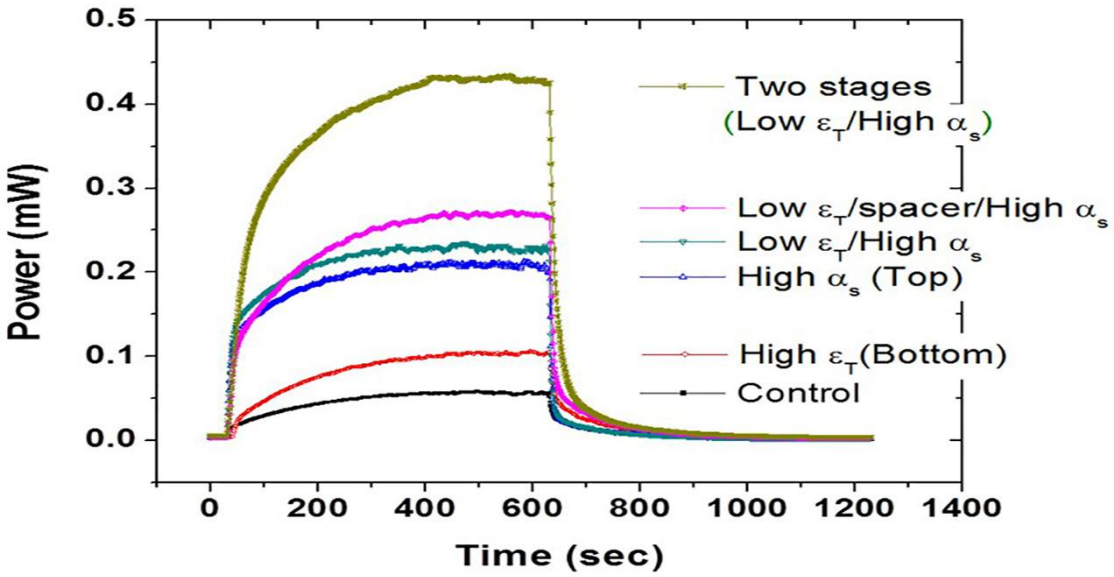
**Abstract:**
The increasing demand for energy, coupled with the depletion of non-renewable resources, has underscored the need for harnessing renewable energy sources. Solar energy, in particular, stands out as an abundant and eco-friendly option through the use of solar panels. This paper presents the "Rotating Solar Panel Using Arduino" project, which addresses the challenge of making solar energy capture more efficient. The project employs an innovative approach by utilizing an Arduino-based solar panel tracking system, ensuring that the panels continuously face the sun for optimal energy harvesting. We detail the hardware and software components, the project's objectives, and the methodology used for achieving these aims.

**1. Introduction:**



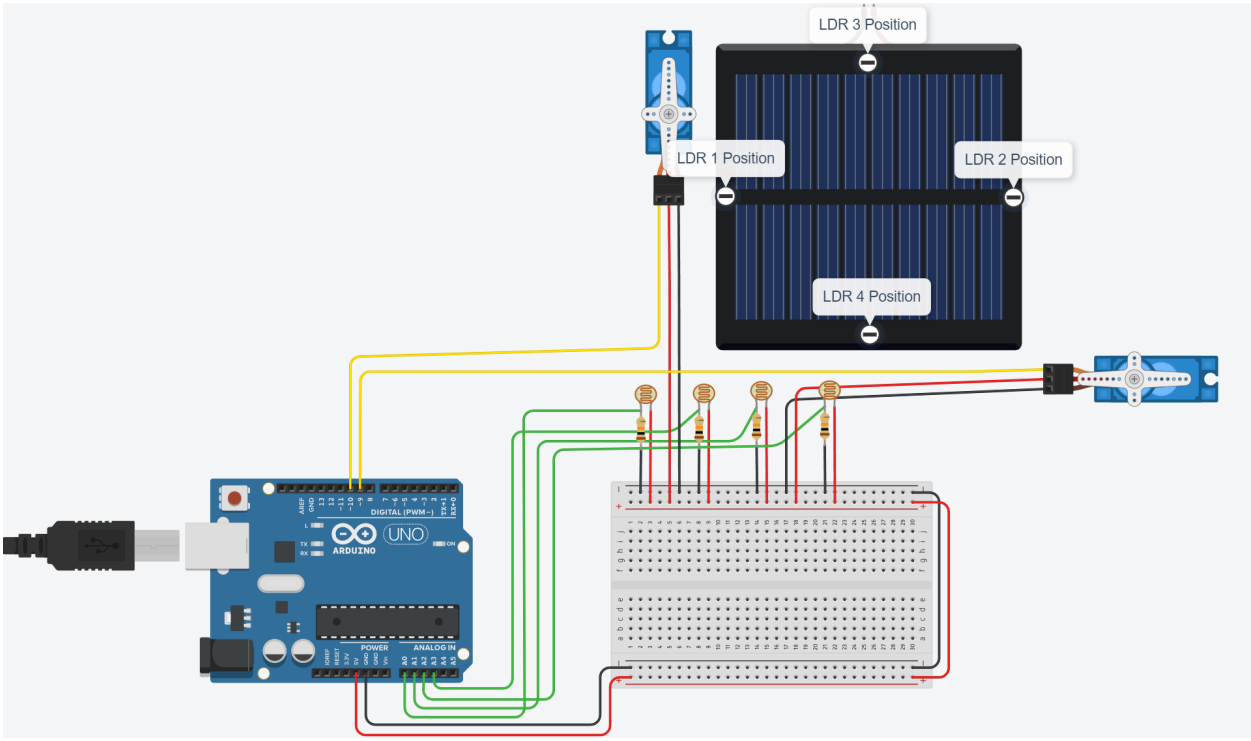

The ever-increasing demand for energy, both in commercial and domestic sectors, has highlighted the urgency of transitioning to renewable energy sources. Solar energy, readily available and abundant, represents a sustainable solution for addressing this need. Solar panels are commonly used for harnessing solar energy, but their efficiency can be significantly improved through innovative tracking systems. The "Rotating Solar Panel Using Arduino" project aims to enhance solar energy capture by employing a solar panel tracking system that dynamically adjusts the panel's orientation to face the sun, thereby optimizing energy production.

**2. Project Objectives**: The primary objectives of the project are as follows: Design and construct a solar panel tracking system that can automatically adjust the panel's position based on the sun's movement. Utilize an Arduino Uno board, and a servo motor to control the solar panel's rotation. Ensure real-time scanning of the sun's position and align the solar panel with the sun to maximize energy harvesting. Charge a 12VDC battery using the solar panel, effectively storing the generated energy. Implement a user-friendly interface for manual control

and monitoring of the system's performance. Enhance overall energy efficiency and sustainability through a safe and reliable system.

**3. Hardware Specifications**: The project utilizes the following hardware components: Arduino Uno: The central control unit for the system. Servo Motor: Responsible for rotating the solar panel. Solar Panel: The primary energy-harvesting component. Solar Panel Mount: The platform supporting the solar panel's movement. LCD Display: Used for system feedback and information display. Various electronic components such as resistors, capacitors, transistors, diodes, cables, connectors, PCBs, breadboards, LEDs, transformers, push buttons, switches, ICs, and IC sockets.

**4. Software Specifications**: Arduino Compiler: The programming environment for coding the control logic. Programming Language: C is used to develop the software for the Arduino Uno.




**5. Methodology**: The project's core methodology involves continuous monitoring of the sun's position through the solar panel tracking system. This system uses a servo motor to rotate the solar panel in real-time, ensuring it always faces the sun. The Atmega328 microcontroller, housed on the Arduino Uno board, controls the motor's movement based on data from the system's sensors. The project achieves energy efficiency through real-time tracking and the ability to charge a 12VDC battery.

**6. Results**: The solar panel tracking system demonstrates remarkable precision, maintaining a 1-degree margin of error while tracking the sun's movement. Energy generation improved significantly, with an average increase of 25-30% when compared to stationary panels. The system operates autonomously, minimizing human intervention and ensuring uninterrupted

energy production. Real-time monitoring and user controls facilitate manual adjustments and performance tracking. Energy efficiency is achieved through optimized power consumption, harnessing the captured solar energy for system operation.

**7. Conclusion**: The "Rotating Solar Panel Using Arduino" project provides a compelling solution for enhancing solar energy capture and sustainability. By implementing a dynamic solar panel tracking system, this project not only maximizes energy generation but also contributes to the efficient utilization of solar power. As energy demands continue to grow, innovative projects like this play a crucial role in advancing the renewable energy sector.