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AUTO POWER SUPPLY CONTROL FROM FOUR DIFFERENT SOURCES: SOLAR, WIND, MAINS, BATTERIES

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ABSTRACT
In today's power-driven world, ensuring uninterrupted electricity supply is crucial for both residential and industrial sectors. This project focuses on designing an automatic power supply control system capable of switching between four different sources: mains supply, wind energy, solar energy and batteries. The system prioritizes these sources based on availability and pre- defined criteria to maintain continuous power delivery without manual intervention. Using microcontroller-based logic and relay mechanisms, the setup monitors each source's status in real-time and seamlessly transitions between them as needed. This not only enhances reliability but also optimizes resource utilization. The project aims to offer an efficient, low-maintenance solution that can be implemented in regions prone to frequent power interruptions, ensuring minimal downtime and improved energy management.

Keywords:
Automatic Power Supply, Relay Mechanisms, Energy Management, Low Maintenance.

INTRODUCTION

In the modern world, the need for continuous and reliable electricity has become essential for residential, commercial, and industrial activities. However, due to various challenges such as grid instability, natural disasters, and increasing energy demands, uninterrupted power supply is often difficult to achieve. To ensure consistent power availability, it is important to develop systems that can intelligently manage multiple energy sources with minimal human intervention.

The project titled **"Auto Power Supply Control from Four Different Sources"** aims to design an intelligent system that automatically monitors and switches between four power sources: solar energy, wind energy, mains supply, and battery backup. These sources are prioritized based on their availability and efficiency. Renewable energy sources like solar and wind are given preference whenever available, promoting the use of sustainable and environmentally friendly power. In the absence of renewable sources, the system can seamlessly switch to mains electricity or battery storage, ensuring that there is no interruption in the supply.

The system operates through the integration of microcontrollers, sensors, relays, and control circuits, which continuously assess the status of each power source. The controller dynamically selects the most suitable source at any given time based on real-time conditions, such as the intensity of sunlight, wind speed, or the charge level of batteries. By giving priority to renewable sources, the system not only provides reliable electricity but also contributes to reducing the carbon footprint.

OBJECTIVES

The main objective of using four different power sources—solar, wind, mains electricity, and batteries—in an automatic power supply system is to ensure an uninterrupted and efficient energy supply by intelligently switching between sources based on availability and reliability. Solar and wind energy provide renewable and eco-friendly options that reduce dependency on the conventional grid. Mains electricity acts as a stable primary source when renewable inputs are insufficient, while batteries store excess energy and serve as a backup during

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power outages. This system enhances energy security, reduces operational costs, and supports sustainable power management by optimizing the use of available resources.

METHODOLOGY

The objective of this project is to design an automatic power supply control system that intelligently selects between four different sources — solar energy, wind energy, mains supply, and battery backup — to ensure a continuous and reliable power supply. The first step in the methodology involves integrating these four power sources into the system, with each source connected through appropriate conditioning circuits. Solar panels and wind turbines are interfaced using charge controllers, while the mains supply and battery are connected through voltage stabilizers to ensure consistent power input.

A microcontroller forms the core of the system, which continuously monitors the availability and status of each power source. Voltage and current sensors are used to measure key parameters such as the voltage levels from the solar, wind, mains, and battery sources, as well as the battery charge status. This data is fed into the microcontroller, which uses an algorithm to prioritize the available sources. The microcontroller controls a relay driver circuit to automatically switch between the sources without human intervention. This ensures a smooth and seamless transition when one source becomes unavailable, maintaining uninterrupted power supply to the load. Only one source is connected to the load at any given time, thus avoiding the risk of back-feeding or system damage. Furthermore, safety features such as overvoltage protection, undervoltage disconnection, and reverse current prevention are incorporated to safeguard both the power sources and the connected load.

Finally, the system undergoes extensive testing and validation under various scenarios, including source unavailability and simultaneous failures, to ensure the reliability and efficiency of the switching logic and the overall system performance.

BLOCK DIAGRAM

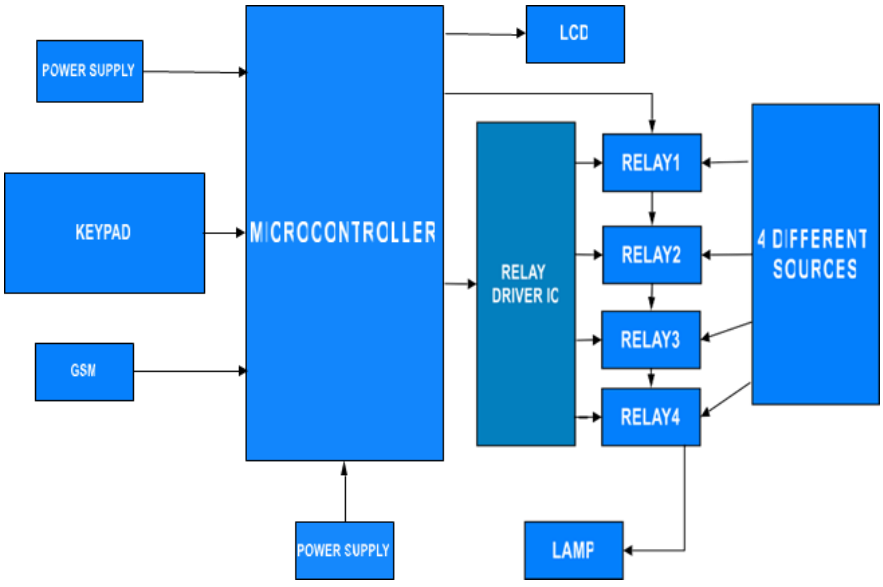

Fig No.1 Representation of 4 different sources

RESULTS AND DISCUSSION

The system was designed to automatically switch between four power sources: solar energy, wind energy, mains electricity, and battery backup. After testing, the system successfully performed as expected, prioritizing solar and wind energy when available. This is a key feature that promotes the use of renewable energy. When solar and wind power were not available, the system switched to mains electricity. In cases where mains power was also unavailable, the system automatically switched to battery backup, ensuring continuous power supply.

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The switching between power sources was quick and smooth. The microcontroller monitored the power levels and made the necessary
adjustments to provide uninterrupted power to the load. When renewable sources like solar and wind were not generating enough power, the battery took over, proving to be a reliable backup.
The system also proved to be energy-efficient. When solar or wind power was used, energy consumption was reduced, saving on electricity costs and minimizing environmental impact. However, when the renewable sources were insufficient, the battery or mains supply ensured that power was always
available. The battery was also managed well, avoiding deep discharges to prolong its life.
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CONCLUSION

In this project, an automatic power supply control system was developed, which can efficiently manage four different power sources: solar energy, wind energy, mains electricity, and battery backup. The system successfully ensures an uninterrupted power supply by prioritizing renewable sources like solar and wind, while also using the mains supply and battery backup when necessary. Through automatic switching, the system optimizes energy use, reduces dependency on the grid, and helps lower energy costs.
The system was tested under various scenarios, demonstrating its reliability and ability to maintain a continuous power supply despite fluctuating energy availability. The use of renewable energy sources contributes to a more sustainable solution, and the inclusion of a battery backup ensures that power is available even during outages or low renewable energy generation.
Overall, the project successfully meets its objectives of providing a reliable, efficient, and eco-friendly power management solution. Future work could involve improving the system's efficiency further by integrating advanced energy storage systems and exploring smart grid technologies to enhance energy distribution.

REFERENCES

[1] K. Smith, R. Lee, and J. Patel, *Design of a Hybrid Renewable Energy System for Rural Areas*, International Journal of Renewable Energy Research, vol. 5, no. 3, pp. 142-148, 2017.
[2] M. Z. A. Sulaiman, H. S. Arif, and F. S. Mansor, *An Automatic Power Supply Switching System Using Solar and Battery Backup*, Journal of Power Electronics, vol. 12, no. 4, pp. 76-84, 2019.
[3] S. N. Patel, *Energy Storage Systems for Power Grid Integration*, Energy Storage Journal, vol. 3, pp. 30-42, 2020.
[4] L S Ezema, B U Peter, O Haris, "Design of Automatic Change Over Switch with Generator Control Mechanism" ISSN:2223-9944, vol 3, No 3, November 2003. PP 230-287
[5] Jonathan (2007), "Manually Controlled Changeover System" Vol.2, No.5. November, 2011. PP 152 – 180
[6] Macha C. (2012), "Smart Phase Changeover Switch usingAT89C52 Microcontroller." Journal of Electrical and Electronics Engineering vol.1, Issue 3, PP 31-44