Electricity and Magnetism - Physics 1C: Honors Project
Solar Panels: Efficiency, Mechanism, and Applications

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Level: Lower Division Undergraduate
Title: Solar Panels in the modern era: Efficiency, Effectiveness, Mechanism, and Applications

Research Focus: Use the learned materials about electricity and magnetism in the study of solar panels, their mechanism, history of development, different deployments, efficiencies, and ways to improve effectiveness of operation, as well as explore the use and applications of such technology in the modern era.

Abstract: In today's world, our society is slowly shifting towards a more environmentally friendly energy production, relying on renewable energy from light, water, etc. However, with today's widely accessible technology, the used solar panels (devices used to produce electricity from light) are considered to be extremely efficient. The paper covers possible and potential solutions for the increase of solar power efficiency in solar panels and cells. Solar Panels are made of three layers: N-Type in which there is an excess of electrons, a P-Type where there are less electrons than protons, and a layer of insulating materials between the P-type and N-type layers. The paper discusses the nature of light and the understanding of the mechanism of solar panels, rooted in basic quantum mechanics: light hitting solar cells (photons) strike electrons to produce energy through the scattering and exciting of electrons. A light wave (a ray) travels through a medium (air) to get to solar panels and once it hits it, the photons emitted to the N-Type layer (the upper layer that "absorbs" the sunlight) release electrons in that layers, so they could go through a circuit (a set of wires connected to capacitors and other devices such as light bulbs) an power it up. The light then goes to the P-Type layer, from which they can go back to the N-Type upper layer. The cycle continues on a much larger scale, where multiple solar cells are put together to form a solar panel. Multiple solar panels can power up an entire household and even more. The problem is, only a certain range of wavelengths of light is absorbed by the solar cells. This specific range of wavelength is included within the visible range of the sun's

rays, and does not efficiently release electrons from the N-Type layer. This paper will discuss possible ways of improving today's solar power taking into account economic, financial, social factors and more. Furthermore, the paper will discuss and explore the many ways offered to increase the machanism's efficiency and performance. Nonetheless, the research will focus and explore the many applications of solar panels in the modern era, and potential uses for it in the future, as efficiency will theoretically increase.