

# Improvement of Efficiency of Solar Cell

Phil Gauthier, Tom Gulo, Greg McCarthy, Erik Oliver, and Josh Price

Advisors: Professor Fred Looft, Professor Diran Apelian, Professor Svetlana Nikitina

## Abstract

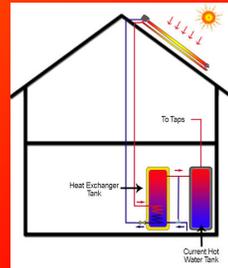
The purpose of this project was to investigate how the design of solar cells could be improved so that they could become a more reliable source of energy. The first design change considered was shape manipulation, in which a normal photovoltaic array would be changed from a flat panel to either a cylindrical, parabolic, or spherical light-capture device. The idea is to change the cell or panel so that as much light is absorbed as possible. The second idea explored was to use a home water heating system in conjunction with the solar cells in order to control temperature fluctuation within the solar array, thus optimizing efficiency. The use of wiper blades, similar to windshield wiper systems in cars, was proposed as our third idea in order to remove any snow or debris from the surface of the panels. Other changes considered included the use of light-manipulation methods, such as Fresnel lenses, to enhance solar flux, prisms, which would be used to redirect light towards an array of solar cells, and one way glass, which would be used to trap light between the "one-way mirror" and the solar panels. After careful analysis of our options, it was determined that a water heating system, shape manipulation, and a wiper blade system would be the most likely way to optimize the efficiency of solar cells.

## Project Goals

- Improved Power Output
  - This means looking into simple design changes to create improvements
- Improved Usage
  - This means that we want the use of solar cells to be more wide spread

## Recommendations

- Final Design
  - Cylindrical solar cells
  - Solar Home Heating/Cooling System
  - Wiper Blades
  - Sun Tracking
- Implementation
  - Private Homes
  - Businesses



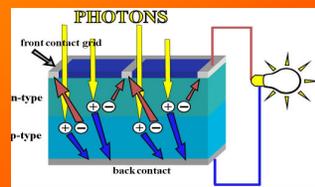
## Methods

- Research of current solar cell technology including cylindrical solar cells, and 3-D solar cells
- Tested solar cells to see change in outputs at different angles from the ground
- Calculated power output using resistors
- Looking into designs and combination of designs to improve power output



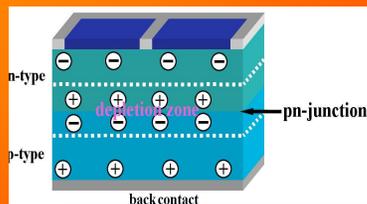
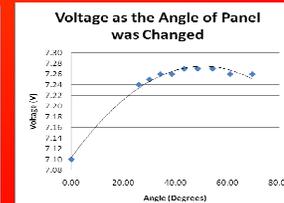
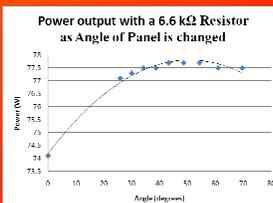
## Solar Cell Function

- Photoelectric Effect
- Semiconductors
- Silicon
- Photons "Free" Electrons
- Light conversion to electricity

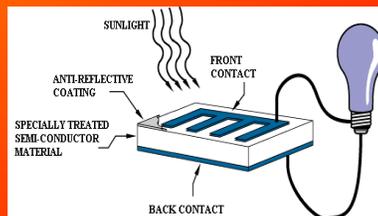


www.specmat.com

## Results



www.specmat.com



www.nasa.gov

## Final Innovations

1. Cylindrical Solar Cells
2. Solar Home Heating
3. Solar Panel Wiper Blades

## Acknowledgements

Jim Dunn  
 Professor Diran Apelian Professor Svetlana Nikitina  
 Professor Fred Looft

## Key References

- <http://www.gatech.edu/newsroom/flash/CNTpv.html>
- <http://www.solarheatingcanada.com/images/solar-domestic-hot-water-schematic.jpg>
- <http://solyndra.com/>