**A FIELD IN MOTION**

Sculpted by the sea breeze, waves are tirelessly reaching the coast and spreading their energy on the shore. Sculpted by the moon, tides are a manifestation of the planets rotations. Their movements are an energy demonstration. This artificial landscape comes upon the sea to catch its energy and bring people closer to the process. As an interface between two worlds, the kinetic installation incorporates natural forces and human activities together. The infinite renewable energy of water motion links poetry to the subtle power of celestial mechanics.

Placed as an extension of the Santa Monica’s Pier, the field in motion is a park raised on stilts, a playful area where pleasure and awareness meet each other. People are offered to delight in leisure activities while experiencing a totally new kind of public space and enhancing their knowledge on renewable energies.

This landscape is modulated so to propose spaces with climatic variations. The composition and density of columns follow the wind direction and sun path in order to suggest sunny or shaded, hot or cool, windy or quiet areas. Then leisure, sport, solitary or family activities are projected on the landscape to offer social and cultural appropriation of the public space. As the artwork is accessible from the pier, distances are significant. Statics activities are situated closer to the pier than sportive ones. These mappings overlap and intersect each other on a topographic platform which reinforces areas by creating flat walking paths, an amphitheater dedicated to social or cultural events, hills where you can rest, allow yourself to daydreams and contemplations, basins for skating or biking, and technological areas where you can come closer to observe how the system works. While rising and ebbing, tides are covering or revealing this landscape, changing the atmosphere. When the tide is low, the entirety of the surface is accessible and sport areas emerge. When the tide is high, the half of the surface is under the water. However, all paths stay dry and accessible.

The roof is not imitating waves in an only aesthetical way, but transmitting their motion instantaneously. The emphasis of the movement shows to people the amount of energy involved in the process. By night, a negligible part of the produced electricity is used to enlight the project with led lights on the top of rods, shining in a different intensity according to the waves. The datavisualisation is the contemporary language which link collective knowledge to the field of sciences. Therefore, working as a showcase of the used technology, the roof merges technical and aesthetical qualities. By making visible the invisible, the artwork is raising our awareness about renewable energies.

**DIMENSIONS**

The whole surface of the field extends within the dimensions of the boundary site. The area is 115 000 m² while low tide, reducing to 50 000 m² while high tide. The fundamental strategy is to highlight the horizontality in the perception of a coastline landscape. The topographic platform is connected to the Pier at its elevation and slowly reaches the sea level, taking in consideration the breakwater volume. The roof level varies following the tide.

**MATERIALS**

The structure is a wire mesh in galvanized steel covered by perforated sheets. To prevent from heat (due to the sun radiations), brightness, corrosion from saltwater, the steel is zinc-plated with epoxy coating. Grip coating is added as strips on every slippery surfaces.

The structure of columns are in steel too, filled by copper coil which are producing electricity. A frosted glass protection is surrounding the coil to protect the visitors while keeping the color quality of the copper.

The roof textile is made with a porous weaving. In this way, the wind can more easily pass through and not exert its pulling force. It also filters the sun and provides shadows. The lightness of this solution allows even some transformation in time, according to a cultural event or specific weather, parts or totality can be removed.

**RENEWABLE ENERGY**

Waves are oscillations travelling through a medium, transferring energies from one region to another without moving the medium itself. The energy is contained by the movement, not by the matter, which make it an endless resource. Waves provide a constant supply of power to the Santa Monica’s bay.

The columns are linear coil generators. An up and down movement from a permanent magnet produces varying magnetic field which generates a voltage in the copper wire by induction. One linear coil generator module is 1.5 meters high which is the average of waves oscillations. One column is made from five to eight modules and linked to one buoy.

The system consists of a magnet hanged to a metallic rod which is then directly coupled to the buoy. The whole object is moving up and down following the waves rhythm and heights. The magnet is moving up and down within the coil, producing electricity. Between the magnet and the rod is a rubber membrane. This element allows the magnet to hold on its own weight, to stay fixed on the rod at one point. The system becomes more sophisticated when it needs to follow the tide. This natural event does not change the amplitude of waves but their global elevation. In order to stay within the coil area, to keep producing electricity, the magnet will be shifted along the rod - using the property of rubber - while tide will be rising or ebbing.

The power of one coil module is73,2W, the whole project content 4683 coil modules (spread on 627 columns) which means a global power of 342 800W. Therefore, the Copper Field can produce 770 880 MWh a year.

The cost of the project is around $100 million, included $10 million of linear generators. In comparison with a wind turbine of 5kW ($3,400,000), for the same electricity production, it would still cost less money and take ten times less space.

**ENVIRONMENTAL IMPACT**

The structure sustaining the artificial landscape remains the one of the existing pier : a rhythm of columns fixed into the ground. These silts are supporting both the technological devices and the public space. It does impact the faunal community through changes in chemical compositions, water velocity but these modifications does not spoil the aquatic life. As we can see with the Pier, columns can host abundant species, it increases habitat complexity, fishes, plankton and microorganisms can pass through this open area.

The metallic structure and coils can be built from recycled materials. The copper can be infinitely recycled without losing its performance.

The installation using the movement as renewable energy does not consume any resource material or produce wastes.

The emitted sound by the system will not be heard as it is lower than the ocean background noise.

Other similar technical innovations are developed nowadays and supplied by ecological studies on artificial reefs. The result of these studies are positive and encouraging. As an example, we can refer to the project *Seabased* in cooperation with the *Ecology and Evolution department of Uppsala University[[1]](#footnote-1)*.

1. <http://seabased.com/>, consulted on February 2016. [↑](#footnote-ref-1)