



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Malena M. Clark	Project Number J0204
Project Title The Effects of Different Swell Generator Designs under Different Ocean Conditions on the Amount of Energy Generated	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My project was to design an environmentally safe way to generate energy from ocean swell. I simulated different waves heights with different speeds on my Swell Generators at home and in the ocean to test how different swells push air through tubes into an electric turbine.</p> <p>Methods/Materials Two 3 inch diameter 10 ft. PVC pipes with end caps with 3/4 in hose were attached to the voltage generator. A voltmeter connected to the generator measured current generated when air turned the turbine. To simulate various wave conditions I constructed 4 inch diameter tubes filled with water. The 3 inch tubes travelled down simulating a swell. I dropped the tubes into the water tubes at different speeds and heights individually and simultaneously; at different speeds, mimicking calm, moderate, and stormy days. The tubes were also attached at the Santa Cruz city wharf to test the generator under natural conditions.</p> <p>Results Wave Height: My data show that bigger swells generate more energy. When I simulated one-meter waves no voltage was generated. When I simulated a two-meter wave with two pounds of weight (slow waves) I generated 18 millivolts (mv) and 55mv for 2.5m waves and 167mv and 235mv for faster waves. With large waves (2 and 2.5m) I generated 98 and 330mv using two tubes. Increasing the speed of the wave (4lb weights) generated 81mv for 1m, 600mv for 2m, and 624mv for 2.5m waves. Waves run sequentially generated 0mv for 1m, 19mv for 2m and 74mv for 2.5m waves. Wave Speed: By changing the speed of the wave (the force) I generated more energy per swell. A 2.5m wave generated 55mv at slow speed and 235mv at high speed, suggesting stronger/faster waves generate more energy. Comparison of Generator Designs: I hypothesized that tubes run sequentially would generate more volts. My results show both tubes generated more energy at the same time.</p> <p>Conclusions/Discussion My results show that if the swell is large enough I can collect energy using my swell generators. I also learned that if the Swell Generator Tubes were aligned perpendicular to the swell I would collect more energy. We have to find new and improved ways to collect energy without burning fossil fuels that emit CO2 and contribute to global warming. There are other ways to generate energy from the ocean, but I suggest that it is better to place generators on structures that are already there, like wharfs, instead of making new impacts to the ocean floor.</p>	
Summary Statement The purpose of my project was to design an environmentally safe way to generate energy from an ocean swell.	
Help Received My father helped set up tubes	