ST KILDA TRIANGLE

St Kilda Triangle

The St Kilda Triangle is a solar art pavilion that aims to use energy production in the urban environment in such a way that enriches the space it inhabits by becoming a part of the urban fabric rather than dominating it or being separated from it. The pavilion achieves this by focusing on smaller scale energy production rather than a single point of mass production. This means that the pavilion can become playful, almost transparent to the landscape surrounding it, and, combined with further urban installations can form a distributed network of mass energy production that is much more resistant to major losses of power. The pavilion uses the energy it produces to enrich the space it inhabits, we see this as a give and take relationship between the sunlight that is taken from the site and transformed into electrical energy and the energy that is given back to the site through other forms. The pavilion tries to balance this relationship so that both the landscape and the future energy needs of the city are taken into consideration and enriched by that process. Excess energy produced that is not required by the park is fed back into the electrical grid. Moving forward, urban energy production must be designed in harmony with the space it inhabits to enrich and empower the urban environment rather than dominate it for the sole utilitarian purpose of energy production.

Structure

The form of the pavilion is inspired by the shape and identity of the site, the St Kilda Triangle, providing an iconic public branding that reinforces the identity of the St Kilda Triangle while forming a solid anchor point for the proposed design. The structure spans 30m along all three sides providing a large canopy to host a variety of activities. The form of the installation is also designed to respect the community’s desire to maintain views from the Esplanade of the Port Phillip Bay horizon with the pinnacle height of the structure rising to 20 meters. The structural supports are formed from recycled scrap steel while the prisms are formed from recycled glass molded into shape. Each prism contains one LG Neon R Monocrystalline solar cell capable of 21.1% efficiency (1), totalling 1024 cells with a combined pmax of 6229W combined with Melbourne’s annual mean average of 4.2KWh per day of sunshine (2) for a total estimated (4.2kWh x 6.229kW = 26.1618kWh x 365) = annual 9.549MWh of energy production.

Urban Node

The integration of the solar art installation within the St Kilda Triangle Masterplan has been considered carefully to integrate and enhance the community driven masterplan developed by the City of Port Phillip. The pavilion has been strategically located at the three primary intersections of the St Kilda Triangle Masterplan; Luna Park (east), the Esplanade (north) and St Kilda Foreshore (west). The installation is designed to form a civic hub which is accessible all year round day or night to provide a continuous activation of the site and to enhance the St Kilda Triangle as a valuable public space. One of the primary functions of the installation is to provide a venue for some of St Kilda’s events and activities including the weekly Esplanade Market and the St Kilda festival. The pavilion is positioned above underground parking as proposed within the Masterplan, which provides 350 car park spaces in order to maximize public amenity space above ground. each solar panel is attached to a prism, with 50% of light falling onto the solar cell to be absorbed and 50% going through the prism refracting off inside to fall beneath the pavilion canopy to enrich the St Kilda Triangle with its coloured light. Energy absorbed during the day is also used to drive mist onto the site through nozzles placed around the pavilion and to power lights placed under the solar panels at night.

Renewable Energy Art installation

The proposal draws upon the prominent cultural history of the site as a destination for leisure. A primary function of the proposal was to create renewable energy production whilst simultaneously providing an interactive art installation harnessing the same energy source in order to enrich the St Kilda Triangle. Light installations typically use energy at night when they can be witnessed / experienced but are inanimate during the day. The installation is designed to animate solar energy throughout the day with the use of glass prisms which refracts sunlight into radiant colours of the spectrum that gradually change throughout the day and seasons. The water is activated when the installation is not being used as a venue and provides an element of play by giving volume to the refracted light. At night some of the energy produced from the solar panels are used to create a light show.

Environmental impact assessment

The carbon footprint to produce the structure would be 3.1 tonnes of CO2 for the 25.3 M2 of Solar Cells (6) 12 tonnes of Co2 For the 26 tonnes of scrap steel (3) and 35 tonnes of Co2 For the 25 tonnes of glass (4). Weight and material is saved from the prisms by building them out of 9mm thick recycled glass and applying a diffraction grating to achieve the same refraction properties of a solid glass prism. The structure would become carbon neutral within 10.5 Years on the assumption that it produces an average 9.549 Annual MWh each year offsetting 4.77 tonnes of CO2 per year (5). The carbon footprint of construction is hard to pin down and would greatly depend on the machinery used and speed of construction. Beyond 10.5 years the pavilion will be offsetting the carbon footprint of Melbourne by an average of 4.77 tonnes Of CO2 per year, however this figure is dependant on Melbourne’s future reliance on fossil fuels

References:

* LG Neon R Solar Cell:

<http://www.lg-solar.com/downloads/products/LGE-Data%20Sheet-LG3xxQ1C-A5_EN_04.2017.pdf>

2. Annual averages of sunshine in Melbourne:

[http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p\_nccObsCode=203 HYPERLINK "http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p\_nccObsCode=203&p\_display\_type=dataFile&p\_startYear=&p\_c=&p\_stn\_num=086220"& HYPERLINK "http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p\_nccObsCode=203&p\_display\_type=dataFile&p\_startYear=&p\_c=&p\_stn\_num=086220"p\_display\_type=dataFile HYPERLINK "http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p\_nccObsCode=203&p\_display\_type=dataFile&p\_startYear=&p\_c=&p\_stn\_num=086220"& HYPERLINK "http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p\_nccObsCode=203&p\_display\_type=dataFile&p\_startYear=&p\_c=&p\_stn\_num=086220"p\_startYear= HYPERLINK "http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p\_nccObsCode=203&p\_display\_type=dataFile&p\_startYear=&p\_c=&p\_stn\_num=086220"& HYPERLINK "http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p\_nccObsCode=203&p\_display\_type=dataFile&p\_startYear=&p\_c=&p\_stn\_num=086220"p\_c= HYPERLINK "http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p\_nccObsCode=203&p\_display\_type=dataFile&p\_startYear=&p\_c=&p\_stn\_num=086220"& HYPERLINK "http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p\_nccObsCode=203&p\_display\_type=dataFile&p\_startYear=&p\_c=&p\_stn\_num=086220"p\_stn\_num=086220](http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=203&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=086220)

3. Carbon footprint of scrap steel

<http://www.newsteelconstruction.com/wp/the-carbon-footprint-of-steel/>

4. Carbon footprint of recycled glass

<http://www.greenrationbook.org.uk/resources/footprints-glass/>

5. Average Carbon footprint

<http://info.cat.org.uk/questions/pv/what-energy-and-carbon-payback-time-pv-panels-uk/>

6. Carbon footprint of Solar panel production

<https://pubs.acs.org/doi/pdfplus/10.1021/es071763q>