in emissions**, 4 times more emissions avoided than with PV technology.



News

- A. As of July 5, 2021, our SHE panel, Solar Heat & Electricity, is officially patented and registered as an invention.
- B. Iraq, South Africa, Lesoto and Russia are the new countries where we have installations and have started to export.
- C. At present, we have several installations all over the world, although mainly in Spain. We are present in 23 countries on 4 continents. And we have more than 10 installation and distribution projects planned in new countries in 2022.

D.

- | | |
|-------------------|------------------|
| 1. Spain | 13. Russia |
| 2. Portugal | 14. South Africa |
| 3. France | 15. Lesoto |
| 4. Italy | 16. Iraq |
| 5. Germany | 17. Mexico |
| 6. United-Kingdom | 18. Colombia |
| 7. Poland | 19. Ecuador |
| 8. Romania | 20. Chili |
| 9. Iceland | 21. Canada |
| 10. Netherlands | 22. Peru |
| 11. Switzerland | 23. Greece |
| 12. Sweden | |

- E. The company is **growing rapidly**. We have almost tripled our number of employees.
- F. In 2022, we opened a branch in Lyon.
- G. In February 2020, our project "**The most profitable Solar collector on the market to supply Heat and Electricity**" was validated by the European Union who decided to fund our research.

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ABORA SOLAR GOES GLOBAL

Abora Solar, creator of the world's most efficient hybrid solar panel, is in the process of internationalising its business model. An international expansion that will take shape with the signing of the first international distribution agreement between Abora Solar and Solarus Smart Energy Production in 2020. Abora is currently present in 21 countries, and the Zaragoza-based company hopes to achieve a turnover of two million euros this year, 50% of which will come from this expansion.

The company's route beyond Spain's borders is to establish itself in Europe, Latin America and the Middle East, where it has installations and distribution agreements. Among other things, the company has just installed its hybrid solar panels in Iraq and South Africa.

Continuously growing, Abora Solar expects to double its turnover by 2023, with 40% of its income coming from projects and agreements outside Spain. For this year, 2021, it expects to double its turnover from the previous year and to have an internationalisation of 40%.

"We are eager to see how far we can go with this project. For now, all the data indicates that we are on the right track and that Abora's presence in more and more countries is becoming a reality," concludes Alejandro del Amo, CEO of Abora Solar.

A hybrid solar panel four times more efficient than a photovoltaic panel



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With experience in the solar energy sector and specialised in the design, development and manufacture of solar panels, the Abora team has succeeded in creating the most efficient hybrid solar panel in the world with an efficiency of 89%, where photovoltaic technology only achieves 20%.

This is a revolutionary advance, thanks to which one hybrid panel is able to produce the same energy as four photovoltaic solar panels, making the hybrid installation more profitable in less time and with less space.

This breakthrough has enabled the Spanish company to obtain two million euros in funding from the European Innovation Council to further develop its hybrid solar technology, which is capable of producing both heat and electricity. Today, Abora is already manufacturing and marketing what is certified as the most cost-effective and efficient solar panel on the market, the aHTech® technology.

As part of its expansion into the international market, Abora Solar has signed an international distribution agreement with the Dutch distributor, Solarus Smart Energy in 2020: an agreement that allows Abora to open the doors to the Dutch market.

The agreement was signed in the summer of 2020. This is Abora Solar's largest international agreement. Thanks to the close cooperation between the two companies, a number of projects have already been implemented in the Netherlands this year, but also in other countries such as South Africa.

Abora Solar's aim is to extend its innovation to more countries that will be able to benefit from green energy while saving money. It aims to raise the profile of its innovative solar technology as one of the solutions to the energy and environmental challenges facing the world.

More jobs and relevance in emerging markets



"By working together, Solarus and Abora Solar remove all barriers for the customer: financial, social, environmental and above all responsible for the planet", says Niels Stolk, CEO of Solarus Smart Energy Solutions.

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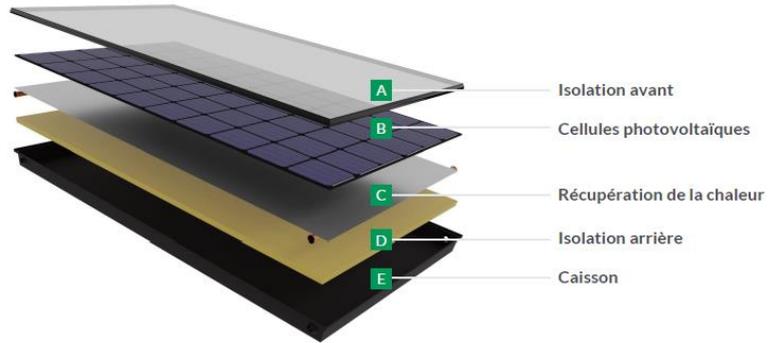
Hybrid Solar Panel, Two in One

A hybrid solar panel is a technological innovation that combines photovoltaic and thermal energy. This technology, still relatively unknown, is a "two-in-one" solution that is more efficient, economical and environmentally friendly than simple photovoltaic or thermal energy. Thus, this solar technology makes it possible to generate electricity and hot water simultaneously for the same building. The general idea of the hybrid solar panel is to be a combination of traditional photovoltaic technology and solar thermal collectors. However, Abora Solar and its aHTech technology has gone a step further in hybrid solar technology by innovating even more to offer the most efficient and effective solar panel in the world.

How does a hybrid solar panel work?

The hybrid solar panel has a very intelligent operation. In simple terms, the hybrid solar panel has high efficiency thermal collectors on the back of the panel and photovoltaic solar cells on the front. These convert solar energy into electricity and at the same time the thermal collectors recover the heat emitted by the sun through a heat transfer fluid or hot air collector. Thus, it is possible to generate electricity and heat simultaneously thanks to its two clearly differentiated operating layers:

- The top layer consists of photovoltaic cells that produce electricity by capturing protons emitted by solar radiation.
- The bottom layer is equipped with a solar thermal collector that captures the heat emitted by the sun.



Combining the characteristics of photovoltaic and thermal panels, hybrid solar panels, known as PV/T, are based on the principle of solar cogeneration, which allows them:

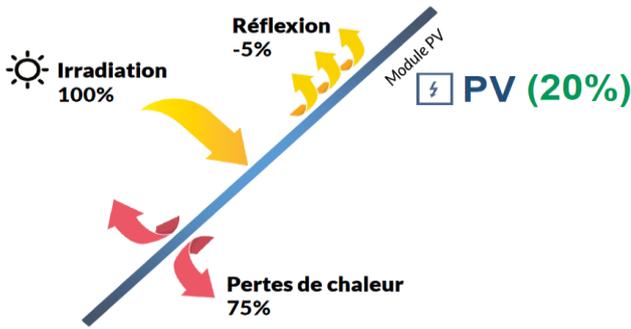
- Generate electricity to light your home and power all the appliances installed in your home from natural energy.
- It produces heat to heat water, a swimming pool, ambient air or even to run your underfloor heating system.

What are the differences?

Let's go back to the photovoltaic solar panel. In general, it is capable of capturing 20% in the form of photovoltaic energy. The remaining 80% of the energy is lost through reflection of the sun's rays and heat loss.

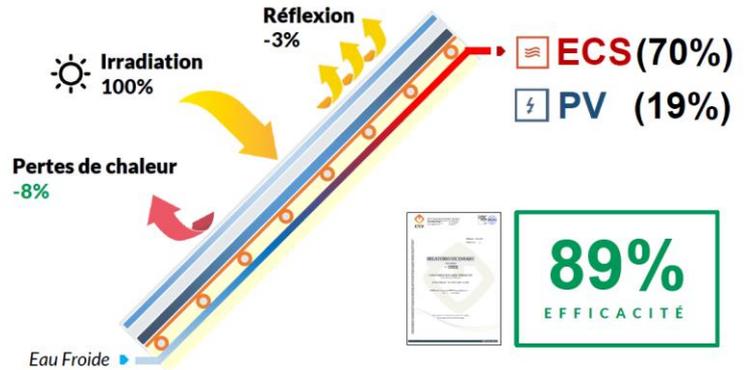
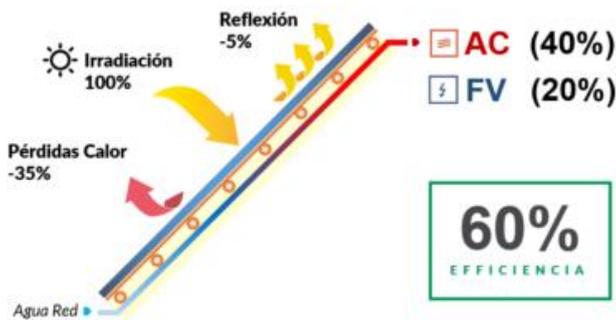
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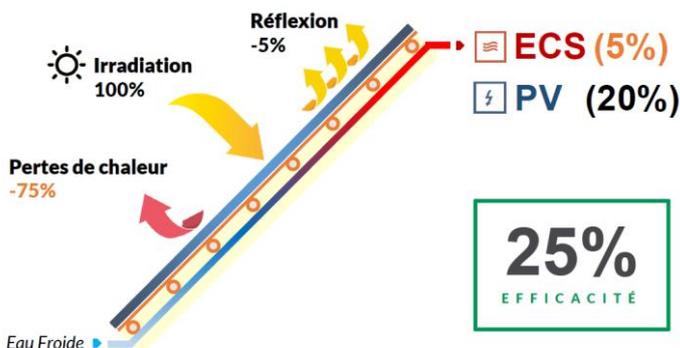


Abora Solar's hybrid solar panel is equipped with aHTech technology that reduces heat loss. The solar thermal energy is increased by up to 70%, as well as the photovoltaic energy. The efficiency of the panel with aHTech is then 89%. With aHTech technology, you will have the most efficient hybrid solar panel in the world, as our technology produces the same energy as 4 photovoltaic solar panels and takes advantage of 89% of the solar irradiation.

The PVT, on the other hand, integrates a photovoltaic panel and a water circuit at the rear. In theory, it converts the thermal losses at the back of the panel (40%) into solar thermal energy. This implies an efficiency of 60%.



In practice, however, this is far from the case. In fact, heat loss to the rear is lost through the front. Only 5% is converted into solar thermal energy. Therefore, the total efficiency is only 25%.



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DECARBONISATION AND SUSTAINABLE INVESTMENT: AHTECH® TECHNOLOGY FOR THE ENERGY TRANSITION

The energy transition is slowed down by limited renewable technologies that cover only a small part of the energy demand of buildings and represent investments that are either uneconomic or complex to implement.

Solar panels are quick to install. Those designed with aHTech technology represent a more virtuous evolution in renewable energy solutions, producing 4 times more energy than traditional photovoltaic panels, the energy produced per useful m2 is greater and cheaper and the installations pay for themselves in 4 to 6 years.

Thinking about your energy means thinking about your electrical and thermal demand

"Year after year, we are recording consecutive records in the renewable energy sector. In fact, renewable energies have made fantastic progress. They outperform all other fuels in terms of growth and competitiveness. (...) but progress in the electricity sector is only a small part of the equation. Not to change the whole energy system is to be blind to reality," warns Rana Adib, Executive Director of REN21.

Indeed, to think of energy only in terms of electricity is to forget a significant part of what constitutes the total energy demand. According to the World Renewable Energy Situation 2020 report, produced jointly by the International Renewable Energy Agency (IRENA), the International Energy Agency (IEA) and the Renewable Energy Policy Network for the 21st Century (REN21), heat accounts for more than 50% of the total energy we consume worldwide, three times more than electricity.

Today, the largest share of renewable energy use is in the electricity sector, where it continues to grow rapidly. One of the main reasons for the low penetration of renewables in thermal end-uses is the lack of supportive policies in these sectors.

It is therefore necessary that, in the decarbonisation plans, we develop renewable heat and sustainable, emission-free electricity generation systems. According to the same report: "The momentum of photovoltaics masks a significant delay in the heating, cooling and transport sectors. It would be short-sighted to celebrate the progress of the PV sector without acknowledging the alarmingly low and slow uptake of renewables in the heating, cooling and transport sectors. Electricity use, for example for lighting, appliances and industrial equipment, accounts for only 17% of global final energy demand, while heating, cooling and transport account for up to 83% of the energy we consume. The share of renewables in heating and cooling is low (10.1%) and barely increasing, even though this sector accounts for more than half of total energy demand.

The needs and attributes of a solar technology that meets the challenge of decarbonisation and the climate issue.

The share of renewables in final energy demand varies according to energy use. The largest share of renewable energy use is in the electricity sector (excluding electricity for heating, cooling and transport), such as lighting and appliances in buildings, where it continues to grow rapidly. Other uses of thermal energy, which include space and water heating, space cooling and industrial process heat, accounted for more than half (51%) of the TRP; of this total, about 10.1% was supplied by renewable energy. By proposing an electricity-only response we are only partially addressing the problem of decarbonisation and the investment is only partial too.

If we want to achieve a global energy transition, to reach the ambitious targets set for 2050 by COP21, we need to produce energy from renewable sources, but more specifically we need

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to bring together 3 essential attributes. Firstly, we need an efficient system: we need a system that can generate renewable energy and convert it, as efficiently as possible, into useful energy ready for consumption. But also a system that is scalable on a large scale, i.e. practical and simple to implement in the manufacturing process, installation and end use: With global energy consumption so widespread around the world for a variety of different uses, we need a system that, regardless of location, type of consumption, or even financial means available, can easily be implemented and provide energy directly. Finally, we need a system that is cost-effective: this means that we must not only produce more energy, but we must do so at the lowest possible cost.

In short, we need a renewable energy system that is efficient, scalable and cost-effective.

Existing solar technologies face the challenge: an insufficient and partial response

Now that we know the keys we need to have green energy by making a sustainable investment let's look at the innovations and solar technologies on the market.

Firstly, we have the famous photovoltaic panel that you all know so much its technology has been democratized. Without going into the details of photovoltaic technology, we know that it is a solar technology which, thanks to the photovoltaic cells of which it is composed, absorbs solar energy to convert it into electricity. And only into electricity. However, as we said earlier, talking only about electricity for energy and decarbonisation is not a sufficient answer since it only addresses 17% of the problem. Moreover, it is a double whammy for photovoltaics with global warming. Indeed, the production of solar energy by photovoltaics will be affected by global warming since the performance of its cells decreases with heat, as indicated in the MIT report on the performance of photovoltaics in the face of rising temperatures.

If we now turn to the solar thermal panel, the answer offered is also only partial, since it only produces hot water. In order to have a complete answer, you will have to invest in a solution including photovoltaic and thermal panels, whereas the available installation surface is often not sufficient to accommodate both technologies and therefore produce the energy corresponding to your consumption.

Hybrid solar panels with aHTech® technology, a sustainable investment for the energy transition

With this statement, I would like to introduce you to aHTech®. Our most advanced solar technology available on the market. aHTech® stands for Abora Hybrid Technology. aHTech® is the technology that our engineers have developed and that is used at the heart of each of the hybrid solar panels we manufacture, in our production facilities located in Spain.

If we go back to the attributes required for a renewable energy system to really disrupt the market and achieve the energy transition. We said we needed an efficient system: aHTech® solar panels are an incredible 89% efficient. Photovoltaic solar panels have an efficiency of around 20%, 21% for the best, which means that 80% of the remaining energy is lost either through heat or reflections. What we do at Abora is that we place a thermal collector on the back of the photovoltaic modules, which allows us to convert an additional 70% of the incoming radiation into energy. Combined with the 19% efficiency of the PV modules, this gives a total efficiency of 89% per panel. Therefore, our hybrid solar panels produce both electrical and thermal energy. And if you remember from the introductory graph, electricity accounts for 22%, and heating 49% of the world's total energy consumption, which we can supply directly from our panels.

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So you need a system that is scalable, practical: At Abora, we reduce installation time and effort for the convenience of our installation partners. aHTech® panels have been designed to fit the standard dimensions of the solar industry. In addition, we design and supply quick connect, plug and play systems, provide prefabricated mounting structures, and prefabricated kits with all necessary components. Everything at Abora is designed to increase installer convenience, so that even large-scale installations can be installed in record time.

We provide technical support to the partners we work with around the world to distribute our technology. By taking care of our network, we benefit from their direct and honest feedback on day-to-day operations, which allows us to continually improve and adapt our solutions.

Finally, a system that pays for itself: aHTech® solar installations pay for themselves in 4 to 7 years, with the panels having a life span of 25 years. Because it is profitable, it is financeable, and we work with several financial institutions to provide our end customers with financing solutions. In this way, with Abora's hybrid solar panels, not only can you save a lot of money from day one, but you won't even need to invest.

Finally, the hybrid solar panel is a winning combination: a combination of two solar panels in one that offers the best cost efficiency on the market and the best performance compared to its competitors, 89% efficiency to be exact, and produces 100% renewable electrical and thermal energy. It is the solar energy solution.

Today, the world is facing an energy challenge and we are not meeting half of it by focusing on electrical energy alone. Hybrid solar panels offer a complete answer to this challenge: by investing in this technology, you are betting on the future. So why choose between two options when you have a solution that gives you both options with best efficiency and productivity?

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Who is the PhD. Alejandro del Amo?

The innovation is his energy.

Alejandro, born in Zaragoza, spent his childhood between the Aragonese capital and his beloved Eastern Pyrenees. This combination of the river Ebro and the snow on the slopes of Candanchú awakened in him the "virus" of rowing and skiing.

As a teenager, he combined the two sports, acquiring experiences and victories that later served him in the business world. In rowing, he has been a national medalist on several occasions. However, his greatest successes were in skiing, where he competed as an athlete in the World Championships in the Czech Republic in 98/99 and obtained an Olympic diploma at the Junior Olympic Games in Slovakia in 98/99, as well as being a national silver medalist in ski jumping.

Alejandro del Amo is considered one of the most creative Spanish man in the business world.

From then on, he concentrated on his studies and started a degree in Industrial Engineering at the University of Zaragoza. He then completed his doctoral thesis on "Solar trigeneration systems", where he developed the first second generation hybrid solar panel. In 2012, he participated in the international university competition, Solar Decathlon, where he was able to try and test his prototypes in a prototype house.

This led him to his first company, in which he started to commercialise the first hybrid solar panels developed in his PhD thesis. After a few years of development, improvements to the panel and a significant investment, in 2017 he founded Abora Solar, with which he is currently expanding and internationalising.

Currently, Abora has managed to develop the most efficient solar panel in the world, with an efficiency of 89%. The company has also won a multitude of awards and recognitions, the most important of which was the EIC Accelerator Pilot, with a grant of 2 million euros for the development and commercialisation of a new panel called SHE, an acronym for Solar Heat and Electricity, funded by the European Union.

All this has earned him inclusion in the prestigious FORBES list of the 100 most creative Spanish man in the business world.



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Awards and recognitions

Forbes



Energy Globe

The world award for sustainability

Alejandro del Amo enters the prestigious list of the 100 most creative Spaniards in business

The Energy Globe Award is the most prestigious environmental award in the world.



Quality label awarded to projects submitted to the EU innovation programme.



SME Award in the category

"Exporting Entrepreneur" awarded by the Zaragoza Chamber of Commerce



Aragon Government Award for Innovative Entrepreneurial Initiatives.

Awarded by MIT to Alejandro del Amo, given to the 35 best innovators under 35 years old.



Seal awarded to clean, cost-effective solutions that have a positive impact on quality of life.



Awarded by Heraldo de Aragón in the category: Technological Innovation.



Prize awarded by La Caixa to young companies with the greatest growth potential.



Award recognising contribution to society as a source of creativity, wealth and prosperity.

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Main references

In total, we have numerous installations in Spain, Europe and around the world. Many people have placed their trust in us and have decided to make the choice of a greener and more responsible energy for the world of tomorrow.



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Photos of installations



Installation at the
OECD, Paris
(France)



Installation on
the roofs of the
Iberostar Royal
Ándalus Hotel,
Chiclana (Spain)

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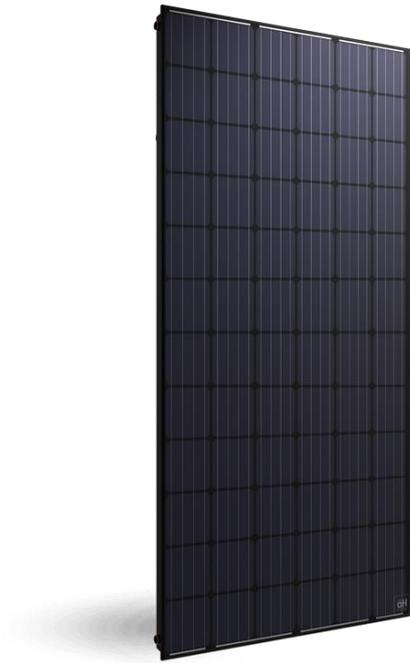
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Graphic material



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