The Reflective Solar Tracker (RST) Collaborative

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Introduction

With an increasing need for alternative energy sources, the demand for cheaper, more productive methods of creating energy to supplement our dependency on traditional energy sources has become more evident. The method of using the sun's energy as an energy source of our own has been in development for close to 200 years, yet it is still an underutilized method due to its expensive costs and low return. An approach to remedy this dilemma is to develop a method using today's standard photovoltaic (PV) panel systems in correlation with a low cost apparatus that will boost the PV system's energy output.

Objectives

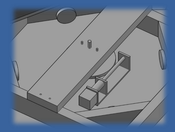
- Design and develop a sustainable low-cost method for increasing the energy output of traditional PV systems.
- Conduct an experiment to test the viability of the device.
- Present results to interested institutions to find potential collaborators.
- Test and analyze data by constructing a commercial device to present to collaborators and collect data for longer periods of time in different areas of the state.
- Present the device at the annual Sustainable Energy Fund (SEF) Energy Path Conference and publish findings.
- Study the economic feasibility of the RST device.

The Method

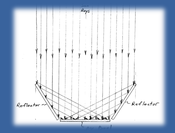
The development of the patent pending Reflective Solar Tracker (RST) was made possible by a $2500 grant from the Sustainable Energy Fund (SEF) and matched by the CAS Deans Office. The RST utilizes simple, low-cost, and effective methods to increase the energy output of traditional PV panel systems by tracking the sun's movements throughout the day to increase the PV panels sunlight exposure. Combined with the purchased PV panels, the RST uses all self-designed, homemade components that include a motor and worm gear driven rotating chassis with attached solar reflectors and a sunlight tracking system.

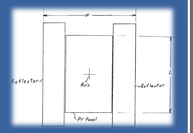
The Design

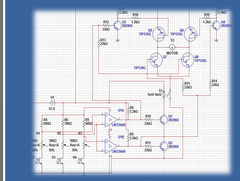
The RST uses a rotating angle iron base that is designed to be electrically driven by a 12v DC motor using a worm gear made out of ultra high molecular weight plastic.



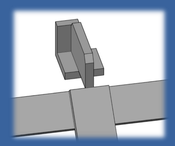
One of the methods being used to boost the energy output of the PV panels are wooden panels lined with a diamond foil light reflecting material that will introduce a greater amount of sun rays to the PV panels.







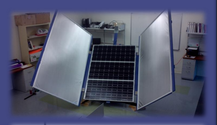
To be able to track the sun's movement through the sky, a comparator circuit using three light sensors and a shadow box was attached to the top of the rotating chassis. As the sun moves through the sky, a shadow casts on one of the sensors, causing the chassis to rotate in the direction of the sensor receiving the greater light level.



The final step in the design was to assemble all of the above technologies into a single model.

Collaboration & Next Phase Testing

The next phase testing is already underway with newer and improved models already on location and collecting data at the University of Scranton, Shippensburg University, and Pennsylvania State University. Data will continue to be collected through July and the results will be presented at the Sustainable Energy Fund (SEF) 2013 Energy Path Conference.



Where to go from here?

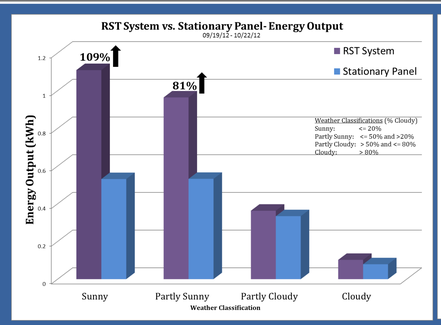
- United Nations
  - SEF Invite to Sustainable Energy For All Symposium
  - Sponsored by the United Nations Industrial Development Organization (UNIDO)
  - SEF Tech Director approached by interested parties
- Involve students in a service trip to install device in the areas of the world that need it
  - Jesuit Commons: Higher Ed at the Margins
  - Identified two locations: Kakuma Camp, Keyna and Dzaleka Camp, Malawi and possible Central and South America

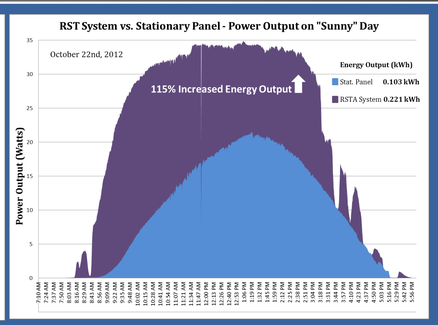
Acknowledgments

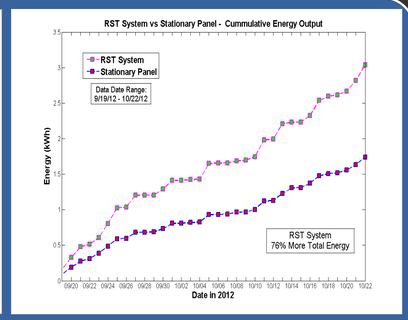
Mr. Mark Murphy (BSEE), Daniel Schlasta, Wally Checefsky, Dr. Robert Spalletta, Mrs. Jennifer Hopkins (Pres. SEF), Mr. John Costlow (Tech. Director of SEF), Dr. Tabbi Miller-Scandle (Director of ORSP)
Dr. Brian Conniff (CAS Dean)
Dr. Joseph Dreisbach (Assoc. Provost)

Testing & Results

Initial testing and result gathering phase involved using a low-cost voltage data logger software to record daily results over a 34 day period. In order to receive reliable and comparative results, a traditional stationary PV system was setup along side the RST.







Over a 34 day testing period, the results gathered show that on a sunny day, the RST produced more than double the energy of the stationary PV system, and that the cumulative results indicate that on any given day, the RST will have a greater energy output.