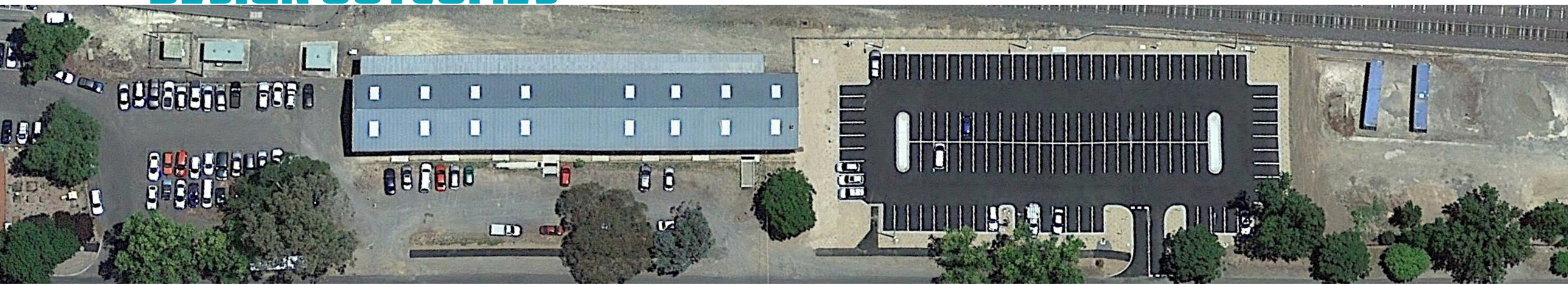
RE-IMAGINING ENERGY CASTLEMAINE
DESIGN OUTCOMES

LAGI2018 MELBOURNE
renewable energy can be beautiful



LAGI 2018 SPONSOR AND HOST

VICTORIA State Government

PARTNERS

land art generator initiative
RENEWABLE ENERGY CAN BE BEAUTIFUL

CARBON ARTS

CROSBY architects

REGIONAL CENTRE FOR CULTURE

Re-imagining Energy Castlemaine was a three day workshop at the Goods Shed, Castlemaine, VIC
Held in partnership with Carbon Arts, Land Art Generator Initiative, CROSBY Architects.

OCTOBER 6–8, 2018

This booklet of design outcomes is a companion to the design guidelines document,
which provides additional background information.

Participants
Jim Coad
Samantha Downing
Cy Gorman
Terri Bird
Scott Mitchell
Jordana Maisie
Andy McDonell
Pierre Proske
Cameron Robbins
Alex Sanson
Maria Simonelli
Jane Toner

Facilitators
Jodi Newcombe
Elizabeth Monoian
Robert Ferry
Geoff Crosby
Euan Williamson

Photography and Assistance
Ashley Sroka

Re-imagining Castlemaine was an invited design workshop to bring forward ideas for an energy generating public artwork for an existing car park in Castlemaine. It was held as part of the Regional Centre for Culture program of events.

The project was a regional component of the Land Art Generator Initiative (LAGI) 2018 design competition. LAGI 2018 is a global ideas competition for art and renewable energy hosted by the State of Victoria and focused on the St Kilda Triangle site in the City of Port Phillip.

The design process for the Castlemaine workshop took a creative placemaking and community-oriented design approach while merging on-site renewable energy infrastructure with the landscape, the architecture, and with other environmental sustainability measures.

The Castlemaine workshop provided a professional development opportunity to local artists, architects, designers, and engineers interested in employing renewable energy technologies as a primary media within their creative practices.

While there is not yet a commitment to construct the outcome of the Castlemaine workshop, the intention is that the exhibition of the designs from the workshop will lead to a broad community conversation around the future of the site and potentially to the implementation of a project that is informed by the outcomes.

CONTEXT

STATE OF VICTORIA
RENEWABLE ENERGY ACTION PLAN

Text courtesy of the State of Victoria

Find the full Renewable Energy Action Plan at this link:

www.energy.vic.gov.au/__data/assets/pdf_file/0027/74088/REAP-FA5-web.pdf

See Action 13 to learn where the Land Art Generator Initiative fits into the State of Victoria's Renewable Energy Action Plan.

The Renewable Energy Action Plan sets out how Victoria will ensure a renewable, affordable and reliable energy supply, which uses large-scale renewable energy technology and ensures grid stability. During this time, we will support Victoria's pathway from a carbon-intensive to net zero emissions energy sector by 2050.

Victoria's *Climate Change Act 2017* establishes a target for Victoria to have net zero greenhouse gas emissions by 2050. Victoria's Climate Change Framework makes it clear that moving to a clean energy supply by increasing renewable energy generation is a key pillar of the state's approach to emissions reduction.

Our transition to a modern and renewable energy future is already well underway. Renewable energy is already the cheapest and cleanest new source of energy supply. Increasing our electricity generation capacity will help to reduce power prices. This is one important reason why we have set Victorian renewable energy targets of 25 per cent by 2020 and 40 per cent by 2025. We are continuing to carefully support the transition from emissions-intensive, centralised sources to cleaner and more distributed sources of electricity. Victoria can benefit economically, socially and environmentally from this transformation.

— Minister D'Ambrosio

We contribute to meeting our renewable energy generation targets of 25 per cent by 2020 and 40 per cent by 2025 through running a competitive process for new renewable energy generation projects. The VRET scheme will complement the Commonwealth RET scheme until 2020. The design and flexibility of our scheme will deliver the best projects at least cost.

Energy systems around the world are transforming, driven by rapid development of technologies, changing consumer behaviour, and global demands for cleaner energy. New sources and methods of supply, such as self generation, are emerging at the same time as demand patterns are changing.

Proven technologies are already available to support modernisation of our energy system. These include energy storage, renewable energy generation, demand management and smart grids. By acting now, we give ourselves the best opportunity to capitalise on the transformation and transition smoothly, reducing the risk of higher late adoption costs.

Victoria's long-term electricity generation profile is transforming and a significant increase in renewable energy generation, from household systems to utility-scale sources like wind and solar farms is anticipated. Today, large-scale renewable energy is already the cheapest source of low-emissions generation.

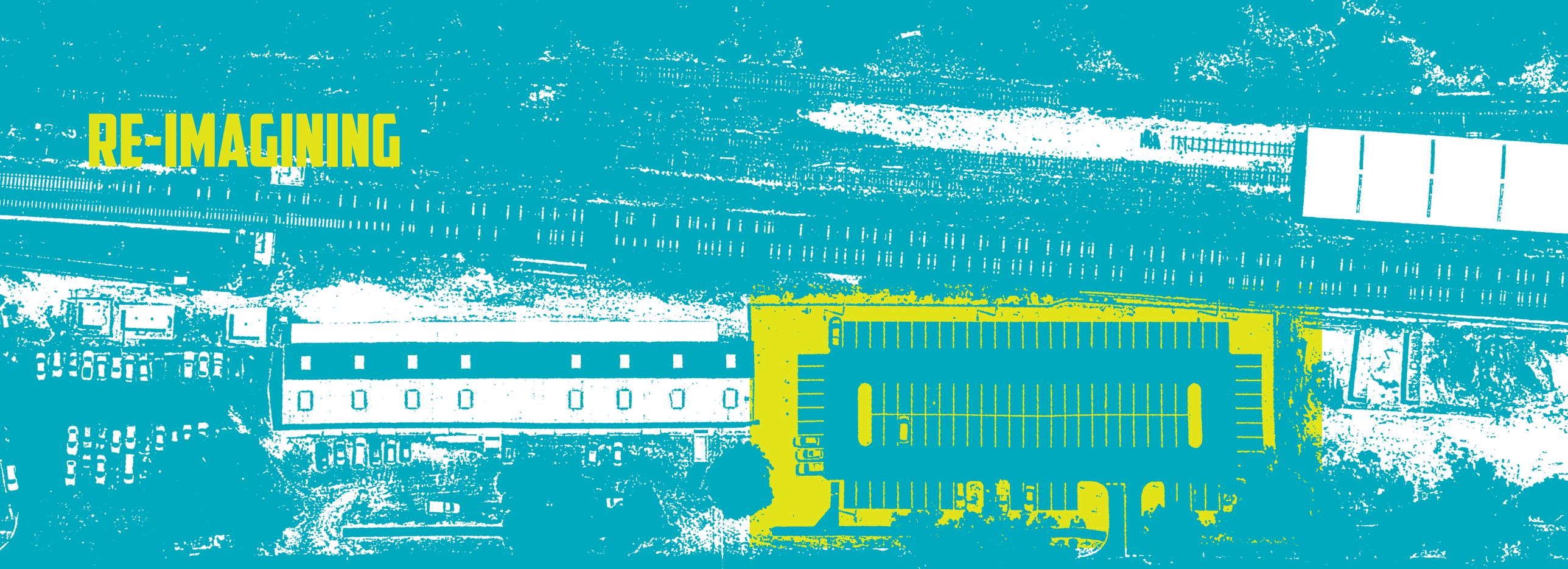
The transition will gather momentum as renewable energy generation becomes more cost-effective and efficient at residential, commercial and utility-scales.

- Investing in energy storage—We will support commercial investments that aim to provide Victoria with at least 40 MW of battery storage and over 100 MWh of capacity by summer 2018, to help security and reliability of supply and encourage downward pressure on energy bills.
- Investing in large-scale solar energy to power Victoria's trams —The projects will provide equivalent electricity load to power Yarra Trams' 400-strong tram fleet, and create up to 300 jobs and $150 million of investment.

Our approach to transitioning the energy system will create jobs, build skills and knowledge for local application, international export of services, and attract capital and investment to our state.

Victoria has a highly skilled workforce underpinned by a world class education system. Building collaborative relationships between research and educational institutions, and international and local businesses, is critical to capitalising on our capabilities within the renewable energy sector.

RE-IMAGINING

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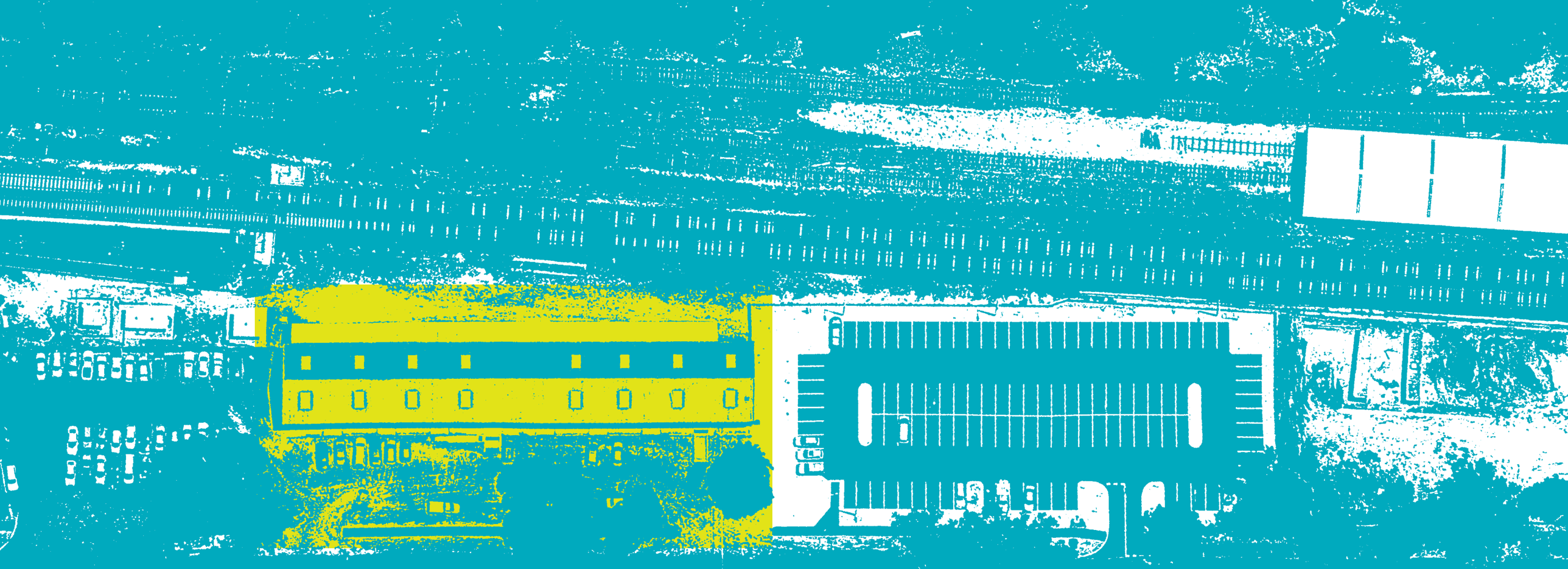



LAGI2018
MELBOURNE
energy
overlays

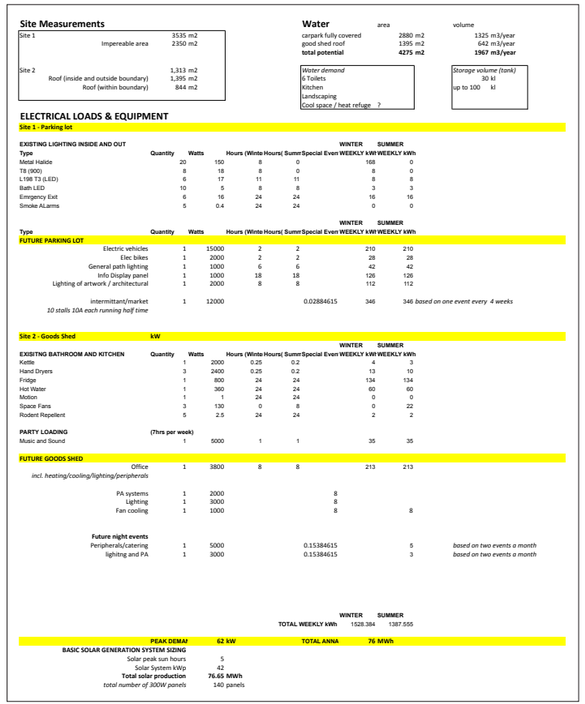
Energy Audit

On the morning of the second day, Euan Williamson led everyone in the completion of an energy audit of the Goods Shed and the parking lot.

Breakout groups tackled various aspects of the audit, including the current and potential future uses of the building and parking lot, implications for water and energy consumption, the dimensions of the site, and the natural energy from the sun that is available on site.

Individuals and teams used this information to inform their conceptual designs for new public art that can meet the current and future needs.

Additional discussion took place around pros and cons of grid connection versus stand-alone (off-grid) infrastructure for the site.



Site Measurements

Site 1		3535 m2
	Impereable area	2350 m2
Site 2		1,313 m2
	Roof (inside and outside boundary)	1,395 m2
	Roof (within boundary)	844 m2

Water

	area	volume
carpark fully covered	2880 m2	1325 m3/year
good shed roof	1395 m2	642 m3/year
total potential	**4275 m2**	**1967 m3/year**

Water demand
6 Toilets
Kitchen
Landscaping
Cool space / heat refuge ?

Storage volume (tank)
30 kl
up to 100 kl

ELECTRICAL LOADS & EQUIPMENT

Site 1 - Parking lot

EXISTING LIGHTING INSIDE AND OUT

Type	Quantity	Watts	Hours (Winte	Hours(Sumr	Special Even	WINTER WEEKLY kWh	SUMMER WEEKLY kWh
Metal Halide	20	150	8	0		168	0
T8 (900)	8	18	8	0		8	0
LYB T3 (LED)	6	17	11	11		8	8
Bath LED	10	5	8	8		3	3
Emrgency Exit	6	16	24	24		16	16
Smoke ALarms	5	0.4	24	24		0	0

Type	Quantity	Watts	Hours (Winte	Hours(Sumr	Special Even	WINTER WEEKLY kWh	SUMMER WEEKLY kWh	
FUTURE PARKING LOT								
Electric vehicles	1	15000	2	2		210	210	
Elec bikes	1	2000	2	2		28	28	
General path lighting	1	1000	6	6		42	42	
Info Display panel	1	1000	18	18		126	126	
Lighting of artwork / architectural	1	2000	8	8		112	112	
intermittant/market	1	12000			0.02884615	346	346	*based on one event every 4 weeks*
10 stalls 10A each running half time								

Site 2 - Goods Shed kW

EXISTING BATHROOM AND KITCHEN

	Quantity	Watts	Hours (Winte	Hours(Sumr	Special Even	WINTER WEEKLY kWh	SUMMER WEEKLY kWh
Kettle	1	2000	0.25	0.2		4	3
Hand Dryers	3	2400	0.25	0.2		13	10
Fridge	1	800	24	24		134	134
Hot Water	1	360	24	24		60	60
Motion	1	1	24	24		0	0
Space Fans	3	130	0	8		0	22
Rodent Repellent	5	2.5	24	24		2	2

PARTY LOADING (7hrs per week)

Music and Sound	1	5000	1	1		35	35
FUTURE GOODS SHED							
Office	1	3800	8	8		213	213
incl. heating/cooling/lighting/peripherals							
PA systems	1	2000			8		
Lighting	1	3000			8		
Fan cooling	1	1000			8		8
Future night events							
Peripherals/catering	1	5000			0.15384615		5
lighting and PA	1	3000			0.15384615		3

	WINTER	SUMMER
TOTAL WEEKLY kWh	1528.384	1387.555

PEAK DEMAI 62 kW **TOTAL ANNA** 76 MWh

BASIC SOLAR GENERATION SYSTEM SIZING

Solar peak sun hours	5
Solar System kWp	42
Total solar production	**76.65 MWh**
total number of 300W panels	140 panels

Pros Grid Connect	**Cons Grid Connect**	**Pros Stand Alone**	**Cons Stand Alone**
Address grid connect problems	Power companies can make it	Goods shed is power shop	Env footprint of batteries
Part of long term solution	difficult to obtain feed-in-tariff	De-central station	Can't sell excess to grid
Advocate on behalf of other	Frustration negotiations with	Beautiful waste	Requires collaborative governance
grid connect people	retailers and DNSPs	Cooling refuge	
		Stormwater for water scarcity	
		Art as a battery	


SIG
SIG
Secondary
Area

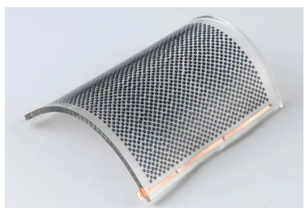

Understanding Energy



Hanging Gardens of Castlemaine

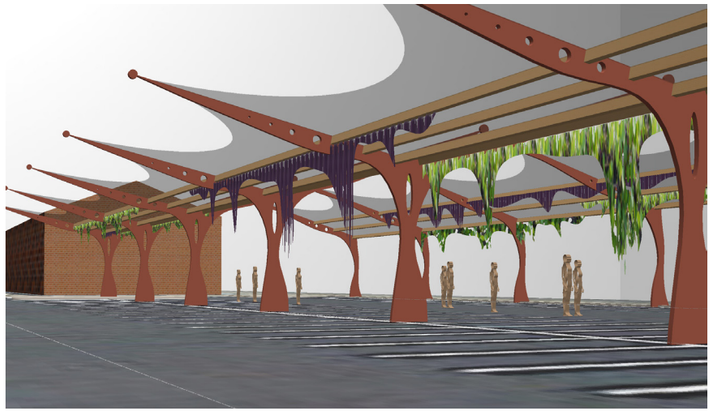
Alex Sanson, Maria Simonelli, Callan Morgan

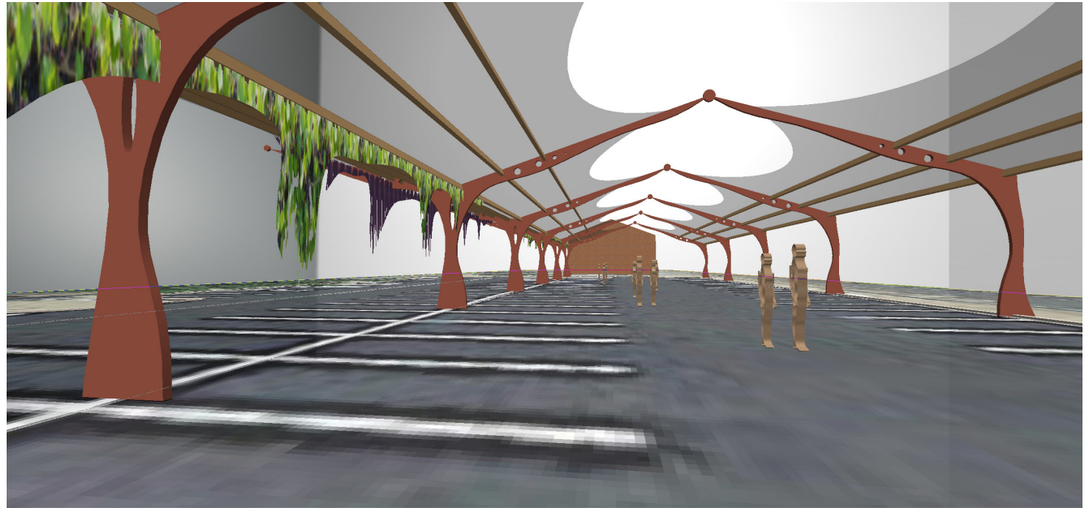
Energy Technology Sphelar™ photovoltaic, gravity storage

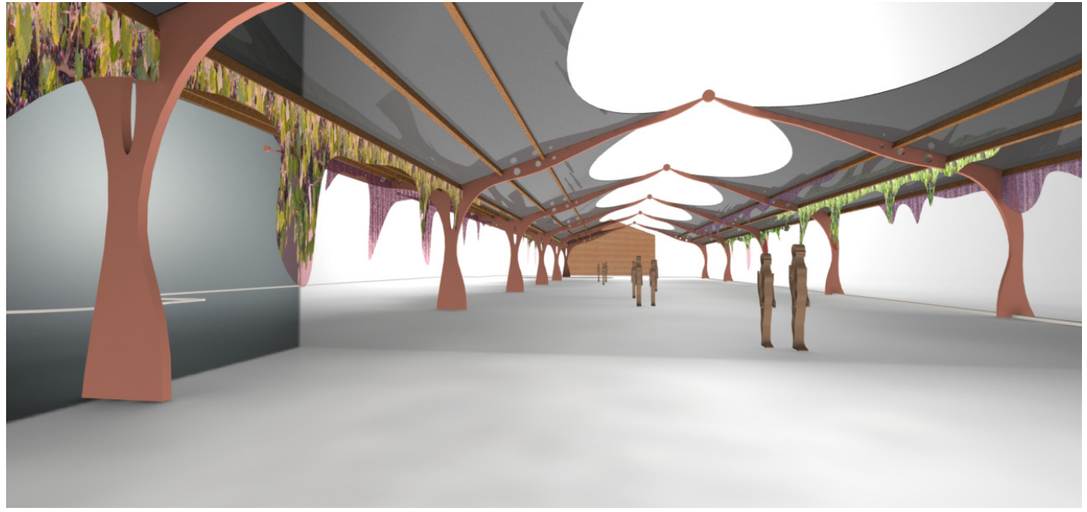


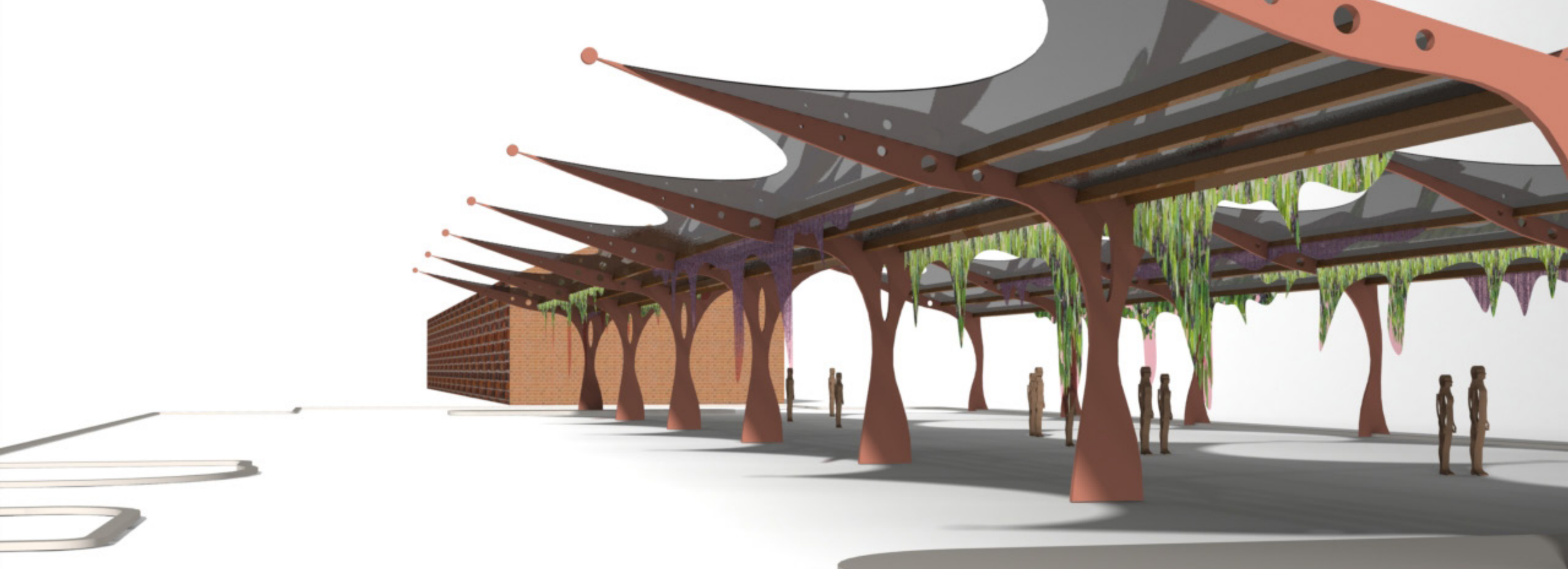
photograph of Sphelar™ solar cell

A long peaked shelter of slender elegant steel and timber framing with construction styles sympathetic to the Goods Shed and nearby railway architecture. Softened by arced semi transparent cladding providing shade for cars and community events, power generation through frameless, glass bead Sphelar™ PV technology allowing light transmission for healthy plant growth. An extensive under-canopy of hanging plants, creepers, wisteria and other species to further soften the form with lush greenery. The roof collects water for onsite storage and automatic watering of the plantings. The installation as a whole will cool the car parking space providing weather protection for cars, as well as an ideal space for farmers markets, community group events, particularly on the weekends. Each column provides power and water to service events as well as electric vehicle charging stations. Excess power is stored by raising the hanging plants on integrated winches/gravity motor/generators symbolising the raising or lowering our carbon footprint. Further excess power can be shared with the community via a grid connection. Finally, soft lighting from solar lace lamps is hangs throughout the structure for pedestrian safety and to enhance the beauty of the space.





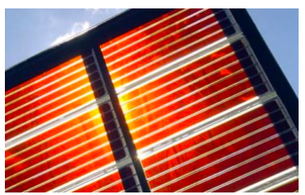




Photovoltaic Waves

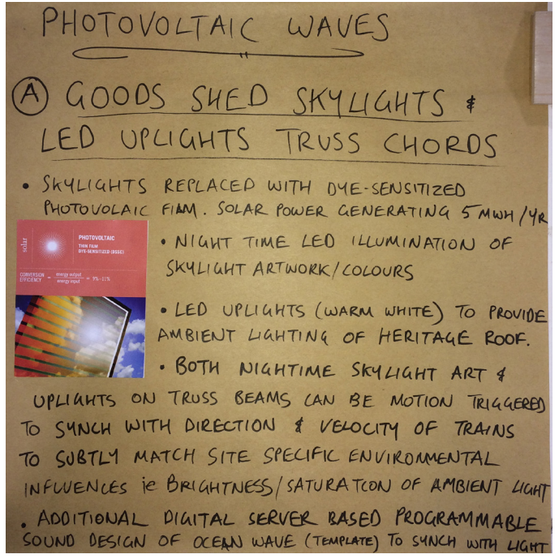
Cy Gorman

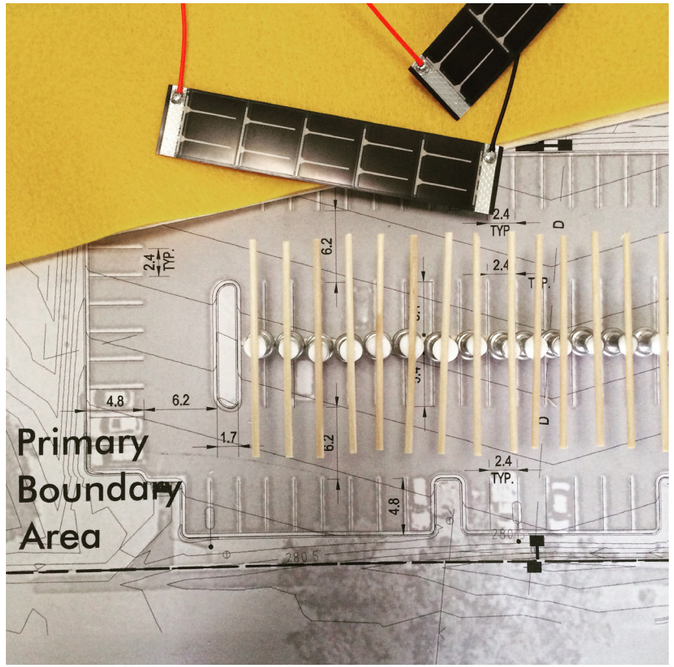
Energy Technology dye-sensitized solar cell (DSSC)



photograph of DSSC solar cell

Photovoltaic Waves presents as a first iteration design overview for the LAGI/Carbon Arts Reimagining Energy Castlemaine project. It is an alchemical design at heart, turning the base elements of environmental disharmony into the gold of social and environmental harmony. The overall design concepts draw from the indigenous mythological medicine narrative of Bunjil the Eagle in response to the colonial environmental impact in the Castlemaine area and it's history as 'gold country'. It was pointed out to me that another indigenous reference to the Castlemaine area is that it is sometimes referred to as the 'Upside Down' land. To me it seemed pertinent that to get 'things in order' as Bunjil's story speaks, is to see the value and importance of the gold in the sky (Bunjil as a star) and to harness the energy of this teaching to bring about a productive, harmonious and integrated relationship between humans and the environment. Materially, technically and creatively all designs in and around the Goods Shed emerged to support the medicinal narrative of the timeless indigenous mythology of the area. Additional digital augmentation of the site utilises light and motion sensors to trigger and accentuate site-specific environmental, social and local industrial activity cycles through embedded light and sound design artworks further expressing the relational nature of identity and environment.

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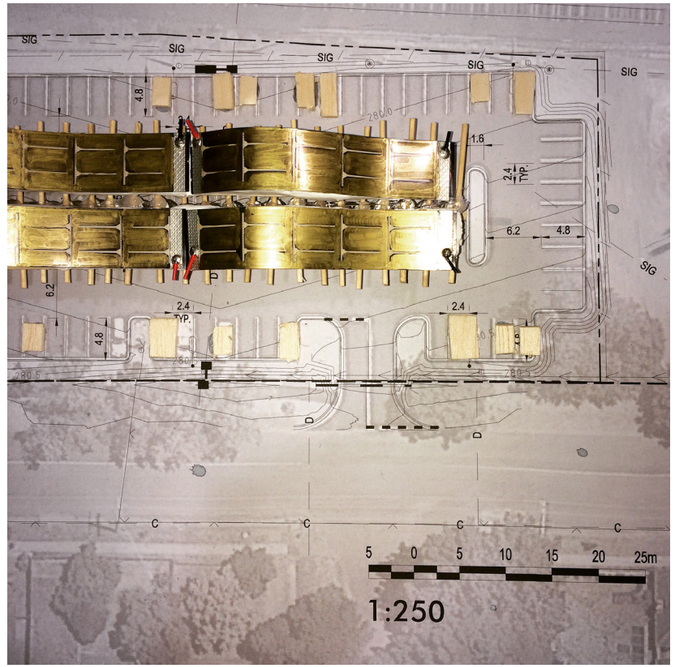
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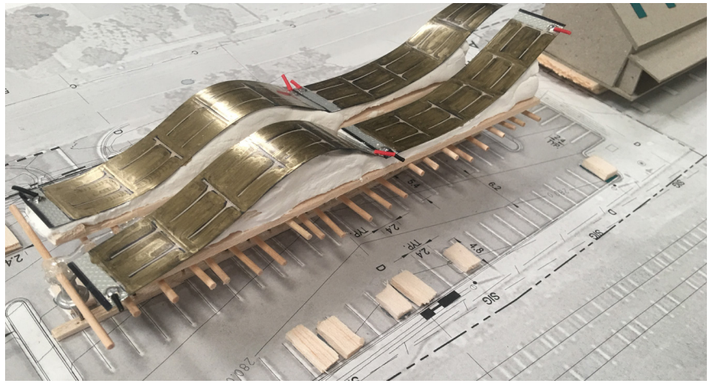
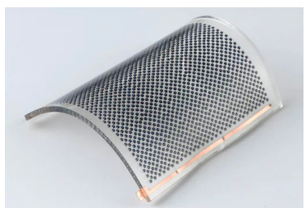


The Venus Flower Basket

Jim Coad

Energy Technology Sphelar™ photovoltaic



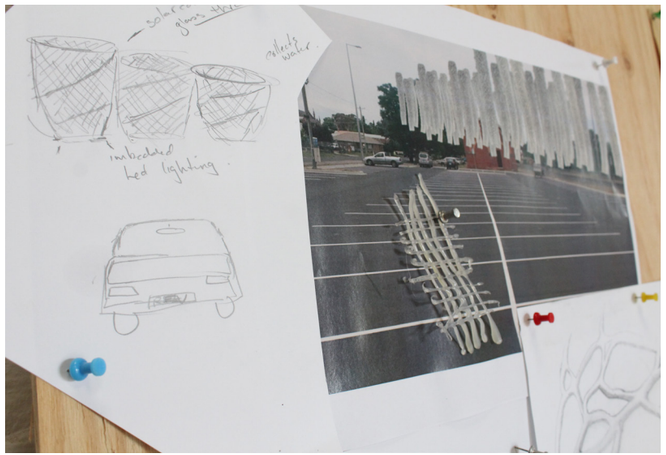
photograph of
Sphelar™ solar cell

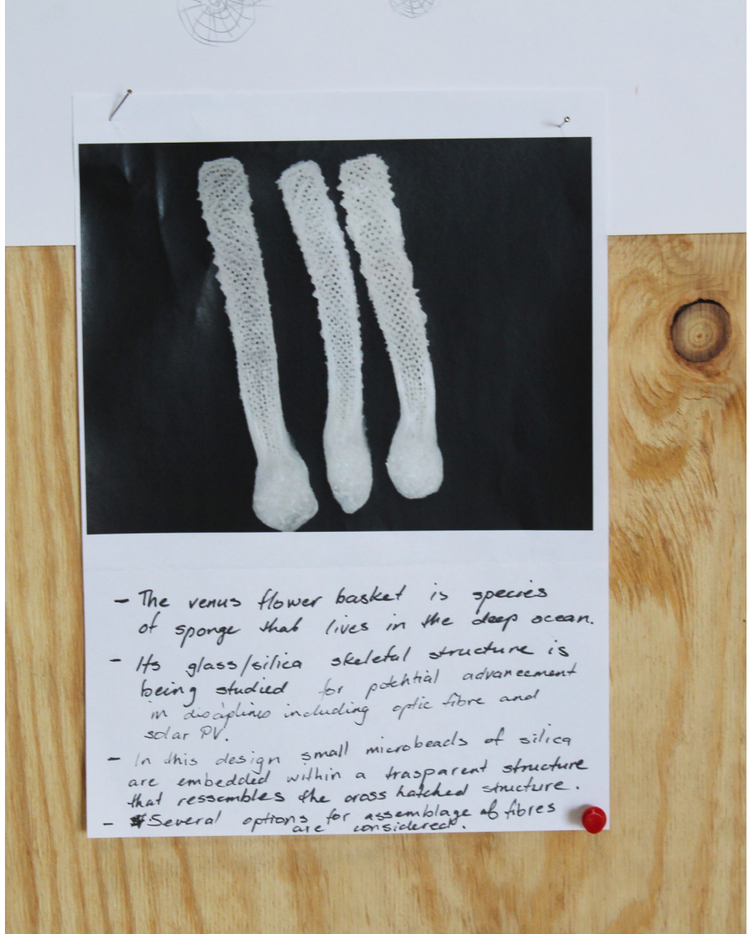
The Venus Flower Basket is inspired by combining organic structures with a new technology that uses waste silicone dust from solar PV production.

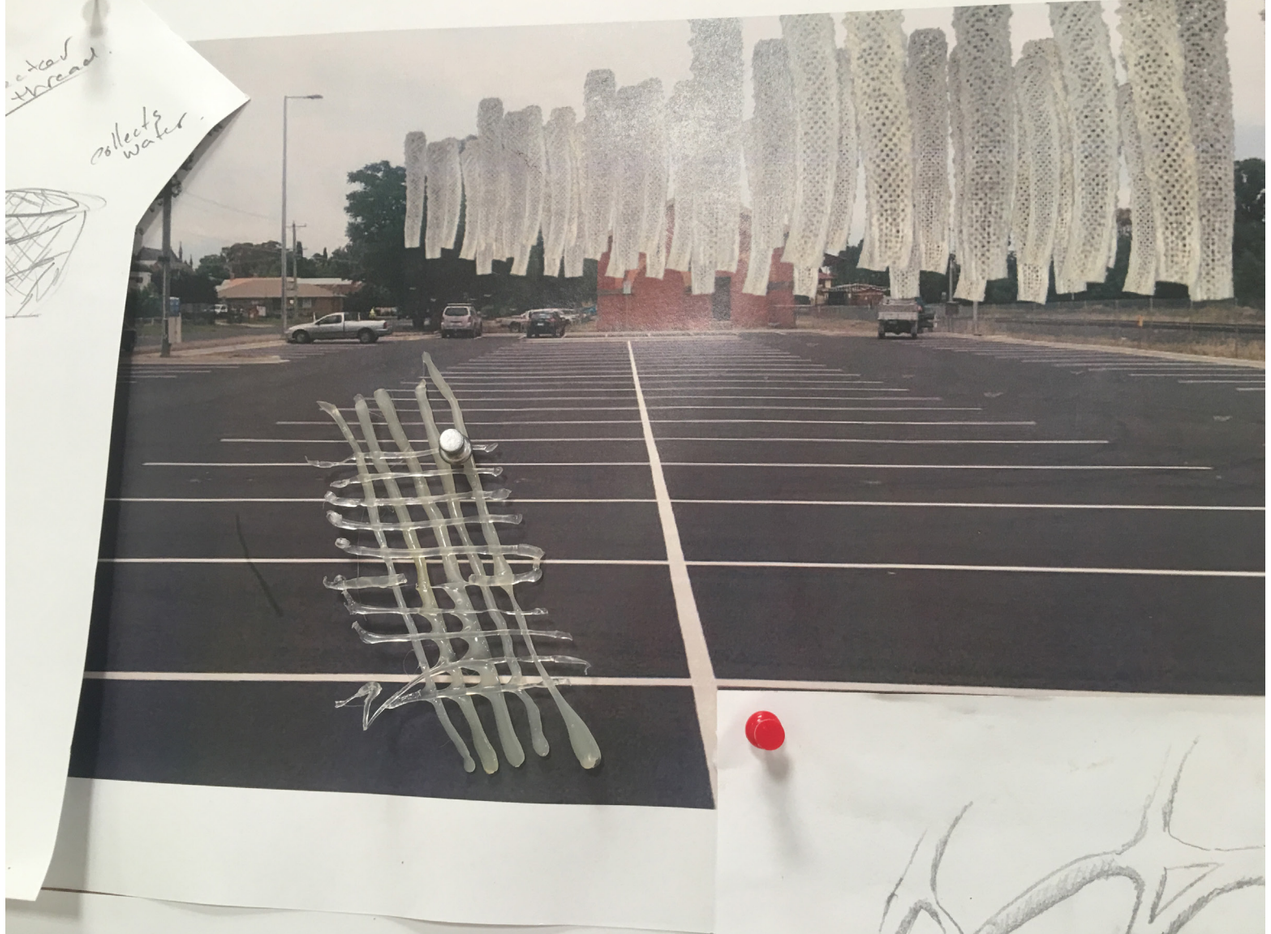
The balls are embedded in a rigid transparent 'fibres' and woven into a long cylindrical basket that resembles the skeleton of *The Venus Flower Basket*. *The Venus Flower Basket* is a deep sea sponge.

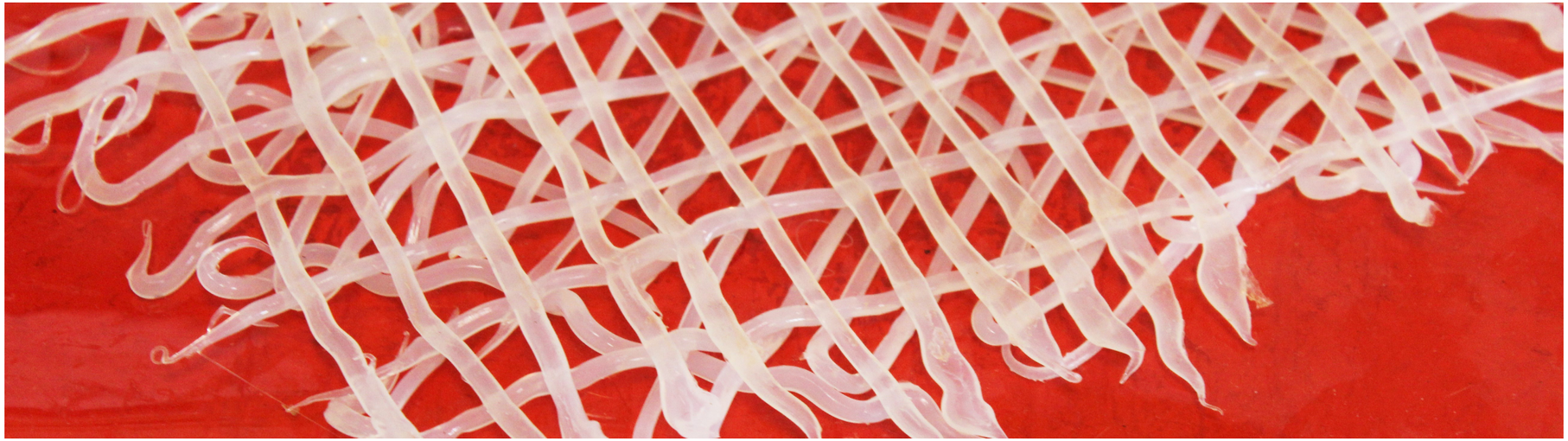
The structures, assembled in clubs and swathes across the site would provide shade to the site. There would also be LED lighting integrated into the forms. This would respond to various inputs so that, when the car park is unused there would be a minimal level of ambient light, replacing the need for other over head lighting. If there is movement in the car park or a train approaching the station the sculpture would be 'excited' into a subtle but more dynamic lighting state, providing extra light and interest.

This Installation is intended to sit within the landscape in a more or less textural fashion.




- The venus flower basket is species of sponge that lives in the deep ocean.
- Its glass/silica skeletal structure is being studied for potential advancement in disciplines including optic fibre and solar PV.
- In this design small microbeads of silica are embedded within a trasparent structure that ressembles the cross hatched structure.
- #Several options are considered for assemblage of fibres.


collects water

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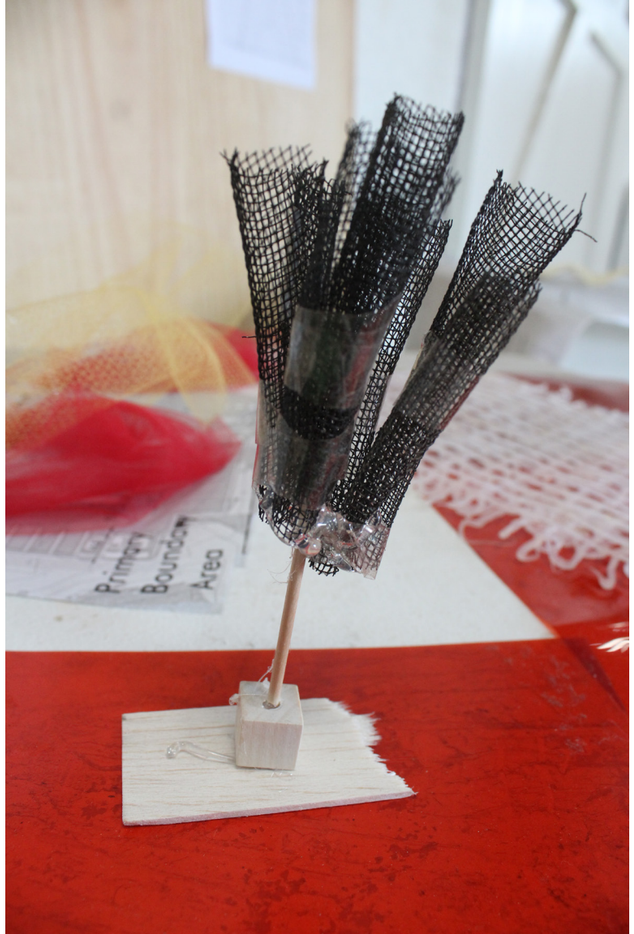
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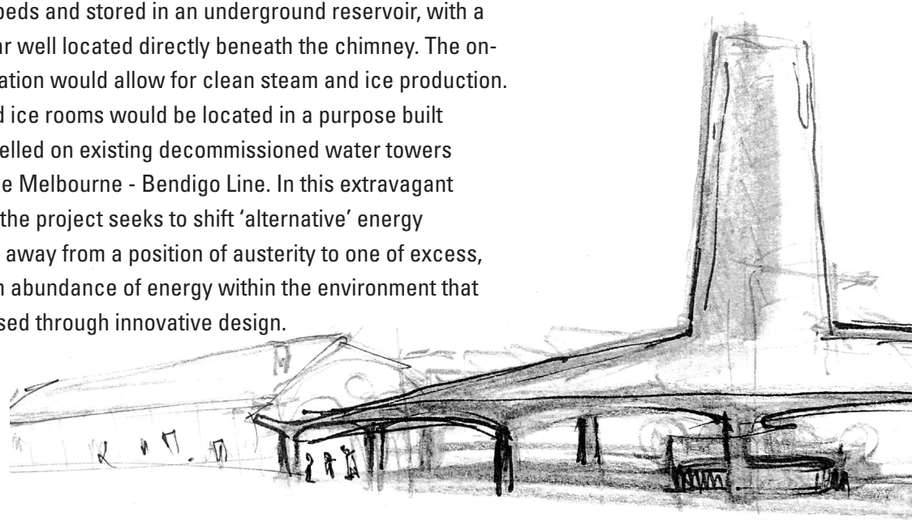
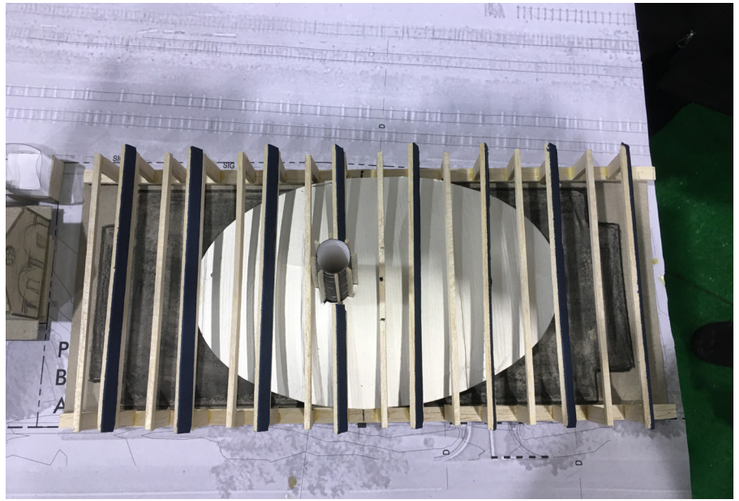
Third Chimney

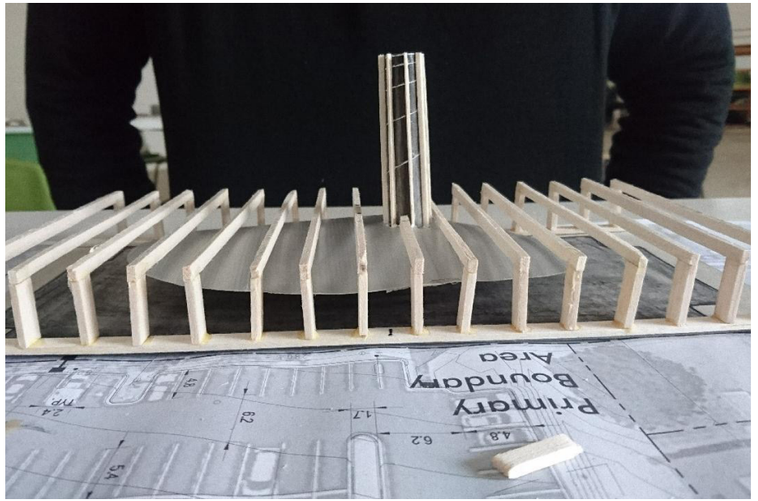
Cameron Robbins, Scott Mitchell and Terri Bird,
Open Spatial Workshops, RMIT and Monash
Universities. Samantha Downing

Energy Technology solar updraft tower,
solar photovoltaic, useful thermal energy store

This project combines a solar chimney with a photovoltaic array, water catchment system, reed bed filtration, and underground water storage. The proposed work would be built over the Castlemaine Station car park. The solar chimney would be of similar scale to the existing Castlemaine chimneys located at the old mill and foundry, adding a third chimney to the Castlemaine skyline. The solar chimney would draw air through the car park, cooling the parking spaces and generating electricity through a turbine located at the base of the chimney. The combined energy output from the solar chimney and PV array would be many times that required to power the nearby arts precinct. The project proposes that excess energy be used to create a free community facility in the form of a steam room, for winter months, and an ice room, for summer. Water collected from the site would be filtered through reed beds and stored in an underground reservoir, with a central circular well located directly beneath the chimney. The on-site water filtration would allow for clean steam and ice production. The steam and ice rooms would be located in a purpose built structure modelled on existing decommissioned water towers found along the Melbourne - Bendigo Line. In this extravagant use of energy the project seeks to shift ‘alternative’ energy conversations away from a position of austerity to one of excess, highlighting an abundance of energy within the environment that may be mobilised through innovative design.



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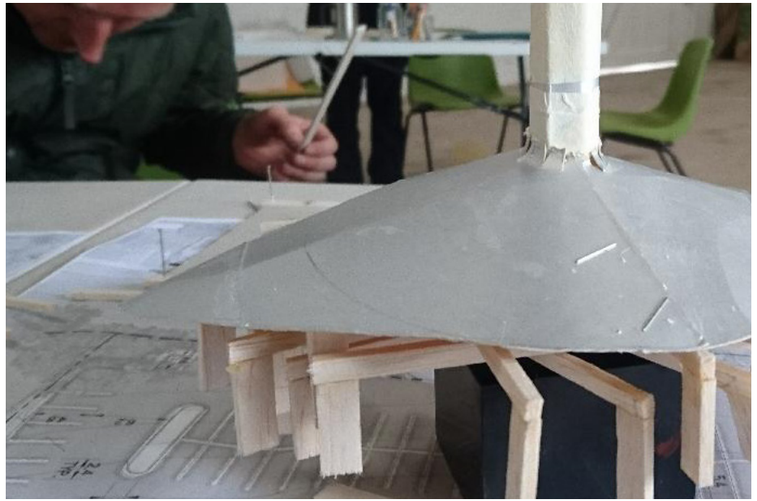
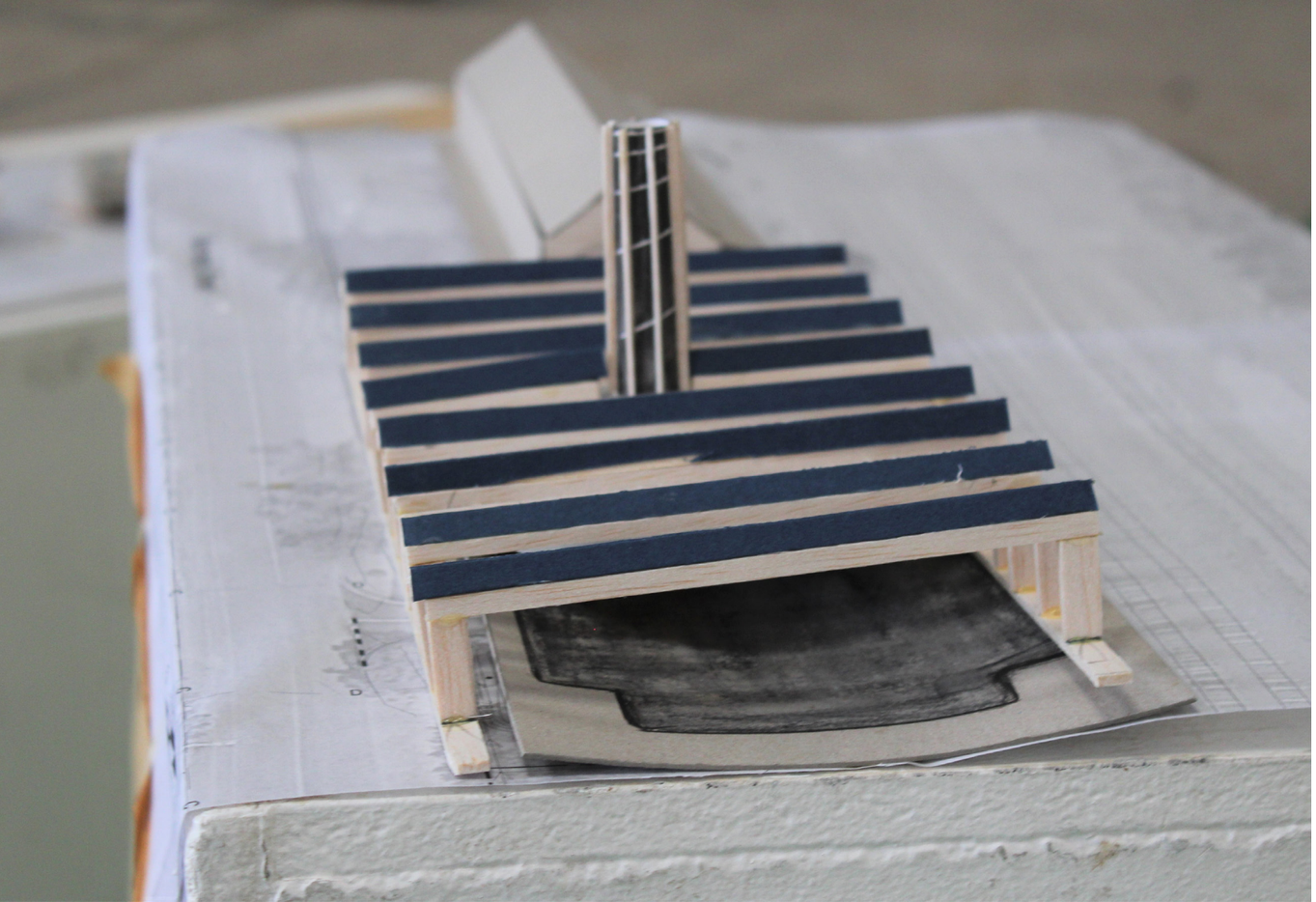
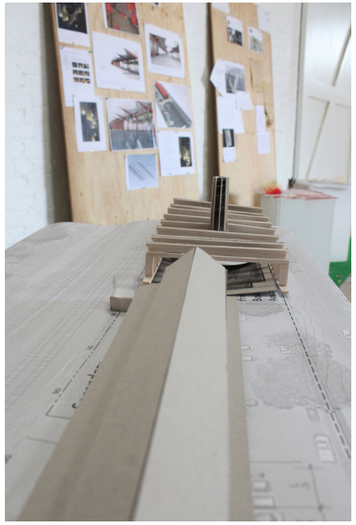
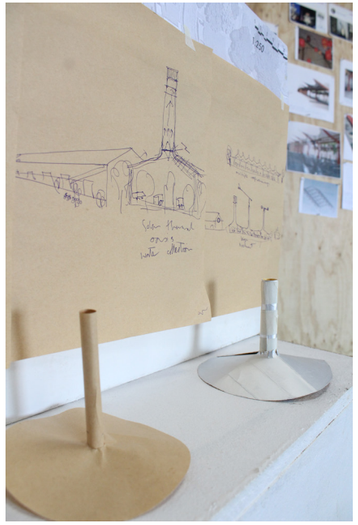
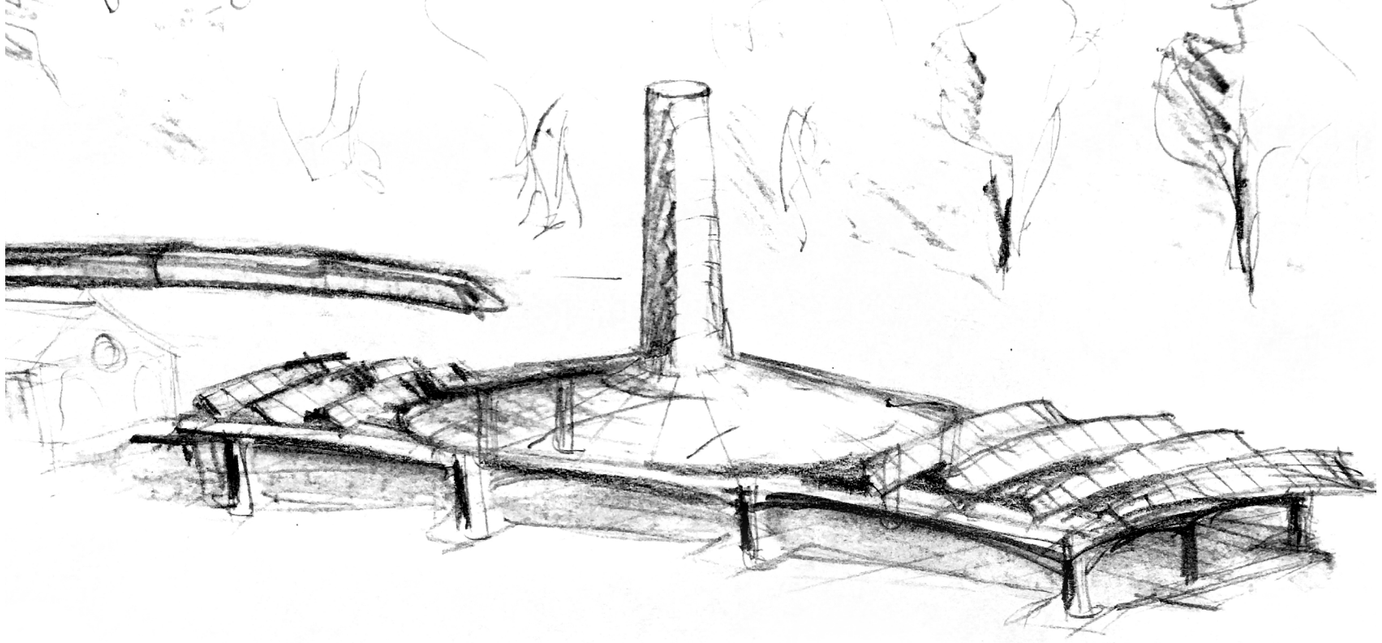





Bunbury 2
SOLD







Follow the Sun

Jane Toner, Biomimicry Professional

Energy Technology amorphous solar thin film

Nature runs on Sunlight.

(Janine M. Benyus, *9 Basic Principles of Biomimicry*)

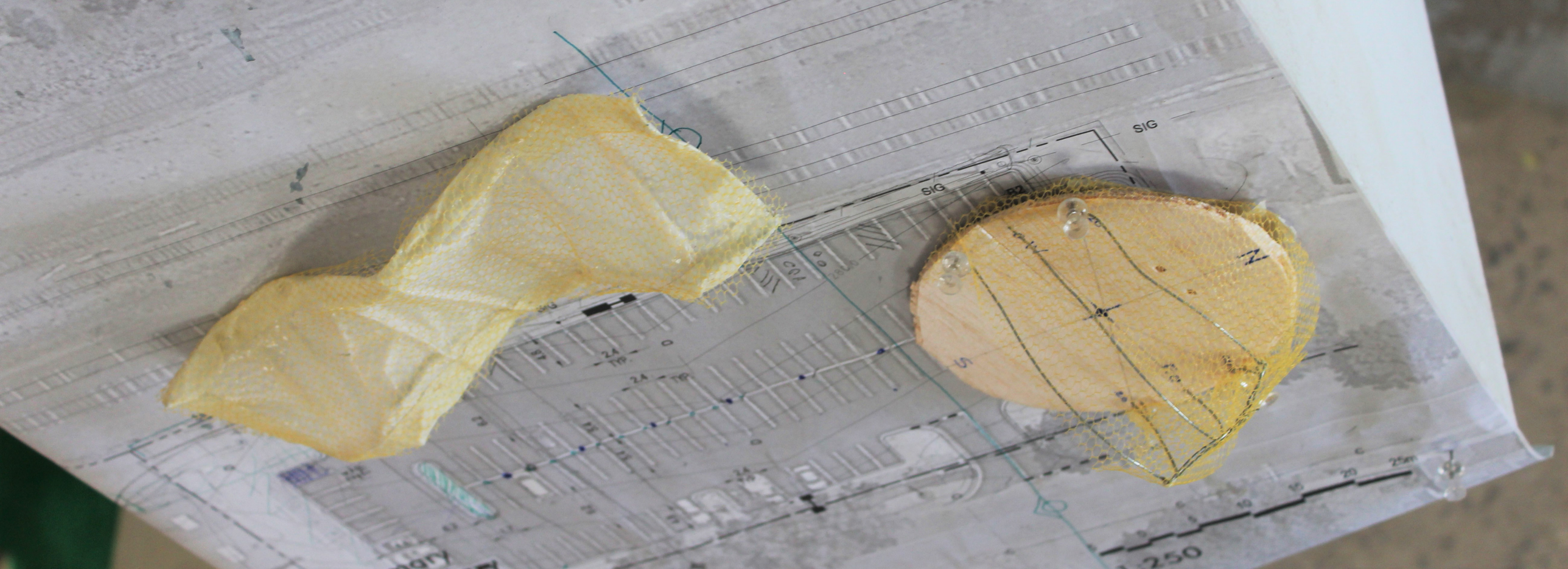
We are Nature. Our existence is entwined within and supported by the web of Life. Although our cleverness allows us to see ourselves as separate from the rest of Nature, we are subject to the same rules.

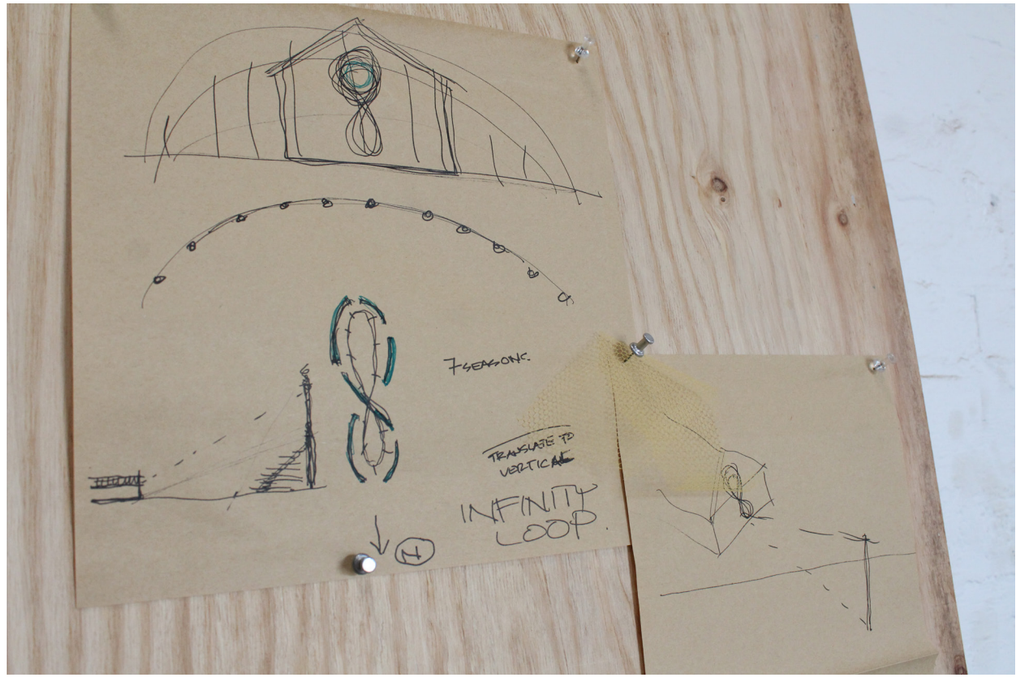
All Life is dependent on sunlight.

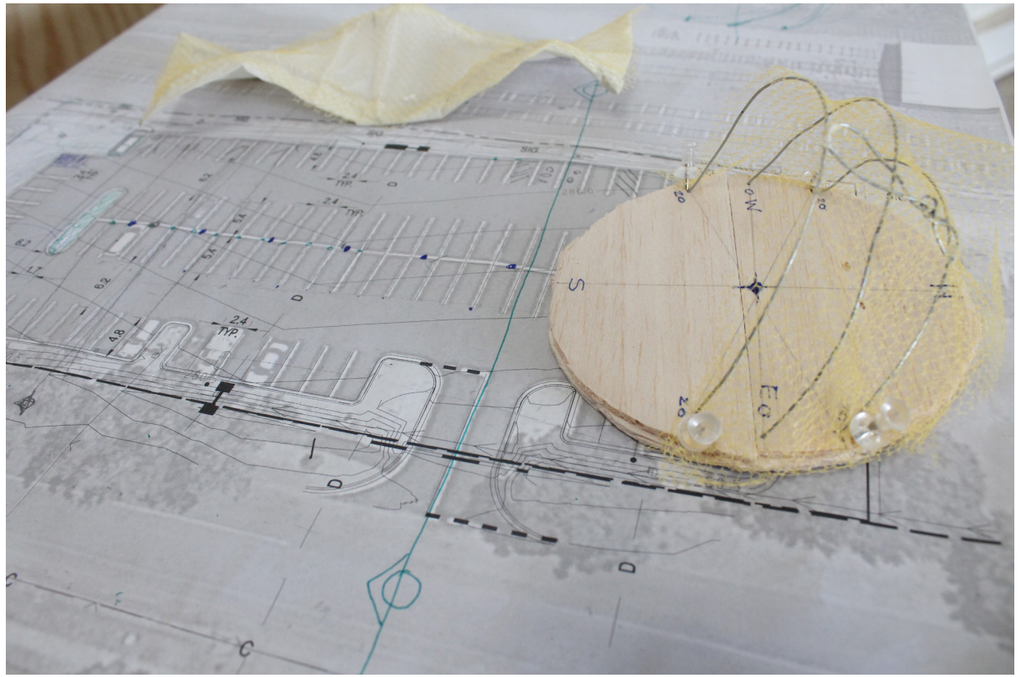
This project seeks to promote reconnection with this fundamental operating condition for Life by creating an awareness of the Sun's journey across the sky, throughout the day and seasonally, locating people in space and time.

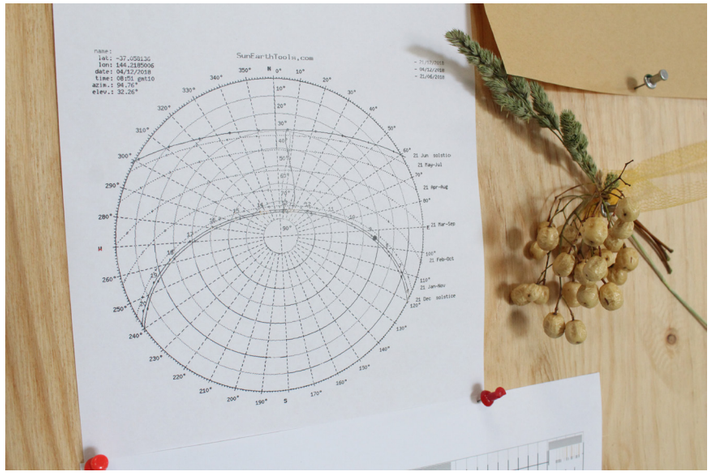
It offers a solar activated platform for performances by the local community utilising the carpark as a viewing space. Structural elements reflect and make visible the sun's altitude at the Summer and Winter solstices, vernal and autumnal equinoxes. A translucent, thin film, amorphous solar membrane covers the structure creating renewable energy while casting shadow of the structure on the ground.

A figure 8 embedded in the structure represents the position of the Sun in the sky at solar noon over the year. The figure 8 curve is a result of the Earth orbiting the Sun on an elliptical path and the Earth's axial tilt of around 23.4 degrees. LED lighting could be embedded in the analemma to demonstrate the Sun's seasonal location.


SIG
SIG
250


7 SEASONS.
TRANSLATE TO VERTICAL
INFINITY LOOP.

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azim.: 94.76°
elev.: 32.26°
SunEarthTools.com
21 Jun solstice
21 Mar-Aug
21 Mar-Sep
21 Feb-Oct
21 Jan-Nov
21 Dec solstice

Transition Castlemaine

A RENEWABLE ENERGY +
PUBLIC ART INTERVENTION

Andy McDonell & Jordana Maisie

Energy Technology solar photovoltaic, flywheel energy storage

Utility flywheel energy storage. Each cylinder houses a free-rotating weight.

Transition Castlemaine is a public art intervention proposed for the new Kennedy St Carpark, adjacent to Castlemaine's historic Goods Shed.

Given Castlemaine's extremely hot summers; a prime objective for this work was to alleviate the heat bank effect created by the large exposed bitumen surface, by introducing a shade structure for the local users of the site.

The need for shade, in combination with the site's unobstructed solar access, pushed us to create a roof system that allowed for natural ventilation, shade and the maximizing of solar energy generation through a dynamic PV solar array spanning the entire footprint of the carpark.

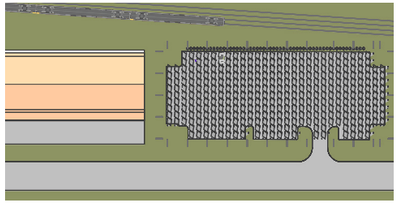
We were interested in the site's capacity to talk to both the local community as well as the transient V-track commuter community (the audiences that occupy either side of the tracks) and saw this as an opportunity to give Castlemaine's rail station a unique and engaging identity.

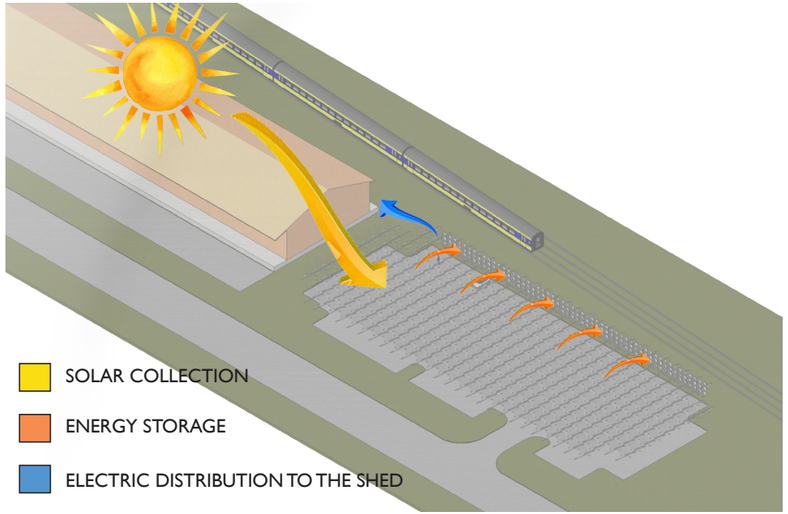
Tapping into the site's connection to the steam engine we identified Fly Wheel technology as an interesting approach to store the energy generated by the solar roof without the need to divert the energy to a battery system.

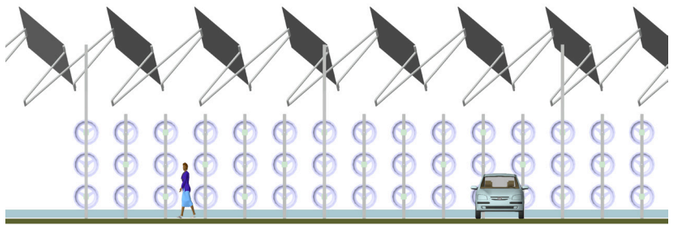
What is so nice about this proposed system is that the rate at which the fly wheels turn, is a real time indicator of how much energy is being stored or consumed. This made us think of a large-scale abacus that shares live local energy generation and consumption data with those passing by.

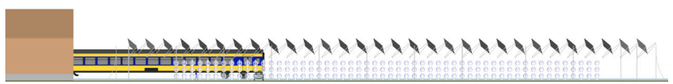
By painting the blades of the fly wheels in different color combinations, we are able to create a large-scale kinetic artwork. As the blades turn, the colors mix, so that as the energy generation and consumption fluctuates, the wall of wheels move through different color gradients.

Transition Castlemaine makes visible the energy generation capacity of the site—while turning it into something the local community can utilize and engage with in a more dynamic and positive way.



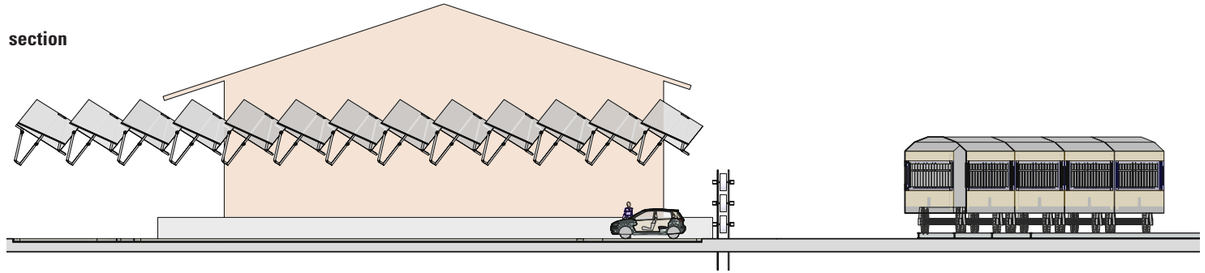

SOLAR COLLECTION
ENERGY STORAGE
ELECTRIC DISTRIBUTION TO THE SHED



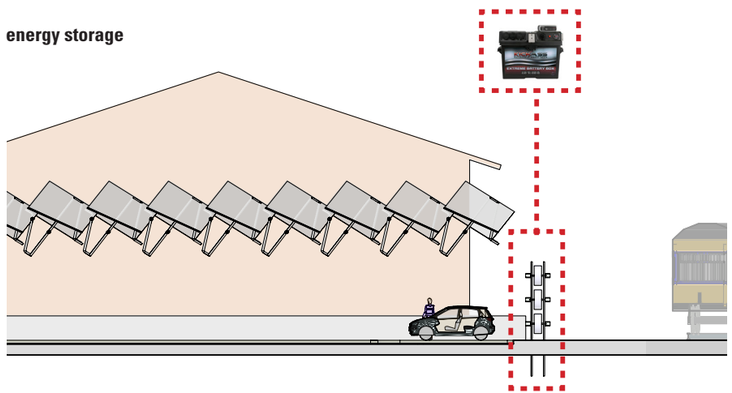


cool refuge

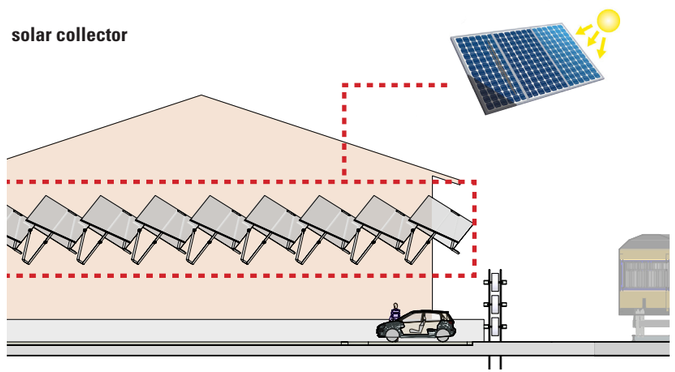
section

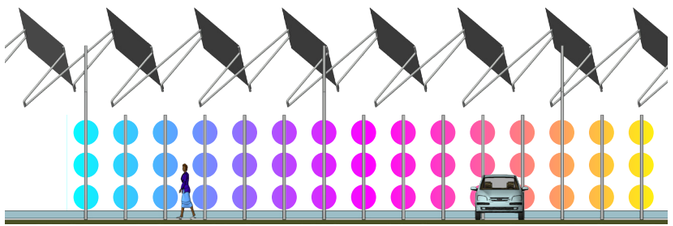


energy storage

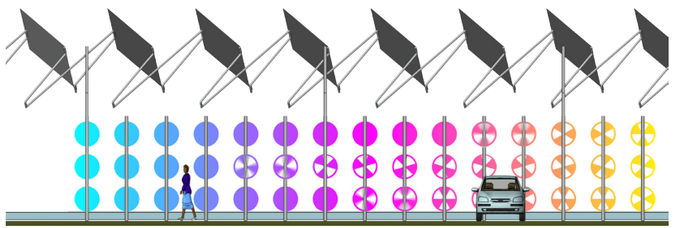


solar collector

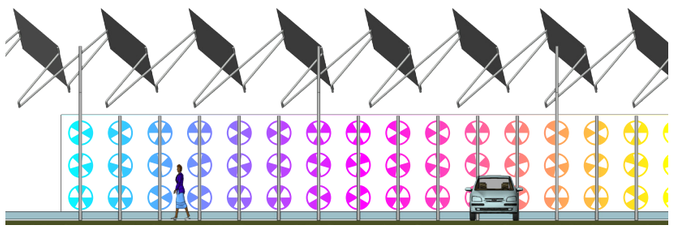




fully charged / full spin speed



partially charged / dynamic



empty / static

Tessellate

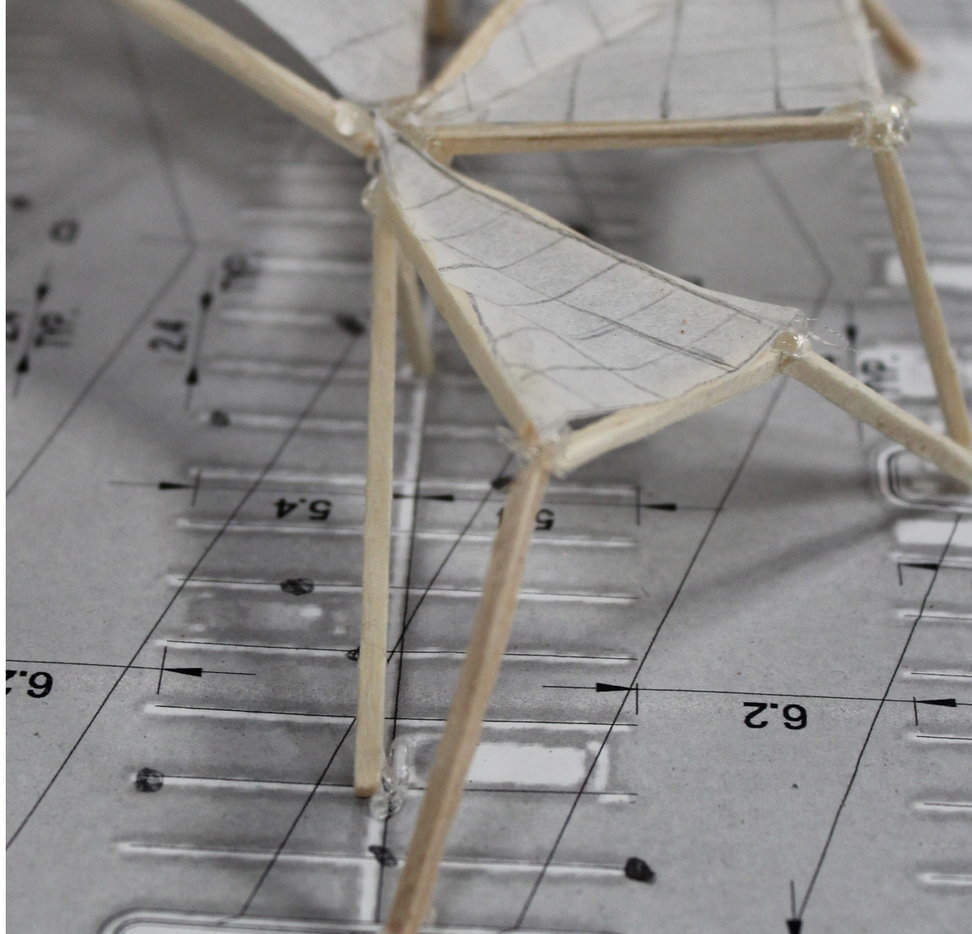
Callan Morgan

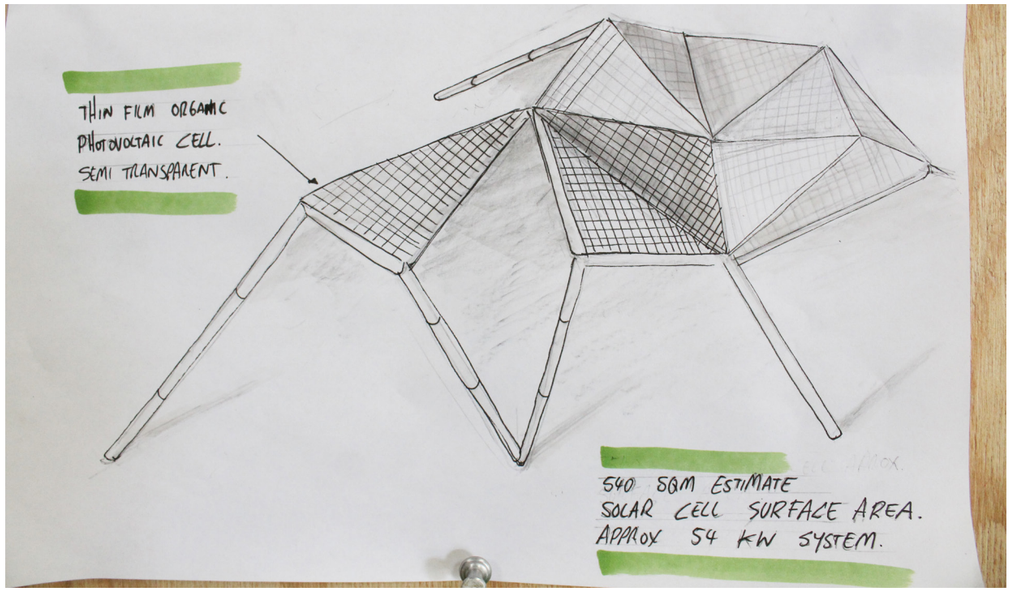
Energy Technology organic photovoltaic solar, gravity storage

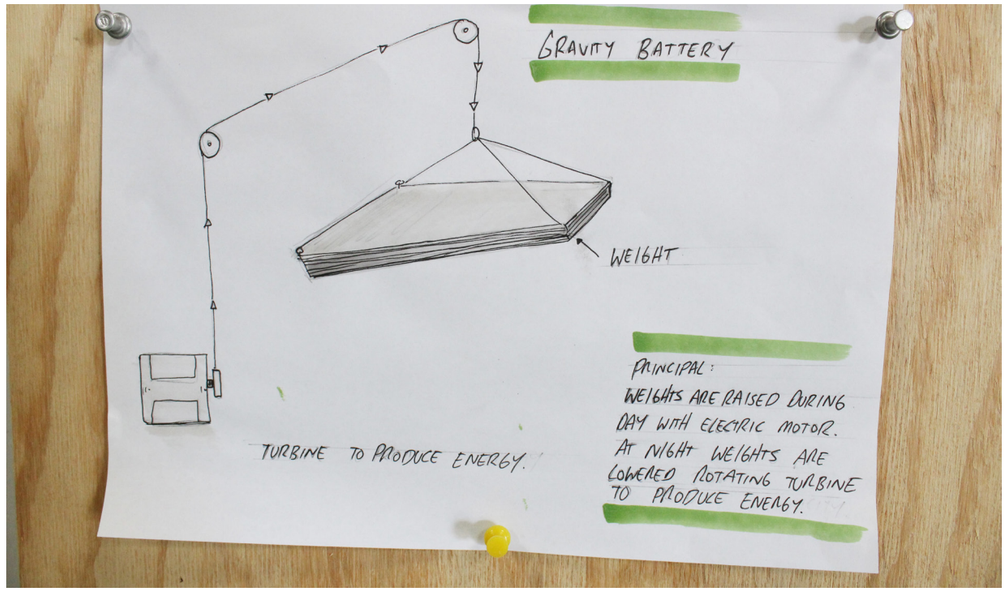
Tessellate's geometric forms create a canopy of undulating surfaces that span the site. Acknowledging the strong linear association with the Goods Shed and the train lines the piece blends into its surrounding environment.

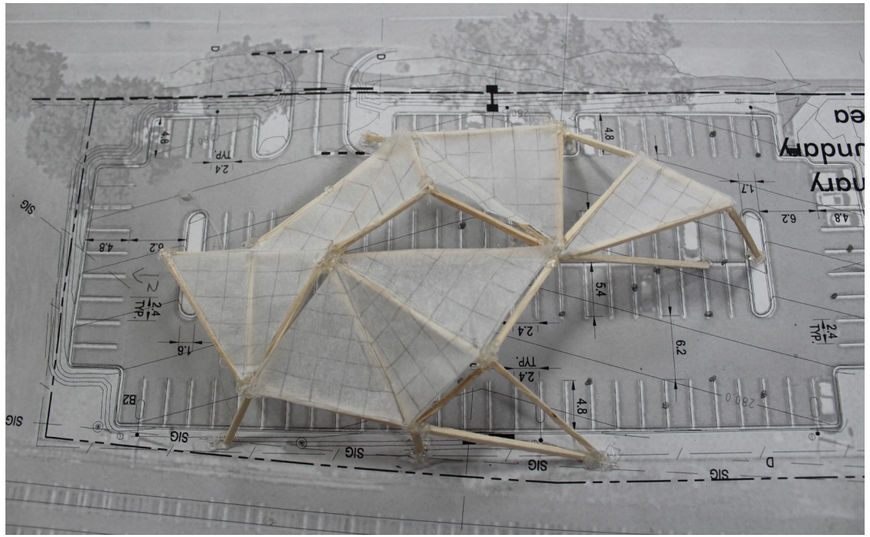
Upon the surfaces are organic photo voltaic solar panels that are transparent in nature which casts a coloured light through the space. The panels provide shade for the parked cars and reduce the heat in the asphalt. It is estimated the total panel output to be 50 kW which will sufficiently power the Good Sheds requirements.

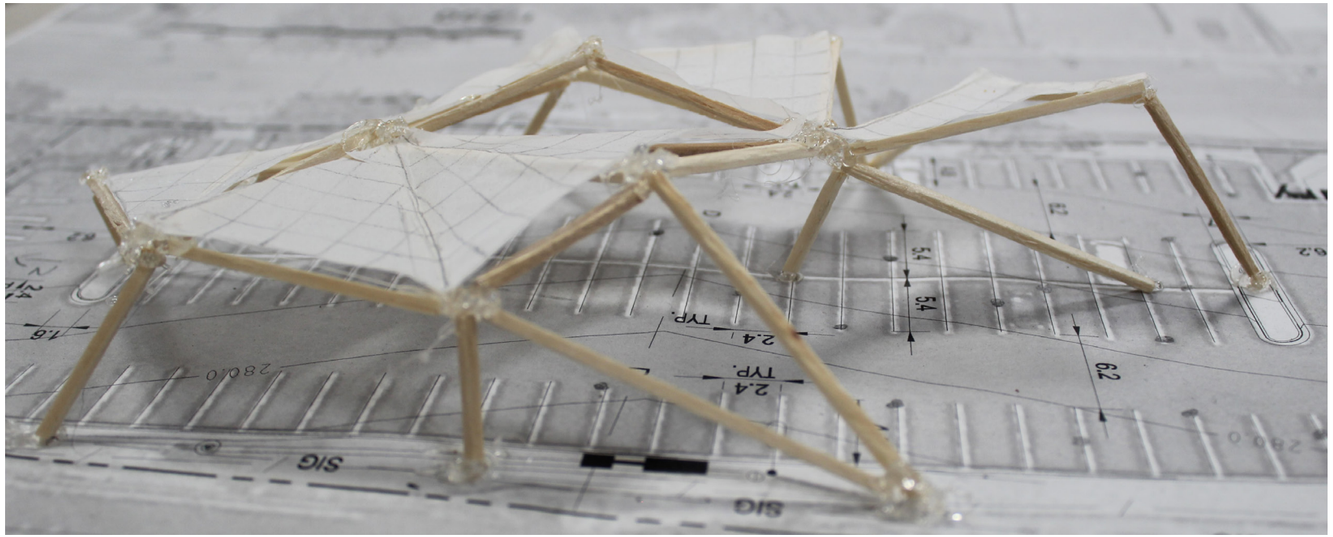
On the underside of the canopy hangs shaped weights that are attached to turbines via a unique geared cabling system. The system acts as a series of gravity batteries. During the day the weights are raised using the sun's energy then at night lowered to produce energy. Individual weights can be lowered depending on the power needs and allows for a more efficient energy producing system rather than one large weight. The weights depict strong imagery of how much energy is being used on a real time basis.

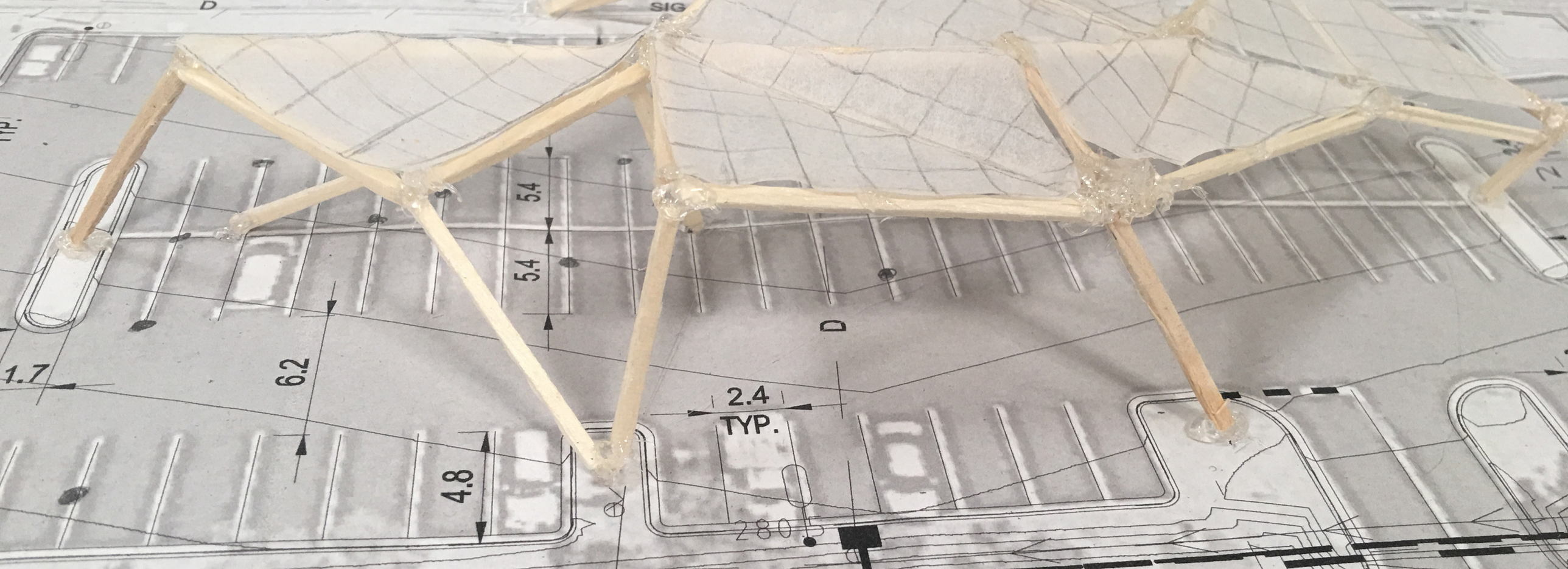



THIN FILM ORGANIC
PHOTOVOLTAIC CELL.
SEMI TRANSPARENT.
540 SQM ESTIMATE
SOLAR CELL SURFACE AREA.
APPROX 54 KW SYSTEM.


GRAVITY BATTERY
WEIGHT
TURBINE TO PRODUCE ENERGY.
PRINCIPAL:
WEIGHTS ARE RAISED DURING
DAY WITH ELECTRIC MOTOR.
AT NIGHT WEIGHTS ARE
LOWERED ROTATING TURBINE
TO PRODUCE ENERGY.






5.4
5.4
6.2
1.7
4.8
2.4
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