Flying nocturne

At the end of route 66, the Flying Nocturne extends the journey beyond the Santa Monica Pier further into the sea, guide the memory along route 66 to the Pacific Ocean, leap, fly and merge into the history. It is sculptured as giant waves lifted and staggered from the sea level, strong, elegant and dynamic. Other than shape, there are more reasons that make the Flying Nocturne dynamic. It is an integrated installation that harness solar, wave and wind energy to generate electricity and produce pure water. It makes itself an adaptive and versatile habitat for various marine lives as well as an inviting attraction for visitors to experience a lot. Why is it “Nocturne”? That because after sunset, music and joy are really going to fly out from the installation.

Power generation and water production

The installation is constructed on a Hyperbolic paraboloid structure, which gives the strength and durability that necessary for surviving in harsh coastal environment. At the bottom of the installation, there are hundreds of oscillating water pumps that driven by waves keep pumping filtered sea water up to the top and stored in sea water tank. The top of the installation is covered by Combined Heat and Power (CHP) system which is built by solar panels and insulating glass. The space between solar panels and insulating glass works as evaporation chamber. The sea water from the tank flow through the long chamber, be heated by solar panel and evaporate. The steam flow into condensation chamber and turn to liquid pure water. The condensation chamber is around the sea water tank to transfer the heat from steam to the sea water, it also store the pure water for drinking or delivering. Along with the water production, solar panels generate electricity, while the sea water in the tank that exceeds the capacity of evaporation chamber flow down through turbine generator to generate electricity. The installation is equipped with two high altitude kite wind power generator systems. Beside power generation, the kite generators are the “wings” that makes the Flying Nocturne “fly”.

According to the research, around Santa Monica area, yearly, the average solar energy density is 5.63kwh/m2/day, average wave energy density is 3.1kw/m, and average surface wind speed is 3.2m/s. Assume the overall CHP system efficiency is 70% (20% solar energy for electricity, 50% solar energy for heat), the overall wave energy efficiency is 25% (90% of harnessed energy for electricity, 10% for sea water desalination and other usage), each wind generator capacity at the local wind condition is 172.8kw. The total yearly electricity production is 6.27x107kwh, which can meet about 9000 California households’ yearly consumption. The total pure water production is 2.82x105m3, which meet 1700 Santa Monica residents’ yearly consumption.

Entertainment and activities

The Hyperbolic paraboloid structure, which is overall a wave shape, divided the Flying Nocturne into two levels. A tunnel connects the installation with the Santa Monica Pier. Visitors can take commuter or walk through the tunnel to access the installation. During low tide, visitors may use the walk way built on the top of the tunnel that go through entire artificial intertidal zone to enjoy the harmony with the marine lives. Once reach the installation, there are various interesting things on the upper level to do. Visitors can enjoy the beautiful viewing from different locations, go through exhibitions at three halls, learning sea water desalination process and kite generators, fishing , and most excitingly, the live concert in the open theater after sunset. Without disturbing the tourists, the maintenance staff can work on the lower level where most of the critical system of the installation are located whenever needed. With the drive way and boat dock at the same level, makes it easy to transport equipment and parts. It also ensures that the whole installation can be quickly evacuated In state of emergency. The theater can seat about 1000 visitors. Together with 3 exhibition hall, it can be reasonably estimate that the installation can attract 2000 visitors a day.

Environment impact and Ecosystem lab

An installation at this scale will inevitably make noticeable impacts on local environment and ecosystem. The Flying Nocturne would change the lighting condition, wave strength and some marine lives travel route in Santa Monica Pier area. Some spots would see changes of salinity level, water temperature and oxygen level.

Instead of finding remedy to ease the impact, the concept of Flying Nocturne is to make use of the impacts in a positive way by making an ecosystem lab for experiment and learn. The installation creates a horizontal intertidal zone on top of the tunnel and a vertical intertidal zone by the side of an existing water break. Those artificial intertidal zones provide potential habitats for various invertebrates and fishes, and further provide food for other marine lives. Additionally, the high salinity water as product of sea water desalination is rich in nutrient, which can be blended with untreated sea water and air to form a designed solution and discharge to certain area to change the salinity, temperature, oxygen and nutrient level. Together with artificial light and other human intervenes; the researchers are provided essential materials and tools to quickly design an artificial habitat for nurturing an ecosystem or adjust the habitat if something is wrong. The dynamic changes within the ecosystem lab also enable researchers to utilize advanced computer technology such as data mining and analysis to speed up the process to find out how to develop ecosystem that human and coastal species can coexist.