



2010

MASSACHUSETTS CLEAN TECHNOLOGY AWARDS

A Program from The Foresight Project Inc; www.theforesightproject.org



Region III: Southwestern
Massachusetts

Paul C. Matthews: New
England Christian Academy,
Swansea

Clean Tech: *Wind Generation
of Electricity*

About Me:

My name is Paul Matthews. I am 13 years old and I am a seventh grader at New England Christian Academy. My dad is a Naval Officer and we have lived in several states. I moved here in August with my mom and dad, two brothers and one sister. I have three pet lizards. I am working on my First Class rank in Boy Scouts and enjoy lacrosse, basketball, swimming, fishing and camping in my free time. I also volunteer for Potter League, a local animal shelter as a dog walker. I chose my project on wind turbines because I am interested in alternative energy solutions for our community.

My Project:

The purpose of my science project was to compare generation of electricity by two different types of wind turbines. These are the Savonius, and the six-bladed wind turbine. My hypothesis was that some types of wind turbines generate more electricity than others.

I made two different types of wind turbines. Both the Savonius and the six-bladed turbines are vertical axis turbines. The six-bladed turbine has six blades (made of plastic cups). The Savonius is made out of soda bottles and has greater surface area. Each turbine was hooked up to a light emitting diode and a voltage meter. Using a hair dryer, I blew warm air across the turbines and measured the amount of electricity generated. I did this for 5 trials per turbine type. The results proved that some wind turbines generate more electricity than others. The six-bladed fan turbines produced almost triple the amount of electricity than the Savonius.

Project Background:

Wind energy is considered a viable alternative energy source for the future. Wind energy is important for a great number of reasons. Among the basic human goals are the want for plentiful energy and demand for a clean and safe environment, so the total energy use will continue to grow at a great rate than the population grows. The increase in need for energy may not be able to be met if the population continues to increase as it has in the past. Since the industrial revolution in the late eighteen hundreds, the world



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has primarily depended on fuels from fossil materials retrieved from the earth's crust. (Kruger, 2006) We need to find other sources of energy, including wind power to meet the world's needs.

There are many alternative fuel options. Some examples are: water power, nuclear power, wood, solar, wind, tidal, chemical and geothermal. The most widely used source of renewable energy currently is hydroelectricity. Nuclear energy is fourteen percent of the world's energy. Wood power is most commonly used for wood burning fireplaces. Geothermal power is power extracted from heat from the earth's crust. Tidal power is not yet widely used. Solar power is the generation of electricity from sunlight. An example of chemical power is the electrical energy stored in batteries.

Wind energy does not have any cost other than what you use to harness it. There are different types of wind energy easily available all around the world. A few of these types of wind power are circulation, circulation of the atmosphere, wind over land areas, local wind (based on topography based on local differences in temperature) and air mass winds. Wind energy can be converted into electrical energy that can be stored for use when the wind is not blowing.

There are many different types of wind turbines. On vertical-axis machines the rotor runs contrary for half of the revolution. The "wind turbines in series" main propeller carries miniature windmills on each blade that drive the generators directly. The "depression" wind turbine has propellers with hollow blades that act as a suction pump to suck in air directly through the turbine (Simmons, 1975).

There are some problems with wind power. How to build the appropriate wind plant design to the specific wind conditions is one such challenge. Another concern is how to design the turbine to hold up well in the specific climate so it can be maintained easily and reduce corrosion (Simmons, 1975).

Wind energy is a viable source of energy for the future. Scientists need to consider alternative fuel sources to help with the world's energy needs. Wind energy can be harnessed easily whenever the wind blows.

<u>Data: Turbine voltage charts</u>	
Savonius:	6 Bladed Fan:
Trial: 1 - 0.6v	Trial: 1 - 1.8v
2 - 0.7v	2 - 1.8v
3 - 0.7v	3 - 1.7v
4 - 0.7v	4 - 1.9v
5 - 0.8v	5 - 2.0v

Conclusion:

I showed that some wind turbines generate more electricity than others: the six-bladed fan turbine generated more electricity than the Savonius turbine. I do not recommend wind turbines to generate electricity to power homes because it takes a lot of wind to make a little electricity. Wind energy is also expensive, because you need a backup energy source for when the wind is not blowing.

The wind turbine is expensive as well. I learned that wind is being considered as a viable alternative energy source but in my opinion it is costly and still not reliable. I enjoyed this project particularly observing how electricity can be generated. More work should be done to develop less expensive forms of wind energy.