

AI Powered Solar Energy Management System using Raspberry Pi

ABSTRACT: Efficient energy management is crucial in today's world, especially with the growing demand for clean and renewable energy sources. Manual monitoring and control of solar power systems can lead to energy wastage and reduced battery life due to improper usage. This project aims to address these challenges by developing an AI Powered Solar Energy Management System, designed to intelligently manage solar power generation, storage, and usage using a Raspberry Pi Zero 2W.

The system collects real-time data from sensors including voltage, current, temperature, humidity, and light intensity to monitor the status of the solar panel and battery. The Raspberry Pi processes this data using machine learning algorithms to analyze and predict power generation and consumption patterns. Based on these insights, it controls battery charging and discharging cycles, ensuring optimal State of Charge (SOC).

A charging circuit, relay mechanism, and inverter are used to convert and manage the power flow to AC loads. Key system parameters are displayed on an LCD screen, while LED indicators and a buzzer alert system notify users of abnormal conditions or faults.

The system uses solar panels to produce electricity and store it in a battery. A Raspberry Pi collects data like power generation, usage, and battery level. Using AI, it makes smart decisions on when to charge or use power. It also shows data on a display and can send it to Thing Speak for monitoring. This helps save energy and works even without main power. In the future, features like voice control, weather-based control, and load prediction can make it smarter and more automatic.

INTERNAL GUIDE

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