**Blue Whale**

1. **Vision & Goals:**

Masdar is Arabic for “spring” or “source”. Blue Whale, as we name this project, echoes the power of nature and the balance between humans and resources. The marine mammal, known as the largest animal in the world stands for both the color of solar panels and the “Greenprint” our plan incorporates to reduce energy use.

1. **Urban study (balance between eco-systems and human habitation / development)**

The Masdar City concept was developed in 2006 and the construction began in 2008. With a main goal of “Zero Carbon Emissions”, the government is to create an “Ecotopia” incorporated technology for a smart city. The site is located on one of the green fingers (according to the city master plan, two open space corridors running through the city), with the city’s group rapid transit (GRT) cutting through in the middle. How to balance the transit needs and massing flows at peak time, as well as power generation becomes our major issue. Inspired by jumping movements of whales, we propose an arch framework overlapping the street. By extending the crooked alignments of the park northwestern to the site, we create a footbridge system with different levels to fulfill the travel of both cars and passengers and to carry some recreational activities as well.

1. **Recreation/events/interaction:**

Over the past years, Sikka has become the ultimate platform for emerging Emirati, UAE-based and GCC talents to showcase their work amongst a diverse audience, both locally and internationally. This project proposes a multi-use corridor consisting three footbridges stretching through the Blue Whale’s cavity, to reflect and celebrate UAE’s values of co-existence and cultural diversity, inviting visitors to experience a colorful array of art exhibits, interactive installations, musical performances, film nights, cafe and more!

1. **Technology used in design:**
2. Parametric design

Voronoi algorithm is a partition of space into cells, each of which consists of the point to one particular object than to any others. Our proposal utilizes computational methods to analyze the urban context and land use patterns as well as accessibilities. Then we take these maps as theoretical basis to simulate massing and spatial frameworks.

1. Thermobimetal

* Self-ventilating: The best way to cool an area is by releasing the hot air. This project uses the ambient air temperature to allow hot air to escape. When the temperature is above 80˚F (26.7°C), the thermobimetal steering the hinge of the solar panel curls. Once cooled, the system returns to a flat position and the surface to its non-porous state.
* Self-shading: By using solar energy, the thermobimetal system can be smartly block the sun. This strategy is especially useful when trying to prevent solar heat gain and glare to enter the structure, while using no energy and needing no controls.
* Self-energizing: Using the sun’s heat to curl the thermobimetal to the right configuration according to solar radiation, it can help the photovoltaic cells absorb the maximization of solar energy daily and annually on site.

1. Sustainable design

* We propose recycling and reusable materials to the blue whale, such as constructed pavement for the footbridge and bamboo fiber for decorations.
* The green bubbles, infused with some culture medium, hanging in the air, increasing the eco-atmosphere within the structural space.

1. **Energy generation & storage:**

The estimate of the nameplate capacity (kWpeak) annual is 5,041,285 kWh (kilowatt-hours).

1. **Dimensions**

The generator is composed with an outer photovoltaic shell about 198.5 meters long by 66 meters wide in middle, the mouths of which are 35 meters and 24 meters wide. The major framework of the generator is the whale-shaped hollowed steel casting structures designed by voronoi algorithm. The framework is similar to the solar ceiling in size, about 194.5m x 59.5m. In between, lays the supporting structure welded to the framework, lifting the whole solar panels.

1. **list of the primary materials used in design**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| items | materials | specifications(mm) | Area(m²) | numbers | Height/Length (m) | areas of photovoltaic panels (m2) | total power generation (kw / year) theory | Photovoltaic power generation (kw / year) actually | conceptual cost estimate (USD) |
| stalk lighting | Monocrystalline photovoltaic cells |  |  |  |  | 1783.65 | 2300256.4 | 264616.62 | 522975.26 |
| Solar shell | Monocrystalline photovoltaic cells |  |  |  |  | 48527.46 | 15651576.31 | 1800524.23 | 3905004.21 |
| Columns | Steel #45 | 500\*500\*8 |  |  | L5496 |  |  |  | 605364.95 |
| keels | Steel #45 | 100\*100\*5 |  |  | 688.23 |  |  |  | 4834896.64 |
| Stalk poles |  |  |  | 23 | H31.2 |  |  |  | 3371.8 |
| Paving/footbridge |  |  | 5800.5 |  |  |  |  |  | 1155892.63 |
| Planting bubbles | Plants, culture medium, plastic |  |  | 28 |  |  |  |  | 4104.8 |
| strains | Steel | 50 diameters |  |  | 1849.5 |  |  |  | 1514.06 |
| Blue whale framework | Steel #45 |  |  |  |  |  |  |  | 14304281.96 |
| gardening | planting |  | 7780.5 |  |  |  |  |  | 4526671.503.19 |
| Interior façade | Aluminum composite panel |  |  |  |  |  |  |  | 1140571.057 |
| shades | Pvc cloth |  |  |  |  |  |  |  | 338355.11 |
| wiring | steel | 2 diameters |  |  | 32760.3 |  |  |  | 9605319.96 |
|  |  |  |  |  |  |  |  |  |  |
| Total |  |  |  |  |  |  |  | 2065140.85 | 40948323.94 |
|  |  |  |  |  |  |  |  |  |  |

1. **environmental impact statement**

The project is located on an open space about 2.6 hectare. The proposed solar generator is a 200 meters long and 60 meters wide hollow structure, with footbridge crossing through. The potential impacts on the public health and safety from exposure to the site and the design is under assessment. The following aspects are considered:

* Ecosystem and the environmental quality

The local climate is hot throughout the year, especially in August. Masdar City has high temperature and humidity in summer, often accompanied by sand storms, and other adverse natural disasters. So we propose an oversized shades structure for the public, which is also working as solar generator. We analyze the local environmental characteristics through wind flow, solar hours, radiation analysis, and then we get data to optimize the design, as well as to maintain our architectural aesthetics. We seek to control the airflow to cool down the hot air and promote the self-ventilating system within the hollowed and pored whale structure. The micro-environment, within and beneath the arched structure will be good to the public health.

* Cultural impact

Through our design, we respect local culture and draw ideas from their culture as well. For example, we introduce a cultural corridor through the whale, which reflects sikka experience. We hope to express our team's awe for local culture.

* Construction concern

Firstly, the selection of the strongest luminosity of photovoltaic panels can remove the chicken ribs and reduce the waste of resources. Secondly, the movement of photovoltaic panels can increase the air flow on site, reduce the thermal conductivity effect, and improve the heat island effect. The green bubbles hanging on the ceiling can also increase the natural atmosphere within manmade spaces. Meanwhile in construction, we use assembly building to reduce welding. Selection of environmental friendly and recycled materials can also reduce environmental pollution in the area.