**cascade**

**Concept Statement**

When I think about going to the beach, the first thing that comes to mind are the waves. I could stare at them for hours, watching them slowly build up height at a distance, and then as they get closer and taller they finally crash over themselves and then quickly recede away again. They come and go and come and go again, one after the other. After one wave has passed, I know that there will always be another one to come. They are reliable. They are constant. And on top of all of that, they are absolutely majestic.

My installation is an oversized sculptural wave that functions to create energy using actual wave power. Water is pumped up to the top of the large first “wave” using a pump that harnesses the up and down movement of the ocean water. Once at the top of the “wave”, the water cascades down through the air until it falls onto the second “wave”. The so-called waterfall continues as the water then falls onto the third “wave” and finally onto the water turbine. This turbine spins with the weight of the water, which generates energy to be connected to the larger power grid.

As seen from afar, such as on the pier or from the beach, the sculpture appears as a magnificent rolling wave on the horizon.

**Technology**

There are two types of technology used in this project: a wave powered pump and a large scale water turbine. The tidal pump will be located at the base of the sculpture, to the southwest. It works like a bicycle tire pump. There are two buoys connected together vertically by a piston. The bottom buoy is secured to the ocean floor and the top buoy sits on the surface of the water, rising up and down to the movement of the waves. The buoyancy and gravity energy pump the water upward.

The second form of technology in this system is the large water turbine that turns from the falling water. The spinning of the turbine produces energy which is then stored in a generator. The energy eventually makes its way through the transformer and to the power lines. The generator and transformer will be placed in protective housing and placed beneath the surface of the water on the breakwater.

When used together, these two forms of technology create a complete renewable energy system that is currently being explored and developed in various parts of the world. The idea is that wave powered pumps would push water up to an elevated reservoir, thus increasing its potential energy. From there, water is released back down towards the sea at a controlled rate, passing through a water turbine on its journey down. The turbine creates power which is then directed to the larger power grid.

My project is intended to serve as an educational tool for the public to learn about this new form of clean, renewable energy. An informational board will also be installed on the edge of the pier for people to learn about this process and then visualize it through the art installation.

**Energy Generated**

This art installation can generate an estimated 50,000 kilowatt hours annually. This number was approximated by considering the average height of the falling water (12 meters), the width of the falling water (5 meters), and the flow of water (56 liters per second). It should be understood that this is a very rough estimation.

**Dimensions**

This project is no small wave. In fact, it is about 45 meters tall. Overall, it is 125 meters long and 160 meters wide. The large first “wave” is 45 meters tall x 105 meters long x 138 meters wide. The second “wave” is 28 meters tall x 61 meters long x 77 meters wide. The smallest inner “wave” is 15 meters tall x 31 meters long x 42 meters wide.

**Materials**

Each “wave” of the installation will have a concrete core at the base. The concrete will also continue down into the water as concrete pilings that secure into the ocean floor, serving as a solid foundation for the structure. Connected to the top part of the concrete core will be a large stainless steel pin. This pin will act as a joint for the structure to bend down slightly due to the weight of the water at the top. Stainless steel sheets will connect to this pin from above. Stainless steel was chosen in order to avoid rust over time. The steel will be painted white using a heavy duty, eco-friendly paint so that the sculpture will stand out from the blue water.

Both the water powered pump and the water turbine will be made of stainless steel in order to avoid corrosion. The housing for the generator and the transformer will also be made of stainless steel in order to protect these essential components of the system.

As an additional water protection, a flexible polyurethane coating will be applied to all surfaces. This coating is completely water proof and is even resistant to salt water. It is extremely tough and will protect against the harmful effects of the abrasive force of the falling water.

**Environmental Impact**

It is a goal of this project to minimize environmental impacts on the site, including effects on the water quality and the local marine life. The concrete pilings are resistant to decay and have very little effect on water quality once hardened. It is important that the piles are allowed to cure for at least 30 days prior to placement in the water in order to ensure that the water does not develop high pH levels.

In addition, the stainless steel is a good choice for the environment because it is 100% recyclable. Also, as a material used commonly in drinking systems, it helps keep water clean and quality standards high. Extra attention must be made to reduce environmental impacts during the manufacturing stages.

The paint and water sealant coating are environmentally friendly as well. They are low in volatile organic compounds (VOC’s), which contribute to air pollution in California. The paint selected will also use zinc oxide as the fungicide in order to reduce air contaminants.