**CHRYSALIS
Description**

A White Birch forest, growing on a constructed topography, covers the site. St. Kilda Triangle is now bursting with biodiversity. Explorers entering the site might think that this wild ecosystem was always there. But some weird details offer clues pointing towards the artificiality of this gesture: trunks are aligned in a strict grid, treetops follow a mathematical sinusoidal pattern, species feel somehow foreign, and ground undulations are too smooth, too perfect. Everything in this landscape exudes an estranging duality, everything seems simultaneously familiar and inexplicable. After Anthropocene, all nature is manmade, synthetic, constructed.

CHRYSALIS is a productive landscape conceived in four layers:

**4th.
Gradient Forest and Forest Glades.**

A white birch forest is planted covering the whole site, initiating a chain reaction of biodiversity and ecological cycles. Vegetation produce O2 and traps CO2. Treetops cast shadows in summer, generating a favorable microclimate. Fallen leaves cover the ground in winter, allowing the solar energy to enter and proving the necessary nutrients for other type of lifeforms to emerge – from lichens and insects, from insects to birds. The different layers of soil, gravel and sand provide the first step in a rainwater collection and filtering system. This water is conducted naturally, by gravity, through the undulations of the artificial topography, towards the forest clearings, where it is finally treated and stored under the protective light structures of CHRYSALIS Energy Domes.

Trees ages and sizes are carefully orchestrated. They are arranged in order to generate a gradient effect, smoothly clearing and decreasing towards four forest glades. One of them is located at the southernmost part of the site: an elevated viewpoint prairie looking towards the bay. The other three are located in the lowest points of the topography, artificial depressions that gather the rainwater and host the energy domes.

Trunks are planted following a 4x6 meters, directing all views towards the bay, allowing the views from the Esplanade of St Kilda Beach and the Port Phillip Bay horizon through the site. This grid enhances perspectives and produces parallax and moiré effects on viewers walking by or cars passing through Jacka Blvd.

**3rd
Energy Domes and Elevated Path.**

The three lowest forest glades are inhabited by the Energy Domes. Performative light structures built out of CNC milled, bent, laminated timber. Vaulted spaces covered by a mix of translucent textiles, vegetal skins, energy-collecting micro-devices and water vaporizers. Domes that harbor filtration water ponds or *schwimmteiche*; natural swimming pools that tame and tune their surrounding microclimates; domestic-scale micro beaches hidden in the park and protected by these vaulted structures.

Four main layers/systems cover these structures.

1. **Vegetal skin [380 m2 per unit].** Facing south, the structure is covered by “plant microbial fuel cells,” a system in charge of collecting electricity out of the electrons produced by root microorganisms. Plants produce organic matter, at roots level, with sunshine that is used to their own grow. The plant only use approximately 40% of it, however, the rest disappears into the soil. With Plant Microbial Fuel Cell technology this organic matter is converted into electricity. The average production of these systems is 3.2 watts/m2. Furthermore, the vegetation growing in this green skin aids in the production of organic nutrients and local biodiversity, and they help in softening temperatures and protecting from the south winds.
2. **Wind skin [225 m2 per unit].** Facing south-east and south-west the skin is covered with wind catcher devices. These are the areas where the geometry of the domed structure generates higher wind pressure. These devices are big leaf-shaped translucent plastic wings, connected to dynamos/resistances at the base, and attached to the skin. These wind-leafs vibrate and the resulting energy is captured by their dynamos and immediately transported and converted into the underground inverters. These wind-leafs are installed on the edges of the vegetal skin, producing an uncanny superposition of natural and artificial forms of “vegetation”.
3. **Solar skin [235 m2 per unit].** Facing north the translucent textile skin is covered by Fresnel lenses and photovoltaic cells attached to the fabric. These Fresnel lenses redirect and concentrate sunlight on the monocrystalline photovoltaic cells behind enhancing their efficiency. The forest glades or clearings ensure no shadow casting on the photovoltaics. Efficiencies are estimated around 40% of the solar radiation (considering an average of 4,1 kwatts/m2 the system would generate close to 1,6 kwatt/m2). The combined photovoltaic production of the three domes could be estimated in 1.162 kwatt hour. The reflecting fabric combined with the Fresnel lenses generate pearly tones and silky reflections, providing an estranging effect.
4. **Water skin [660 m2 per unit].** A network of water vaporizers, sprinklers and drip irrigation is in charge of watering the plants of the vegetal skin, cooling the cells of the solar skin, and controlling the temperature of the surroundings of the pavilion through evaporative cooling effect. The water skin is connected to the rainwater collection ponds (or *schwimmteiche)* underneath the structure, from where the water is pumped up.

Besides their performative functions, these Energy Domes work as cultural catalyzers. Thematic activities are programmed and public gatherings occupy these forest glades. Open air art festivals, energy awareness meetings and participatory workshops on health and ecology are celebrated periodically in these spaces.

These three forest glades are interconnected through an elevated trail. A runway that crosses the site amid the birch treetops offering unexpected views of the blooming life of the forest. This corridor extends its way south to bring people to the elevated viewpoint prairie, and it extends north to generate a pedestrian bridge over Jacka Blvd., connecting St. Kilda triangle to the Bay Trail and with the Catani Gardens ecological corridor.

This structure is used as well to generate an energy network between the different Energy Domes (balancing and compensating those producing less with those producing more) and to bring technical services (water and electricity) to different areas of the forest.

**2rd
Suspended Prairie.**

A technical green slab covers the whole site, hiding the parking level and generating an artificial topography. This topography is adjusted to conduct rainwater towards the forest clearings and their Energy Domes, and to generate smooth and seamless transitions with the Palais forecourt and the Jacka Blvd. Watched from these angles, the terrain seems a natural gradation: this technical slab is covered by a mantle of organic soil and grassland vegetation.

The only point where the artificiality of the operation is revealed is at the south corner, where the green slab hoovers over the crossing of Jacka Blvd. and Cavell St., generating an elevated prairie, a privileged viewpoint over the bay.

**1st
Covered parking.**

The site is cleared and leveled in order to optimize the parking disposition. The site includes 260 car parking spaces for general use and 50 parking spaces reserved for theater administration. The plan includes technical services and equipment rooms, loading bays for the Palais Theatre and for the park itself, charging points for electric cars (fed by the solar energy harvested by the domed structures) and three vertical cores located at the south-east endpoints of the elevated corridor. These vertical cores connect parking level with the theatre, elevated prairie, forest level and elevated trail.

**Energy generation**

Estimate energy production in Kilowatts hour

|  |  |  |
| --- | --- | --- |
| **FOREST CO2 CAPTURE** |   | UNIT |
| CO2 captures per year per tree | 22,60 | CO2 kilograms |
| White birch | 935,00 | units |
|  | **21,13** | **CO2 tons / year** |
|  |  |  |
| **PHOTOVOLTAIC ENERGY PRODUCTION** |   | UNIT |
| Solar radiation Melbourne | 4,16 | kwatts hour / m2 |
| Fresnel efficiency | 40,00 | % |
| Fresnel surface per dome | 235,00 | m2 |
| Number of domes | 3,00 | units |
|  | **1.173,12** | **kwatts hour**  |
|  |  |  |
| **WIND ENERGY PRODUCTION** |   | UNIT |
| Average wind speed | 10,00 | m/s |
| Power | 0,25 | kwatts hour / m2 |
| Wind skin surface per dome | 225,00 | m2 |
| Number of domes | 3,00 | units |
|  | **168,75** | **kwatts hour**  |
|  |  |  |
| **PLANT MICROBIAL ENERGY PRODUCTION** |   | UNIT |
| Power | 3,20 | watts hour / m2 |
| Vegetal skin surface per dome | 380,00 | kwatts hour / m2 |
| Number of domes | 3,00 | units |
|  | **3,65** | **kwatts hour**  |

**Primary materials and measurements**

Estimate bill of quantities

|  |  |  |  |
| --- | --- | --- | --- |
| **LANDSCAPE** |   | UNIT |  |
| Prairie landscaping | 20.000,00 | m2 |  |
| Covered facilities (parking and technical services) | 12.000,00 | m2 |  |
| Elevated path | 520,00 | lm |  |
| White birch | 935,00 | units |  |
|  |  |  |  |
|  |  |  |  |
| **DOME skins** |   | UNIT | per dome |
| Solar skin | 235,00 | m2 |  |
| Wind skin | 225,00 | m2 |  |
| Vegetal skin | 380,00 | m2 |  |
| Fabric skin | 660,00 | m2 |  |
| Water network | 1.500,00 | lm |  |
| Laminated timber | 800,00 | lm |  |
| Water storage pools | 120,00 | m2 |  |

**Environmental Impact**

The main strategy addressed by the proposal is the construction of a forest big enough as to serve as an important node in the coastal green corridor, aiming to belong at the category of green pieces such as Catani Gardens, M.O. Moran Reserve and Elwood Park. The chosen tree, Australian white birch, grows fast and easily, its seasonal behavior (loosing leaves in winter and casting fresh shadows in summer) ensures a dynamic and resilient biotope. More than twenty tons of CO2 are captured yearly by this artificial forest. This synthetic ecosystem serves as well a social purpose, providing a common ground to reinforce public environmental awareness. Trees are aligned in rows NW-SE generating permeability for bay views and winds.

The energy strategy is addressed in a contained scale. Rather than covering the whole site with monumental energy generators the proposal aims to create only three small domed structures (15 meters diameter, 20 meters height), within the scale given by the surrounding trees, organic in appearance and materiality, and exhibiting a complex mix of experimental technologies for energy harvesting and biodiversity enhancement. These three structures provide the perfect scenario to perform special events and participative workshops, transforming the forest in an active and lively research platform.

Lastly, the park and its structures are emphatically connected to the wider-scale, the coastal ecological corridor, through the installation of an elevated pathway: a pedestrian bridge that starts by the Bay Trail, crosses above Jacka Blvd., and travels amid the treetops through the site, weaving together each of the forest glades and interconnecting the different energy structures and public facilities together.

The necessary parking remains covered, supplied with electric charging points and electric bike parking spots, fed by the clean energy harvesters above. All rain water is collected, filtered, stored and reused in this green slab.