

RENEWABLE ENERGY-BASED POWER CONTROL SYSTEM WITH ISLAND CONTROL

Bhawal Mrunal Balasaheb*1, Dr. Dev Kumar Rai*2

*1PG Scholar, Electrical Engineering, ZCOER, Pune, Maharashtra, India.

*2HOD, Electrical Engineering, ZCOER, Pune, Maharashtra, India.

ABSTRACT

Dependencies on fossil fuel for day to day activities must be reducing due to limited stock of fossil fuel resources, also to prevent earth atmosphere. Optionally it's necessary to increase the usage of natural resources as it is available in abundant. Energy crises led to fall of nation due to dependencies for fuel, gas, coal, petroleum on other countries which in turn leads to nation falls bankrupt just like srilanka. Also use of fossil fuels leads to pollutions which is destroying earth atmosphere, increasing growth in new diseases such as corona, monkey pox, etc destroying human health and reducing human life, that's why becoming necessary to be independent as well utilization of natural resources and pollution free clean energy for day to day needs of energy in transportation, electricity generation. This paper suggest the basic development and design for cost effective energy generation and utilization from combination of renewable energy sources such as solar, wind, hydro power generation. Design shows maximum utilization of natural resources for energy supplies to industries, homes as first preference and if natural resources not available at time then switching over to fossil fuels or available grid supply.

I. INTRODUCTION

In fewer than ten decades, according to the World Energy Forum, fossil fuels including coal, oil, and gas will run out. Combined with the urgent need to stop the harmful climate changes, this has compelled planners and policymakers to explore for alternative sources or maximum utilization of renewable energy sources. The most significant event in international climatic cooperation will be the 2015 United Nations Climate Conference in Paris. In order to achieve sustainable growth and prevent catastrophic climate change, it was reiterated that a swift and global shift to renewable energy technology was necessary.

Design mainly focus on energy utilization obtained from multiple renewable sources such as pv, wind, hydro. Operational system will extract energy from renewable sources and supply to designed AC/DC micro grid for longer time removing dependencies on fossil fuels energy generation sources. AC/DC micro grid will extract energy from fossil sources only in absence of renewable sources. Design is also focused on development of cost effective system and sustaining for longer life providing uninterrupted supplies to load as per requirement

II. METHODOLOGY

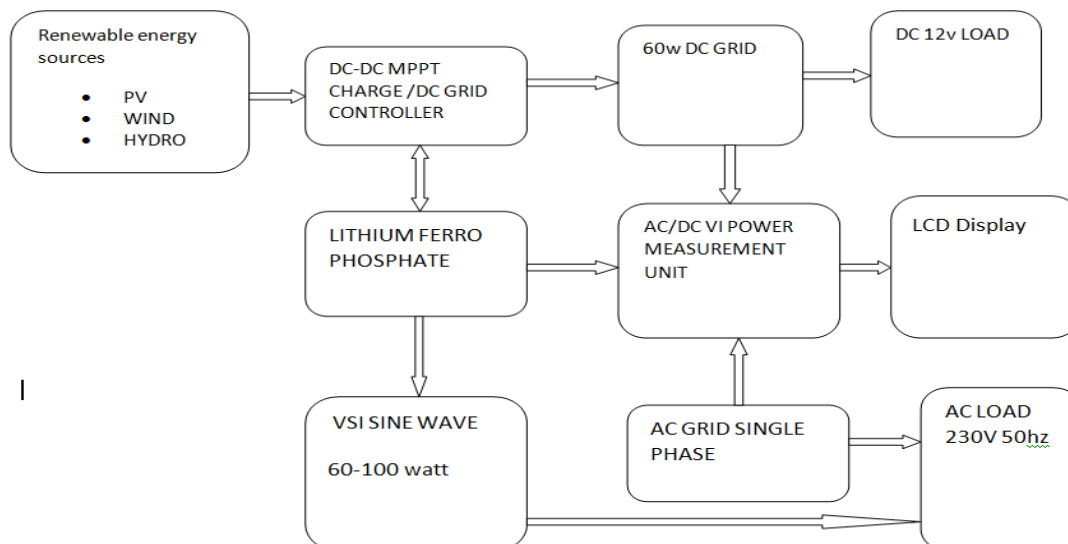


Figure 1: Block diagram of proposed system

III. TYPICAL BATTERY CHARGING

Inverters are circuits that convert dc to ac. We can easily say that inverters transfer power from a dc source to an ac load. The objective is to create an ac voltage when only a dc voltage source is available. A variable output voltage can be obtained by varying the input dc voltage and maintaining the gain of the inverter constant. On the other hand, if the dc voltage is fixed & not controllable, a variable output voltage can be obtained by varying the gain of the inverter, which is normally accomplished by pulse-width modulation (PWM) control within the inverter. The inverter gain can be defined as the ratio of the ac output voltage to dc input voltage. Modified sine wave inverter emulates a sine wave. It introduces a dead time in a normal square wave output. The wave is produced by switching the DC source between three values at set frequencies thus produces fewer harmonics than square wave . It provides a cheap and easy solution of powering devices that need AC power. Its main drawbacks are that not all device that are not resistant to the distortion of the signal like medical equipment and computers work properly on it . It should be noted that modified-sine wave inverters are not rated for Total Harmonic Distortion (THD).

Rating a modified-sine wave inverter for harmonic distortion would be useless, for their intended use is not to reduce the harmonics introduced to devices. Their purpose is to provide affordable and portable AC power. A question of efficiency is brought up in the discussion of harmonics. The pure sine wave inverters are 5% less efficient, but this rating is from the conversion of battery energy to modified sine wave output. This does not take into consideration the effect of harmonics on battery-to-device output efficiency. The high frequency harmonic content in a modified sine wave produces enhanced radio interference, higher heating effect in motors / microwaves and produces overloading due to lowering of the impedance of low frequency filter capacitors / power factor improvement capacitors. A pure-sine-wave inverter may be less efficient in terms of battery energy conversion, but more of the output energy is used by the load.

IV. RESULTS AND DISCUSSION

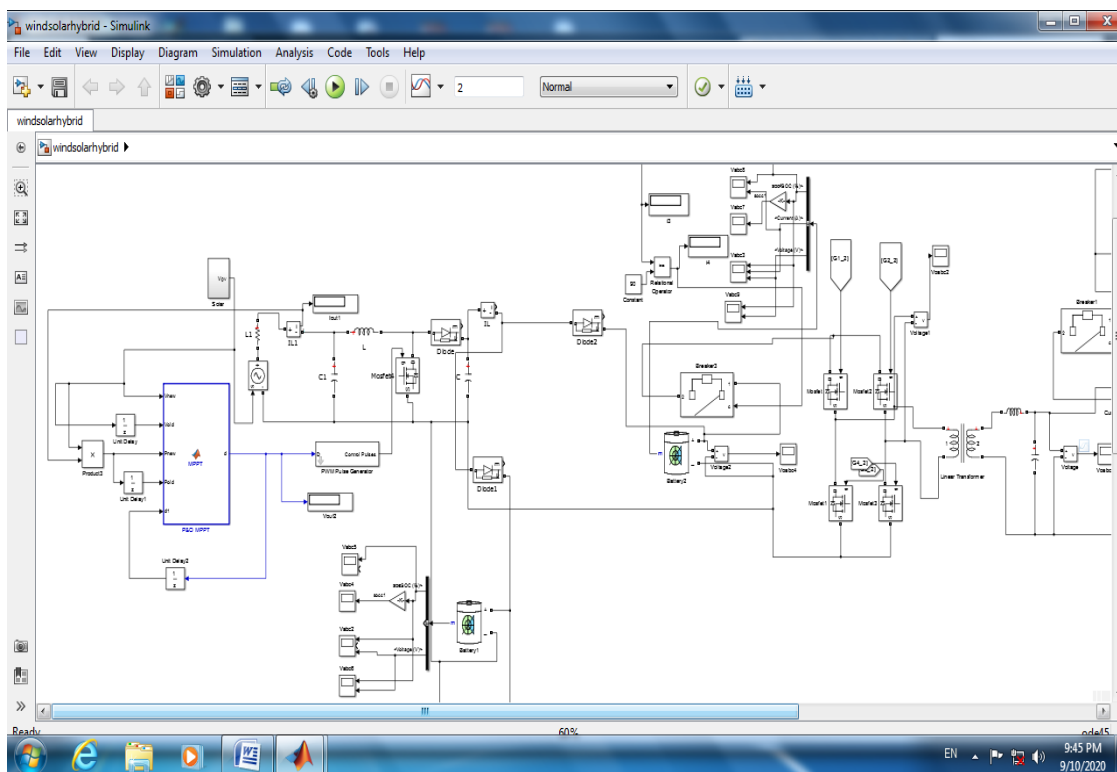


Figure 2: P and O solar mppt charger

V. CONCLUSION

Renewable energy provides supply for 18 hours out of 24 hours to load and 6 hours time period of 24 hours load receives supply from grid electricity. Pure sine wave inverter provides max 249v 50hz frequency with +/- 0.1% voltage change with load providing voltage THD to 4.8% maximum and current THD below 6% as per

valid limit values. Low cost prototype setup with DC microgrid capacity of 50watts providing 6hrs backup time on battery of 12v 12ah lithium ferro phosphate. Ac grid with capacity of 500watts pure sine wave providing 3hrs backup time on battery of 12v 100ah. With 1kw solar and 500w wind power provides 6 units power generation and saving of 6 units daily. Combined wind and PV saves 150 unit per month in summer and 100 units in rainy atmosphere and 130 units in winter. IOT provides remote monitoring of power utilization on thingspeak friendly user interface. This setup provides low cost design of renewable energy sources power utilization to generate eco friendly electricity utilize for maximum time by user in 24hrs day night cycle saving energy from fossil fuel, saving electricity, reducing energy bills, reducing pollution, saving energy for future generation.

VI. REFERENCES

- [1] R. E. Oguand G. A. Chukwudebe: "Development of a Cost-Effective Theft Detection and prevention System based on IoT Technology " 2017 IEEE 3rd International Conference on Electro-Technology for National Development (NIGERCON).
- [2] Muhammad Tariqand H. Vincent Poor:" Real Time Electricity Theft Detection in Micro grids through Wireless Sensor Networks"@2016IEEE.
- [3] Leo Raju, Sajna Gokula krishnanet. al:" IoT based Autonomous Demand Side Management of a Micro Grid using Arduino and Multi Agent System."@2017 IEEE.
- [4] Sholeh Hadi Pramono, Sapriesty Nainy Sariand Eka Maulana: "Internet -Based Monitoring and Protection on P V Smart Grid System" 2017 international conference on sustainable information engineering and technology (SIET)@2017IEEE.
- [5] Anuj Banshwar, Naveenkr .Sharma, Y. R. Sood, Rajnish Shrivastava: "Optimal Approach fo Efficient Utilization of Renewable Energy Sources in Power System ". 2016 IEEE Student's Conference on Electrical Electronics and Computer Science. @ 2016 IEEE.
- [6] Yibeltal Tarekegn : 'Distribution system Voltage Control by Using Distributed Energy Resource' IJSRET, ISSN 2278- 0882 Volume7, Issue 4, April 2018.
- [7] PSanjeev, Narayana Prasad padhy and promod Agarwal: Peak Energy Management using Renewable Integrated DCMicro grid. DOI10.1109/TSG.20172675917,IEEETransactions on smartgrid.
- [8] R.lakshmanrao, Rsireesha, sobhana.O: "power quality improvement Ingrid connected fuzzy based system using a modified converter of distributed generation. IJSRET, ISSN 2278-0882 Volume 6,Issue 10, October2017.
- [9] Fast charging system for passenger electric vehicles, Rick Wolbertus and et all. World electric vehicle journal 13 nov 2020.
- [10] Battery Condition Prognostic System using IoT in Smart Microgrids,5 nov 2018 IEEE
- [11] Miftahul Anwar1, *, Muhammad D. Ashidqi1, Sunarto Kaleg, Feri Adriyanto1, Sukmaji. Cahyono, Abdul Hapid, Kuncoro Diharjo, State of Charge Monitoring System of Electric Vehicle Using Fuzzy Logic. 1nov2018 (ICSEEA).
- [12] Mohammad Asaad1, Furkan Ahmad1, Mohammad Saad Alam1, Yasser Rafat2, IoT enabled Electric Vehicle's Battery Monitoring System. The 1st EAI International Conference on Smart Grid Assisted Internet of Things. 2017