SOLAR SLOPES responds to the history of entertainment of the triangle site and its context with dynamic undulating surfaces that flow together to articulate a new cultural hub. The language of the new site was developed by mirroring the existing site’s slope and juxtaposing it with an array of solar surfaces that generate energy and provide new performance spaces. Biodiversity is increased by the addition of native planting and permeable surfaces throughout the site, meanwhile allowing for other native wildlife to flourish. Key views across the site are maintained and respected, and users are invited to meander through the site and across a new pedestrian bridge leading you to the outdoor amphitheater and beachside. The SOLAR SLOPES are not only a land art generator, but also a place to host art.

**The Challenge**

The challenge of the site was to consolidate the masterplan’s visions with community expectations and the need for a new cultural hub with a paralleled goal of producing energy. We challenged ourselves to create a large-scale energy generator which is both socially engaging and educative, as well as a sculptural piece of land art.

**The Response**

Given the variety of options in renewable energy generation, we identified solar as the most viable option. Australia has a huge potential market for solar energy generation with one of the highest solar irradiation values in the world (kilowatts per square metre) [1]. Even when nearly one quarter of Australian homes have invested in rooftop solar panels [2] only 2% of the energy generate in Victoria in 2014 was solar [3].

As opposed to using a traditional solar PV panel technology, we decided to use solar tiles for its versatility in form applications.

Through simulations and calculations [4], we were able to demonstrate a wider spectrum of angles and shapes that would still enable considerable quantities of energy generation to occur. Utilising smaller PV tiles also gave us the freedom to create undulating forms that express the St Kilda’s dynamism without overwhelming the natural landscape and context.

Other renewable options such as wind and wave energy were considered, but both were unsuitable for the context of the project’s site. Wind energy would have a high noise and visual impact, whereas wave energy would interfere with social enjoyment of the beach.

**The Concept**

The concept was developed by mirroring a popular site feature – the slopes – and creating an offset array of surfaces that both generate energy and form a functional internal space. The response led to ribboned surfaces that flow through the site and articulate a character of movement and dynamism. The SOLAR SLOPES are not only a land art generator, but also a land art installation for hosting art. The interior space of the main building allows for a large cinema/theatre space, while the open-air amphitheatre provides space for more casual events or festivals.

Currently, only 40-50% of native vegetation remains in Victoria [5]. And as much as energy generation was important for the project, we saw this loss of biodiversity as an opportunity to bring back and improve the local native ecosystems. We did this by introducing a large green area that blends into the flowing forms of the SOLAR SLOPES.

**Technology used in design**

Through explorations and research of existing renewable energy solutions, solar roof tiles were selected. Over time, the efficiency of these products will also improve and become more affordable.

There are also currently a large amount of companies that are already manufacturing and selling solar tiles. Some of these companies are listed below;

* Telsa
* Monier
* Tractile
* Bristle Roofing

**Annual kWh**

Using solar analysis software built in to *Autodesk Revit 2018* allowed us to generate an estimate of 2,340 MWh/year. This figure was based on a solar tile product from *Monier*, which has an efficiency of 17%.

Based on the average Australian household energy consumption of 5,475 kWh/year, this gives us enough energy to run approximately 425 Australian homes annually.

**Primary Materials + Dimensions**

The primary materials used in the design are solar tiles. These cover the slopes on the northern orientations and are replaced with native gardens when the slopes’ orientation changes. The slopes would be supported by a steel frame structure and built up earth.

Approximate material quantities:

SOLAR TILES 9,750m2

NATIVE PLANTING 7,000m2

**Environmental Impact Summary**

The SOLAR SLOPES increases local biodiversity by providing 7,000m2 of native planting and a well needed habitat for birdlife and other animals alike. The asphalt covered carpark is transformed into a permeable site with rainwater harvesting and beautiful gardens that both inspire and educate people on the possibilities of renewable energy solutions. Creating a native landscape within the St Kilda context will also improve the quality of life, happiness of residents, while also lowering CO2 emissions. By generating solar energy the SOLAR SLOPES lowers Melbourne’s CO2 emissions by 1,920 tonnes annually.

As well as generating energy, the SOLAR SLOPES harvest rainwater – approximately 5.9 Megalitres per year – which may be used for building use (toilet flushing, etc.) and the maintenance of the new native landscape and adjacent Catani Gardens.

Nested below the surface of the SOLAR SLOPES is an underground carpark with space for 200 cars, battery storage and rainwater tanks. This infrastructure also has the potential to become a central storage unit for a future electrical community grid, or an electric car charging station, which utilises the energy generated on site.

**References**

[1] Global Solar Atlas

<http://globalsolaratlas.info/downloads/world>

[2] Renew Economy, “One quarter of Australian homes now have solar”

<https://reneweconomy.com.au/one-quarter-of-australian-homes-now-have-solar-70886/>

[3] Victoria’s Renewable Energy Roadmap, 2015

[4] Solar Irradiation analysis, simulations and calculations done in *Autodesk Revit 2018.*

[5] Australia’s Native Vegetation Framework. <http://www.environment.gov.au/system/files/resources/76f709dc-ccb3-4645-a18b-063fbbf0a899/files/native-vegetation-framework.pdf>