

STEAM through the Sustainability lens



- Drain Detectives
- Public Art powered by renewable energy

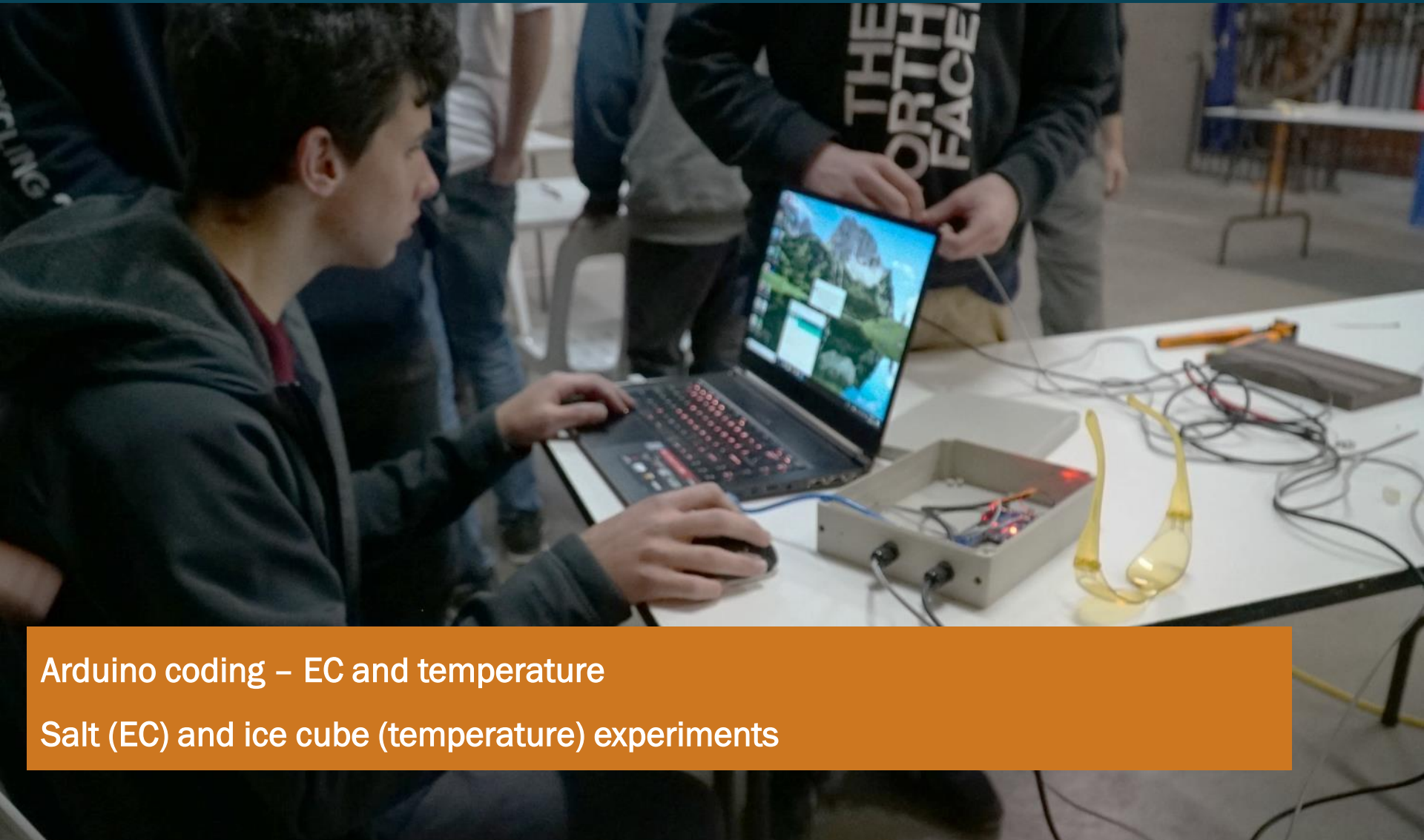
Karen Jones, Education Manager
Port Phillip EcoCentre, Victoria

Drain Detectives Program



1. Building a sensor & experiments
2. Planning location of sensors in drainage network
3. Analysing sensor data and making recommendations
4. Conduct Beach EPA water quality experiments

Drain Detectives Program



Arduino coding – EC and temperature

Salt (EC) and ice cube (temperature) experiments

Drain Detectives Program



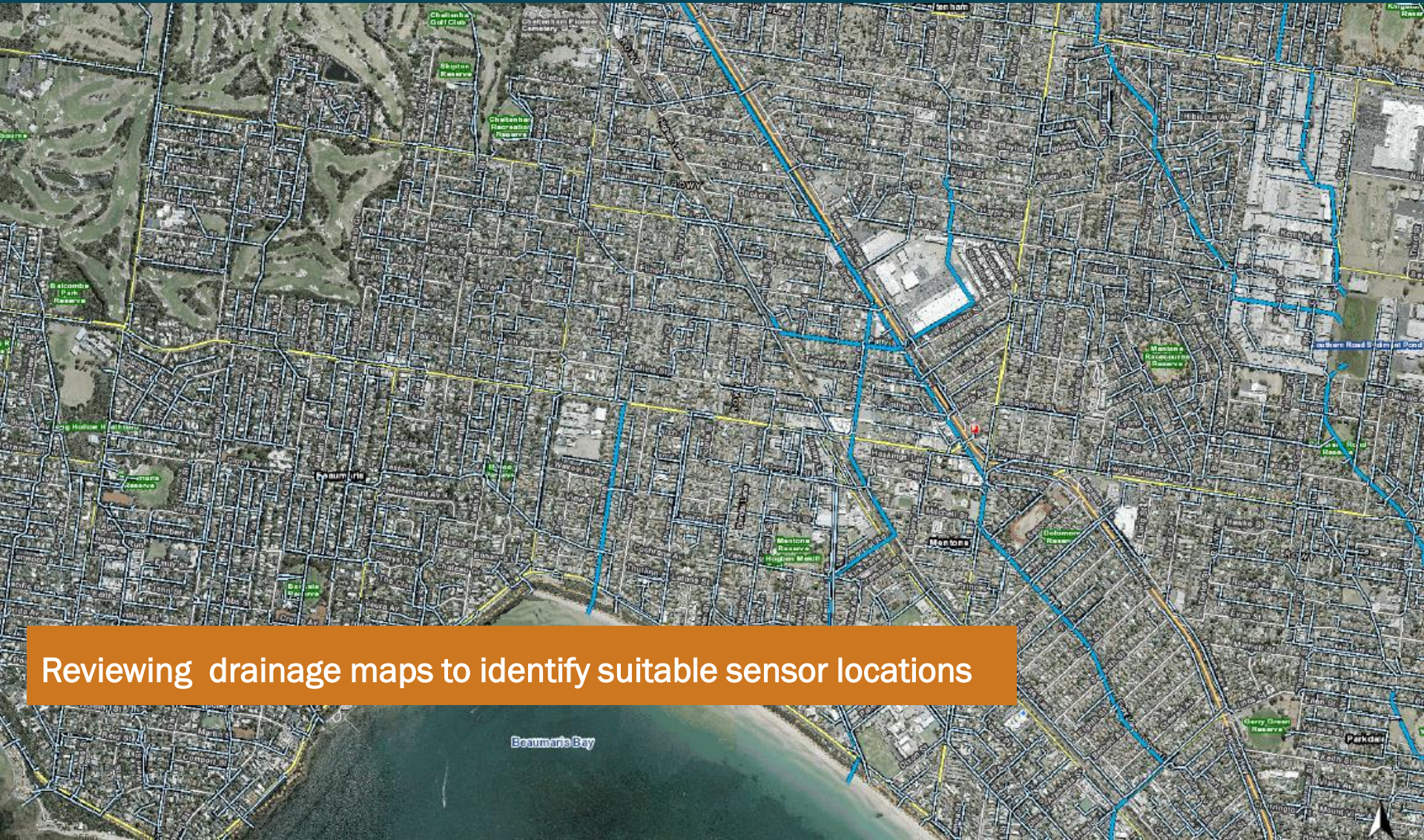
EPA water quality testing

Drain Detectives Program



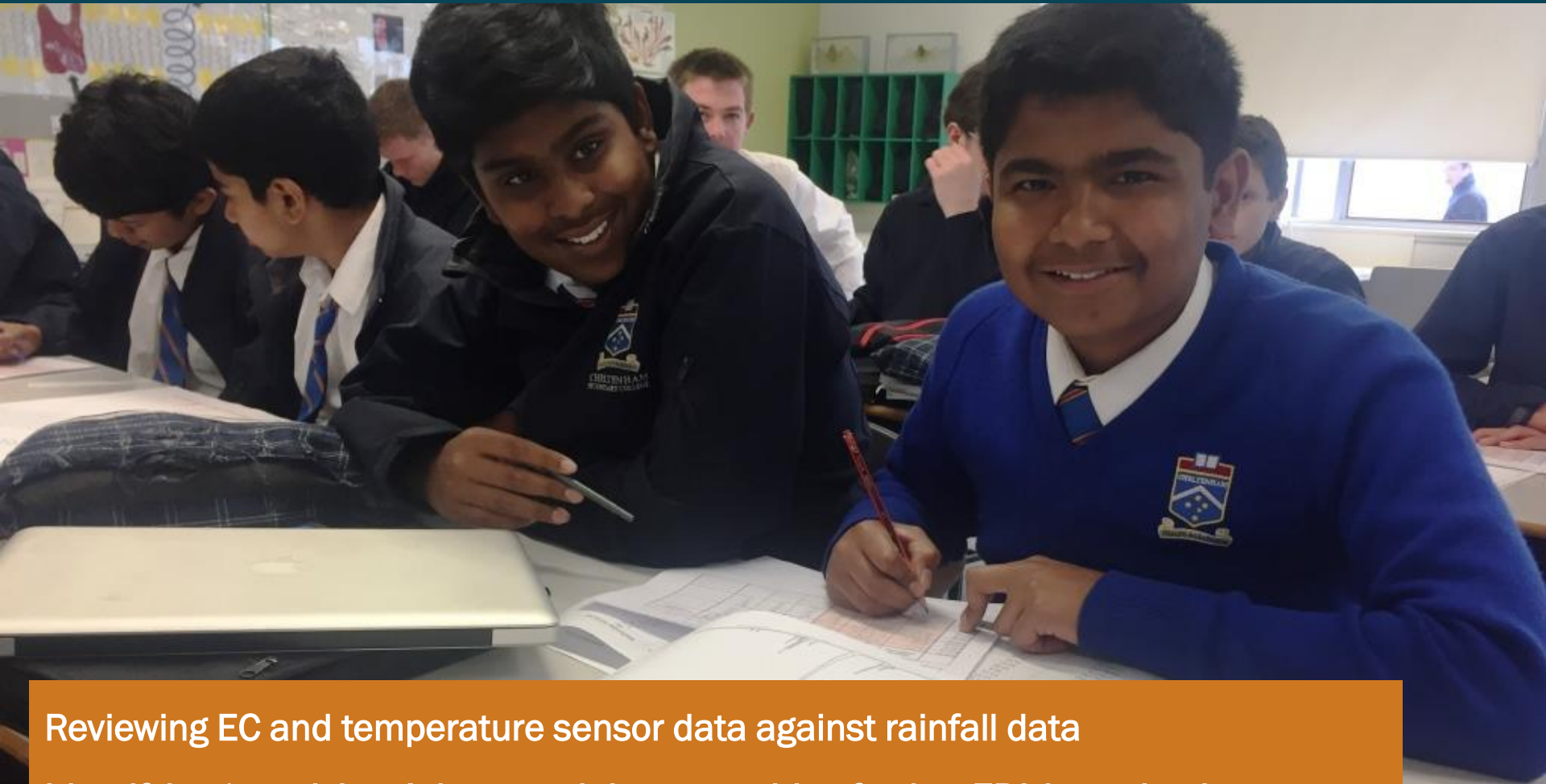
Reviewing land use maps to identify where sensors to be installed

Drain Detectives Program



Reviewing drainage maps to identify suitable sensor locations

Drain Detectives Program



Reviewing EC and temperature sensor data against rainfall data

Identifying 'suspicious' dates and times requiring further EPA investigations

Drain Detectives Program



Presenting recommendations

Public Art powered by renewable energy



St Kilda Marina senario

St Kilda Marina scenario

Researching:

- Land use
- Council requirements
- Requirements for public art
- Renewable energy technology



St Kilda Marina scenario



Connection to nature and landscape

Renewable Energy Technology



Renewable Energy

2-5 players
Ages 13 +

INSTRUCTIONS & GAME RULES

HOW TO MATCH

Match an **ART** card with its corresponding **INFO** card for a two-card match.

EXAMPLE

Sun Ray **ART** ①
Sun Ray **INFO** ②

OR Match an **ART** or **INFO** card to the **TECH** card that it works with.

EXAMPLE

Sun Ray **ART** ① or **INFO** ②
Solar Thermal CSP Linear Fresnel Reflector **TECH** ③

OR Match a full set of **ART**, **INFO**, and **TECH** cards.

EXAMPLE

All three cards together as shown below

A **WILD CARD** can take the place of any **TECH** card in its category (solar, wind, bio, hydro).



WILD CARD

Play this card with any bio **ART** or **INFO** card.



DESIGN
INNOVATION

Innovation happens when you dare to think creatively about challenges. The next decade promises to be an exciting time for new energy products and solutions, both in clean generation and in energy storage. Advances in our understanding of organic systems are leading to new energy technologies such as artificial photosynthesis and microbial fuel cells. How can we reveal the way these systems work through art in public space?



GOLDEN ROOTS



A field of rye and poppies creates a natural energy landscape.

ENERGY TECHNOLOGY
biomass

11 HOUSES
can be powered by this artwork (55 MWh per year)

DESIGN TEAM

Ronny Zschörper, Franziska Adler



GOLDEN ROOTS

Golden Roots contrasts the urban environment with the experience of unspoiled nature. A system of paths and bridges guides visitors through a constellation of crop circles, bringing the calm countryside to life in the city. The fields are periodically harvested to generate high-energy biomass as well as to provide rye bales for the construction of observation towers, which change every season. The towers can rise up to 18 meters tall when maximum crop yields are achieved.

LAGI 2014 COPENHAGEN

ENERGY TECHNOLOGY
biomass

Crossing Bridges
Bridges and underpasses provide barrier-free and unlimited access to the observation tower and the water's edge.

Observation Tower
The tower provides an additional view point with an altitude of 18 meters above the ground.

Water Platform
A direct water connection, additional entrance point, and a place to relax with a view of the city.



SHIFTING ALGAE FOREST

Shifting Algae Forest is a celebration of the hybrid ecologies that humans are formulating to protect and ensure the survival of our planet. The algae trees take the harmful legacy of urban waste streams and convert it into a newly productive landscape. As the "branches" of the bioluminescent algae trees glow at night, site users are informed of the amount of carbon dioxide that is actively being sequestered from the landfill during the day.

LAGI 2012 FRESHKILLS PARK, NYC

borosilicate

ENERGY TECHNOLOGY
algae photobioreactor



SHIFTING ALGAE FOREST



These trees are made of algae



ALGAE PHOTOBIOREACTOR



Biodiesel fuel can be produced from the naturally occurring oils (biolipids) that are found in algae, which can be cultivated by combining untreated waste water with CO₂ that is diverted from emissions streams at power plants, landfills, or other industrial



BIOMASS



Biomass can be combusted directly as a solid fuel or converted to liquid or gas biofuels. These biofuels can be used in either a combustion engine (conversion to mechanical energy) or in a fuel cell (conversion

Renewable Energy Technology



Art + Energy Designs

ENERGY Melbourne OVERLAYS

Land Art Generator Initiative



Art + Energy Designs

HEAD IN THE CLOUDS

After an afternoon picnic at St Kilda Triangle, clouds pass by over a translucent airy canopy. As the sky clears, the sun finally peeks out. At the same time, the poles holding up the canopy grow taller, stretching it up into a billowing space, the form of which is designed to capture as much heat and light as possible. While the Melbourne sun transforms the city into a blazing afternoon heat, *Head in the Clouds* creates a naturally cool pocket. The interwoven design is informed by the ubiquitous—and recognizable—rooftop solar panels, as well as the site's various contextual narratives, from the entertainment district to foreshore sunbathing.

The artwork, as a series of clouds scattered throughout St Kilda Triangle's new masterplan, provides a unifying identity to the new lawn adjacent to the Palais Theatre, St Kilda Festival Park, and the beach.

A translucent tensile fabric embedded with Sphear® solar cells is used to transform a typical flat roof canopy into a billowing cloud-like structure, creating rolling peaks that orient towards the north to collect maximum sunlight. The innovative Sphear® solar cells woven into the structural fabric are spherical in shape and capture solar energy from all angles.

Responsive to the amount of sunlight it receives, *Head in the Clouds* educates visitors about renewable energy while allowing them to directly engage with the moving structure.

In addition to collecting solar power, the installation collects wind energy with Windbelt™ wind harvesting devices embedded within telescoping columns in the skeletal steel structure, producing enough energy to operate the cloud fabric's vertical billowing effect.

The immersive cloud structure embraces those who interact with it, welcoming an optimistic view of sustainability as they stand—quite literally—with their heads in the clouds.

TEAM
Yuxun Emmelly Zhang,
Alexandra Siu, Liyang Zhang

TEAM LOCATION
Cambridge (ON), Canada

ENERGY TECHNOLOGIES
transparent silicon solar mesh
(Sphear®), aerostatic flutter
wind harvesting (Windbelt™)

ANNUAL CAPACITY
260 MWh

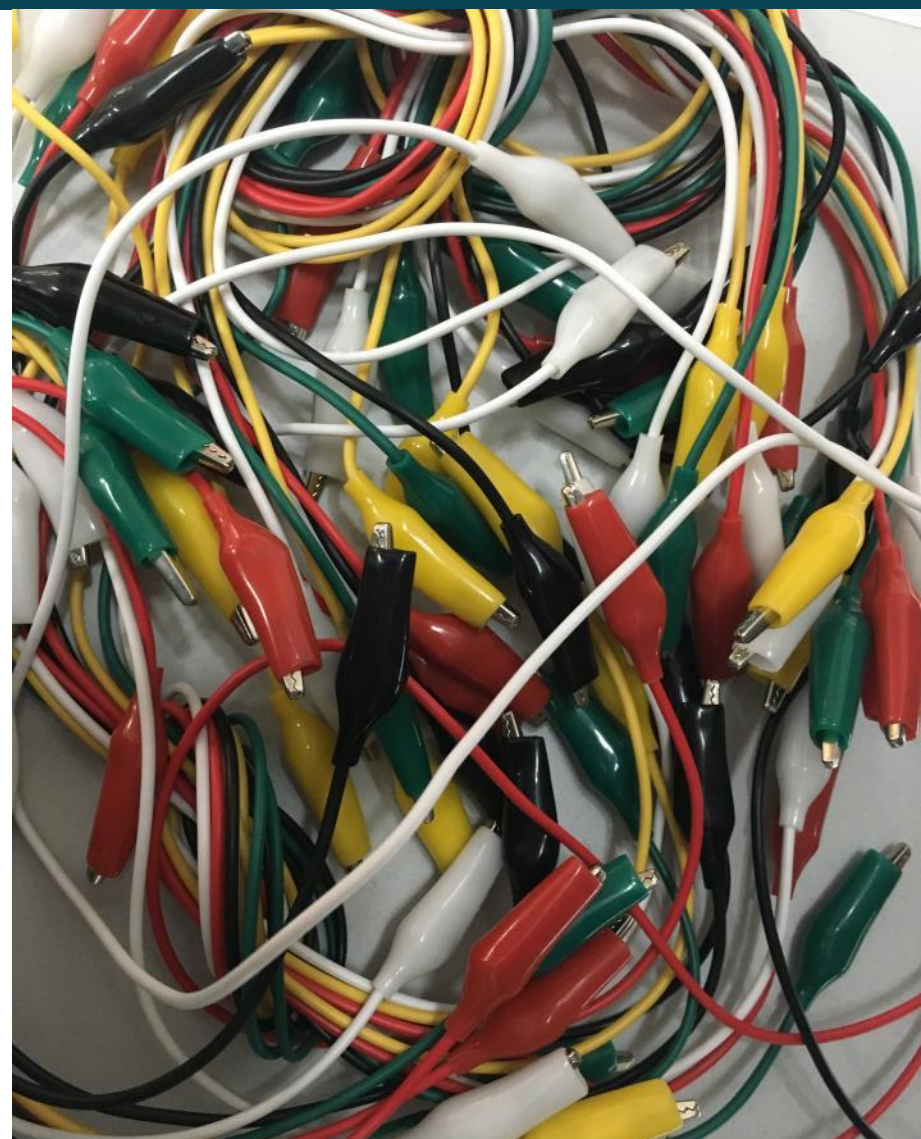
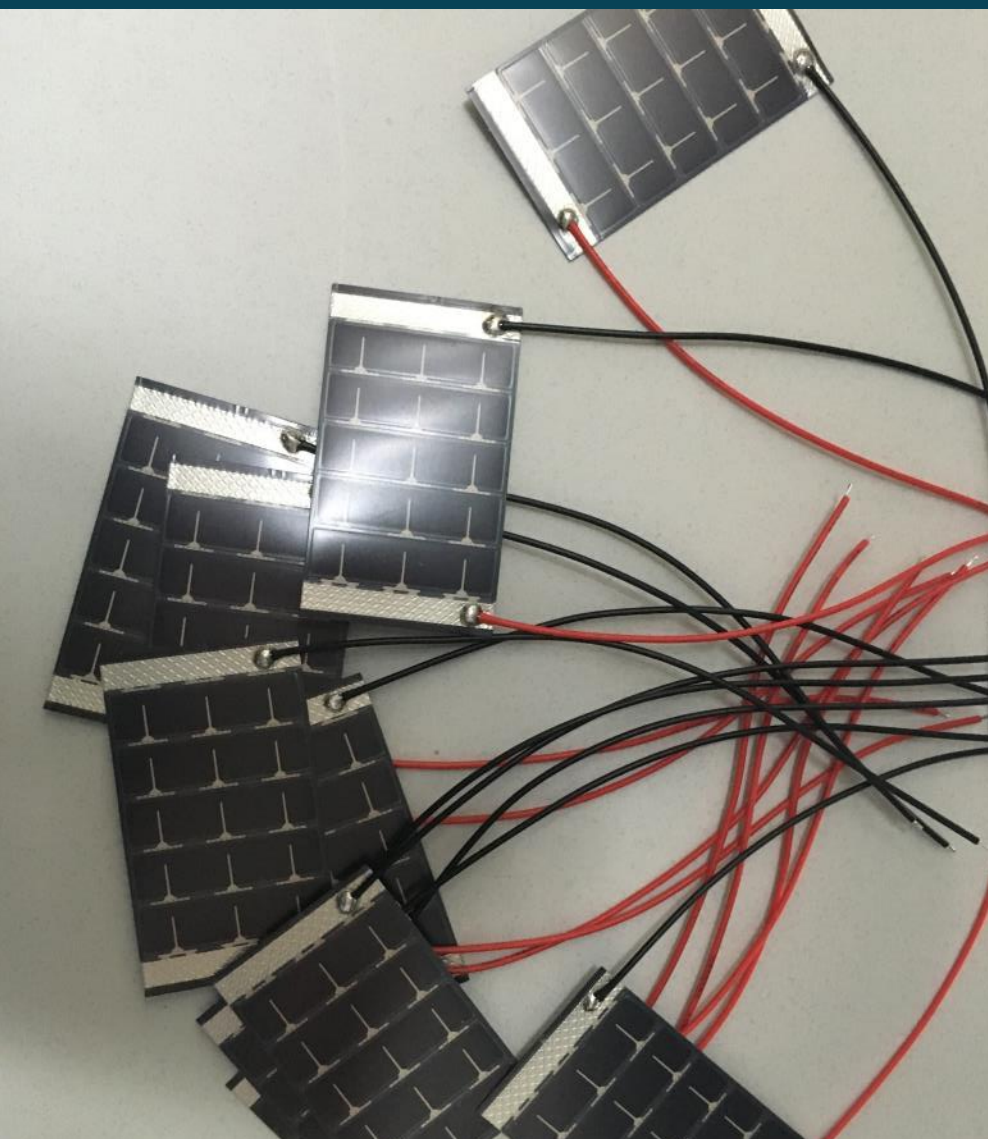


Sitting in a "Park Cloud"



The formation of the cloud structure is derived from the optimal angle and location for capturing over 30° and facing north.

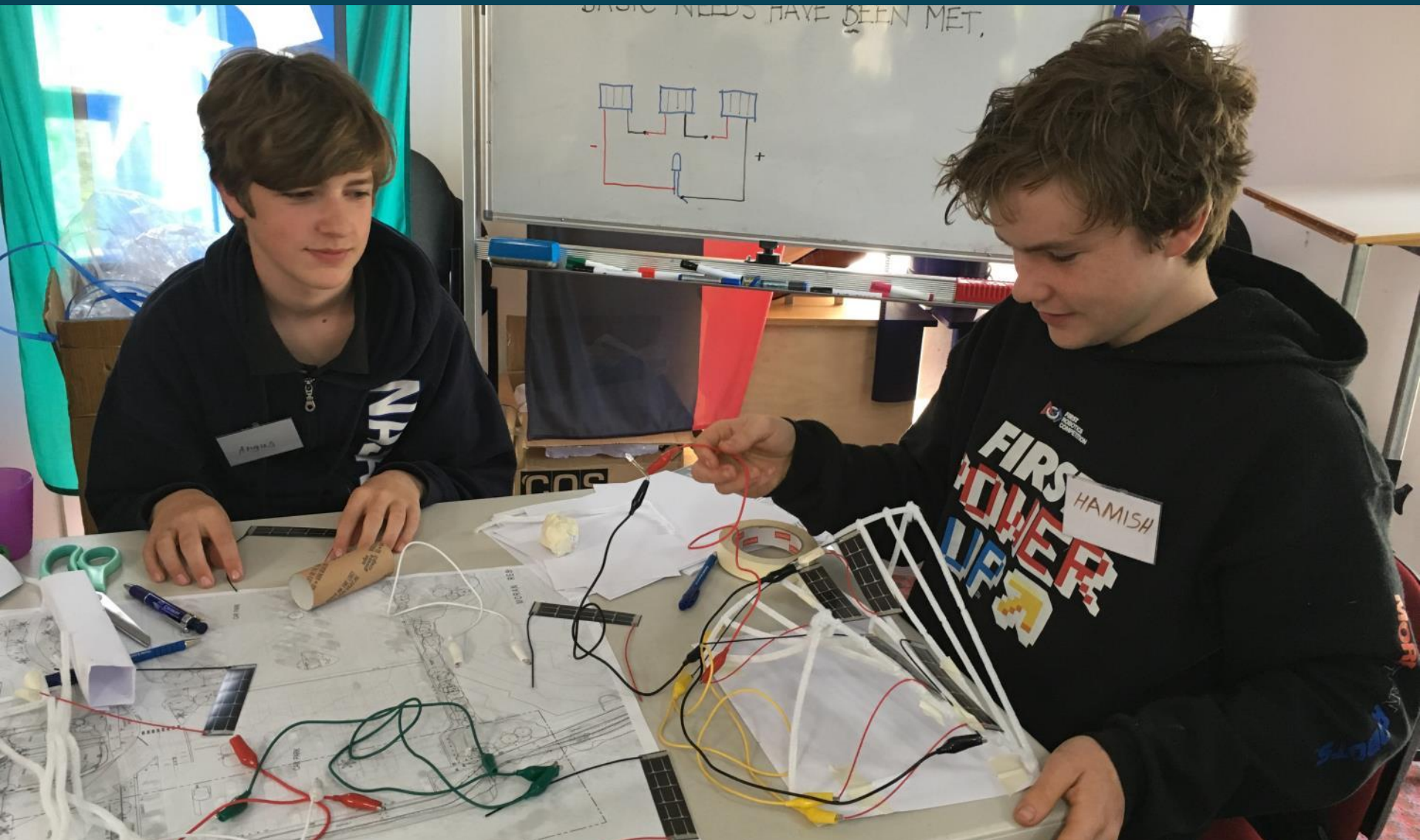
3D models



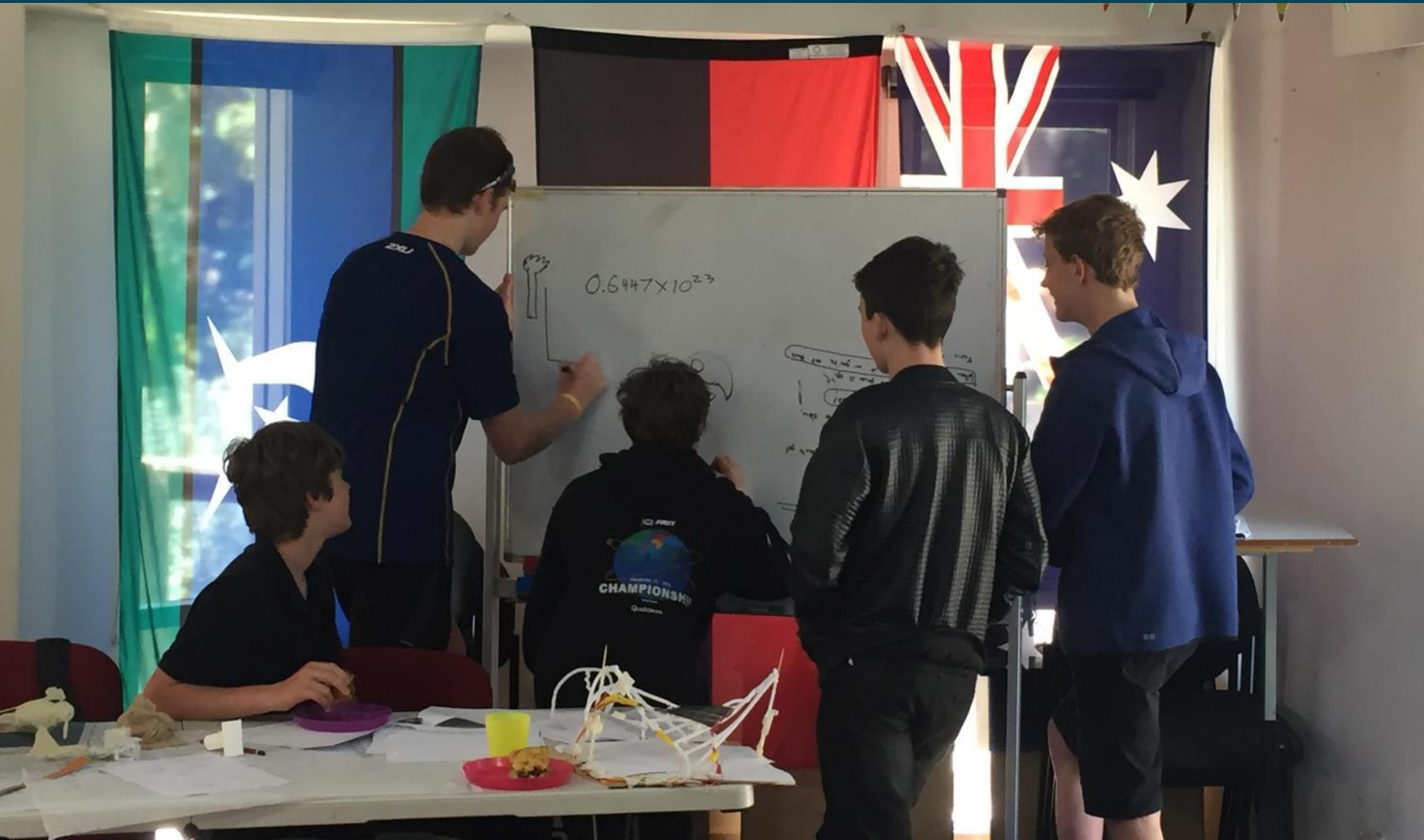
3D models



3D models

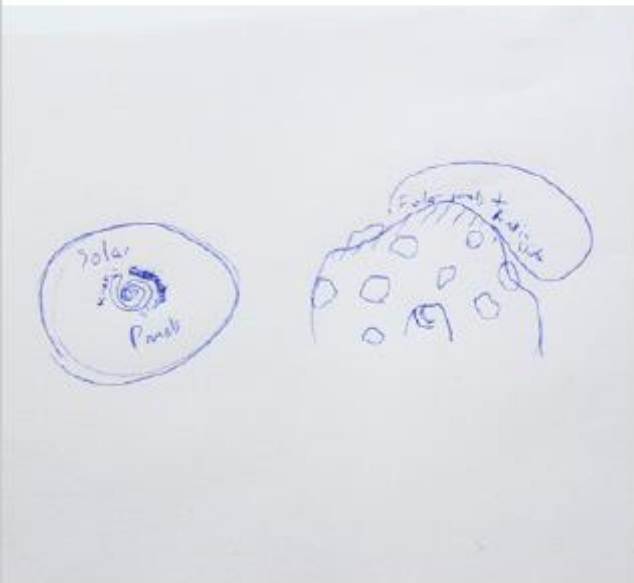


How many homes powered?



KINETIC ROCK

Participant Mikayla



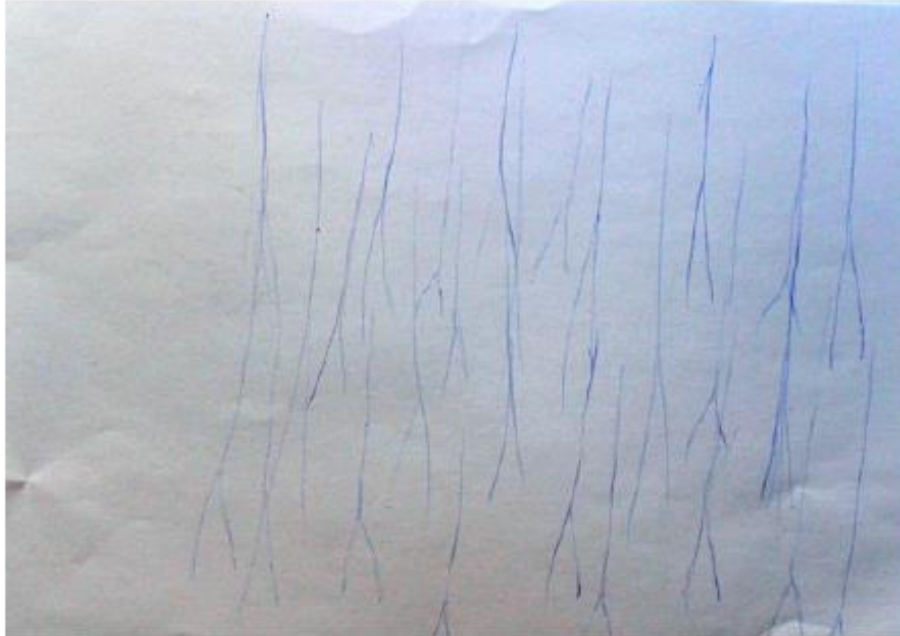
Keywords: Climbing, colourful, play, weird

Technology: Kinetic (piezo), solar panels

Inspiration: There were lots of rocks on the site, which provided the original source of inspiration.

MUTANT SEAGRASS

Participant Liora



Technology: Piezoelectric

Inspiration: Sea grass

Keywords: big, green, filter, marine, grass

Experience: A moment of surprise when they see it for the first time.

Greater interest in renewable energy and nature.

SOLAR PENGUIN

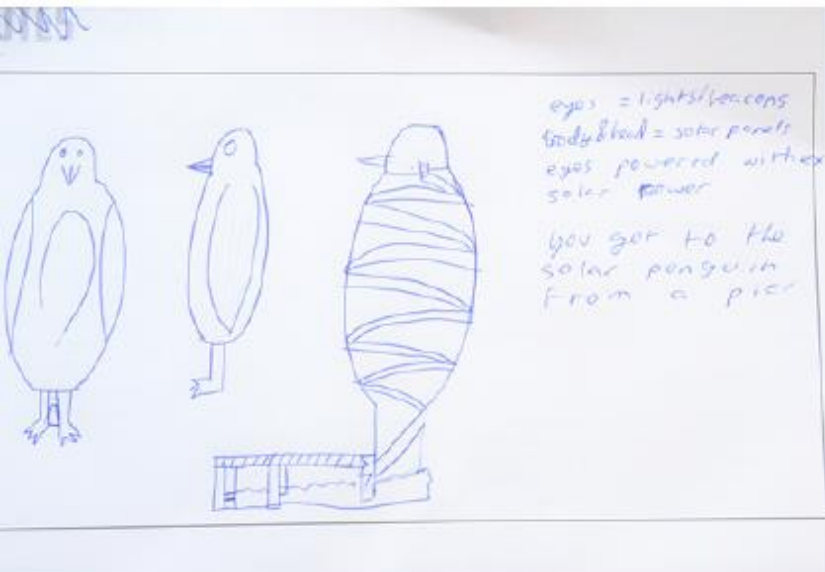
Participant Evan

Technology: My *Solar Penguin* is completely covered with solar panels and will tower over St Kilda.

The two eyes are lightbulbs and can be used when the city is in complete darkness. The *Solar Penguin* powers 123 houses.

Inspiration: My inspiration is from the solar duck and the penguins that visit the lighthouse

Keywords: massive, bright



Experience: Visitors will be able to walk inside the penguin which they access from a pier once you get all the way to the top of the penguins head you could look out of the penguins beak.

Celebration



Questions

Port Phillip EcoCentre
www.ecocentre.com

55A Blessington Street, St Kilda VIC 3182
ph:03 9525 3102 e:schools@ecocentre.com

Karen Jones
Education Manager

