

Design And Development of Solar Based of Integrated Power Inverter

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Abstract- This paper presents problems facing in India like communication, transportation etc. here we concentrated on the major problem of shortage of electricity. Sun is the best source of energy due to geographically location sunlight is free available throughout the year.

In this paper it gives detail information about hardware prototype solar grid tied inverter. An inverter is use electrical device which is use to convert Direct current to Alternative current. Solar panels are use to convert electrical energy into light energy.

Keywords- inverter, meter, solar panel, Battery, ARMLPC 2138.

I. INTRODUCTION

In this project we are detail study design and development of solar based integrated power inverter. In today's climate of growing energy needs and increasing environmental concern alternatives to the use of renewable and solar energy .Solar energy quite simply the emery produce by the son and collected elsewhere normally the earth. Sun creates its energy through a thermo nuclear process.

Renewable energy also called as non conventional type of energy it is continuously replaced y natural process for example solar energy bioenergy, wide energy, hetero power. A renewable energy system convert the energy found in sunlight, falling water-,wind, c waves, geothermal heat pr biomass into a form, which we use in the from heat or electricity .The majority of renewable energy comes either directly or indirectly from sun or wind and can never be fatigued, and therefore they are called a renewable.

Solar energy is radiant light from the sun a using a range of technologies of solar heating photovoltaic's, solar thermal energy, solar architecture, and artificial photosynthesis.

It is important sources of a renewable energy and technologies are broadly characterized as a active solar or passive solar depending on how they captured and distributed

solar energy and convert it into solar power. The oil, coal, keep rising and global warming becomes more severe due pollution, people. This page expires the many positive impacts of clean energy.

The benefits of wind, solar, hydroelectric, and biomass. For more information on the negative impacts-including effective solutions to an avoid and minimize on the environmental impacts of renewable energy Technologies.

One of the solution of these issue is to introduce renewable energy, such as photovoltaic, wind energy. Today the contribution of photovoltaic energy compared to the other renewable energy source is very blow but due to decreasing system price the market of PV system is one of the most stable and fastest growing in the world .if this trend continues, PV is one of the most important source in the futures. To maintain the further spread of PV system it is important to decrease the cost and the same time improve the efficiency and the reliability of these system .Valuable improvement can be made on the side of inverter of PV system .Therefore it seems to be a well spent effort to have close looks at the inverter , their topologies and control. As he energy from the sun is free, the major cost of photovoltaic generation is the installation cost which is mainly composed of the cost of solar module and the interface converter system with the development of solar cell technologies, the price of solar module has dropped dramatically.

Following figure 1.1 shows the energy generation in India. By different fuel types. Majority of world energy comes from conventional source which are 90% and only 10% of energy comes from non conventional energy source.

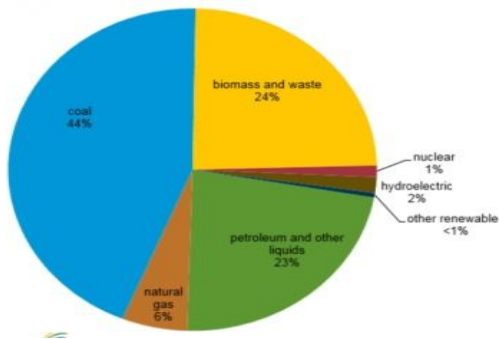


FIG 1.1 Energy generation in India by different fuel types.

4. Consumption of energy resources-

Of the total sales 2016-17 ,industrials sector accounted largest share(40%) followed by domestic (24%) agriculture(18%) ,commercial sector(9%) traction (2%),misc(7%).

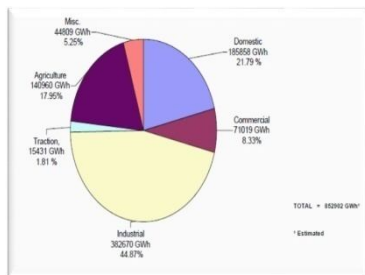


Figure 1.2 Sector wise electricity consumption in India 2018-2019.

5. Renewable energy sources

There is high potential for generation of renewable energy for a various sources wind, solar, biomass and small hydro and cogeneration biogases.

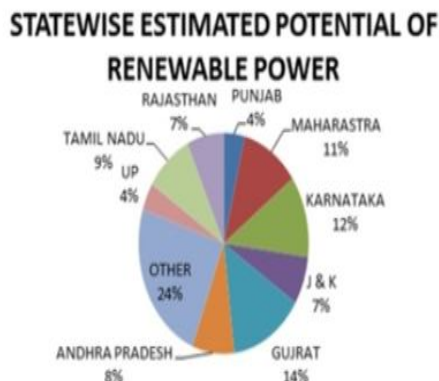
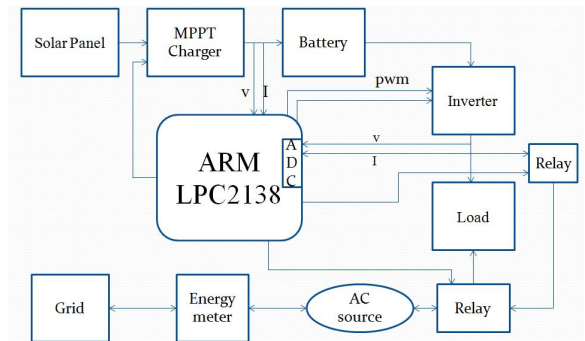


Fig.1.3. State wise renewable power generation in India.

6. Objective of project-

The main objective of the project is to design hardware prototype of solar grid tied inverter which provides

the power of consumer and to the commercial electrical grid or to local of grid electrical network and include and integrated energy meter for displaying and recording



1.4 Block diagram of implemented system.

1. Solar panel:

solar panel is the power source of photovoltaic installation It is the result of set of photovoltaic in parallel and series solar panel gives power to inverter.

2. MPPT Charger:

The position of converter between the panel and batteries will improve the will improve the whole photovoltaic installation .It is element to protect the battery against to risking the situation and over discharges.

3. Battery:

Batteries are open source with a PV system the primary purpose is to store the electricity not immediately use which could be use at some later time .Backup generator may be include in system to provide power. When the PV system is not operating and are generally included when system are not grid connected.

4. Inverter

The inverter transforming the DC current to AC current the photovoltaic installation that an inverter can belongs to two different situations based on alternating networks. The first situation is based on an isolated system the inverter is the element of network and has to feed set of loads and the second based on the the inverter is based on public network, which is the send to energy generated by the system.

5. Energy Meter

Energy meter is to designed with import /export facility. In the market the inbuilt fay is not available.

Therefore we have to use two meter one is read import and one is read export and the excess electricity is fed into grid .is measure electrical energy and also know as watt-hour meter.

6. Relay and load

It use for switching purpose the operate automatically. The control through ARM LPC 2138.

In relay there are four main parts

- . Electromagnet
- .Movable Armature
- .Switching point contacts
- .Springs

Proposed system

Fig 1.5 solar operated system

Fig.3.4 shows the block diagram of proposed solar operated system, in this design the solar panels the primary source of energy and the AC mains is secondary source. In conventional method the AC mains is the primary source and battery bank is secondary, when AC mains is not available then and then only we are using the battery but in proposed method when supply from battery is insufficient or not available then only we are using AC mains supply, so the proposed inverter can operate in three modes as follows

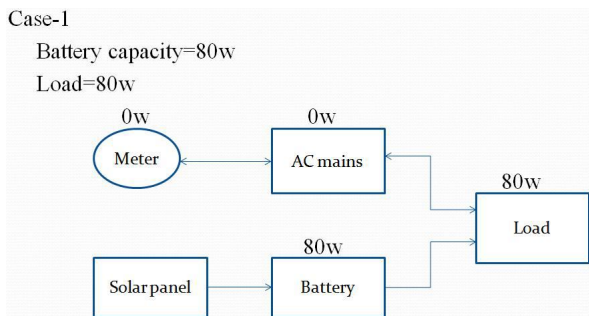


Fig 1.6 case-1 Battery capacity and load requirement are same

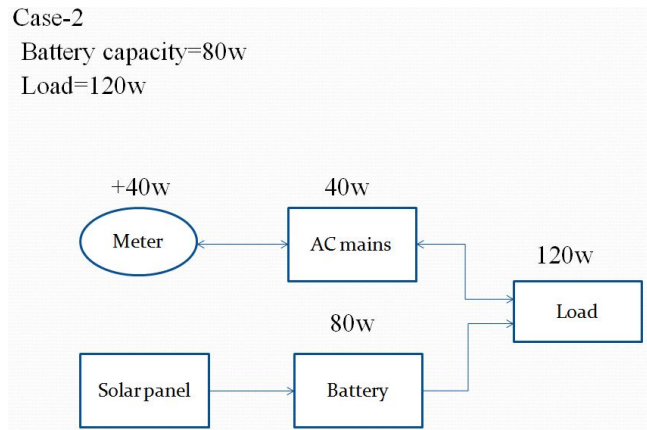


Fig1.7 case-2 Battery capacity is less than load requirement

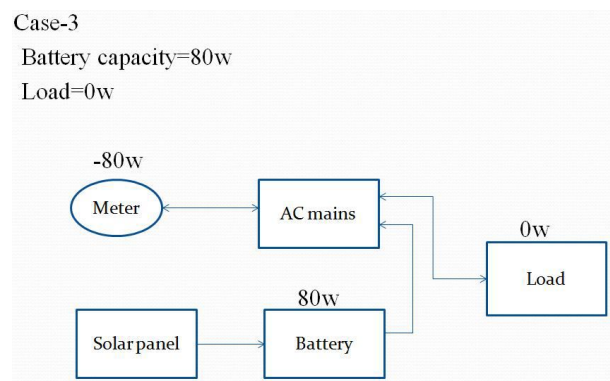


Fig 1.7 case-3 load consume 0W

Considering the operation of proposed system we observed that,

In proposed system

Power required for charging battery= $p_1=0w$

Power required for load = $p_2=40w$

Total power consumption $p=p_1+p_2=40w$

5.1.1 Relay Board

Fig 5.1 shows snap shot of relay board with meter to read import and export energy. Three sockets are provided to connect different loads which are useful to check different working cases. Two induction type single phase meters are used to measure import and export energy whose output is given to controller to show reading on LCD.

Indication

Connection to loads

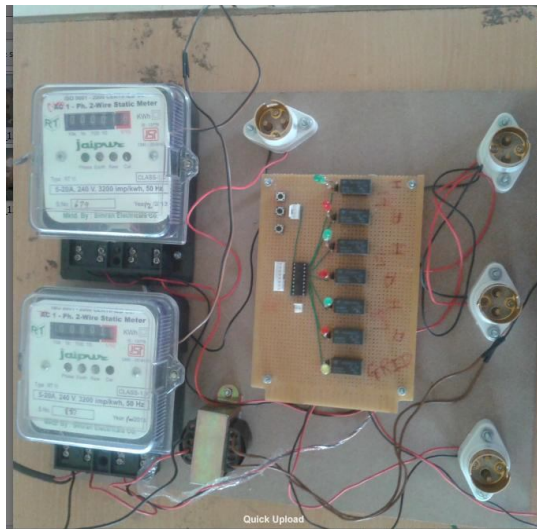
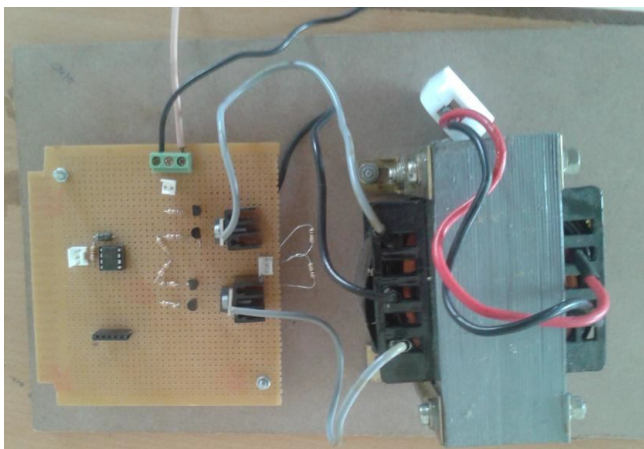


Fig. 5.1 Relay Board

5.1.2 Inverter Board

Fig.5.2 shows inverter board which consist of transistors and MOSFET with step up transformer which converts 12V in to 230V, 50Hz AC. The 8 pin PIC12F675 IC is used to generate PWM pulses which are given to base of transistors. PWM decides the ON OFF state of transistor and according to that the output wave form is generated.



II. RESULT AND CONCLUSION

In the above paper we have given detail regarding designing and development of solar based integrated power inverter. Thus the solar operated inverter system is designed with ARM LPC 2138 which can operate in grid connected mode and off grid mode which can provide better output than conventional system and able to reduce 66% of electricity bill. The system is designed for 100W but the same concept can be used for developing the system for higher loads. A highly efficient MPPT charger circuit is designed which can provide up to 2A of charging current. A smart , metering system is

designed which is able to read import and export energy from grid. The reading of meter is displayed on the LCD and stored in EEPROM IC. The LCD also displays the working mode of load, charging condition of battery and charging current. The inverter is designed for 100W which convert 12V DC in to 230V, 50HZ AC. The relays are used to switch load on inverter or no mains supply. Hence with our concept we can solve the energy shortage. Therefore challenged faced by world to a great extent.

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