**SOUNDSCAPE**

Soundscape is a sensory experience that captures sight and sound, while harnessing clean energy from the sun, wind, and motion; allowing the people of St. Kilda to be fully immersed in the energy production. Soundscape embraces the musical culture of St. Kilda by building on the creative potential of the area and creating a dynamic, interactive musical landscape.

Experience first-hand the power of a footstep and the energy potential of a single concert. Come to St. Kilda for your favorite concert; dance, jump, and move on the Soundscape to create energy. The Soundscape consists of the Wave, the Acoustic Shell, and Power Pavers,transforming the St. Kilda Triangle into a self-sustaining musical hub, reducing the need to extract energy from the grid by producing the energy needed on-site. See your movement come to light before your eyes on the Acoustic Shell sound stage, along the length of the Wave, and below your feet along the Power Paver walkways. Entertainment and energy come full circle at the St. Kilda Soundscape, making the invisible visible bringing music to light.

The Soundscape creates a visual experience of the sounds of St. Kilda while harnessing clean energy. Through the combination of solar, wind, and kinetic energy, the Soundscape will gather and store enough energy to power 125 St. Kilda households annually and power the entire St. Kilda Festival, without drawing from the grid. The energy created on site can flow to the grid to power the surrounding community, contributing to Melbourne’s net-zero energy goals[[1]](#endnote-1). Energy is also stored on site within the Acoustic Shell to be used to power concert events, contributing to a net-zero St. Kilda Festival.

**TECHNOLOGY:**

**Windbelts:** windbelt technology uses aerostatic flutter to oscillate magnets through an electromagnetic field, creating energy. The specific technology in our design are Humdingerwind’s Windcells[[2]](#endnote-2). The windbelts are located along the length of the Wave at half meter intervals.

* + Average length of 12 meters per belt.
  + Each belt produces 53 kWh/year per linear meter, with a 30% capacity factor[[3]](#endnote-3) and 41,136 linear meters of belts.

**Energy Produced: 654,062.40 kWh/year**[[4]](#endnote-4)

**Thin Film Photovoltaic:** a thin, flexible film placed on the structure itself collects energy through photovoltaic technology. Produced by Heliatek[[5]](#endnote-5),[[6]](#endnote-6), the thin film is an organic polymer sheet that absorbs sunlight and transmits electrical charges. The film is strategically placed on the entire length of the Wave and the surface of the Acoustic Shell.

* + One square meter of thin film creates 1,825 kWh/year of energy. With a 20% capacity factor, the thin film can produce 365 kWh/year per square meter.
  + Along the length of the Wave, there is 1,714 square meters of thin film, and an additional 370 square meters on the Acoustic Shell, totaling 2,084 square meters of thin film.

**Energy Produced: 760, 660 kWh/year**iv

**Kinetic Paving:** Manufactured by PAVEGEN[[7]](#endnote-7), a multifunctional custom flooring system with kinetic pavers harnesses energy from the pressure of footfalls. The pavers are durable and efficiently designed to maximize the energy captured per footfall. The kinetic paving is located along all pathways and plazas on site and is also located below the turf surface of the concert viewing area, making concerts an energy productive event.

* + 9 pavers per square meter produce 5 watts per footfall each, with a capacity factor of 15%, the kinetic technology will produce approximately 60 kWh/year per square meter.
  + With kinetic pavers below the turf of the concert viewing area, the energy created increases fivefold during a high-energy concert event, produced by the dancing, jumping, and motion of the crowd.
  + On average, with 5,788 square meters of kinetic paving space (paths, plazas, and concert area):

**Energy Produced: 342,244 kWh/year**iv

* + A single concert event on our 2,150 square meter concert space, will produce an additional **305 kWh** for a 3-hour concert.
    - The St. Kilda Festival has the potential to produce an additional **2,000 kWh** based on duration and crowd size.

**STORAGE SYSTEM:** The energy created on-site can be stored within the Acoustic Shell in a 1 MW high-capacity sodium-sulfur battery, produced by Younicos Island Systems[[8]](#endnote-8),vi.

**ANNUAL KWH/YEAR:**

In total, the Soundscape will create **1,756,966 kWh annually** on average, with additional energy produced during concerts and events.

In more practical terms, the energy produced by the Soundscape could power 125 average St. Kilda homesper year[[9]](#endnote-9).

**DIMENSIONS AND PRIMARY MATERIALS:**

The Wave structure is 1 meter wide by 1,714 meters long, constructed with recycled aluminum alloy and supported by steel rods secured to recycled concrete footings.

The Windbelts are 1-meter flexible polymer ribbons stretched between lightweight recycled aluminum framesii.

The Acoustic Shell is 370 square meters and is constructed with recycled stainless steel with a structural footing and base of recycled concrete.

PAVEGEN kinetic pavers are individual triangular pavers, 500mm on each edge and constructed of steel, recycled aluminum, and compositevii.

**ENVIRONMENTAL IMPACT STATEMENT:**

The structures of the St. Kilda Soundscape will locally source materials as much as possible, utilizing recycled materials and reducing transportation costs and effects. By maximizing space efficiency within the paving patterns and structural layouts, Soundscape aims to create the maximum amount of energy with minimal structural interventions. The design works with the earthwork of the proposed master plan[[10]](#endnote-10), reducing the amount of excessive land moving, avoiding any extra and unnecessary environmental effects from construction.

The energy produced through the Wave, Acoustic Shell, Power Pavers has the ability to power over 125 housesix in the St. Kilda area if directed straight to the community grid and can also be stored on site within the Acoustic Shell structure and be used to power concert events, all while continually producing clean energy.

The Soundscape contributes to the City of Port Phillip’s Toward Zero Goali, addressing the key climate challenges facing the world today while encouraging the public to directly partake in creating energy and reducing the need for fossil fuel energy. The Soundscape responds directly to sustainable urban design and development, sustainable purchasing procurement, reducing greenhouse gas emissions, and mitigating climate change; key goals in the Toward Zero movement. Through the means of capturing clean energy from renewable sources, Soundscape will contribute to preventing further climate change through greenhouse gas abatement and drawing the need away from fossil fuel energy, moving the St. Kilda Triangle into the net-zero future.

1. “Toward Zero - Sustainable Environment Strategy”. City of Port Phillip. Accessed April 30, 2018 [↑](#endnote-ref-1)
2. “Technology: Wind Belt” Humdingerwind. Accessed April 25, 2018. http://www.humdingerwind.com/pages/the-technology-behind-wind-belt/ [↑](#endnote-ref-2)
3. “Windbelt Holds the Hopes of the US Industry” Richard A. Kessler, *The Global Energy.* May 13, 2016. Accessed April 25, 2018.

   <https://www.triglobalenergy.com/viewpoints/wind-belt-holds-the-hopes-of-us-industry> [↑](#endnote-ref-3)
4. “LAGI 2018 Melbourne Q+A: Version 4 (April 9, 2018)”. Accessed April 25, 2018. [↑](#endnote-ref-4)
5. “Truly Green & Flexible – Solar Films” Heliatek: The future is light. Accessed April 25, 2018. http://www.heliatek.com/en/ [↑](#endnote-ref-5)
6. Ferry, Robert, and Elizabeth Monoian. *A Field Guide to Renewable Energy Technologies*. 2012. [↑](#endnote-ref-6)
7. “Permanent”. Pavegen 2018. Accessed April 25, 2018.

   <http://www.pavegen.com/permanent> [↑](#endnote-ref-7)
8. “Younicos: Smart Energy Storage and Battery Solutions worldwide”. <https://www.younicos.com/about-us/> Accessed April 30, 2018. [↑](#endnote-ref-8)
9. “Australian Energy Update 2016”, Office of the Chief Economist. <https://industry.gov.au/Office-of-the-Chief-Economist/Publications/Documents/aes/2016-australian-energy-statistics.pdf>

   Accessed April 30, 2018 [↑](#endnote-ref-9)
10. “St. Kilda Triangle Master Plan: Purple Document”. City of Port Phillip, 2016. Accessed April 30, 2018 [↑](#endnote-ref-10)