**Photosynthetic Hump**

**Description**

White leaves rise at the entrance to the land of the BUGA 23 exhibition. Unique elegant and simple sculptures not only attract visitors but create a place to rest for them, a place to work, pick up a full charge electrical bicycle and get to explore new places on the exhibition, leave a car in the shade and charge it there while enjoying the event.

During the dark time, they serve as navigational light, providing soft downlight, which corresponds to the standards of not polluting the atmosphere and sky with artificial light.

The design was inspired by the leaf's capability of capturing and transmitting water and collecting solar energy. The ergonomic shape of the leaf catches water and transfers it down to the ground. The shape allows reduce material needed for production, using one structural perimeter to hold and stress durable double layered membrane, we also provide a surface for solar panel installment. Our proposal aims to develop a systematic approach for the site. Modular units are adaptable to various areas of purpose and hold corresponding functions. Each canopy is 6 meters high and creates around 20 square meters of shaded space for visitors under it.

As the sustainable installation of BUGA 23, the design proposal aims to create dialogues with the site, assist the operation of the festival in the program, collect solar and rainwater for the use of the festival and neighborhood communities, and develop a prototype that can easily contribute to other sites.

**Contextualization**

The design proposal follows its context to translate the history, urban fabric, materiality, and tectonic of the site to its formal expression. It connects the new infrastructure to the existing U-Hall, urban structures, and green tunnel.

**Program Adaptation**

It provides functionalities that not only meet BUGA’s requirements but are also able to extend to the future utility of the site and other universal places. It is a street light, public seating device, urban table for dining/working/charging, electric vehicle charging station, and decentralized parking spot. A group of them can easily be assembled or divided separately to form various scales.

**Modularization**

To make its flexibility and mass production easy to realize, one duplicatable module is designed that assembles all the functions so that it can work either alone or as a group. The form comes from a single leaf getting benefits from its solar absorption and rainwater collection.

**Technology & Sustainability**

Tensile structure and double-layered PTFE membranes form the main structure to create a lightweight cantilever for solar panels, shading, and lighting. The upper layer of PTFE will hold the flexible solar panels. Collaborating with the lower layer, artificial lighting will be reflected on the ground to avoid direct light and the blurred pattern of solar panels will be an aesthetic feature.

**Morphology**

The singular module with a double curvy form is developed from a series of morphology studies of the existing tree shades in the context of the facade of the U-Hall, the significant existence on the site indicating the history and program of the site. The shape is analyzed, simulated, and optimized to collect solar power and rainwater the most efficiently.

What is more, the soft solar panels are utilized to gain more sun power absorbing surface area and combine the form and function more closely and casually.

**Environmental impact summary**

The proposal is going to serve as street lighting as the fundamental functionality with the solar energy generated from itself, which allows bringing the territory of the non-functioning military base back to the fabric of the city with a positive impact on the zone. The modules collect rainwater, which gathering and redistribution will be used for green landscape development. The singular leaf form with optimized double curved form can not only create a large area of coverage but also collect the rainwater blocked by the canopy to the centralized underground water tank to recycle them for the park and the communities around it.

The optimized double curve creates a more efficient and larger area of solar panel foundation. Even though the soft linear solar panel would drop the percentage of power transformation from around 20 % to 13%, the perfect fitting to the curve itself gains more area of solar panel and makes the total amount of solar power transformation more than the traditional flat panel option. What’s more, the double curve would obtain more perpendicular and high-angle sunlight compared to the flat one. Electricity produced by modules would be used for the functioning of the park and excesses will be returned to the city’s grid.

The proposal is designed from highly durable materials, which will minimize waste. And the lighting design prevents light pollution of the sky and keeps native species and nightlife safe.

**The technology used in your design**

Tensile structure, PTFE membrane stretched, flexible solar panels.

**List of activities your design would support**

1. Providing public seating in the shade on a hot day
2. Providing public space protected from rain during rainy times
3. Provide parking / electric car charging
4. Providing scooter parking/charging
5. Providing sharing electric vehicle spot
6. Providing public for working, dining, electric devices charging

**List of system inputs**

Inverter, an electrical panel, the power grid, and the sun.Components to store and collect rainwater, system to distribute it to the site.

**List of system outputs**

24.78 cubic meters of water per year, 5076 kWh of electricity per year

**List of the primary materials used in your design and major dimensions**

PTFE membrane(36 square meters), steel structural profile (32 meters), and flexible PV modules (30 square meters).

**Order-of-magnitude conceptual cost estimate**

550$ cost of membrane(15-20 per square meter by 36 sq. meters), (30 by 90= 4500) 4500$ for flexible solar panels, 390$ per steel structure= 5000$ per unit

**On-site Installation Strategy**

The steel perimeter structure is prefabricated and bent in the factory. The PTFE membranes are also cut and stitched in the factory. They will be packed, transported, and assembled on site after the foundation and energy (electricity and rainwater) recycling system are finished.