**THE RAINBOW-SERPENT**

**| INTRODUCTION |**

*‘‘In Australia when the rainbow is seen in the sky, it is believed to be the Rainbow-Serpent moving from one water-hole to another. The native’s believe that staying next to the edge of the water-hole can recharge your energy and make you full of life or power.’’*

 Aboriginal belief

If you take a moment to look at your surroundings, you will notice that all elements of life rely on energy. This energy is constantly vibrating and flowing all around you. It is part of all of us; the ebb and flow of this energy shapes our surroundings and how we interact with them. In today’s urban environment people live chaotic lives, and living in cities can be draining. The city’s fast pace together with its physical and visual pollution can drain our mental energy. As a result, our minds can become unclear and distracted and we experience the diffusion of our natural force.

How can we design something both inviting and refreshing that recharges our mind and body while also generating power?

Exercise helps to recharge a tired mind through the release of the feel-good hormones in your body called endorphins and dopamine. A twenty minute walk when you feel depleted can help you recharge a mentally drained brain.

With every step a person takes, potential energy is transferred into the ground in the form of impact force, vibrations and sound. Relatively speaking, this wasted energy can be harnessed and transferred into more beneficial outputs; ideally each step would be converted into an electrical energy.

We simply propose to focus our design on teaching the user about the importance of harnessing their mental energy through an invitation for a low paced physical exercise. In return, the design will transform our physical activity into electricity.

**| PROJECT DESCRIPTION |**

We propose an energy generative landscape in the form of a double spiral staircase – The Serpent. The design aims to collect human kinetic energy, solar power and rainwater.

The structure comprises of a series of two rainbow coloured glass spirals staircases which intermingle each other and connect in the centre to form a loop. The double-spiral allows for a dense packing of steps and invites the user to go for a 75m long trek in the form of 200 steps. The pathway is formed by a chain of structural glass steps, assembled individually to allow them to move independently of each other. Each step converts the kinetic energy from a person’s footsteps into clean, renewable electrical energy. People are encouraged to regularly climb up and down the structure and to even jump or dance on each step, while also offering the opportunity to take a rest or sit down within the structure.

The structure will harness the sun’s energy and turn it into an electrical energy through the use of the latest transparent solar PV panels. The whole staircase is constructed of energy harvesting structural glazing units, including handrails, threads, risers and columns. The energy harvesting glass technology allows the visible spectrum of light to pass through almost undisrupted, while trapping the invisible rays such as ultraviolet and near-infrared light in transparent electrodes situated in the unit. The glass is coloured with a theme of all the visible spectrums of light to both emphasize how the technology works and to educate the public about it.

The space between the flights of stairs encompasses a snake-like pond that will become a natural habitat for local plants and fish, which in parallel acts as rainwater collection tray. The collected rainwater is filtered and used in the integrated misting system, which will keep the users of the Rainbow-Serpent cool and comfortable during their exercise on the hot days.

A percentage of the power produced by the serpent will be used to run heating and cooling systems incorporated throughout the design. In the cold weather a translucent heating coil integrated in the glass will locally heat the surface of the step and balustrade. This will create a warm surface for people to sit on and lean on, while demonstrating to the users how energy can be conserved and later emitted into other forms of energy.

The heating and cooling systems create a micro-climate within the design which allows for physical exercise to take place in a comfortable environment which helps to energize a person’s mental well-being.

**| THE COMMUNITY |**

The production of electricity from the movement of people is an innovative concept that entices everyone to get involved in producing renewable, eco-friendly electricity for our needs.

The collective effort in the production of sustainable energy symbolise the collective energy of the community. The Rainbow-Serpent is designed to encourage and allow everyone to participate in the generation and conservation of sustainable energy, while allowing individuals to connect with a wider collective group.

The Rainbow-Serpent feature an interactive and accessible design that promotes a healthy lifestyle and encourages collective workouts. The act of walking across the Rainbow-Serpent is a fun endeavour which benefits both physical and mental health, while also symbolising an individual’s effort into making Melbourne a more environmentally friendly and community oriented space.

**| DIMENSIONS + TECHNOLOGIES + MATERIALS + ESTIMATE POWER |**

DIMENSIONS

Diameter: 20meters.

ENERGY HARVESTING GLASS

A clear glass photovoltaic unit allows transmitting light visible to the human eye pass through, while trapping invisible ultraviolet and near-infrared light, which is transferred into electricity by transparent electrodes that deliver the charge to solar cells around its borders.

FOOTSTEP POWER

Each stair step is using the weight of a footstep to rotate a horizontal flywheel. The more impact that is applied the greater the energy is produced. One footstep can generate approximately seven watts of electricity.

RAINWATER COLLECTION

Rainwater is collected in a water collection pond located around the spiral stairs at ground level. The water is then filtered and stored for use in the mist cooling system.

COOLING SYSTEMS

A comprehensive range of high pressure misting transparent lines are integrated into the energy harvesting glass panel. The mist nozzles are located along the edge of the glass. A small pump will run the system which is powered by the energy created from the Footstep Technology. In hot weather the mist is turned on as the person steps on each step.

HEATING SYSTEMS

The film heating elements are incorporated into the energy harvesting glass panel and can quickly heat the surface of the glass. In cold weather if a person will remain sitting or standing on an individual step for some time the heating system will activate and heat the steps and balustrades.

**Total Solar Energy Harvested per Annum:**

Formula: Total Solar Panel Area (m²) x Solar Panel Yield (%) x Annual Average Solar Radiation on Panels (MJ/day) x Performance Ratio x 365 days = Total KiloWatts Hours Produced in a Year.

(675m²) x (0.10) x (16 Mj/day or 4.44 KwHr) x (0.75) x (365) = 82,050 KwH/year

**Total Water Collection per year:**

Formula: (Catchment Plate Area) x (Annual Rainfall) = Total Litres Collected.

(314.1592654) x (650) = **204203.5225 Litres**.

**Total Electrical Energy generated by a single person doing 20 minutes of walking per day in a year:**

Formula: (Number of Steps) x (Number of People) x (7 Watts) x (0.25\*365) = Total Watts Produced.

(2800) x (1) x (0.007) x (120.45 hrs in a year) = 2,360 kWh/year.

**| ENVIRONMENTAL IMPACT |**

How can we design great sustainable architecture and have a positive environmental impact in to the future?

We believe that the goal is to accelerate the transition to post-carbon economies lies in public participation. Therefore, the main objective of the design was to create a project where members of the public can participate and contribute to the creation of the sustainable energy. The invitation to physically participate has a lasting impact on the public; it acts as a reminder that each individual’s actions do have a direct impact on the planet and that everyone has the power to make a difference on our impact on the environment. This design encourages everyone to assist in doing their part to make our world a little greener.

The Rainbow-Serpent shows us that some of our greatest contributions come not only from renewable technologies, but also from individual participation. It also highlights Melbourne’s movement to net zero carbon emissions.

The project is an inviting public space that creates an educational environment for people to learn about the importance of clean sustainable energy and the importance of energy conservation in human life. The idea has as much to do with educating the public about renewable sources of energy as it does with promoting a healthy lifestyle. The act of walking across the Rainbow-Serpent stair is a fun activity, which is beneficial for both physical and mental health.

The architecture itself becomes its own energy production enterprise. It also excites our imagination, showing us that energy can be created by re-examining what we already have around us.

The rainwater collection pond allows the project to seamlessly blend and form part of the St. Kilda triangle landscape and provides a living space for local plants, insects, birds, small fish and other fauna.

We believe that good architecture truly becomes sustainable when several generations are engaged, and when a community loves and strives to maintain its qualities. Similarly, the legend of the Rainbow-Serpent sprung from the dreamtime and has continued to be passed down from generation to generation. Likewise, our project seeks to tell a story and engage people in the current generation’s challenges, which will act as a symbol of our efforts and become a story to pass on to the next generation.