**SOLAR TREE -** *Reflection on lives and Creation of colorful life*

**OVERALL CONCEPT**

When thinking about the source, the Sun is the one thing that comes to people’s mind. The Sun gives lives on earth. Vegetation thrives when the first sunlight penetrating through white clouds and initiating photosynthesis in leaves. Then you can imagine numerous replicated cells that form organs and organic matters, which support the overall health and ecological balance on earth, and also add to the complexity in lives day and night. As the wavelengths of the sunlight divided into visible and invisible to human eyes, the visible spectrum creates dynamics in people’s life and the invisible one can be converted into energy for sustainability and advancement in life.

The solar tree supports lives, triggers imaginations and creates memories.

***Typical Scenario One***

The solar tree situates in a linear park beside the light rail that transits to and from downtown Abu Dhabi. As the light rail passing by, residents and tourists on it will catch a glimpse of the solar tree beside and start to wonder what the magnificent tree-like artworks are. That short glimpse intrigues passengers’ curiosity and desire to explore that area and then the location becomes part of their journey in the country.

Just like oxygen transferred from tree leaves, converted into energy to tree branches and continuously travel through the tree trucks to the roots, the 1617 solar glass panels on top collect the invisible ultraviolet and infrared light from the Sun and convert them into electricity, then transfer down to the underground service for daily energy consumptions in the Masdar City. A thin layer of ClearViewTM Power glass coating deposited directly onto the glass panels on top of the solar tree makes the conversion possible. The solar tree branches and trucks are made of coated aluminum alloy pipe with electrical wiring transferring the energy to underground service during the day.

The energy will never be in shortage.

***Typical Scenario Two***

Adjacent to residential blocks and offices, the solar tree acts as a primary leisure space and a shared outdoor square for local communities. At the early morning of a particular weekday, the street starts to get busy and people commute through the place under the solar tree and suddenly notice the changing atmosphere, especially the shadows with various colors on them, on the ground and on all the objects they walk past. That draws them back to this place and try to find out what was so special there under the solar tree. As the numerous colored shadow projection constantly changing, they can never experience the same and they will be always exploring. The solar tree becomes an attractive destination over time that people cannot resist because every moment is unique and dynamic.

The ClearViewTM Power glass coating comes with a variety of color tint possibilities, including neutral color with transparencies between 50-80%. Given the technology, the solar glass panels are coated with 15 neutral colors in 70% transparency, which generates over 437 x 1015 different colors in the shadow. The variety of colors created from the solar glass panel provide a dynamic experience for residents and travelers day and night due to the constant movement of the Sun. The combination of colors and shadows offers thousands of millions of dynamic visual configurations for people to engage across the entire place.

They will never get tired.

***Typical Scenario Three***

The solar tree can be seen in the sky from dusk to dawn when the LED lighting pattern is active in the dark. As its adjacency to the Abu Dhabi International Airport, the solar tree creates an aspiring symbol and unforgettable land art, which greet and send-off its guests.

Nature always reminds people of trees, which are the essential elements and maintain the overall health of our planet as producers for many other kinds including human beings on earth. As we develop further, it is easy to forget where energy and food are from.

The tree pattern on the solar tree is a reminder to respect the natural producers that exist at the bottom level of the food chain. From the sky, the tree pattern, appearing at night, is a symbol of the natural environments that human heavily rely on and deeply attach to. On the ground, this is a place for people gathering after dusk, relaxing after dinner and enjoying the time with their friends and families in the dark. To form the tree pattern, 1775 LED lights selectively fix to the end of the Ø50mm coated aluminium alloy pipes that support the solar glass panels on the edge.

The solar tree presents the art as existence, a message for passengers and a gift from nature.

***Behind the Theme: the Technology***

The ClearView Power™ technology makes the combination of land art and energy generators possible. The solar cell selectively transmits light visible to the human eye while absorbing only the ultraviolet and infrared light and converting it into electricity. This makes ClearView Power™ technology the first truly transparent solar technology, allowing any surface to convert ambient light into useful electricity without affecting the way it looks. Two-thirds of the light available for energy harvesting are in the ultraviolet and the infrared, leading to practical efficiencies over 10% while maintaining up to 90% visible transparency. The award-winning technology is developed by the co-founders of Ubiquitous Energy at MIT and MSU. The company are currently working with global glass manufacturers to bring transparent PV-integrated glass products to the architectural glass market within the next 2 years.

**CONCEPTUAL COST ESTIMATE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item No. | Item Name | Quantity | | Cost (USD) |
| **MATERIALS** | | | | |
| 1 | Ø50mm Coated Aluminum Alloy Pipe with Wiring | 10,712 | m | $ 160,000 |
| 2 | Ø100mm Coated Aluminum Alloy Pipe with Wiring | 8,245 | m | $ 390,000 |
| 3 | Ø200(top)-300(bottom) Coated Aluminum Alloy Pole with Wiring | 482 | m | $ 12,000 |
| 4 | Ø50mm Low Energy LED Light | 1,775 | piece | $ 18,000 |
| 5 | Glass Pane 10mm Tempered | 10.8 | m2 | $ 3,300,000 |
| 6 | ClearViewTM Coating to Glass Panel | 10.8 | m2 | $ 18,000 |
| 7 | Concrete 30 MPa Footing | 110 | m3 | $ 7,000 |
| **LABOUR & COMPOSITE TRADE** | | | | |
|  | ***Site Area*** | 7,471 | m2 |  |
| 8 | Group 1 Tradesman - electrician | 8 | $/m2 | $ 60,000 |
| 9 | General labourer | 5 | $/m2 | $ 38,000 |
| 10 | Site foreman | 12 | $/m2 | $ 90,000 |
| 11 | Excavate basement | 7 | $/m3 | $ 79,000 |
| 12 | Lighting installation | 55 | $/m2 | $ 410,000 |
| 13 | Formwork (labor & material) | 36 | $/m3 | $ 270,000 |
| **Total Cost** | |  |  | $ 4,852,000 |
|  | Minimum Energy production | 2,868,000,000 | Wh |  |
|  | Construction Cost per Watt Energy Production |  |  | $ 1.69X10-3 |

**ENVIRONMENTAL IMPACT SUMMARY**

The solar tree involves an advanced solar harvesting technology to absorb only the ultraviolet and infrared light and convert it into energy. Infrared, a thermal radiation, can burn skins with long exposure, while ultraviolet as an ionizing radiation can damage DNA in the skin cells. Those radiations are not visible and harmful for human. By converting it into energy to support the daily uses in the City, it also creates a safer and healthier outdoor space for local residents and tourist underneath. The electricity is transferred through electrical wiring installed in the steel pipes to underground service for city's energy consumption.

As the solar glass panel coated with neutral colors in 70% transparency, it allows the visual accessibility to the site from above. The minimum distance between individual solar tree is 3.5 meters, which enables public accessibility. In addition, the solar tree is located in the areas with a minimum of 9 hours of sun exposure, which ensures the minimum annual electricity generation capacity of 2868.56 X 103 kWh and maximizes the energy production for city consumption.

LED lights installed to the top aluminium pipes do not emit harmful radiations, which is also good for public spaces. The lights do not cause eye damage and consume only solar as their energy sources. There will be 1.2-1.5 meters depth of concrete footings for the installation of the solar tree. Therefore, prior to any future development, the construction of the footings needs to be integrated into the proposed infrastructure underground for adjacent buildings and services.