

The Solar Poplars

LAGI 2022 Mannheim

The Solar Poplars concept is a line of products that can revolutionize the way renewable energy in local, micro, scale is generated.

Thanks to its attractive design, simplicity and cutting-edge technology, it can make any home or commercial photovoltaic installation visually interesting both during the day and at night, more effective and serve innovative purposes.

The Solar Poplars are a way of implementing a renewable energy solution within any green place without obstructing its natural beauty. Instead, **it's added value**.

Structure

The idea behind the concept is simple - to take a natural form, redesign and implement photovoltaic technology and reintroduce it to the environment. In order to achieve this goal, we designed The Solar Poplars - a modular organic photovoltaic system.

The Poplars take the form of a simplified, symbolic tree and are designed in three sizes: 208 cm, 244 cm and 295 cm tall. Their base is made of painted stainless steel and the active photovoltaic element is a laminated sandwich of two layers of polycarbonate integrating semi-translucent organic PV modules made by **ASCA®** (the technology declared the winner of the **2021 German Sustainability Award, in the category "Climate"**). The ASCA® modules are able to take on any shape and size and thanks to the laser structuring method, the module design itself is personalized. This unique feature has been leveraged for The Solar Poplars design. LED illumination makes the Poplars look stunning also in the evening.

The Poplars are tilted by 60 degrees from the ground for the best power generation efficiency and looks. Optionally, other tilt degrees can be manufactured.

The base frame of the structure can be anchored to any kind of a foundation or simply to the ground.

The design allows for easy installation of the Poplars even by an inexperienced person, as all it takes is assembling only three parts together and connecting the plug to the inverter. The Solar Poplars are intended to be used in on-grid installations, but they can also be used in off-grid systems.

Technology and sustainability

In order to make the whole system as simple to manufacture and assemble, we designed the Poplars to consist of only three elements that need to be assembled: two steel parts for the "stem" and one PC element for the "tree crown". This makes the product easily accessible for everybody, from small garden owners to large, commercial solar energy companies.

Secondly, OPV (organic photovoltaic) technology by ASCA® is not only effective, but also sustainable.

Facts about the ASCA® OPV film

- It's 100% recoverable (energy recovery).

- It uses mainly organic materials and no silicon or any rare earth materials.
- It's locally sourced (fully manufactured in Germany or in France on an industrial scale), so it minimizes the carbon footprint related to long-distance shipments.
- Its production consumes much less resources and energy compared to legacy technologies.
- Its Energy Pay-Back Time is just between 3 to 6 months in optimal conditions, compared to 1 to 1.5 years for the 2nd generation solar panels and to 1.5 to even 3 years for the 1st generation panels.
- Compared to polycrystalline PV, for 1kWh installed, considering a 25 year-lifetime, using the ASCA® film equals 1.12 T of eq CO2 avoided per kWh.

Embodied energy required to manufacture the product

Thanks to the use of the locally-sourced and most eco-friendly PV technology on the market combined with stainless steel, we managed to optimize the ratio between the energy needed to manufacture the product and its durability.

Embodied energy required to manufacture the product in three available sizes:

- 208 cm tall version
851.00 kWh
- 244 cm tall version
1063.25 kWh
- 295 cm tall version
1348.75 kWh

Energy generation calculations

We conducted the calculations for the climate conditions in Mannheim, Germany. The results may vary depending on the desired installation location.

- 208 cm tall version
148.2 kWh per year
- 244 cm tall version
174.3 kWh per year
- 295 cm tall version
148.2 kWh per year

Integration into land and space

The Solar Poplars are intended to be a modular and scalable technology. Thanks to the three available sizes and the fact that the client can install either just one piece, a few of them or build a whole solar farm with them, they can fit any location, from a small garden, though city squares, boulevards, to a large public park.

The nature-inspired form makes it fit within literally any place, where they physically fit - depending only on the taste of the client.

However, there are many more benefits of this design than just effective generation of renewable energy.

- They can serve as sound barriers if installed along a busy road - without obstructing the visibility too much, thanks to their **transparency**.
- They can become useful shade structures, protecting the plants growing underneath them from scorching sun. This also helps the soil to maintain water more effectively,

which is a huge environmental problem these days, thus allowing the plants, whether they're vegetables, fruit or flowers, to grow and blossom in a better environment. This way, the Poplars can also address the issue of **agrivoltaics** by not only producing electricity, but also optimizing the crop quality and yield.

- They not only improve the visual attractiveness of any location they are installed at, but still discretely serve their main purpose - renewable energy. Thanks to The Solar Poplars, even public places like parks or gardens can be where solar energy is generated, without obstructing their relaxing, leisure role, with industrially looking, conventional solar solutions. It's simply **added value**.
- A casual visitor of places where The Solar Poplars are installed will see them as something completely new and interesting without even knowing what purposes they serve. However after realizing what they are, they will understand and truly appreciate the fact that renewable energy production does not have to look boring and it can be done almost anywhere, and without any cons for the surroundings. It can even be integrated with nature. The **educational aspect** of art is maintained here.

Materials

- Stainless steel
- Polycarbonate sheets
- ASCA® OPV film

Environmental impact summary

The Solar Poplars are designed with sustainability in mind. By sustainability we mean not only the lowest possible embodied energy used in the manufacturing process, but also the fact that they can serve their purpose for decades. We achieved that by using extremely durable materials, such as stainless steel and polycarbonate. No toxic materials or rare metals are used in the organic photovoltaic modules, which makes them **100% recoverable**.

The design is also intended to improve the conditions for flora. Casting a delicate shadow on the ground makes the soil hold water better and protects the plants underneath from the scorching sun, so they need less watering and yield better crops.

Thanks to a narrow, elliptical and slanted structure of a single Poplar, even if many of them are installed in the same location, they do not form a solid barrier and do not obstruct the green corridor of air moving through a city.