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# A Review On Design And Implementation of Solar Inverter Based Battery System Using Arduino In Grid For Load Conditions

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A B S T R A C T

Solar power plants, which capture energy from the sun using ecologically friendly technologies, might be a solution to the coming electricity shortage, making them the most extensively developed and dependable option. In order to convert solar energy into usable electricity, you'll need the state of the sun. Large PV systems may be powered by the sun under sunny situations. until the battery is fully charged While it's overcast outside,situations or at night, the PV system delivers the demand and is free of charge battery. When the battery's stored energy is gone, the device will shut off.The load will be cut off before the desired time. As a result, do some digging. in order to boost the capacity of the PV system, a load management system is required maintaining the level of electricity generated by solar power and provision of power to the load As an example, consider the following approach of managing load power:bright, overcast or wet weather simply looking at the time of day.leftover battery capacity that may be used Loading installations are high-, medium-, and low-load installations are all included in the plan. Simulation results show that the use of V load management strategies can lead to an increase in power generation. power generation capacity and duration

## 1. Introduction

The sun's energy is often used to generate electricity. That being said, daytime availability and monsoon changes alter the availability of the same. IR sensors are proposed in this paper as an alternative method of solving this problem. It is possible to utilise an IR sensor grid to power the solar panel at night or even during the days of a monsoon fluctuation. The IR grid used to generate electricity is examined in this study for efficiency and driving capacity. The goal of this project is to control the opening and closing of the solar panel cover based on the amount of sunlight. The number of power outages has risen as a result of this phenomenon, which occurs on a regular basis. Every day and night, there is a loss of power. This project is designed to solve this problem. LDR, amplifier, ADC, Infrared, microcontroller, driver circuit, and motor and limit switches are all included in this project's design. When sunlight strikes a solar panel, it creates voltage signals, which are subsequently sent to a circuit that changes the circuit's state. Increases in produced voltage are caused by changes in the size of the panel board. As the sun rises and sets, the direction it travels naturally changes. During the night, an infrared circuit is activated to generate electricity. The sun's energy is often used to generate electricity. That being said, daytime availability and monsoon changes alter the availability of the same. IR sensors are offered in this research as an alternate method of solving this challenge. It is possible to utilise an IR sensor grid to power the solar panel at night or even during the days of a monsoon fluctuation. The IR grid utilised to generate electricity is examined for efficiency and driving capacity in this study. The stage an electrical system may be built around an Arduino with sensors pre-installed, which can be used to measure and operate the system. Using Arduino, a solar-powered inverter charging system may be built at a reasonable price. The solar panel converter DC/DC, battery, MPPT circuit employing Microcontroller, sensors, and the MPPT algorithm are all part of this system. On an Arduino Uno, the MPPT (Maximum Power Point Tracker) method has been successfully implemented. It is the Panel's voltage and current that are being measured so that the algorithm may be used to obtain MPP. This research focuses on the solar charge controller at its most powerful setting. Natural energy supplies including uranium, petroleum, and natural gas have been depleted as the business has expanded and spread around the globe. In order to effectively manage resources and use renewable energy sources, such as solar photovoltaics, energy prices and environmental concerns are driving the development

of new technologies. One of the cleanest and most sustainable energy sources is photovoltaic (PV). Because there is no noise when sunlight is converted into electricity, solar panels are a quiet energy source. If you want to ride the siren and control many different gadgets, you'll need an Arduino microcontroller-based kit like this. Arduino software is compatible with all operating systems and is simple to use for novices, it is less costly, and we can construct Arduino-based projects that may be entirely stand-alone or projects that need direct contact with software stored on the computer. Other uses for Arduino include actuators, controlling relay circuits, and so on. It is the primary goal of this project to use an Arduino to run Siren for a certain amount of time. An Arduino is a free and open-source platform that includes a programmable circuit board as well as a computer programme. A user's siren can be set to sound at specific times based on system events. Powered by solar energy, sirens produce a lot of noise. Solar energy is used as a backup for the biometric unit in this scheme. Using this system, the siren can be switched off for the required amount of time without being interrupted by the user, and a backup power supply for the biometric unit can be provided if the main supply fails.

## 2. Literature survey

There is a lot of research going on Raspberry Pi, Arduino and cloud data uploading are used in this suggested system.[1] When using Raspberry Pi as a central monitoring device, When compared to other systems, the Raspberry Pi is a cheap and portable device that is straightforward to use. In this project, the Arduino may be used to monitor the voltage and current values of the power system. Continued observation of the solar system provides information on power and energy. Using the system's easy-touse features to construct a smart grid These data are gathered from the number of solar panels and analytics data that may be shared with a particular address on an IoT platform that is studied in this literature review[2]. There are a voltage and current sensor, ATmega328, Wi-Fi Module and LCD in the system that may be used for monitoring the voltage and current of the system. Using the solar panel as a power source, the current sensor and voltage sensor measure how much power is being drawn from the panel and how much voltage is being applied to the panel. It's the Wi-Fi module that connects to the cloud. An MPPT approach (maximum power point tracking) in this system's major goal is to keep the solar panel rotating in a direction that receives high intensity sunlight. There is a lot of microcontroller, voltage measurement, PWM technique, and MPPT method usage in this suggested system. An internet-connected system for monitoring and managing voltage and current output has been devised and is being studied in [4]. (IoT). Using IoT, you may access the system from a distance, run a distant location, and use a real-time application. Coded signals are used to transmit information to the other side. It was found that the LDR, GSMA, PV, Node MCU and LCD are the primary components of the suggested approach in this method. This project's main goal is to maximise the amount of electricity generated by the PV. By using the Internet of Things, a solar panel keeps track of several factors including current, voltage, and temperature. The open source cloud platform applications in this suggested system are used to think and talk. Make advantage of hypertext transfer protocol (HTTP) and an Internet-connected sensor system to transport data from the local network to the cloud. Data records were sent to the sensors in full.

## 3. Methodology

Off-grid solar power systems use this digital charge controller to monitor voltage and battery charging mode. After that, a relay alternately powered both batteries. Voltage is the only factor that affects the performance of the two batteries that are linked. For example, if one battery's voltage is less than 5 volts, the other battery will immediately go into charging mode, and vice versa. If battery A is about to run out of juice, the Relay will put it into charging mode, and then battery B will be able to charge. Batteries are usually connected to a controller in a controller system. In order to keep the batteries charged to the correct voltage, a charge controller is used. The charge controller prevents overcharging of the batteries by controlling the input voltage from the solar array. To regulate the amount of electricity generated by the solar panels and stored in the batteries, a charge controller is installed between the array of solar panels and the batteries. The lifespan of a solar panel is far longer than the lifespan of any other source of electricity. In recent years, solar power has emerged as a viable alternative source of energy. Because of its quantity, pollution-free status, and capacity to be replenished.

## 4. Block diagram

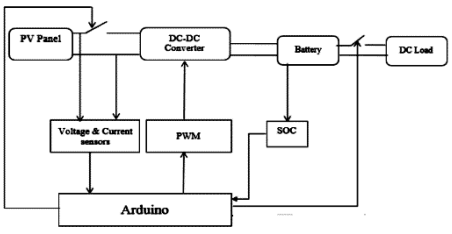


Fig 1 .Block Diagram of overall system

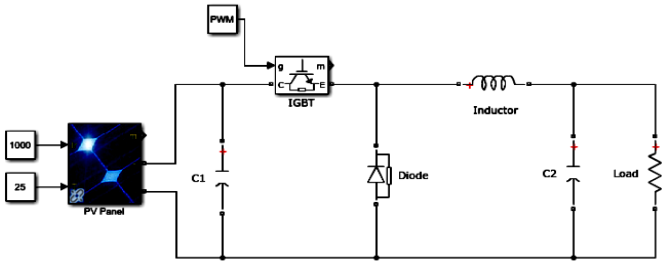


Fig 2**.** Equivalent circuit

An Arduino-controlled power supply was utilised as a starting point for the design of this charger's circuit. The circuit will be powered by an AC/DC power supply, which needs a 5-volt regulated voltage source such an AC adapter or an ATX computer power supply. Because of current limitations, most USB ports are not suited for this project. To charge the battery, a 5V supply is sent via a 10 ohm power resistor and a power MOSFET. Solar panels, which absorb energy in the form of light, turn the sun's beams into electricity. Solar panels may be used for a wide range of applications, including powering individual devices, electronics, and even automotive batteries. Photovoltaic (PV) cells, which are also called solar cells, are the solar panel's smallest component.. A "module" or panel is a set of cells placed together; a collection of two or more panels is referred to as a "array". A flashlight, a smart phone, or even an electric automobile may all be powered by an electric battery, which is made up of electrochemical cells and external connections. The cathode and anode are the positive and negative ends of a battery, respectively, while the battery is providing electricity. When an external circuit is linked to the negative terminal, electrons flow and provide energy to the external device. Any chemical processes that take place at the battery's different terminals may be completed and the energy needed by an external circuit when it is linked through an external circuit. In order to accomplish work, current must flow out of the battery via the movement of these ions. "Battery" used to refer only to devices with several cells, but now the word is also used to describe devices with a single cell. Using a 12 volt DC battery, the system may be powered as necessary.

## 5. Design considerations

Working Condition of the System Solar power is a significant source of energy. While this is possible during daytime hours, the rainy season may alter this. This study suggests that infrared sensors might be a viable solution to this problem. The solar panel might be powered by the IR sensor grid architecture at night and even on days with monsoon fluctuation. This research studies the efficiency and driving capacity of the IR grid for power production. With this project, we're going to automate the solar panel cover's opening and closing depending on the quantity of available sunshine. There has been an increase in the demand for energy in recent months because of the frequent power disruptions. This initiative aims to find a long-term solution to the issue of constant power interruptions. LDR, amplifier, ADC, Infrared, microcontroller, driver circuit, and motor and limit switches are all incorporated in this project's design. Voltage signals are created when sunlight shines on a solar panel's silicon cells. A circuit that alters the current is supplied these voltage signals. PV systems' production is extremely dependent on operating circumstances, even as the technology has grown in recent years. Most of the time, it's difficult to get the greatest possible outcome. MPPT controllers, which monitor the sun's precise position, are becoming more used in solar-electric systems. The algorithms utilized by these controllers, for example, vary widely in terms of tracking speed, complexity, and sophistication. MPPT controllers may currently be divided into two broad categories: classic and advanced. Traditional methods, notwithstanding their simplicity, are ineffective because they cannot distinguish between local and global peaks when partial shadow occurs. Because of their effectiveness, sophisticated tracking technologies are often used. To get around the limitations of both conventional and advanced methodologies, hybrid approaches have been developed as a workaround. Despite the fact that the optimum MPPT methodology is still a mystery, a study of the methods that have previously been used might help. In this study, the categorization and assessment of all MPPT techniques are summarized. As a starting point for larger-scale studies in the near future, researchers may utilise this work. The voltage produced by a bigger panel board is proportional to its overall size. Every hour, the sun's path automatically shifts. An infrared circuit creates power when night mode is activated.

## Conclusion

Power producing system is fantastic and effective solution for power production than conventional energy resources. It has greater efficiency. It may provide to faraway places where government is unable to reach. So that the power may be employed where it produces so that it would lessen the transmission losses and cost. Cost reduction may be done by extending the manufacture of the equipment. People should encourage to employ the non conventional energy resources. It is highly safe for the environment as it doesn’t create any pollution and toxic waste product like conventional energy resources. It is cost effective alternative for producing. It only demand initial investment. It has also extended life span. Overall it is good, consistent and affordable way for electricity production

## REFERENCES

[1] Y. M. Safan, S. Shaaban and M. I. A. El-Sebah, "Hybrid control of a solar tracking system using SUI-PID controller," 2017 Sensors Networks Smart and Emerging Technologies (SENSET), Beirut, 2017, pp. 1-4.

[2] Vaishali T. Tekade1 , Mrunali R.Kude2 , Bharat D.Deore 3, Priyanka V. Ahire4 , “Design and development of solar panel inverter with MPPT. International and research journal of engineering and technology. Vol: 04/ April-2017.

[3] Bal Bheem Nadpurohit1 , Roopa Kulkarni2 , Kadappa Manager3 , Nagaraj Devar4 , Rahul Karnawadi5 , Edmund Carvalho6 , “IoT Enabled Smart Solar PV System”, International Journal of Innovative Research in Computer and Communication Engineering. Vol. 5, Issue 6, June 2017.

[4]Megha A Joshi1 , Kavyashree S2 , “IOT Based Smart Inverter Using Raspberry PI”, International Journal of Latest Technology in Engineering, Management & Applied Science (IJLTEMAS), Volume VI, Issue VS, May 2017 | ISSN 2278-2540.

[5] Ninganagouda Biradar1 , Dr. Baswaraj Gadgay2 , Veeresh Pujari3 , “An IOT Enabled Smart Inverter” . International Journal for Research in Applied Science & Engineering Technology IJRASET, Volume 5 Issue VI, June 2017.

[6]Solar energy.https://www.solarreviews.com/blog/peak-sun-hours-explained.

[7] Arduino board/ https://machirurgie-esthetique.com/chapter-1

[8] Smart Grid, Smart Inverters for a Smart Energy Future https://www.nrel.gov/state-localtribal/blog/posts/smart-grid-smart-inverters-for-asmart-energy-future.html

[9] V. B. Venkateswaran and V. Manoj, "State estimation of power system containing FACTS Controller and PMU," 2015 IEEE 9th International Conference on Intelligent Systems and Control (ISCO), 2015, pp. 1-6, doi: 10.1109/ISCO.2015.7282281.

[10] Manohar, K., Durga, B., Manoj, V., & Chaitanya, D. K. (2011). Design Of Fuzzy Logic Controller In DC Link To Reduce Switching Losses In VSC Using MATLAB-SIMULINK. Journal Of Research in Recent Trends.

[11] Manoj, V., Manohar, K., & Prasad, B. D. (2012). Reduction of switching losses in VSC using DC link fuzzy logic controller Innovative Systems Design and Engineering ISSN, 2222-1727.

[12] M. Prabakaran, A. P. Kumar and R. Hariharan, "Hybrid H-6 inverter coupled automatic dual axis solar tracking system," 2016 International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT), Chennai, 2016, pp. 4722-4731.

[13] Dinesh, L., Harish, S., & Manoj, V. (2015). Simulation of UPQC-IG with adaptive neuro fuzzy controller (ANFIS) for power quality improvement. Int J Electr Eng, 10, 249-268