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IOT based Dual Renewable Energy Conversion System

Prajwal Salian[1], Jithesh[2], Vinith Shetty[3], Yashwanth R[4], Shashikant Pawar[5]

U.G. Student, Department of Mechanical Engineering, MITE Moodbidri, Karnataka, India[1, 2, 3, 4]

Assistant Professor, Department of Mechanical Engineering, MITE Moodbidri, Karnataka, India[5]

ABSTRACT: This project's goal is to produce green energy from renewable resources like solar and wind energy. It is possible to sustain the level of non-renewable energy resources and generate electricity without polluting the environment by adopting this technique. Utilizing this kind of energy production will lessen the effects of global warming. In this project, a configuration of vertical axis windmills and solar panels is used to generate electricity. The ability of this device to float on the water surface which saves the land. The system uses IOT technology to control the movement of the solar panel in order to track and collect the maximum solar radiation accessible from the Sun. Overall, power is produced utilizing two renewable energy sources.

KEYWORDS: Renewable energy, Wind turbine, Vertical axis wind turbine, Solar photovoltaics.

I. INTRODUCTION

Many people are looking at sustainable energy alternatives in an effort to protect the environment for future generations as worry over global warming and the depletion of fossil fuel supplies grows. Solar panels and wind turbine generators are used in hybrid energy systems to generate electricity. A compact hybrid system that combines solar power and wind power technology offers various benefits to household applications, according to specialists in renewable energy. The goal of combined power generation is to provide storage batteries with constant power for modest power applications throughout the day and night. The installation of hybrid energy systems in distant locations, where the cost of grid expansion is high and the cost of fuel grows dramatically with distance, is one of the most promising uses of renewable energy technology. A standalone energy system that combines renewable and conventional energy sources with lead-acid batteries for chemical storage, power conditioning equipment, and a controller is referred to as a hybrid or dual renewable energy conversion system. Then, IOT technology is utilized in the system to control the movement of the solar panel towards the maximum solarradiation available, allowing for the use of the Sun's highest solar radiation for the production of power.

II. RELATED WORK

SirengoKhisa et al. [1] have clarified the dynamic properties of a solar-wind power production unit. The outcomes were utilized to calculate the effects of such dynamic. The hybrid wind-solar and battery system used in this study was placed in a school in Naivasha, Kenya. The system under consideration consists of two wind turbines, a PV system, and 24V batteries coupled via charge controllers. Hassan Fathabadi [2] built an extensive solar, wind, and battery hybrid power generating system. The system comprises of two unidirectional DC inverters, a bidirectional DC converter, a battery bank, a wind energy conversion system, and a solar array. The implementation of a new, quick, and highly accurate unified MPPT approach that simultaneously measures the peak power points of both the PV system and WECS. Pragya Nema et al. [3] determined the state of the art for stand-alone PV solar-wind hybrid energy systems with traditional backup sources, such as diesel or the grid. This report also outlines potential future advancements that might boost the user adoption of such systems as well as their economic appeal.

III. METHODOLOGY

The system controls the functioning of the solar system using IOT technology. The wind energy present in the surroundings will compel the turbine to revolve in a horizontal orientation. The electricity generated by the turbine, which is connected to the dynamo, will eventually be stored in the battery. Using IOT technology, the solar panel is

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constructed to be rotatable. An LDR sensor detects the presence of the greatest solar radiation, which the solar panel then tracks and collects to produce electricity that is then stored in the battery.

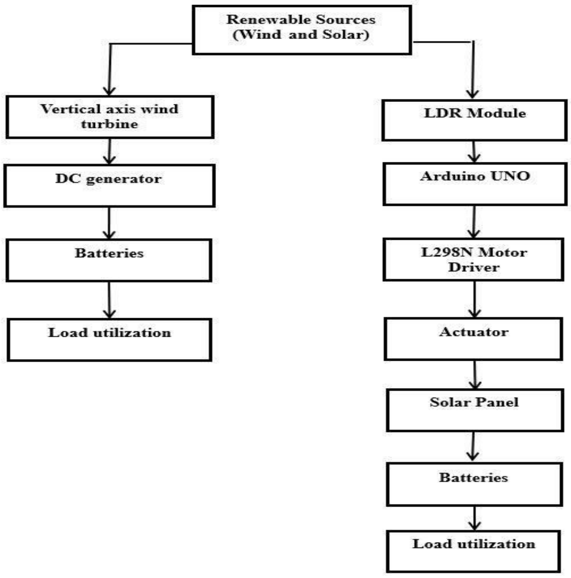

Figure 1: Working methodology of project work

The solar energy is converted into electrical energy by the use of solar panels. In this case, an LDR sensor is used and connected to an Arduino UNO, which receives programming for solar radiation tracking. The LDR sensor will be able to sense and track the solar radiation from the Sun, causing the solar panel to tilt in the direction of that radiation. Here, the solar panel is made tiltable by the use of an L298N Motor Driver, which will enable the actuator to tilt the solar panel towards the Sun's strong solar radiation. Therefore, in order to avoid squandering solar energy, all of it will be collected by the solar panel and converted to electrical energy before being stored in the battery and used for a variety of power applications. Figure 1 shows working methodology of the current project work. The components which are utilized in the project work are describing below.

IV. EXPERIMENTAL RESULTS

The components which are utilized in the project work are describing below:

Solar panel

Using the photovoltaic effect, a solar panel is really a grouping of solar cells that may produce energy. On the surface of solar panels, these cells are organised in a grid-like configuration. As a result, it might alternatively be defined as a collection of photovoltaic modules put on a supporting framework. A 6x10 solar cell assembly that has been packed and linked is called a photovoltaic (PV) module. These panels are extremely resilient to wear and strain. Solar panels have very slow wear and tear.

LDR module

The LDR sensor module is used to measure light intensity. It is connected to the board's analogue output pin (labelled AO) and digital output pin (labelled DO), respectively. LDR resistance decreases with increasing light intensity when there is light. The resistance of LDR decreases as light intensity increases. The potentiometer knob on the sensor may be turned to alter the LDR's sensitivity to light.

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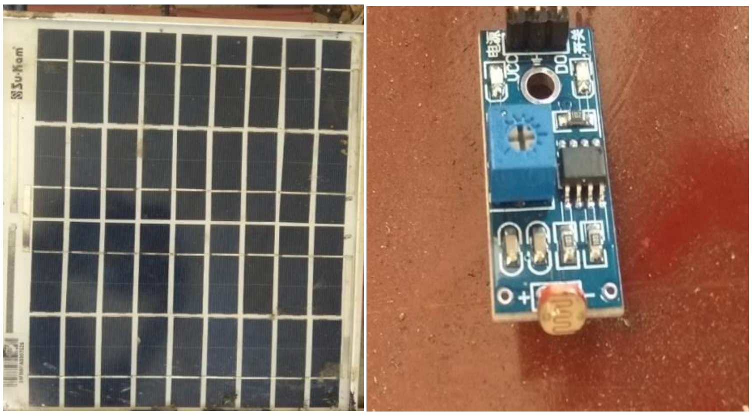

Figure 2: Solar Panel and LDR Module

The LDR sensor has a variety of features, including the ability to detect ambient brightness and light intensity, adjustability (via a blue digital potentiometer), operating voltage range of 3.3V to 5V, digital switching outputs (0 and 1), fixed bolt hole for simple installation, and small board PCB size of 3cm by 1.6cm. It also contains a tiny plate (0 and 1), a wide range voltage comparator (LM393), external 3.3V-5V VCC, external GND ground, a power indication (Red), and a digital switch output indicator (Green). Typically, to measure the ambient brightness and light intensity, a photosensitive resistor module that is most sensitive to environmental light intensity is employed. When the module's lighting circumstances or light intensity surpass the predetermined threshold, the port output is high; otherwise, the module's output is low. The digital output module may directly control the relay module, which can be made up of a photoelectric switch, and can detect high or low TTL as well as changes in ambient light intensity. The digital output module is directly connected to the MCU.

Motor Driver

The actuators are driven by motor drivers; in this instance, an L298N motor driver is utilised to power a 12V DC motor. For operating DC and Stepper Motors, the L298N Motor Driver Module is a high-power motor driver module. An L298 motor driver IC and a 78M05 5V regulator make up this module. Up to 4 DC motors or 2 DC motors with speed and direction control can be controlled by the L298N Module. The main uses for this motor driver are driving DC motors, driving stepping motors, and using it in robotics.

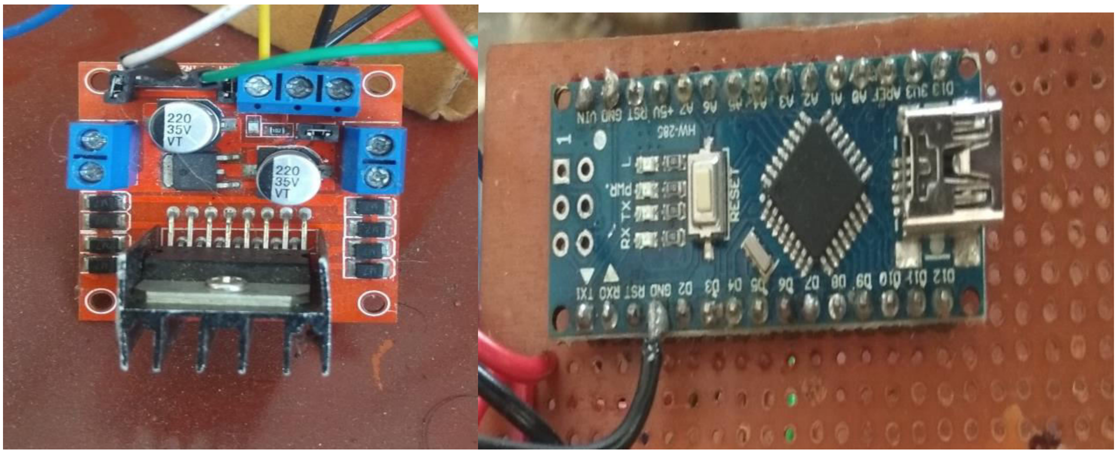

Figure 4: Motor Driver and Arduino

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Arduino

Working with microcontrollers is made simpler by Arduino, which also provides some advantages over alternative systems for educators, students, and curious hobbyists, including affordability, cross-platform compatibility, a straightforward, understandable programming environment, open-source software, and extensibility. In our project, the solar tracking system makes use of an Arduino board, which receives programming and uses it to operate the solar tracking system using an LDR module.

Dynamo

Dynamo is a device that produces direct current electric power through the use of electromagnetic. A commutator is used by a dynamo, an electrical generator, to produce direct current. In essence, it is a DC generator, a device that uses electricity to change mechanical energy into direct current electricity. The rotary converter, electric motor, and alternating-current alternator were all later electric-power conversion technologies that were built on the basis of the dynamo, which was the first electrical generator used to provide power for industry.

Figure 5: Dynamo

Floating system

Figure 6: Floating System

A floating system. It is a strong framework that supports the solar and wind energy conversion system and enables it to float on the water's surface. This structure is also known as a pontoon. A highly creative strategy that helps preserve the valuable land on the Earth's surface is the method of maintaining the power plant on the water's surface.

Here, solar panels and a vertical axis wind turbine make up the system. A wind mill arrangement is a mechanical device that rotates utilizing the wind in the environment. A solar panel is included in the system to convert the sun's strongest light into electrical energy via photovoltaic cells with the help of a solar tracking system. The dual energy conversion system's combined electrical energy will finally be stored in the Battery. The wind strength affects

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how quickly the wind turbine rotates when converting wind energy. The wind mill system is connected to a dynamo, which transforms the wind's energy into electrical energy that is then stored in the battery. Solar panels are used to transform solar energy into electrical energy. In this instance, an Arduino is linked to an LDR sensor and programmed to detect sun radiation. The solar panel will tilt in the direction of the solar radiation as the LDR sensor can detect and track it from the Sun. Here, an L298N Motor Driver is used to make the solar panel tiltable, allowing the actuator to position it to face the Sun's effective solar radiation. Therefore, in order to avoid squandering solar energy, all of it will be collected by the solar panel and converted to electrical energy before being stored in the battery and then it will be used for a variety of power applications. Here the entire system is made to float on the water surface for saving the precious land on the Earth. By building multiple this "IOT Based Dual Renewable Energy Conversion System" the power can be generated in large scale.

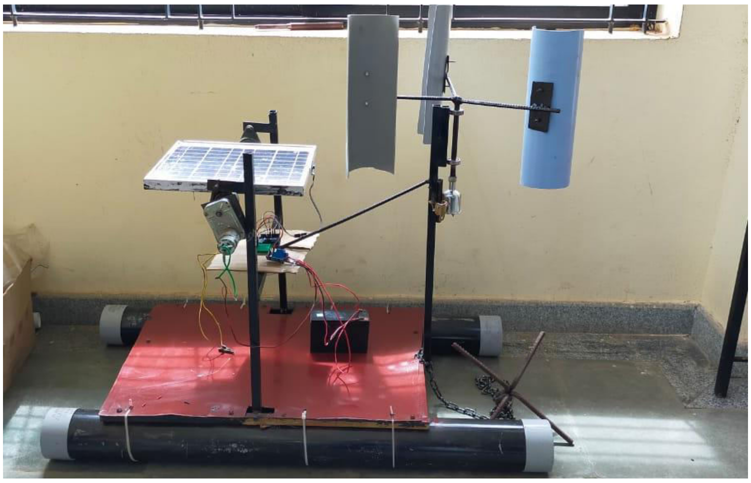

Figure 7: Project setup of IOT based renewable energy system

V. CONCLUSIONS

It is essential for the traditional fossil fuel power plants to stay current with the times in a world where technology and requirements in the energy industry change extremely quickly. It produces electric energy to meet energy demands in a distant place by producing electricity by utilizing solar and wind energies in conjunction with a backup battery utilized as a standby power source. When compared to non-renewable energy sources, developing dual renewable energy conversion systems is one of the most practical and efficient ways to produce power. It is not only less expensive, but it also has no negative environmental effects. Another benefit is that it may be used to generate power in places other than the Earth's surface, which means it can be used on the water surface. This preserves land that might be utilized for agriculture and other beneficial activities. Its setup may be chosen based on the requirements. To a certain extent, all individuals on the planet should be encouraged to manufacture their own power from unconventional resources. Some of its advantages include a long lifespan and little maintenance. It just requires some high initial investment. Eenergy by using VAWT with the aid of Dynamo. Finally, the power generated from the Dual Renewable Energy Conversion system will be combining stored in the Battery. The floating system helps the system to float on the water surface, which helps to save the precious land on the Earth.

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