**Santa Monica’s “Energy Wave” - 23072106**

**Abstract**

Visible, physical waves such as those we see when a rock is thrown into water are what many people think about when they first began to think about waves.

Since then, we have discovered that every sound we hear, every photon of light that hits our eyes, the movement of grass blown by the wind and the regular beat of the tides are all examples of waves. They are all around us.

Alike side a rock, the wave of renewable energy was available to us in the beginning only through our senses but we did not know, and we are still yet to discover, its true potential.

The Santa Monica’s “Energy Wave” is the perfect embodiment of that true potential. Providing energy for thousands of households it is also a great reminder that alternative energy sources will soon take over the fossil fuel industry contributing to a healthier planet.

Being a gathering place for the local people and visitors, for recreational and educational purposes it constitutes a significant step towards sustainability while becoming a landmark for Santa Monica.

Making use of the latest technologies available informs people of our current knowledge in the renewable energy sector. Wave energy converters (Wave Rollers) cover the surface of the seabed beneath the area, whilst concentrated solar power panels (CSP Fresnel) form a highly productive energy creating layer.

**Design and materials**

The design makes use of the most available space according to the Location Plan. The width is slightly smaller than the maximum potential in order to avoid building on the mountain of rocks situated on the seabed.

The pier decking beneath your feet continues up becoming the wave structure, giving the realistic feeling of standing on a wave. The curved structure is achieved by bended aluminum battens reinforced with steel at the core. The design is optimized in such a systematic way that the same bends are used multiple times, making the production of the elements more efficient.

Aluminum is one of the more durable materials as decking. Compared to wood it can withstand direct sunlight, rain and snow much better, it will not expand or contract and it does not need regular treating, All of the above and being 100% recyclable makes Aluminum the reasonable choice for an off-shore construction.

**Technology description and environmental impact**

**Wave energy converter (Wave Roller)**

Wave roller is a proven and patented product for the generation of electricity from near-shore wave movements. The device is installed under water to a depth ranging from 8 to 23 meters, where the movement of the waves is stronger.

The panel spans almost the entire depth of the water column from the seabed without breaking the surface. This ensures that the panel does not protrude into the seascape and avoids creating unnecessary materials that would put an additional load on the structure.

As the panel moves absorbs energy from ocean waves. All elements of the hydraulic circuit are within a watertight structure inside the device and are not exposed to the marine environment. Therefore there is no risk of leakage into the ocean. The technology does not affect the natural movement of water or sea fauna.

One of the unique characteristic of the Wave Roller is the operation and maintenance concept. The Wave Roller devices have large ballast tanks that are filled with air, so they can float to their places of deployment. These tanks can be filled with water to submerge the unit. While the power converter remains fully submerged during an operation, it can easily be refloated to the surface for maintenance emptying ballast tanks.

A height of 10 m below the pier ensures enough space for maneuverability and maintenance purpose below the deck. The placement of the rollers between the piers defines a minimum distance between them of 10-20 meters.

The potential of the Wave Roller according to weather conditions in Santa Monica per unit are cca. 73000 kWh/y. A total potential of 8700 MWh/y is available from 120 units.

**Compact Linear Fresnel Reflector (CLFR)**

Concentrated solar power solutions use lenses or mirrors to direct a large area of sunlight onto a small surface. The production of mirrors when compared to PV cells is less energy-intensive and more environmentally friendly. Compact Linear Fresnel Reflector (CLFR) technology is a form of CSP that is valued for its simple, robust design.

It uses modular, flat mirrors to focus the sun's heat onto long, elevated "receivers," which consist of a system of boiler tubes through which water flows. The concentrated sunlight boils the water in the tubes, generating saturated and superheated solar steam for use in power generation and industrial steam applications, thereby generating electricity.

The energy production of CSP plants based on linear Fresnel collectors is about 1700 kWh/m2y per m2 of occupied land with storage capacities in the range of 4-12 hours. An outstanding potential of 85000 MWh/y is available from 50000 m2 of collectors.