



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Luca Younes	Project Number J0217
Project Title Wave Energy Optimization	
<p style="text-align: center;">Abstract</p> <p>Objectives The goal of this project is to determine what mechanisms work best for capturing energy from certain wave shapes, sizes, and speeds. This is important because wave energy could be a significant source of renewable power; there are 620,000 km of coastline on Earth. Most previous research provides information on size, aesthetics, or efficiency of a method. What has been missing is situational efficiency information. I hope to fill in some of these gaps with my data.</p> <p>Methods I performed a series of constructive tests. I analyzed data from some initial tests, then I ran more tests to verify my preliminary conclusions. I built a wave tank, using an Arduino microprocessor to create different wave types/patterns. I also built two different wave energy capture mechanisms: - Pulley Apparatus: Uses the up and down motion of the waves with a buoy to move a dynamo. - Bar Apparatus: Uses a rotating paddle and the linear motion of the waves to generate electricity.</p> <p>Results I collected a total of 10,158 data points for the series of 6 tests that I ran. Analyzing the results led me to believe that the pulley apparatus performs better with most wave types and sizes. In my final set of tests, I used my intermediate results to design a condition that would allow me to verify my initial ideas. I found that the pulley apparatus does better on three quarters of the tests, but when the bar apparatus does do better, it is significant.</p> <p>Conclusions In this project I looked into two different ways of capturing wave energy. I proved with my data that the pulley apparatus is better overall, but that the bar apparatus is better for more balanced waves. This is the exact data that I can't find online because most articles say the bar apparatus is better. But they fail to realize that for more balanced waves the pulley apparatus is better. Therefore, this project has done something useful!</p>	
Summary Statement The goal of this project is to determine what it takes to capture wave energy and what types of models work best for converting energy from certain wave shapes, sizes, and speeds to electricity.	
Help Received I discussed the project with my parents, and they helped me purchase some of the materials.	