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Hybrid Power Generation

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Abstract: *Energy today, is the need of 21st century. The renewable energy resources therefore are used in tremendous amount as they are easily available and cost free. But these energies in standalone forms have disadvantages such as unpredictability, availability in all time etc. which can be overcome by hybrid energy systems. They are basically consists of combinations of number of renewable energy resources. They provide efficient response against voltage and frequency fluctuations, harmonic measures and power issues in standalone systems. Hybrid power system provide reduction in complexity, maintain lowest unit cost, energy fluctuations due to DPSP (deficiency of power supply probability), with the help of proper design, advanced fast response, good optimization and control feasibility. There are various research has been done and continuously achieve new technologies and idea in this system. The paper report will discuss the different system to organize the generation of renewable sources and combining them with present energy plant into hybrid energy conversion project. This paper also gives the idea about the various properties and various conditions to construct the wind farms with their Global wind power cumulative capacity and their location..*

Keywords *–grid, hybrid generation energy, Solar power, wind power.*

I. Introduction

Since 17thcentury there is rise in energy requirement due to increase in population day by day. Environmental concern and cost are the issues are taken under consideration while discussing various methods and processes of generation of power via hybrid renewable energy resources. There are many such places in India which represents systems with hybrid energy providing increase economy and environmental conditions. Now-a-days in India the central part is found to have generation of electricity by using renewable energy resources such as coal, gas, oil, water or nuclear as fuel in primary order, The usage of coal and nuclear substrate in primary manner produces risk and creates the dangerous impact over environment. Hence use of hybrid combination of solar and wind combination gives the account of better environment and reduce the usage of existing fossil fuels. Again the standalone system such as wind or solar system can't produce the energy all the time. Hence energy should be generated with the help of combination of renewable energy resources. The hunger of electricity developed by various areas across the world has been simulated by using renewable way thereby great variety of grid power supply. About 30,000 wind turbines and 1, 00,000 off-grid solar PV panels are installed all over the world. The technical feasibility of PV wind hybrid system in given range of load demand was evaluated and economical evaluation of standalone PV, standalone wind and PV wind hybrid system have been developed using the model. It offers generation of power in rural areas. Hybrid model with proper assembly is keen interest for recent years. India among fifteen states Rajasthan is one of the most potential states of renewable energy resources. Non-renewable energies are present in very less amount and can be exhausted after years. Renewable energy assets are always available and never will be exhausted as they renew themselves. The escalation in costs and environmental concerns involving conventional electric energy sources has increased Interest renewable energy resources. Wind, Solar PV and Biomass power generations are viable options for future power generation. Besides being pollution free, they are free recurring costs. They also offer power supply solutions for remote areas not accessible by the grid supply.

II. Working Principle

Solar and wind hybrid power systems are designed using solar panels and small wind turbine generators for generating electricity. Generally, solar wind hybrid systems possess small capacity. Typical power generation cannot exceed more than 1kW to 10kW.[1] Solar power system includes solar panels, solar photovoltaic cells, and batteries for storing the converted energy. The electrical energy generated by solar panel is in AC form which can be converted to DC using invertors and used effectively. The solar panel output is electric power which can be given by Watts or Kilo watts. These solar panels are available at the output ratings

like 5 watts, 10 watts, 20 watts, 100 watts etc. Hence we can select the solar panel as per our need.[2] But, in fact, the solar panels cannot resist factors like climate, panel orientation to the sun, sun light intensity, the presence of sunlight duration, etc. During normal sunlight a panel which has 12 volt 15 watt can produce 1 Ampere current. The huge wind turbines are rotated and thus kinetic energy is generated by these rotations which can be converted to electrical energy. Minimum wind speed required for connection of the generator to the power grid is known as cut in speed while, maximum wind speed required for the generator for disconnecting the generator from the power grid known as cut off speed. Generally, wind turbines are accessible to the range of speed between cut in and cut off speeds. Wind turbine is a device consist three blades which on rotation produces the electricity in such a way that that the axis of rotation must be aligned with the direction of blowing wind. A gear box is termed as a high-precision mechanical system because it converts energy from one device to another device. Horizontal axis turbines and vertical axis turbines are the most frequently used turbines. An electrical generator is followed wind turbine; hence it is known as wind turbine generator. Generate electricity into battery bank with the help of solar charge controller and wind controller. The DC load which is stored into battery is converted into AC load with the help of inverter.[1]

III. Block Diagram

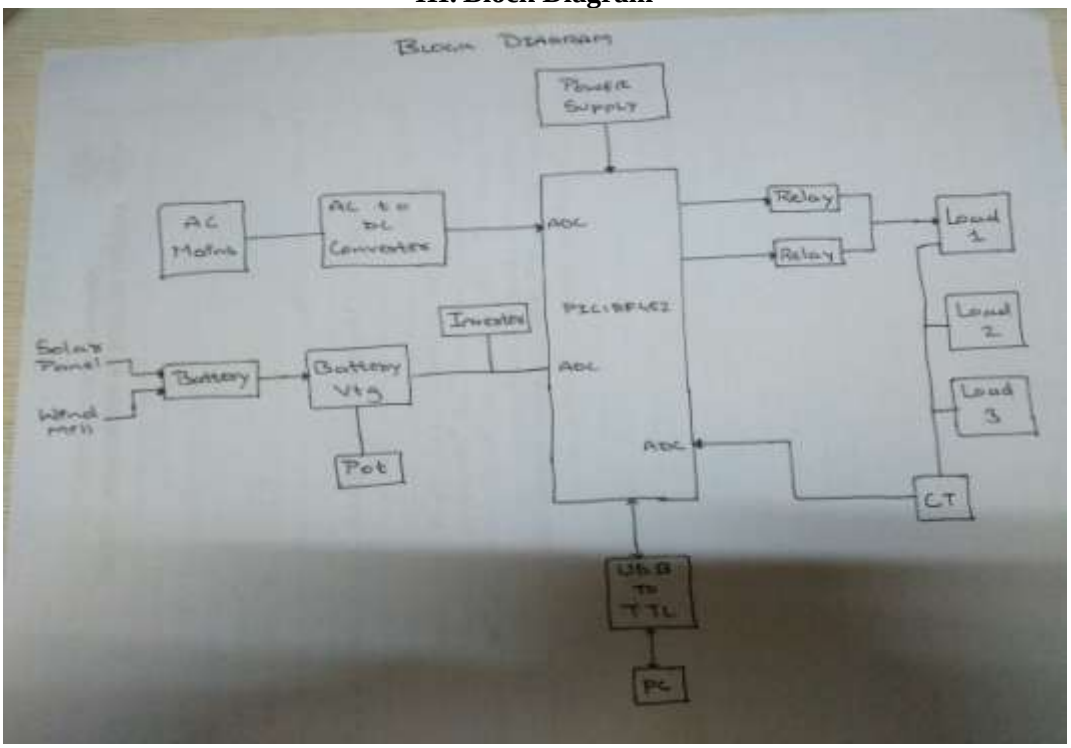

Fig .wind and solar hybrid power generation[1]

IV. Important Components

IV.I PIC18F452

The PIC18F452-I/P is a high-performance Enhanced Flash Microcontroller with 8 channels of 10-bit Analogue-to-digital (A/D) converter. The PIC18F452 features a C compiler friendly development environment, 256 bytes of EEPROM, self-programming, an ICD, 2 capture/compare/PWM functions, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI™) or the 2-wire Inter-Integrated Circuit (I²C™) bus and Addressable Universal Asynchronous Receiver Transmitter (AUSART). All of these features make it ideal for manufacturing equipment, data acquisition, power conditioning and environmental monitoring.

IV.II AC to DC CONVERTER

Electric power is transported on wires either as a direct current (DC) flowing in one direction at a non-oscillating *constant* voltage, or as an alternating current (AC) flowing backwards and forwards due to an oscillating voltage. AC is the dominant method of transporting power because it offers several advantages over DC, including lower distribution costs and simple way of converting between voltage levels thanks to the invention of the transformer. AC power that is sent at high voltage over long distances and then converted down to a lower voltage is a more efficient and safer source of power in homes. Depending on the location, high

voltage can range from 4kV (kilo-volts) up to 765kV. As a reminder, AC mains in homes range from 110V to 250V, depending on which part of the world you live it

IV.III RELAY

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit.When a relay contact is normally open (NO), there is an open contact when the relay is not energized. When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized. In either case, applying electrical current to the contacts will change their state. Relays are generally used to switch smaller currents in a control circuit and do not usually control power consuming devices except for small motors and Solenoids that draw low amps. Nonetheless, relays can "control" larger voltages and amperes by having an amplifying effect because a small voltage applied to a relays coil can result in a large voltage being switched by the contacts.

IV.IV USB TO TTL

The USB TTL Serial cables are a range of USB to serial converter cables which provide connectivity between USB and serial UART interfaces. A range of cables are available offering connectivity at 5V, 3.3V or user specified signal levels with various connector interfaces. All cables feature an FTDI FT232R device integrated within the cable USB type 'A' connector, which provide access to UART Transmit (Tx), Receive (Rx), RTS#, CTS#, VCC (5V) and GND connections.

V. Methodology

V.1 Proposed Calculation

The total power generated by this system may be given as the addition of the power generated by the solar PV panel and power generated by the wind turbine.
Mathematically it can be represented as,

$$PT = NW * Pw + Ns * PS \quad (I)$$

Where,
PT is the total power generated PW is the power generated by wind turbines
PS is the power generated by solar panels NW is the no of wind turbine
Ns is the no of solar panels used[2]

V.2 Calculations for wind energy
The power generated by wind energy is given by,

Power = (density of air * swept area * velocity cubed)/2

$$PW = ½.\ \rho\ (AW)\ (V)\ 3 \quad (II)$$

Where,
P is power in watts (W)
ρ is the air density in kilograms per cubic meter (kg/m^3)
AW is the swept area by air in square meters (m^2)
V is the wind speed in meters per second (m/s).[2]

V.3 Calculations for solar energy
To determine the size of PV modules, the required energy consumption must be estimated.
Therefore, the power is calculated as

$$PS = Ins\ (t) * AS*Eff(pv) \quad (III)$$

Where,
Ins (t) = isolation at time t (kw/ m2)
AS = area of single PV panel (m2)
Effpv = overall efficiency of the PV panels and dc/dc converters

The overall efficiency is given by,

$$Eff(pv)= H * PR \quad (IV)$$

H = Annual average solar radiation on tilted panels.
PR = Performance ratio, coefficient for losses.[2]

VI. Conclusion

This Integration of renewal Energy source will be highly effective in all places, especially in commercial areas where need of electricity is more. It causes no effect on nature i.e. pollution free, at the same time not proneness any kind of accident due to lightning. It is also useful to minimize power supply load i.e. cut short power charge.[4] By using this system, we can save electricity charge because very less maintenance charge to this equipment is required. The designing of this equipment is done in such a way that it is very compact and acts as user friendly. When it is manufactured in a large scale, cost of this integrated natural resources power generation system is affordable. Moreover there is no power failure or load shedding situation at any times.[11] Therefore, it is the most reliable renewable power or electricity resources with less expenditure.This research is at an intermediate stage and may take years to bring to fruition and into the market. The advances made by our research team have shown that some of the early barriers of this alternative PV concept have been crossed and this concept has the potential to be a disruptive and enabling technology. We encourage the scientific community to consider this technology along with others when contemplating efforts and resources for solar energy.[1]

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