**Arcux**

Arcus(x) (Latin) – rainbow, arch, suspended

***Formless Wind, Sculptor of the Air***

Let the nature to shape beauty by lending the force from the wind. The presence of unseen yet chilly breeze along the St Kilda esplanade always welcome the local to embrace. What kind of sculpture can create visual excitement over its ever-changing form, be it extreme or subtle? St Kilda wind breeze is always present, yet undefined, formless, vague and faint.

**Wind Concept**

What could this installation take shape in representing its presence of public energy infrastructure which in future support decades of electrical power for the Yarra Trams?   
Through the mapping of whole tram network system within Melbourne, together with the overlay of tram usage frequency, this shaped a “framed heat map”. This framed image highlights its importance as public transport network for the people. St. Kilda site with the colourful Luna Park, Palais Theatre of wonderful concerts and drama, together informed an artistic mix of contextual colour. Thus the name, *Arcux* the suspended net, a subtle yet light-weight sculpture, where the wind choreograph its form, like a flexible set of membranes moving fluidly in the air. The proposal was inspired from Janet Echelman, an American sculptor and fibre artist, whose project are internationally recognised for its light-weight and fluid net installation.

By 2031, the number of tram passengers will exceed one million each day. To cater for this demand the Victorian Government has invested in 50 new generation E-class trams and modern infrastructure that will revitalise the network. E-Class trams, including air conditioning and automated announcements, means they require more power to run properly. St. Kilda triangle site is exposed to strong northerly winds approaching along the esplanade and Jacka Boulevard, plus to westerly and southerly winds approaching over rising ground from St. Kilda Beach. *Arcux*, develops a series layer of catenary to form a weightless sculpture hanging in the air generating renewable energy through the wind. Respecting the current St Kilda Triangle 2016 Masterplan, the proposed sculpture, without altering any ground condition, while maintaining the visual transparency to the esplanade. Crowds can gather around *Arcux*, admiring its changing form, or even holding public events at the open ground with it “umbrella-ing” the moment of celebration.

**Piezo Technology**

“Wind is the hidden energy”. The net sculpture suspended at a varying height range between 1-20m, the cables design allows the object to take the wind from all directions and maximize the energy harvesting efficiency. The form takes advantage of the wind strength where the longitudinal side of the sculpture faces the beachside. With wind breezing into the sculpture, the suspended nets are freely oscillating to gain the maximum momentum. At the both end of the cables, customized piezo actuators transfer the motion into electrical energy. This custom system consists of a disk bimorph actuator and flexure actuator with multi-axis motion, which allows the actuator to consume the motion from three-axis, in three-dimensionally known as X, Y, and Z axis. They are located around the main structural cable of the 4 major sculptural layer and transduce the electricity to the storage. The proposed internal net will be *Spectra@ Fibre* high tenacity polyester fibre, which is light-weight, high strength, and a durable string that is able to sustain all kinds of weather condition. As the piezo-electrical system convert wind motion to electrical power, the supporting electrical cables will deliver the energy to underground, where a large battery/energy storage can be built with the car park structure. Finally, this system will be able to generate approximately 374,000 KWh/year and 1,024 KWh/day.

*Arcux* will become a symbolic sculpture to St Kilda, building a brighter renewable energy future for the city’s public space and transportation, given a new fluid language to the city’s vivid and lively neighbourhood. During the day, the sculpture respond to the wind choreography; the night celebrates with spotlights as its surrounding Victorian night life comes alive; gathering backpackers and families into the St. Kilda Triangle.

**Environmental Impact Statement**

The project, *Arcux*, is a sculpture with minimal disruption to the surrounding built environment, views and proposed masterplan for St Kilda Triangle. It maintains the panoramic view from the Esplanade Hotel and provides the programmatic volume to the habitants in the lightest way. Unlike traditional wind turbine energy harvesting, which are monotonous, noisy, disruptive and non-interactive, *Arcux* offers an alternative that is light and spectacular. It performs as a visualizer of the wind with constant motion and harvests wind energy through its constant momentum.

The sculpture is least disruptive to its landscape and surrounding. It floats in the air only with few visible structure on the top. The vertical supports are the surrounding light poles with minimal construction requirement on the site, contradicting the traditional wind energy generation with heavy construction work.

**Sources**

1. Spectra Fishing, “High tenacity polyester fibre”, Honeywell International, Inc. Retrieved 20 Apr 2018. <https://www.spectrafishing.com/ht/>
2. City of Port Phillip, “St-Kilda-Triangle 2016 Masterplan (Purple Document)”, Victoria, Australia.
3. Public Transport Victoria, “Powering Our Trams”, Victoria State Government, Australia. <http://www.yarratrams.com.au/media/156982/ptvh0429_tram_upgrades_factsheet-2015_albertpark_print.pdf>
4. Peizo Technology, “Piezoelectric Energy Harvesting”, Germany, Retrieved 20 Apr 2018. <https://www.piceramic.com/en/applications/energy-harvesting/energy-harvesting/>