



# POTENTIAL ENERGY

TO: Team Potential Energy

FROM: Kendall Aubertot

SUBJECT: Analysis of Photovoltaic Solar Panel Key System

DATE: November 5, 2008

## Analysis of Photovoltaic Panel Key System

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### INTRODUCTION

On August 25, 2008, our team decided to take on the project give us by Mr. Andy Miller. The goal of this project is to research economically viable energy sources for the residents of Grand County. These energy sources were to be green in the sense that they were to have little environmental impact on the environment. Since that time, we have decided to break the project up into key systems [1]. We have designed a flowchart to describe the project plan (fig. 1). This report contains an overview of the photovoltaic solar power key system.

### BACKGROUND INFORMATION

Photovoltaic solar panels have been in use for some time. The first viable production of solar cells began in 1963 with the Sharp Corporation. Since that time, the solar cell business has become more profitable and provided a better product that is much more efficient [2].

Photovoltaic solar cells transfer energy from the sun into electricity. The premise consists of creating a cell made of a semi-conductor, generally silicon. When light hits the solar cell, the electrons in the cell become excited and become free of their regular state. Solar cells have electric fields going through them so that the loose electrons will flow in the same direction, creating an electric current. By placing metal contacts on either end of the cell, electricity can be drawn from it (fig. 2)[3].



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Today, solar panels are increasingly efficient and are becoming much more frequently used. The installation of photovoltaic solar panels on homes has gone from being rare to, at the very least, far from atypical. More than 1 million American homes now use some form of solar energy. Over 20,000 of those homes use photovoltaic solar panels [4]. While the largest market for solar power is currently in California, Colorado is a great state for integrating solar power into homes. With many parts of the state receiving more than 300 days of sunshine per year, photovoltaic solar cells are a viable energy solution in the state. Furthermore, Colorado state law allows homeowners to use net metering. Net metering is what allows a homeowner to generate energy that goes to the grid and pull that same amount of energy off of the grid free of charge [5].

## FINANCIAL CASE FOR GOING SOLAR

In the United States, the federal government has provided incentives for switching to alternative energy sources. These incentives, however, are intended to make the country attain certain alternative energy goals. Once these goals are reached, the incentives will cease to exist. As a result, waiting to install photovoltaic panels in residential homes makes little sense. The current federal program in place can pay for as much as 30% of the cost to convert a home to work on solar power [6]. The state of Colorado has a similar program in place, but not all areas of the state participate in the program. Local government determines participation and Grand County has opted out of the program [7]. As a result, solar installations in Grand County will have to rely largely on the federal incentive program.

The fact that solar power is federally subsidized does not necessarily make it financially feasible. The installation of photovoltaic solar panels does, however, make financial sense for most people. First of all, homes with photovoltaic solar panels often eliminate their electricity bill or pay significantly less. Next, solar panels also increase the value of a home. For example, purchasing a \$12,000 solar system instantly increases the value of a home by \$20,000. Finally, because energy companies charge tiered rates for the electricity they sell to homes, any energy residents do need to purchase from the grid comes at a lower rate. Energy companies charge more per kW of energy the more a consumer buys. When homeowners switch to solar, the solar energy generated subtracts from the highest price tier first. Because of all of this, the cost of installing solar panels is usually made up in 5-10 years [8].

## INCORPORATING SOLAR POWER INTO HOMES

Photovoltaic solar panels are easily installed on the roofs of existing homes. Insurance companies are also required to insure these panels as if they were part of the home. The integration process is relatively easy and generally takes only three days. Solar panels can be designed to fit on any roof (fig.3) [9]. In addition to the solar panels, the solar panel mounts, inverter, and a conduit need to be installed. The inverter converts the DC power produced by photovoltaic solar panels to AC power, which is what is used in homes. Inverters are relatively inobtrusive (fig. 4). The conduit transports the electricity from the solar panels to the inverter



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box. In the event a home does not have a net meter that can run backward, the homeowner will have to purchase one [9].

## SUMMARY

All in all, installing photovoltaic solar panels on homes is a great alternative energy solution that makes good financial sense and also produces clean energy. Because the government incentive programs on solar power will only last for a limited time, it is wise to begin install solar panels now or in the short run rather than waiting a long period of time. Photovoltaic solar panels significantly reduce energy expenses, increase the value of homes, and are easy to integrate into existing homes. Our team will focus our work on the eastern part of Grand County, as it is the more populous area (fig. 5). We now need to work on the final report, the first draft of which needs to be finished November 19. The report should be completed by December 3. A client meeting should also be scheduled for the week of December 1, shortly after Thanksgiving. Team Potential Energy has some exciting weeks ahead.

cc: Robert Neukirchner



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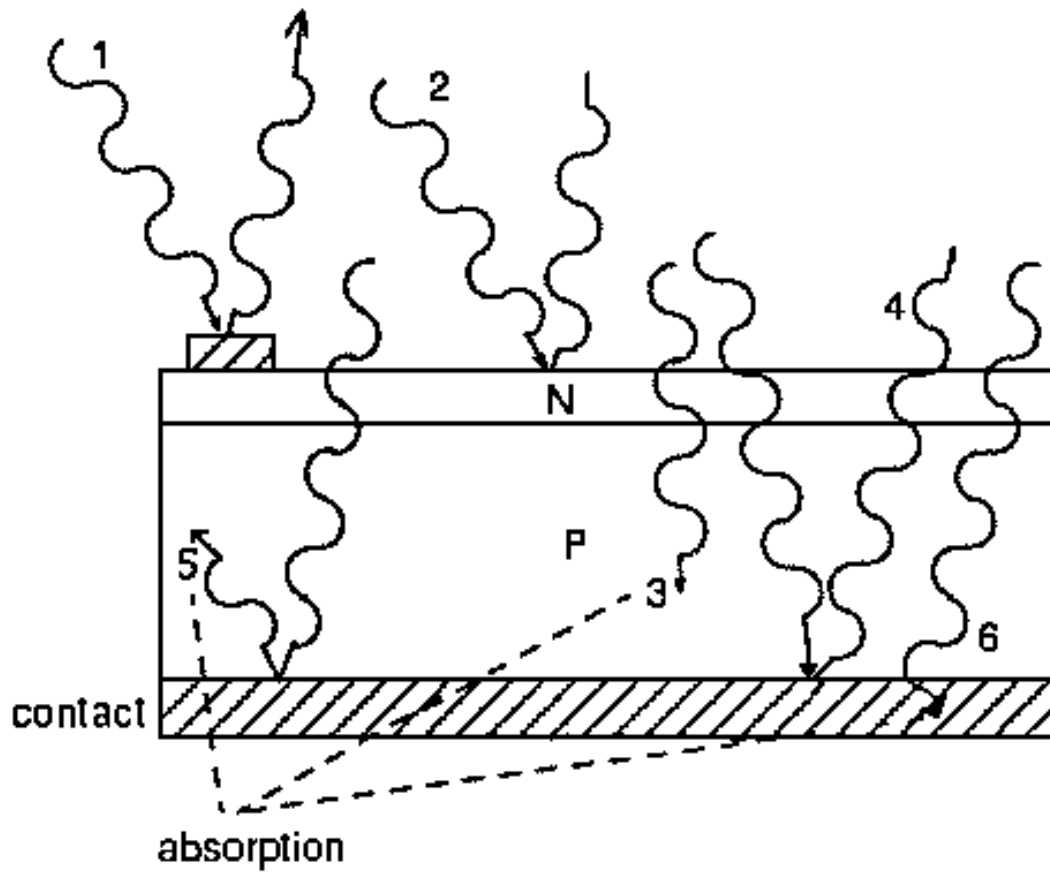
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FIGURES



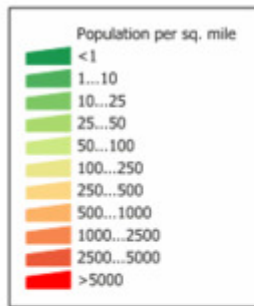


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Source: U. S. Census Bureau  
Census 2000 Summary File 1  
population by census tract.

