**Technology used : Hydropower Electric**

**Background**

A timely rainfall is expected in St Kilda and more often than not, these rainfall are claimed to be excessive and disregarded by the people. What better way could we use unused rainwater for a good purpose? With the process of rainwater collection and hydropower, unused rainwater can then be generated for a clean energy production.

**Vision**

The idea of collecting rainfall is relatable to a very tropical concept. I have proposed to collect this rainfall by designing a tree column structure that has a linear tube installed in it. The tree column, rainwater collection and people assimilate in a social engaging experience, with a code of architectural design, where tree column structures are part of the roof structure, and changes in the level of height, to become a seating area.

**A place for community**

St kilda has a very strong community and high density of tourists. These tree columns moves like a parasite around the building drawing people to discover exciting new places across the site. The level of changes in height bringing people from the Esplanade down to Jacka Blvd, at the same time walking through a field of greens. With performing spaces and seating areas hidden behind bushes of greens. The tree columns are also designed as seating areas for the people where friends and family and gather together with a scenic view. The jungle by the bay will be the core of the community. A space designed for the people.

**Form & Function**

The form is driven by the tree column structure -Circles. These circles are then mapped onto the site. The form is then designed following the circular shapes around the building. The form is carefully design in changing the level of heights, making sure the iconic view from the esplanade is not being blocked. Therefore, the circles then changes in level of heights from the roof, down to form a seating area. Allowing people to walk on the roof, to experience even better views of st Kilda Beach. The tree column structure is like a parasite onto the building and is located all over the building.

Power

To measure power for one tree column:

**P = m x g x Hnet x η**

P = power measure in Watts (W)

m = mass flow rate in kg/s (numerically the same as the flow rate in litres/second because 1 litre of water weighs 1 kg)

g = the gravitational constant, which is 9.81m/s2

**Hnet =** the net [head](http://www.renewablesfirst.co.uk/hydro-learning-centre/what-is-head/). This is the gross head physically measured at the site, less any head losses. To keep things simple head losses can be assumed to be 10%, so Hnet=Hgross x 0.9

**η =** the product of all of the component efficiencies, which are normally the turbine, drive system and generator

For a low gross head of 2.5 metres, and a turbine that could take a maximum flow rate of 3 m3/s, the maximum power output of the system would be:

First convert the gross head into the net head by multiplying it by 0.9, so:

**Hnet = Hgross x 0.9 = 2.5 x 0.9 = 2.25 m**

Then convert the flow rate in m3/s into litres/second by multiplying it by 1000, so:

**3 m3/s = 3,000 litres per second**

1 litre of water = 1kg, so *m* is the same numerically as the flow rate in litres/second, in this case 3,000 kg/s.

Therefore, the calculated hydropower power:

**Power (W) = m x g x Hnet x η = 3,000 x 9.81 x 2.25 x 0.751 = 49,729 W = 49.7 kW**

There are approximately, 50 tree columns across the site.