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***"never can the innate power of a work be hidden or locked away.......it can be forbidden and rejected but the elemental will always prevail over the ephemeral."***

The ephemeral machine is at the same time a dense energy installation, and a landscape element that sets two major references with the surrounding site. The first pays tribute to the history of the site considered as an icon of Danish ship industry after that Burmeister & Wain established a major shipyard in 1871. The second one is the recognition of the present day landscape of a flat harbor punctuated by a series of marking vertical elements: chimneys, cranes, silos and antennas. So, the project ideally mixes the image of the steams engines produced by B&W (characterized by massive volumes with pistons moving vertically) with the vertical elements of the site to give birth to an evocative ephemeral machine.

Movement, and the energy produced by it, are the substantial elements of this installation while the form and the materials of its components are nothing more than ephemeral temporary conditions. In fact this 120m high massive installation occupies the sea portion in front of the former shipyard and it is composed more than 550 vertical elements. Each element is divided into an underwater structure leaned onto the sea floor, a floating buoy-like raft and a transparent vertical helium balloon connected by a steel wire to the raft. The whole is in an unsteady balance to be easily set in movement by the waves and the movements of the balloons. So the breezes and the waves create a continuous gentle movement source of the energy of the installation. Moreover the rafts are accessible by visitors contributing to the production of movement and energy.

From a landscape point of view the project creates a massive dense volume (hinting to the shape of engines but also to the voluminous encumbrance of present day cargos and sea liners) but it dematerialize it thanks to the lightness and transparency of the balloons the only visible elements from urban-scale distances. As the site sits in front of one of the most famous symbols of Copenhagen, the little Mermaid, the installation set a dialogue with it through a series of ephemeral and oniric scenarios both in day and night time. Like the Mermaid, the installation is partly below water and partly above it and this hybrid state is shown by its continuous movement.

We decided not to use the entire site but a portion of it only. The area that the machine occupies is the sea zone in front of the shipyard and we want to talk about density in terms of power production. In fact, this marine portion has a surface of 10000 m2 and as the machine can reach 1000 Mwh/year which means that it can provide an energy density of 100 Kwh/year/m².

The machine sits on a the sea floor thanks to an extremely regular grid made out of recycled steel beams. This grid collects the energy coming from the cylindrical piston chambers below the rafts and send it to the generator and the battery units besides the machine at an underwater level. To reduce the impact to the marine environment the grid will not have foundations and it will simply lean onto the sea floor as it is conceived to be function as a stabilizing mass.

Rafts are composed by a recycled steel core and by a recycled reinforced fiber glass shell. The steel core is a supporting platform connected to the piston and it is designed to transfer each movement of the raft to the piston. The shells are made out of recycled reinforced fiber glass and they are interconnected by small passages. This because all together they form a sort of big flexible swinging carpet accessible by visitors. At the center of this big carpet four panoramic platforms (sort of panoramic slow elevators) traverse the balloon portion of the machine to reach the height of 120 m becoming four extraordinary points to look at the sea, the harbor and the city of Copenhagen. These are the only elements that utilize electrical power and they will move inside the transparent portion of the machine like pistons. They allow visitors to have a more direct and funny experience of the machine and beautiful views of the of the surrounding environment, but since they consume energy visitors, that can access the raft carpet for free, will have to pay a ticket. This concept is not developed here, but it can be easily realized. The shipyard will have only outlined passages leading to the machine. We wanted to leave this space completely empty as the machine can become an attractor of big events (concerts, fairs and exhibitions). In fact more people will come to the site more energy the machine will produce. Access to it will be, in any case, regulated for security reasons.

Concerning the production of energy the ephemeral machine utilizes existing technologies. For the buoy-like rafts we used as references the products of Ocean Products Technologies (OPT) that is a leading renewable energy company specializing in cost-effective, advanced, and environmentally sound wave power technology, and particularly the APB 350 Autonomous Power Buoy a patented platform we took as starting poiut for our design. We involved OPT in our early stage design and they told us that this system can produce 7,2 KWh/day.

So, we took as conservative estimation for ours buoy-like rafts, an average value of 5.0 Kwh/day considering also the movements triggered by the balloons and the visitors. Since the machine is composed by 500 rafts this means that it can reach the average of 2.5 Mwh/day which makes a possible annual production of roughly 900 Mwh. Moreover, the ballons produce energy as well. In fact shaped like capsules they have two semi-spherical caps. The upper one will be covered with semitransparent photovoltaic cells, so that the whole can produce 150 Mwh/ year. Therefore, the machine can have an overall production of more than 1000 MWh/year. The ballons and the rafts are conceived to counterbalance each other in order to increase soft an gentle movements.

Finally, we wanted this machine to consume the minimum of energy possible. Bioluminescent bacteria could be “hosted in a cavity inside the ballons to provide a low-energy means to lit them during night time. More specifically, the Photobacterium phosphoreum emits the brightest light of all bioluminescent bacteria. It is normally found in fish, squid, and octopus that live in the deep depths of the ocean. It has a very promising future in research and technology especially since it has no known pathogenic activity and is not known to cause disease in humans, plants, or animals. So it is possible to envisage the fact to recreate in the cavity of the balloon the same conditions that these bacteria find in the guts of squids and fishes. Of course this is a kind of theoretical approach to be proved, and more probably the machine would be lit by projectors in present day reality.

Nonetheless we propose it because the idea of providing biological source of energy complies with the overall design of a project aiming at minimizing its impact into the surrounding environment. In fact despite its height the machine will have no foundations perforating the site. It adopts only recycled/recyclables materials in a modular design. The transparency is a key factor to integrate the machine with beautiful landscape of Copenhagen and finally biomimicry strategies could be adopted to reduce energy consumption and CO2 emissions.