DESIGN AND IMPLEMENTATION OF HYBRID ENERGY SOURCES FOR DC LOAD APPLICATIONS

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ABSTRACT

In a hybrid energy system, an engine can be driven by more than one type of fuel, and energy can be made or stored in more than one way. This approach is a big reason why fossil fuel-based economies are becoming less important. Even though new innovations are still being made to make it easier to use environmentally friendly power sources, combining traditional warm electric production with environmentally friendly power production can help spread the use of environmentally friendly power sources, especially temporarily.

There are two primary approaches to electricity generation: conventional energy resources and nonconventional energy resources. Currently, conventional energy sources such as coal, diesel, and nuclear power are primarily employed to produce electricity. However, these sources have certain limitations. They produce waste materials, such as ash in coal power plants and nuclear waste in nuclear power plants, that necessitate costly and cautious disposal methods. Moreover, these conventional resources have negative environmental consequences. In particular, nuclear waste poses significant risks to human health. In addition, conventional energy resources are swiftly depleting, and it is anticipated that they will be exhausted in the future. Consequently, alternative techniques of electricity generation must be investigated to address these issues.

INTRODUCTION

The optimal new energy source should be reliable, operate without producing pollution, and be cost-effective. Nonconventional energy sources are viable alternatives to conventional ones. Non-conventional energy sources include geothermal, tidal, wind, and solar energy. However, tidal energy has limitations because it can only be harvested in coastal locations, whereas geothermal energy extraction requires significant infrastructure. In contrast, solar and wind energy are broadly accessible in a variety of environments. Wind and solar energy can be particularly viable alternatives. One disadvantage of solar energy is its limited production during cloudy and inclement seasons. To circumvent this, a hybrid strategy employing two energy sources can be utilised. By combining sources, if one fails, the other can continue to generate electricity in the event of its failure. When weather conditions are favourable, both sources can be utilised simultaneously.

Conventional energy sources have been crucial to the world's accelerated development in the modern era. Electricity has become a requirement for human survival. Nevertheless, conventional energy sources are dwindling and pollute the environment. Therefore, the transition from conventional to nonconventional energy resources is necessary. Electricity

production can utilise a variety of pure and renewable energy sources. The focus of this endeavour is a combination of wind and solar energy. This strategy promotes the production of renewable energy without harming the environment. Incorporating two energy sources, namely solar panels for converting solar energy into electricity and wind turbines for utilising wind energy, the hybrid energy system ensures uninterrupted power supply. This economical electricity generation can be utilised in a variety of contexts. By combining two sources, the initiative prioritises cost-effective electricity generation while maintaining ecological balance.

EXISTING SYSTEM

POWERGRID has developed infrastructure/software and computer-aided facilities for gearbox system Planning, Design, Use, and Maintenance. Before planning a gearbox system, different system studies are done, such as Load flow, Stability, Short-Circuit, etc. These studies take into account the existing system, current and future load flow needs, and the optimal gearbox system is designed with the least amount of redundancy possible. Also, design studies are done to choose the important system and equipment factors for gearbox systems up to 800KV.

PROPOSED SYSTEM

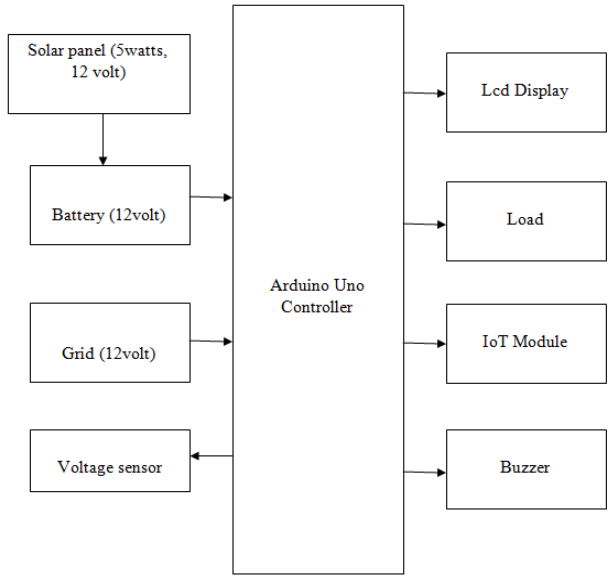
In order to reduce costs, environmental damage, and system disruptions, hybrid energy systems incorporate new components into the existing energy infrastructure. A hybrid electricity system is designed with a greater emphasis on market factors than on specific technologies. To meet users' needs as quickly as feasible, it is necessary to identify the most effective and dependable combinations of energy technologies.

In hybrid energy systems, at least one of the materials used to power a generator typically originates from renewable sources. The primary objective of this system is to increase the value and dependability of renewable energy sources. This can be achieved by assuring redundant energy production from conventional sources or by integrating energy storage to store electricity generated from intermittent sources. Computer applications are required for autonomously adjusting conventional generation or battery use in response to fluctuations in the production of renewable resources. The objective is to advance the coordination of maintainable power systems.

OBJECTIVE:

Hybrid systems can increase both the amount of green energy that can be used right away and the reliability of energy access in rural areas.

BLOCK DIAGRAM



LITERATURE SURVEY

[1] Distributed Generation

R. C. D. A. T. E. Mcdermott present the paper**,** Due to a lack of generating and transmission capacity and rising energy demand, distributed generation (DG) sources are gaining popularity. There is right now no all inclusive meaning of DG. This paper looks at the different definitions proposed in the scholastic writing. It is necessary for additional DG systems to be connected to the existing grid system in order for them to become significant players in the current energy scenario. Distribution systems will be affected financially, technically, and operationally as a result of this integration. Additionally, a summary of these various DG effects on the distribution system is provided in this paper.

[2]. A Review on " Grid-connected photovoltaic power systems: technical and potential problems".

Mohamed a. Eltawil and Zhengming Zhao, present the paper provides an overview of the application of power electronics devices in PV solar systems.As a Power electronics (PE) and grid technologies are essential components of electricity generation, transmission, storage, and consumption. And they will assume increased responsibilities as the transformation of the energy system continues and the proportion of renewable energy grows. In this article, a concise description of semiconductor switches is provided. PE devices, such as photovoltaic inverters and battery converters or dischargers, are utilised to change the form of electricity. The study compares and contrasts all prevalent PV Solar converter and inverter varieties and their topologies.

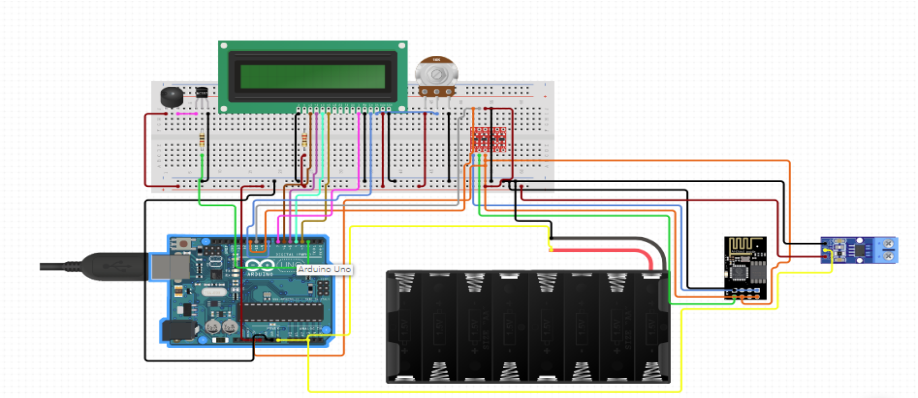
[3] Requirements for Harmonic Control in Electrical Power Systems

In IEEE Recommended Practise**,** the goals for designing electrical systems with both straight-line and curved loads are laid out. There is a description of the voltage and current waveforms that can be found in the system, as well as the goals for waveform distortion for the system creator. The point where sources and loads connect is called the interface, and if you stick to the design goals, there will be less interference between electrical devices. This

best practise talks about limits on steady-state behaviour. There may be short-term situations that go beyond these limits. This document lists the power quality standards that must be met at the place of common coupling. This document doesn't talk about radio-frequency interference, but it does talk about wired telephone lines.

PROJECT DESCRIPTION

CIRCUIT DIAGRAM



WORKING PRINCIPAL

In this prototype version. Researcher implemented a dual-grid system (Solar and electrical grid) for energy sources. Here, the battery is charged via solar and the electricity grid. According to the instructions provided by the Arduino controller, the battery is charged via solar and the power grid. The highest priority is placed on renewable energy (solar). The power grid comes in second place. It will transition when solar power production falls below 70% of the gridVoltage sensors are used to monitor power generation from solar and the power grid and display the information on an LCD display, while IoT is used to share the data via the internet.

In this battery, the circuit will break when the power level falls below 20%, and it will charge above 80%.

HARDWARE DESCRIPTION

HARDWARE REQUIRED

- Power supply
- Solar panel
- Battery
- Arduino controller
- LCD display
- IOT module
- Buzzer

POWER SUPPLY

The ac voltage, which is usually 220V rms, is attached to a transformer, which lowers the ac voltage to the right dc level. A simple capacitor filter first screens a full-wave rectified voltage from a diode rectifier. This makes a dc voltage. Most of the time, there are waves or changes in the AC voltage in the DC voltage that comes next. No matter what happens to the dc voltage at the input or the load attached to the dc voltage at the output, a regulator circuit keeps the dc value the same. Most of the time, a common IC voltage regulator is used to control this voltage.

SOFTWARE DESCRIPTION

SOFTWARE REQUIRED

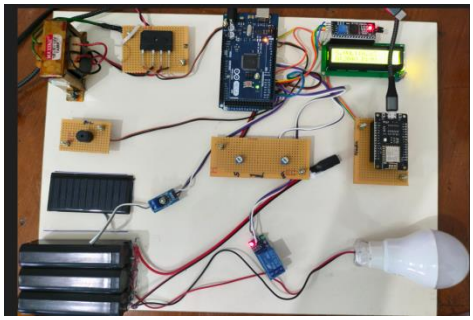
- Arduino ide
- Proteus testing tool
- Embedded c

ARDUINO IDE

- Integrated Development Environment stands for IDE. It is a text editor that allows code to be uploaded to Arduino. Every programme file is referred to as a sketch and comprises every line of code written for a project. Every file now has the.ino extension, which used to be.pde! Verify Button
- The initial button is the confirm button. The verify button is used to compile and examine your code for errors. It identifies any mistakes in the sketch. If there are no errors, there will be no highlighted text and you can proceed. The shortcut key for the verify button is ‘cntrl + r’.

RESULTS &DISCUSSION

OVER ALL KIT IMAGE



In this process we just switch on the power supply and all details will displayed through LCD display

In this all 3 source power will monitor through controller and updated in LCD display and IOT application. In this we can switch over to the other source when the power get above and below the limit to prevent from unwanted damages

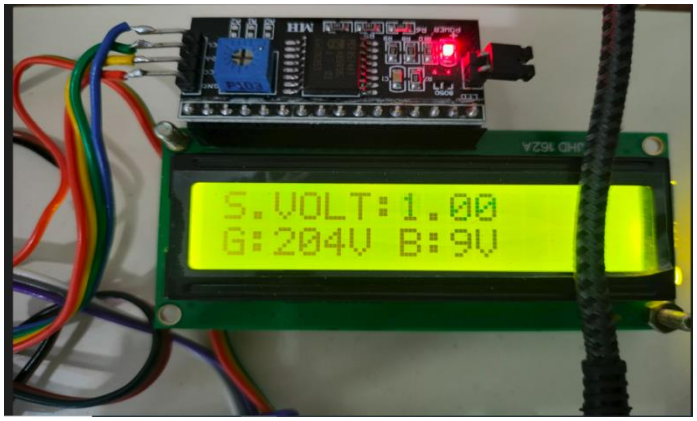


Figure 6.1 (a) Power level of Grid, Solar and Battery

In this it show the power level for grid, solar, and battery

S- solar power
G- grid power (transformer)
b- battery

Figure 6.1b(i) When PANEL voltage is Low

If the Panel voltage is less than or equal to the 0.5v,Then Power switch over to the Grid ,then it will give supply to the load. If Panel voltage is greater than 4v, then power switch over to the grid,then grid will provide the supply to the load.

Figure 6.1b(ii) Power Switch over to Grid if Panel voltage is low

When the Battery voltage is less than or equal to the 5v, then the power switch over to the Grid ,then it will provide the supply to the load

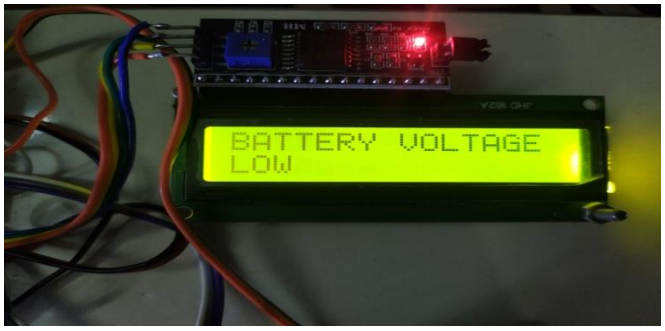


Figure 6.1c(i) When Battery voltage is Low

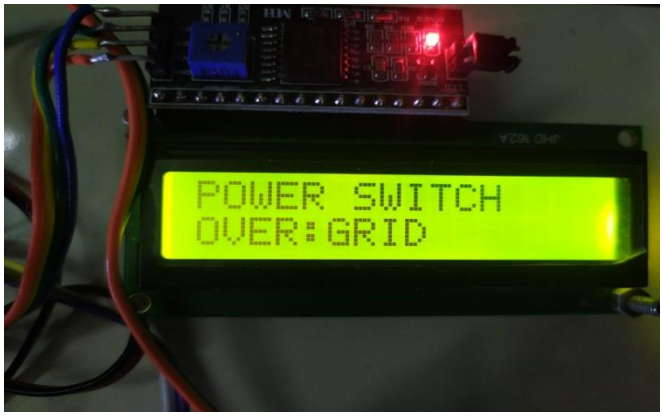


Figure6.1c(ii) Power switch over to Grid if Battery voltage is Low

If Battery voltage is greater than or equal to the 11v Similarly , power switch over to the grid. Battery voltage range between 5v to 11v,then load is supplied by Battery ,Otherwise Grid

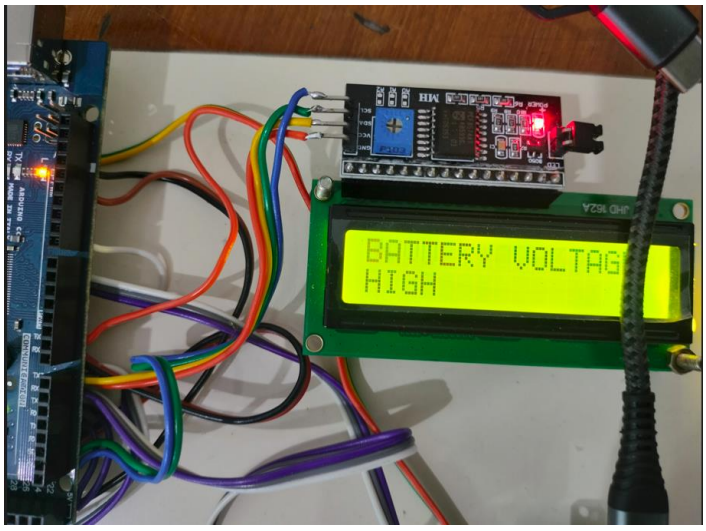


Figure 6.1c(iii) when Battery voltage is High

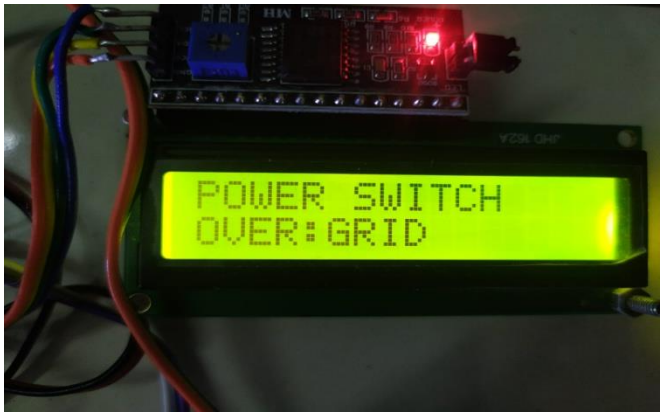


Figure 6.1c(iv) Power switch over to Grid if Battery voltage is High

Grid voltage is less than or equal to the 180v,then power switch over to the battery,and load is supplied by battery

Figure 6.1d(i) When Grid voltage is Low

Figure 6.1d(ii) Power switch over to Battery if Grid voltage is low

Similarly,Grid voltage is greater than or equal to the 230v,then power switch over to the battery,and the load is supplied by battery.

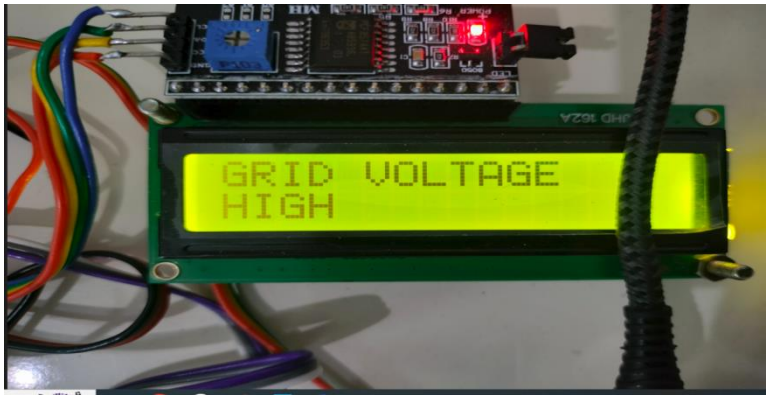


Figure 6.1d(iii) When Grid Voltage is High

Figure 6.1d(iv) Power switch over to Battery When Grid voltage is High

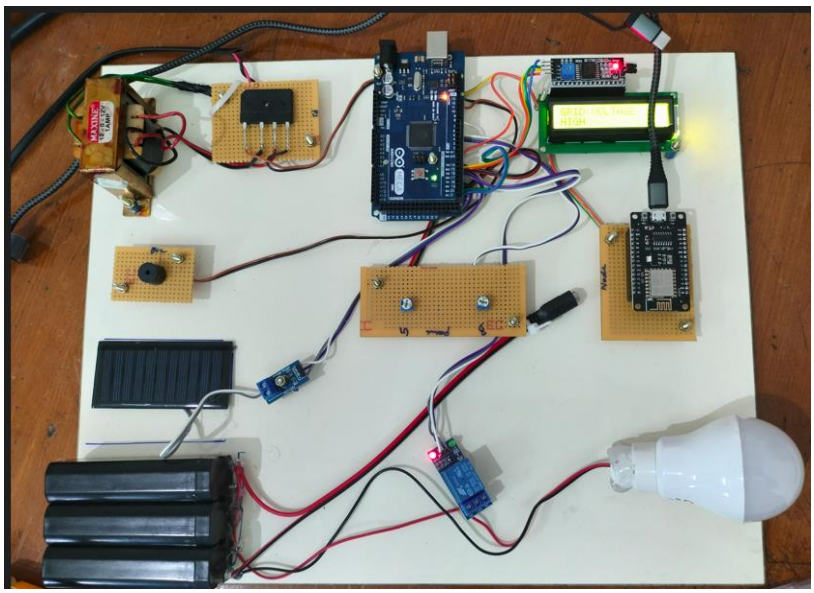


Figure 6.1(e) Hardware module

CONCLUSION

Costs for putting electricity into homes in distant areas depend on how far they are from the power grid. A person can always use an off-grid PV system when the cost of getting electricity is too high. Both photovoltaic (PV) systems that are linked to the grid and those that are not have their pros and cons. One's choice of action can be made based only on what they need. Most of the time, grid-tied systems are found in urban and semi-urban places that already have electricity. The off-grid method works better in places where electricity isn't yet available or where the consumer doesn't want to send the energy he or she makes back to the grid. This project shows how to build a PV system that doesn't connect to the grid. Using a bus shelter at EIU, a PV system was made to hold a WIFI module, charging spots, lights, and sensors that would help the students who used it. The planning method doesn't just work for bus stops; it can also be used for other things that need an off-grid system. The economy of the system have not been looked at in this project because there are many sellers on the market. After figuring out how much the system can handle, a person can look for the best equipment for their price.

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