**MaxSwell**

1. **Written description (608 words)**

The LAGI 2014 design site is an old landfill located at the north end of Amager Island named Refshaleøen. As a part of Copenhagen harbour, the site used to be home to shipyards. Therefore, water is a significant feature of the landscape of the area. Moreover, being located right in front of the Langelinie Promenade at the other side of the channel, Refshaleøen lays in the background of the Little Mermaid statue. Though it used to be an industrial site, now Refshaleøen has become a home to creative start-ups, small craft facilities, flea markets, leisure and cultural venues.

Our proposition is designed to use the power of the sea to create electricity. As a consequence, different types of devices are implemented through a totally reshaped landscape that becomes an area for leisure.

In the proposed design, the idea is to recreate a “natural” shore landscape made of islands, reef, small cliffs and dunes. The ground level is progressively lowered below the sea level in a smooth slope. The excavated earth is recycled to form six islands and two hills whereas the concrete that fills the former basin is used on the surface allowing salt resistant plants such as lichens to settle. With time the bottom of this recreated shallow marshland will also be covered with vegetation. The islands are connected to the shore with two floating pontoons covered with wood panels. On each island, the pontoon goes through a trench also covered with wood panels and shaped like a boat hull reminding the past functions of the site. Outdoor activities such as strolling, picnicking, sunbathing, climbing will become possible on this site. People will also be able to experience the introspective feelings that come with the fact of being on an island.

Regarding the electricity production, three types of device are implemented in this design. The first one uses wave power and was developed by the University of Uppsala (Sweden). “*A buoy follows the waves’ motions up and down. The buoy's motions are transferred via a rope or cable to the generator's moveable part, which in this case consists of a piston. The piston is equipped with very strong neodymium-iron-boron magnets and induces currents in the stator's windings. In addition, the piston is connected to a spring system, which gives the generator additional power also when the buoy is mowing down a wave.”* In our proposition, the buoys are designed to become a feature of the landscape looking like reeds. Lightning effects from red to green will inform the public on the amount of electricity produced by the reeds.

The second device uses the salinity difference between freshwater and seawater. The harnessing of this osmotic power uses a new technique developed by the team led by physicists at the Institut Lumière Matière in Lyon (CNRS / Université Claude Bernard Lyon 1), in collaboration with the Institut Néel (CNRS) using a membrane pierced with boron nitride nanotubes. The ions displacement from the freshwater tank to the seawater tank through the nanotubes generates an electric current. In our proposition, this specific reaction takes place in the ponds featured on some of the islands as a part of the landscape.

The third system is made of piezoelectric devices located under the pontoons. The electricity is generated from the kinetic energy produced by people strolling on the pontoons. The effect will also be increased by the action of the swell on the floating pontoons.

All the electricity will be collected and stored in a 25 metres high tower located at the end of the south pier. This storage tower will also be an architectural landmark for this whole design and for Refshaleøen.

1. **Technology**

As described in the written description, our proposition uses three types of technology:

* Swell power: buoys motions are transferred to a generator to create an electric current. Aka “The Reeds”
* Osmotic power collected from the displacement of ions from freshwater to seawater through boron nitride nanotubes. Aka “the Ponds”
* Piezoelectric devices located under the floating pontoons. Aka “The pontoons”
1. **Annual production**

|  |  |  |  |
| --- | --- | --- | --- |
| **Technology** | **kWh per Units** | **Number of Units** | **Total Amount** |
| The Reeds | 15 000 kWh/U | 1 422 | 21 330 000 kWh |
| The Ponds | 30 000 kWh/m² | 816 | 24 480 000 kWh |
| The Pontoons | 1 kWh/m² | 1 500 | 1 500 kWh |
| **TOTAL** | **45 811 500 kWh** |

This production is equivalent to the annual consumption of around 6500 households.

1. **Materials**

*Islands*

Excavated earth and concrete: 57 000m3

Backfill: 15 000 m3

*Pontoons* 1 600 m²

1. **Environmental impact (39 words)**

Most of the raw material used in the design can be found on site.

In order to avoid pollution of the channel, the excavating process will require the installation of a steel sheet pile wall to encapsulate the site.