



# CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

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<b>Project Title</b> Gravity Wheel Electric Generator: Harnessing Free Energy from Ocean Waves	
<b>Objectives/Goals</b> The world is currently heavily dependent on fossil fuels for power generation, which has negative impacts on the environment. Our project objective is to design and build a functioning scale model of a buoy that generates electricity through the motion of ocean waves. Our design, if successful, will help to contribute to a greener environment. <b>Abstract</b> <b>Methods/Materials</b> Our design concept is based on the principle of electromagnetic induction. By converting the kinetic energy of ocean waves into motions that cause multiple strong magnets to move through copper coils as well as rotating a DC motor, we can generate a constant source of electricity. The design will be in the form of a buoy that, in real world, application, will be anchored to the ocean floor along the shore. Our prototype will be a small scale model made with easily available components. We expect the prototype to generate a minimum of 1.5 Watts of energy output with moderate wave motions. Since we cannot test out design in an actual ocean environment, the results will be based on simulated motions of ocean waves. As for our materials, we used a stopwatch, various plastic components, rectifiers, capacitor, magnets, digital multimeter, and various power tools. We tested our prototype by measuring voltage over time through hand-simulated motions. Multiple design revisions and improvements were done throughout testing. <b>Results</b> The finished prototype was able to generate electricity, however, not the the level we had originally expected. It generates enough power to drive multiple LEDs through continuous simulated motions. It was tested to generate about 0.18 Watts of power, which is way below our design goal of 1.5 Watts. This is due to the limited output of the DC motor. To improve this, a more efficient DC motor can be used to achieve a higher amount of output power. Our design shows that it is possible to harvest electricity from ocean waves through the use of electromagnetic induction. <b>Conclusions/Discussion</b> From our experiment, we can conclude that our design works as expected. With improved mechanical and electrical designs, a significantly larger buoy can definitely generate more power. The power multiplies with the deploying of more buoys along the shore. Through this project, we learned the valuable experiences in applying the theory of physics to real life applications that can help to improve our environment.	
<b>Summary Statement</b> We created a working prototype that converts mechanical movement from ocean waves into electricity via electromagnetic induction.	
<b>Help Received</b> We built, designed, and tested the prototypes ourselves. A parent assisted us in using power tools.	