**Energy in Motion**

Energy in Motion transports visitors back to the vibrant seaside entertainment precinct it was in the early 20th century with interactive piezoelectric paving, playful swings and slides, and a glowing sculptural pergola referencing the colors of festive Luna Park. This pergola serves both as a shelter and an overhead sculpture that will capture solar energy for use on the site via Luminescent Solar Concentrators (LSC) and a lighted focal point in the evenings. Bench swings hung from the pergola engage CSRIO’s Infinity Swing technology allowing visitors to generate renewable energy while they swing back and forth people watching. Additional sculptures employing LSC energy technologies act as a landmark on the overlook and two site entries at Jacka Boulevard crossing points.

The energetic atmosphere of the place is further captured via piezoelectric tiles embedded into the pavement of the promenade and in stepping stones across the activity lawn. At night the stepping tiles are lighted dimly and become brighter when stepped upon. Additional tiles are placed around the perimeter of the site enticing visitors to follow them into the seaside park. A piezoelectric energy-generating slide provides a fun connection from the upper promenade down to Jacka Plaza where visitors can enjoy an old-fashioned boardwalk lemon shake from citrus grown on-site.

The energy harvested via human motion acts as a demonstrative opportunity for the public to see how they can help channel their energy into site lighting and other energy capture. It also encourages and motivates people to get up and move around promoting healthier lifestyles.

**Energy Calculations**

Energy in Motion is estimated to generate 4,062 annual MWh via piezoelectric technology producing enough energy to power 406 inefficient homes in the Melbourne area. An additional 8 MWh is produced annually through the Luminescent Solar Concentrator structures.

Though the Luminescent Solar Concentrator sculptures do not generate an abundance of excess energy, the playful elements of the design attract people to engage in the site using their motion to generate additional energy.

PIEZOELECTRIC STEPPING STONES

Stepping stones = 0.15 square meter per tile

650 pieces x 0.15 square meter = 97.5 square meters

1 stepping stone generates 10 W per step\*

x 650 stepping stones

x 500 estimated steps daily per stepping stone

x 10 W per step

x 365 days per year

÷ 1000000 Wh > MWh

**= 1,186 MWh**

1,186 MWh

÷ 10 MWh per year (inefficient home)

**= 118 homes**

\*Resource: Elhalwagy, Adnan Mohamed et el. “Feasibility Study for Using Piezoelectric Energy Harvesting Floor in Buildings’ Interior Spaces”. ScienceDirect. Study conducted 2017 and published by Elsevier.

PIEZOELECTRIC PROMENADE PAVING

5,342 visitors per day to St. Kilda (including events)\*

x 295 average steps to walk the promenade

x 5 W continuous power from footsteps

x 365 days per year

÷ 1000000 Wh > MWh

**= 2,876 MWh**

2,876 MWh

÷ 10 MWh per year (inefficient home)

**= 287 homes**

\*St Kilda Triangle Comparative Analysis for Cultural Tourism Attractors study conducted in February 2016.

SOLAR STRUCTURE

x 627 square meters luminescent solar concentrator panels

x 7 W per square meter conversion

x 0.20 capacity factor

x 365 days per year

x 24 hours per day

÷ 1000000 Wh > MWh

**= 7.689 MWh per year**

7.7 MWh per year

÷ 10 MWh per year (inefficient home)

**= <1 home**

**Environmental Impact Summary**

The design and implementation of Energy in Motion poses minimal environmental impacts. Energy that the structures generate is more than enough to offset the lighting of the fixtures at night. Consideration of the environmental factors outlined in the masterplan were taken into account with the design of Energy in Motion as well as existing views and vistas.

Design of the glass panels includes a textured pattern that minimizes reflection protecting both vehicular traffic from glare as well as protecting birds against collisions with the structure.

**Art/Sculpture**

The luminescent solar concentrator pergola structure provides a translucent overhead structure providing refuge from the sun. During the day, the color-tinted glass panels allow triangular shadows to be cast on the ground plane creating a 2-dimensional piece of art in addition to the 3-dimensional structure itself.

The trapezoidal sculptures are also constructed of LSC glass panels on steel frames. Similar structures are used for the two crosswalks of the site to the oceanfront. Intended to be landmarks of the site, the sculptures provide various framed views of the ocean and landscape when viewed from different angles.

Piezoelectric tiles in the grass lawn contribute to a playful ground plane enticing people to engage in a game of jumping from tile to tile. The lights on the tiles turn brighter when engaged in activity. Piezoelectric slides connect the upper promenade to the Jacka Plaza generating yet even more energy. Energy in Motion is a destination enjoyed by Melbourne residents and tourists alike.