A Design and Fabrication of a Solar Agriculture Water Pumping System

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Abstract

This study explores the use of a solar driven water pump. PV technology replaces conventional electricity and diesel pumps by using solar energy to power DC or AC water pumps. The main objective of this study is to design and construct a solar-powered agriculture water pumping system and to evaluate its performance. The solar agriculture water pumping system used in this project consists of a 40-watt monocrystalline solar cell with an efficiency conversion of between 23% – 24%. This can supply power to a 16.8 W DC Flow Submersible Pump. It could lift the water up to 5m and a flow range of 700 Liter/Hour. The system also includes a PWM 30A Solar Charge Controller to regulate the input power to a 12V, 7.2A Sealed Rechargeable Battery. Finally, a 20m long watering kit with nozzles irrigation system is connected to a 12V DC Submersible Pump to water the plants.

Keywords: Solar panel, water pumped, renewable energy, irrigation system, SPVWPS.

1. Introduction

Electricity is an essential element of nature and a widely utilized form of energy that is vital for various human activities, such as lighting and work. With the ever-increasing global population, energy consumption has surged significantly in recent times. From 2005 to 2014, global energy consumption increased by 18%, and it is expected to grow by 35% by 2035 [1]. Renewable energy sources, including biofuel, waste, hydro, solar, wind, geothermal, and thermal, Comprise merely 13% of global energy consumption. Fossil fuels, such as natural gas, coal, and oil, make up 81%, while nuclear power contributes only 5.7% [2]. Sustainable energy, such as water, sunlight, and wind, is a solution that has no harmful impact on the environment and contributes to achieving sustainable energy goals [3]. The sun is the most significant power source on Earth, providing more energy in one hour than all nations produce in a year. It delivers over 15,000 EJ of energy to the planet every day, which is more than 104 times the daily energy used by human activities [4]. However, only 0.1% of the sun's energy is consumed for electricity [5]. Alexandre-Edmond Becquerel observed the PV effect for the first time in 1839 [6]. The initial contemporary silicon solar