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Solar PV with Storage Battery & Stand-Alone Load with Mobile Monitoring

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ABSTRACT: The photo voltaic (PV) stand-alone system extends the maximum power from solar PV using a maximum power point tracking system (MPPT) by Pert and observe uses the (P&O) method and with the help of electronic device called of DC-DC converter, to Improve power quality by sinusoidal pulse width. Modulation (SPWM) technology inverter output harmonic reduction technique that changes the switching frequency of the power MOSFET by changing the switching frequency of the MOSFET, changing the switching frequency of the power MOSFET, their gating signals, automatic battery charging and discharging controllers with the help of electronic circuits The inverter controls the output voltage. Changing the switching frequency of MOSFET, this system gives ideas about increasing the efficiency of solar system, this system explains with the help of simulation results and hardware.

KEYWORDS - Maximum Power point tracking, Pulse width modulation, Pert & Observed, Photo Voltaic, MOSFET, Inverter, AC, DC-DC converter.

I.INTRODUCTION

We are introducing a solar based project in which we are going to provide power to loads of HOD Cabin by using solar energy to charge battery and then the DC battery is used to power an AC load using inverter. Our solar panel is used to constantly charge the 12 V DC battery using charge controller circuitry. And once we turn on the load switch the battery charge is inverted and stepped up from 12V DC. This is now provided to the AC load. As we switch on the loads, the battery charges the inverter and it gets converted from DC to AC, then the step-up transformer increases the voltage required to run the device. Whatever the solar energy captured by sun in a day we can continuously track by using mobile application. It includes solar panel, Charge Controller, 12V battery, microcontroller unit, inverter, etc. Solar energy helps to charge the battery by a natural source of energy. Thus, our system is successfully power AC load using a solar panel and batter.

The main objective of this project is to use solar energy to power AC loads with the help of DC battery and DC to AC inverter.with a population of 1.4 billion and one of the world's fastest-growing major economies, India will be vital for the future of the global energy markets. The Government of India has made its impressive progress in recent years in attaining self-sufficiency in producing green energy through National Solar Energy Mission-2020. Report on India 2020 energy policy review states that India successfully implemented a range of energy market reforms and carried out a huge amount of renewable electricity deployment, notably in solar energy and other renewable including wind energy. It is recognised that India is one among the several countries of the world and has made huge strides to ensure full access to electricity, bringing power to more than 700 million people since 2000. By the end of 2030 India is planned to bring secure, affordable, and sustainable energy to all its citizens so that India can make its significant progress in reducing the use of traditional biomass in cooking. The chief cause of indoor air pollution that particularly affects women and children is mainly due to the use of tradition use of firewood and other carbon emission fuels by relying more on green energy for cooking and other Domestic requirements including irrigation.

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II. SYSTEM MODEL AND ASSUMPTIONS

The design of the solar PV with storage battery and standalone load with mobile monitoring includes a specially designed inverter circuit and a solar panel. The inverter circuit has been designed according to the requirements and specifications of solar panel. Many sample circuits have been studied to optimize the existing circuit.The design of the solar PV includes a specially designed inverter circuit and a solar panel. The inverter circuit has been designed according to the requirements and specifications of solar panel. Many sample circuits have been studied to optimize the existing circuit. The all operation will be monitoring on the mobile phone, Such as how many power generated by the solar panel.

When the sun shines onto a solar panel, energy from the sunlight is absorbed by the PV cells in the panel. This energy creates electrical charges that move in response to an internal electrical field in the cell, causing electricity to flow.The solar panels is used to always charge the 12V DC battery with help of charge controller circuit and then once we turn on the switch the 12V battery output is applied to the inverter input. The inverter converts the 12V DC to 12V AC, and then it is step up to 230V AC supply with help of step-up transformer. Whatever the solar energy captured by sun in a day we can continuously track by using mobile application.

III. NECESSITY

The necessity of a solar PV with storage battery alongside solar power depends on various factors, including your specific energy needs, the reliability of your solar power system, and your tolerance for power interruptions.Here are some reasons why you might consider integrating a solar PV with storage battery with your solar power system. While solar power is renewable and generally reliable, it is still subject to interruptions due to factors like weather conditions (cloud cover, storms) or maintenance issues. A UPS can provide seamless power during these interruptions, ensuring continuous operation of critical equipment. Electrical devices, especially sensitive electronics, can be damaged by power surges or sudden power outages. A UPS acts as a buffer, regulating voltage and providing surge protection to safeguard your equipment.Some UPS systems come with built-in battery storage, which can be charged using solar power during the day. This stored energy can then be used during the night or during periods of low solar production, enhancing the reliability of your energy supply.If you rely on solar power for critical applications such as medical equipment, telecommunications, or data centres, a UPS becomes essential to ensure uninterrupted operation.In grid-connected solar power systems, a UPS can provide backup power during grid outages, allowing you to continue using solar energy even when the grid is down.

IV. CONTINUITY IN POWER

A solar photovoltaic (PV) system,which generates electricity from sunlight, and a storage battery, which stores excess energy produced by the PV system for later use. The system is designed to power a standalone load, meaning it operates independently of the electrical grid. In case of cloudy atmosphere solar photovoltaic is unable to provide the energy in that case we can use power from electrical grid to charge the DC battery and it converted into AC voltage using inverter. The primary objective of this project with solar is to ensure uninterrupted power supply to critical loads, regardless of external factors such as grid outages, fluctuations in solar generation, or sudden spikes in power demand.By integrating a solar PV with storage battery, you can balance the load between solar generation, battery storage, and grid power more efficiently. This optimization helps maximize the utilization of renewable energy sources and minimize reliance on grid electricity, especially during peak demand periods or when solar generation is insufficient.Another key objective is to protect sensitive electronic equipment from power surges, voltage fluctuations, and sudden power outages. It acts as a buffer, providing clean and stable power to connected devices, thereby extending their lifespan, and ensuring reliable operation. For systems equipped with battery storage, the UPS facilitates energy management by storing excess solar energy generated during the day for use during periods of low solar production or high demand.

This helps optimize self consumption of solar energy and reduces dependency on grid power.Integrating a UPS with solar power enhances the resilience of the energy system by providing backup power during grid outages or emergencies. This is particularly important for critical applications where uninterrupted power supply is essential, such as healthcare facilities, telecommunications networks, or data centres. Many modern PV systems come with advanced monitoring and control capabilities, allowing users to remotely monitor system performance, track energy consumption, and receive real-time alerts about potential issues. This enables proactive maintenance and troubleshooting, improving system reliability and efficiency.By harnessing solar power and minimizing reliance

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on fossil fuels, the integration of UPS with solar contributes to environmental sustainability by reducing carbon emissions and reliance on non-renewable energy sources.

Solar PV system generates electricity from sunlight, The electricity is used to power the standalone load directly, meeting the immediate electrical demand, Any excess electricity generated but not immediately consumed by the standalone is directed to the storage battery for storage. When the solar PV system is not producing enough electricity to meet the standalone load's demand (e.g., during nighttime or low sunlight periods), the stored energy in the battery is used to supplement the shortfall. The mobile monitoring system allows users to track the systems performance, monitor battery charge levels. The combination of solar PV, storage battery, and mobile monitoring provides a sustainable and reliable source of electricity for standalone loads, reducing dependence on the electrical grid and potentially lowering energy costs.

V. RESULT AND DISCUSSION

These graphs shows the temperature vs solar radiation. In this experiment halogen light source were used for irradiation in laboratory. The procedure is devoid of sunlight irradiation. The I-V & P-V characteristic are measured and plotted at different intensity. The PV system which was taken into consideration comprises of two 37watt PV module, halogen light, blogger& plotter. Blogger is the equipment which comprises digital meters, charge controller, MPPT, battery, dc-dc converter & ac-ac converter. Plotter is the equipment which is connected to blogger and computer. In blogger which is digitally supported indicates the reading of current, voltage, dc voltage, ac voltage, dc current, ac current and temperature of the module. The data was collected and the performance of 37 watt PV system was analyzed.

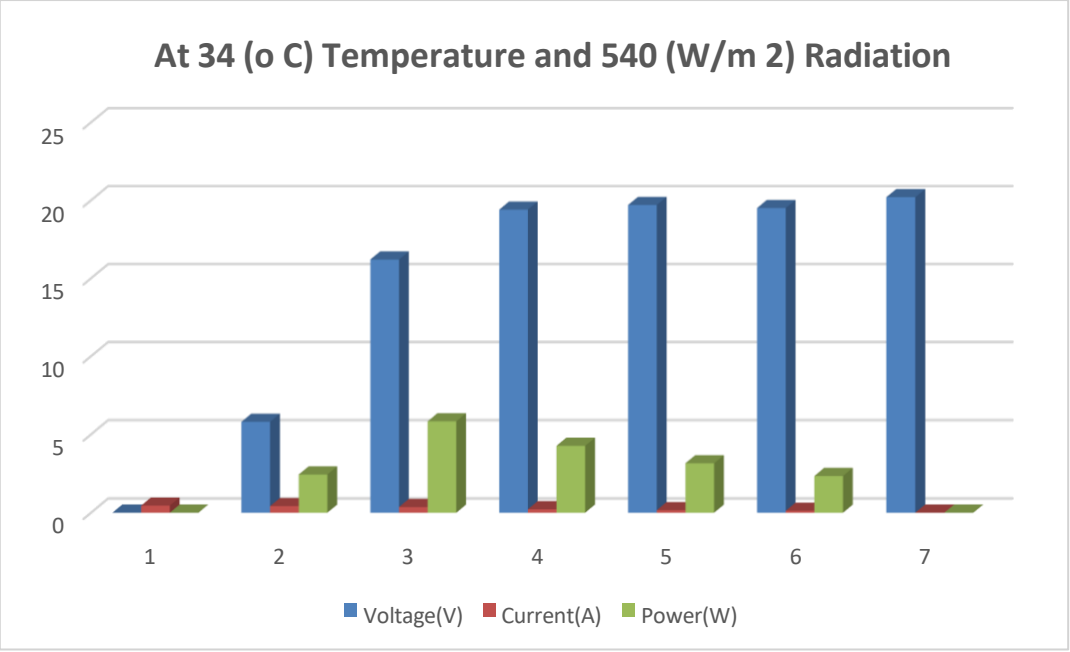

Fig. 1 At 34 (o C) Temperature and 540 (W/m 2) Radiation

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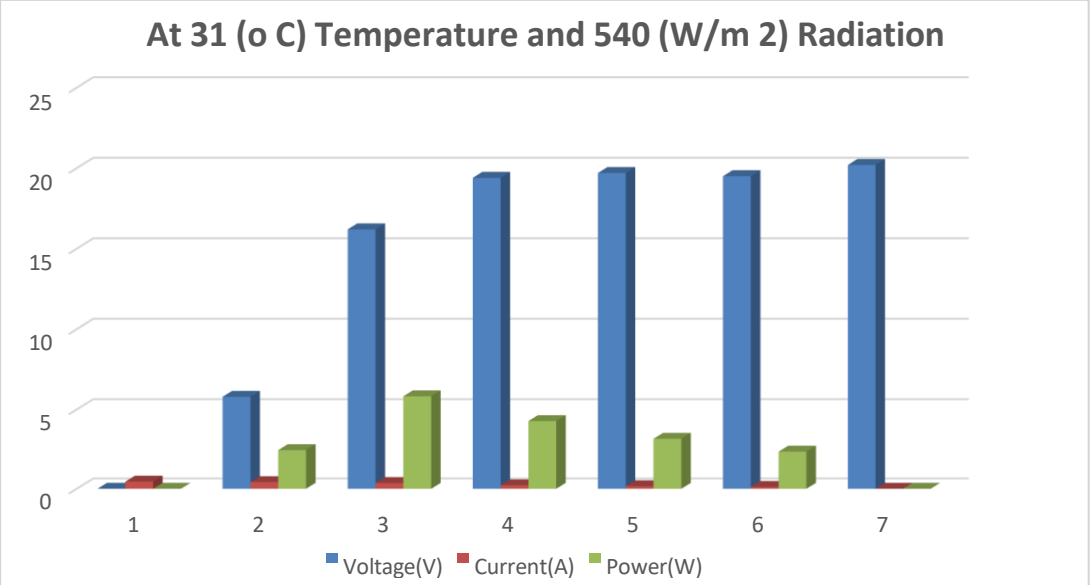

Fig. 2 At 31 (o C) Temperature and 460 (W/m 2) Radiation

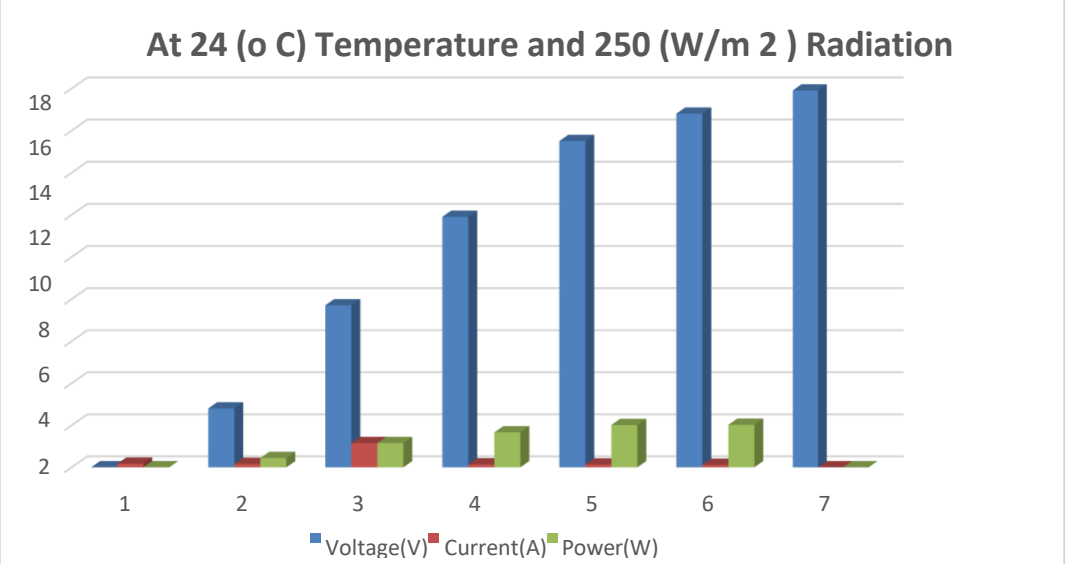

Fig .3 At 24 (o C) Temperature and 250 (W/m 2) Radiation

V. CONCLUSION

The result of the economic analysis shows that a combined system has potential for both a lower in- vestment cost due to cheaper components and increased energy savings through lower conversion losses. The conclusion from the study is that a combined solar energy and UPS system is technically feasible.In conclusion, solar energy technology has both advantages and disadvantages. On the positive side, it is a renewable energy source, does not produce greenhouse gas emissions or other harmful pollutants, and can provide energy independence to households and businesses.

REFERENCES

[1] Khan, B.H; Non-conventional source of energy,5/e, Mc Graw Hill Education(India).
[2] Milliman, Jacob & Christors Halkias: Integrated electronics, 2/e, Mc Graw Hill Education India.
[3] Muhammad H.Rashid “Power Electronics” Pearson.
[4] Regine Mallwitz, Bernd Engel, “Solar power inverters” IEEE transactions, INSPEC Accession Number

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11874184, International conference on Integrated power electronics systems, Nuremburh, Germany, 6 March 2010.

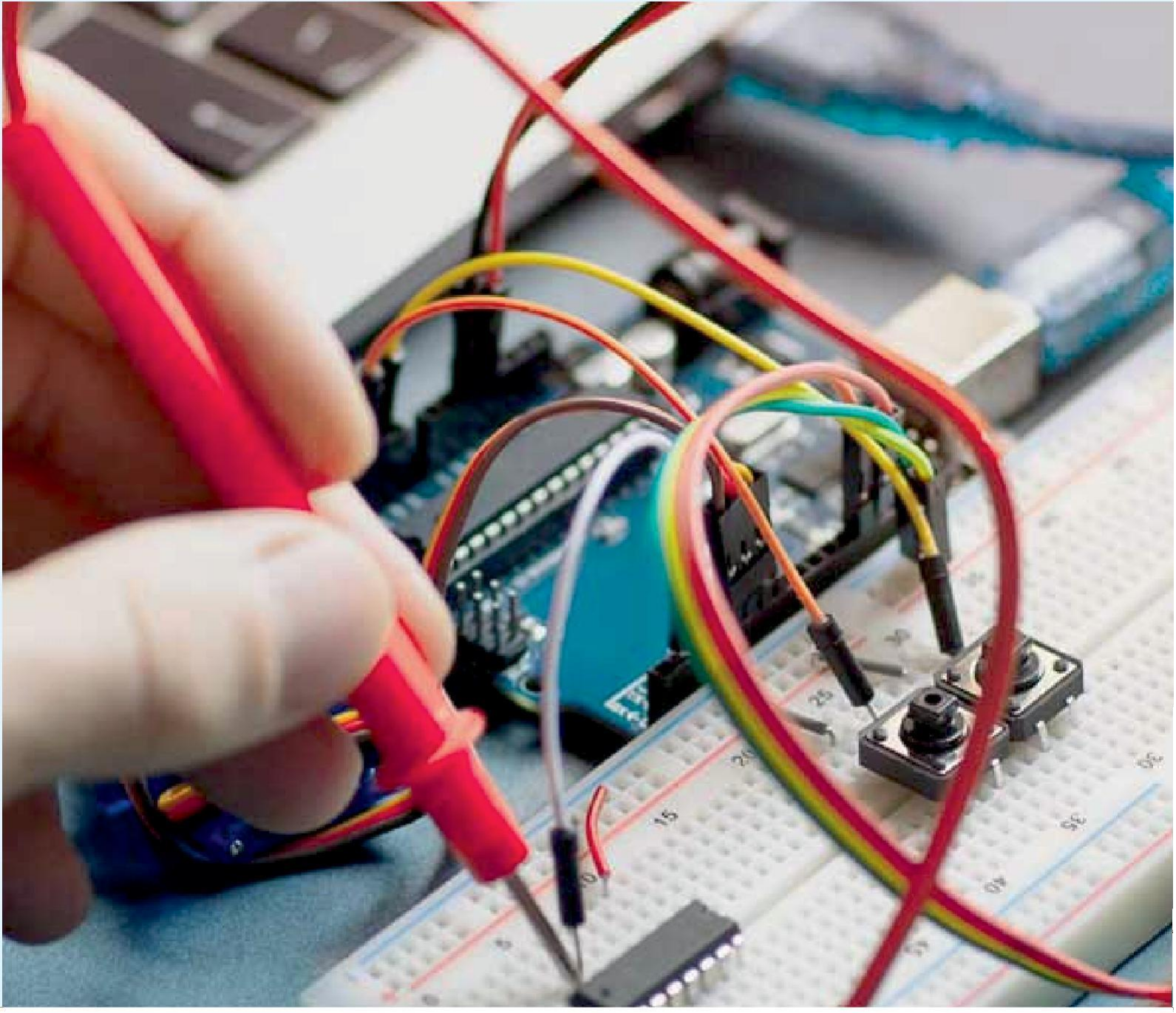
[5] C. Cavallaro, S. Musumeci, C. Santonociti, M. Pappalardo, "Smart photovoltaic UPS system for domestic appliances" IEEE transactions, INSPEC Accession Number 10846357, International conference on clean electrical power, Capri, Italy, 9–11 June 2009.

[6] Kanakasabapathy p, Vinod Kumar Gopal, Adhijith V, Athul Mohan, E. Hema Sridhar Reddy, "Energy management and control of solar aided UPS" IEEE transactions, INSPEC Accession Number 15416040, International conference on Technological Advancements in Power and Energy

[7] M. Asif, Sustainable energy options for Pakistan Renewable and Sustainable Energy Reviews, Volume 13, Issue 4, May 2009. 3. M. A. Ahmed, F. Ahmad and M. W. Akhtar, Estimation of Global and Diffuse Solar Radiation for Hyderabad, Sindh, Pakistan, Published ISSN: 1814-8085 in Journal of Basic and Applied Sciences Vol. 5, No. 2, 73-77, 2009. 4. K.

[8] Peter Stafford, Photovoltaic Concentrator Systems and their prospects [Oniline]. Available: http://researchrepository.murdoch.edu.au/1647/1/Stafford_2008.pdf.

[9] T. Naib, Organic Solar Cell Breakthrough, Unpublished: 2007 Nanomaterial Research Center Massey University NZ. 14. Michael Grätzel, Solar Energy Conversion by Dye-Sensitized Photovoltaic Cells, Published: Laboratory for Photonics and Interfaces, Swiss Federal Institute of Technology, CH-1015 Lausanne.



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