Department of Mechanical and Materials Engineering

SENIOR DESIGN ORGANIZATION SYNOPSIS – FALL 2013

3-DIMENSIONAL SOLAR PANEL

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Solar panel research and development has been around for many years, since the 1800s, and in recent times they have become more popular as a means of primary power generation. Since the sun's energy is an unlimited resource, it has the potential to become the main source of energy in the future. All other forms of energy can be indirectly sourced back to the sun and solar movements. The motivation behind our project is to harvest the sun's energy in the most efficient manner, thus reducing dependence on fossil fuels, and greatly reducing the cost of electricity. Since our design will be portable, we will be able to reach remote areas that either don't have an energy source, or can't afford one.

The main objective of our project is to find the most efficient geometry possible for a solar panel, in order to maximize the energy generated for a given base area (energy density). The common geometry of most solar panels is a basic, rectangular shape. While this shape has proven to be effective, it also has many downfalls. The sun is a moving source, and therefore the amount of sunlight, and the angles of approach are always changing. The most efficient position for a solar panel will always be ninety degrees, or perpendicular, to the rays of sunlight. For the preliminary design stage, we have come up with three possible geometries that will give us this maximum absorption at all times: a dome, a parabolic bowl, and a pyramid. We plan on researching and experimenting with these geometries and comparing them to the basic rectangular solar panel of the same surface area. A secondary input into our design will be the use of reflectors. By implementing mirrors between solar cells and/or around the panel itself, the stray sunlight that bounces off the panel can be reflected back to the solar cells where it will be absorbed and utilized, hence increasing absorption of sunlight energy.

Once our project proves to be successful, further optimization will prepare it to be used for potential applications in commercial and residential areas as opposed to industrial. Places such as Florida, Central America and the Caribbean that have a year round supply of sunlight and hot climate will be able to implement this design and eventually reduce dependence on fossil fuels and make solar power their primary energy source.