

2008 TAIWAN INTERNATIONAL SCIENCE FAIR

CATEGORY : Engineering

PROJECT : Viable Energy From Ocean Waves

AWARDS : Engineering Third Award

SCHOOL : Northcliff High School

FINALISTS : Mathew Robert Bray

COUNTRY : South Africa

Abstract of exhibit
Taiwan International Science Fair

Category: Engineering

Title: Viable Energy From Ocean Waves

Name: Matthew Bray

Country: South Africa

School: Northcliff High School

(a) Purpose of Research

To investigate the wave conditions offshore along the South African coast to determine wave heights, intervals, and patterns. These results have demonstrated the power potential of ocean waves and identified sites for offshore power stations. The waves off of the South African coast are the most viable, as they have wave heights of between 2.7m (9ft) and 14.6m (48ft).

It is also to assist in the development of my power station design, through research into offshore wave composition, principles, periods and characteristics.

(b) Procedures

I have used various calculations including the surface pressure of salt water per square meter to calculate the potential power produced by a buoy. These figures have been expressed in Kilowatt Hours, and are then able to be divided by the known consumption of a single USA household in 1 year. A figure of the amount of households that can be supplied by a single generator will then be reached. An approximate power output for a single buoy is between 200 and 300 homes per year (Dependant on wave height)

A concept for a maintenance free electrical generator suitable for marine use has been investigated. The design will be made as:

- A working demonstration model capable of producing electricity, which consists of a Rotary Induction Generator,
- a scale model to show the appearance of one such generator &
- A large scale model to show how generators can be congregated to form a power station offshore.

(c) Data

Utilising the calculations of potential power output and the wave data, the financial viability of the generator has been calculated, in relation to current fossil fuel power stations, down to a cost per Kilowatt.

Wave data from international marine monitoring websites that provide real time wave condition graphs, have been tracked by myself daily for over 1 month and recorded to provide a large data resource. This provides wave heights of multiple weather systems as well as averages.

Costs have been investigated from Internet sources for electrical integration to the national power grid, as well as the generator manufacture. These are estimates, as the exact specifications of my device cannot be finalised without further prototypical research.

(d) Conclusion

With conclusions reached by thorough research into wave dynamics, weather patterns and their effects on wave heights, Rotary induction power generation and costs related to multiple power systems, I intend to demonstrate fully to the International Electrical Producers, that coal fired power plants are more costly and environmentally damaging than my revolutionary concept for a truly economically viable, ocean based generator system.

By Matthew Bray, Northcliff High School, South Africa. (Age 14)

評語

本作品是一件工程模型的建構研究，透過學理的計算，足以證明其功效及可行性，是件好作品。如能有微型實物，將更具完整。