

DESIGNING AND DEVELOPING A SOLAR POWER PLANT (PLTS) USING AN IOT-BASED SINGLE AXIS SOLAR TRACKER AS THE MAIN ENERGY SOURCE FOR A VENDING MACHINE

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ABSTRACT

Indonesia's demand for electrical energy continues to rise annually in line with population growth and technological advancement. According to the Ministry of Energy and Mineral Resources, Indonesia's per capita electricity consumption reached 1,337 kWh in 2023—an increase of 13.98% from the previous year. The key challenges faced are high electricity consumption and limited access to power in certain areas. To address these issues, there is a pressing need for an independent and environmentally friendly alternative energy system. This study aims to design and develop a Solar Power Plant (PLTS) system utilizing the Internet of Things (IoT) and a single-axis solar tracker as the main energy source for a vending machine. The system is built using an ESP32 microcontroller as the control center, two LDR sensors for solar tracking, a PZEM-017 sensor for electrical parameter measurement, and employs Blynk and Google Spreadsheet platforms for real-time data monitoring. Testing results show that the system can automatically track the sun's position and generate a maximum output of 39.1 Watts at 15.16 Volts and 2.58 Amperes. Voltage, current, power, and energy data are successfully transmitted and recorded with high accuracy. The system operates reliably in supplying power to the vending machine and demonstrates significant potential to reduce dependence on the national electric grid (PLN). Thus, this PLTS system offers an efficient and eco-friendly alternative energy solution, particularly for remote locations.

Keywords: *PLTS, Solar Tracker, ESP32, IoT*