DEVELOPMENT OF A DYNAMIC SOLAR PANEL AND REAL-TIME MONITORING SYSTEM

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ABSTRACT

Generally, most solar systems are not developed in a dynamic system and cannot be remotely controlled or monitored. Solar panels must be directly connected to the solar source to obtain the maximum energy from a solar source. Thus, the objectives of this project are to develop a dynamic solar power system with a real-time monitoring system and analyse the performance of a solar power monitoring system remotely in terms of input power, current, and voltage. Hence, the research developed a dynamic solar system using a solar panel, Arduino MEGA 2560 as a microcontroller, and microchip NodeMCU ESP8266 as a (Wi-Fi) module central system. The data were collected using voltage and current sensors and then monitored using Blynk application. The position of the dynamic solar panel system was controlled through a smartphone Application by adjusting the motion button. Based on the results, the proposed dynamic solar monitoring system has improved daytime input voltage (7.44%), power (7.45%), and current (0.2%) compared to a statically solar panel. In conclusion, a dynamic solar power monitoring system produces more power, voltage, and current that will increase the efficiency of solar power stations to generate more electricity.

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TABLE OF CONTENTS

CHAPTER ONE
INTRODUCTION

1.1 Research Background

Solar energy is the most exciting natural-renewable energy source for a green future because it has a lower environmental impact than other energy sources. Oil, coal, and natural gas are conventional but non-renewable energy supplies that will run out very soon if they are over-exploited [1]. Instead, burning fossil fuels raises the greenhouse effect, causing global warming. In addition, the greenhouse effect is not caused by solar radiation. Renewable energy sources have several advantages, such as being pollution-free, unlimited, and conveniently accessible [2]. Solar power has been one of the fastest-growing renewable energy sources in the last decade. The vast and expanding usage of solar power energy is due to its low maintenance costs, substantial environmental benefits, and supporting energy legislation. Solar energy has significantly reduced energy use, and it now predominantly serves low-income customers. This renewable energy equipment cost has decreased due to new technologies encouraging large-scale photovoltaic (PV) installations.

Solar power systems have become highly competitive as a clean energy source in both grid-connected and standalone modes of operation applications [3]. The most important solar power system components are PV cells, which convert solar energy into electricity. Solar cells follow the same semiconductor principles as diodes and transistors in physics. Consequently, as long as sunlight is available as a source, solar cells will convert energy [4]. In addition, solar cells have an intriguing feature that can be exploited to create electricity. One of the most exciting properties of solar cells is converting the most abundant and accessible energy source into electricity without causing any dangerous chemicals that damage the environment.

Solar power monitoring is an excellent way to keep track of solar panels' performance [5]. The solar panel's output of generated electricity quantity can also be tracked through this monitoring system. If the performance of a solar panel is low, users will track if anything happens to the solar panel. For example, broken wires or cracked solar panels can be detected instantly. In addition, the real-time solar power monitoring system is designed to measure collected data from the solar panels. Thus, this system