**PILE POWER**

**THE IDEA**

The Santa Monica Pier provides abundant recreation and entertainment features that sit atop a wonderful hidden world of power – ocean waves. As a metaphorical gesture, our proposal **flips the pier** to expose and capture wave energy. At the same time this exposure offered the opportunity to also capture wind energy. The strategy of flipping reverses the traditional pier structure – boardwalk, joist supports, pile supports – and utilizes these structures as productive energy capturing devices – **Pile Power**.

**COMPONENTS**

**Wind Energy Piles:**

The attachment and growth of barnacles to a wooden pile provided the conceptual beginning for the overall sculptural form of the wind energy piles. These traditional pier support piles are transformed into sculptural Wind Energy Piles that are designed to capture wind energy. The wind energy piles rise from the ocean to form a splash of playful geometric forms, which are designed to funnel wind through the top intake down into the wind turbine chambers.

The piles rise 39.5-meters (130 feet) from the ocean surface, high tide level, and are moored to the ocean floor. Within the shaft of the piles are a series of internal turbines that speed up the airflow to create maximum usable energy. Near the bottom of each pile are diffusers that slow the wind as it is exhausted back into the atmosphere. The Wind Energy Pile system design can be expanded to generate more energy as needed over time.

**Oscillating Wave Surge Energy Converters:**

A grid of Oscillating Wave Surge Converters is situated between each of the wind energy piles moored to the ocean floor. The energy generated by the wave action is intensified by their proximity to the existing breakwater and the wind exhaust generated by the wind energy piles.

**Power Converter Sub Station**:

A boat docking platform for maintenance crews and the visiting public is located at one end of the energy pile field. The circular form of the boat docking platform is an echo of and in unison with the circular grid of pile stabilizers that support each energy pile. One totally enclosed Energy Pile is located at the docking station, acting as the hydroelectric turbine and transformer point for all energy from the wind/wave energy system before transmitting energy to the land-based Santa Monica energy grid.

**PUBLIC ACCESSIBILITY**

The Pile Power grid system and Power Converter Station is located just beyond the existing breakwater and is only accessible to the public by boat system, which is designed to ferry passengers from the Santa Monica Pier to the Power Station for interpretative tours. The

entire energy generating system is designed as a cohesive sculptural field within the ocean that can be seen from the Santa Monica Pier and shoreline as well as offshore ocean vantage points.

**ENVIRONMENTAL IMPACT and SYSTEM STATISTICS**

The proposal utilizes renewable resources of wave and wind energy to facilitate a combined flow of energy that has no adverse environment impacts. Two major components are employed:

Wind Energy Piles (WEP)

The piles are designed with omnidirectional wind intake collectors at the top of the pile that are 17-meters in diameter (56 feet) and lined with pleats for wind flow intake. The base column is 17.3- meters high (57 feet) and contains the interior wind channel that tapers to accelerate wind velocity and reduce wind pressure. This Venturi affect assist in enhancing the output capacity of three stacked internal wind turbines. The bottom of each pile base is outfitted with outtake pleats, which also includes diffusers to slow the wind as it exits

each pile.

Each WEP is secured to the ocean floor with a cable mooring system connected to a buoy base that also acts as the distribution point and link to the power cable system. The buoy base is connected to a field of circular pile stabilizers (29-meters in diameter – 95 feet) just below the surface of the water, ensuring that each wind energy pile remains upright and secured. A single WEP Unit can potentially generate three times the amount of a single traditional wind turbine, using lower wind speeds, shorter towers and smaller turbine diameters.

Oscillating Wave Energy Converters (OWEC)

A linear system of visually connected OWEC are positioned within the 29- meter circular pile stabilizers. This system of wave energy flap structure meets the requirement for nearshore placement within the established 10-meter water depth near the existing breakwater. Each OWEC oscillates with the wave movement to create highly pressurized water hydraulic energy using cylinders mounted between the flap structure at the base of the OWEC.

Like the wind energy piles, the highly pressurized water hydraulic energy is directed to a hydroelectric turbine located within an enclosed Pile located on the service/visitors platform. A series of controllers, monitors and transformers assist with the final linkage to the land based power grid for both the WEC and the OWEC generated energy.