

A Review on Hybrid System for Power Generation

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Abstract:- Renewable energy systems, such as photovoltaic and wind power generation, are live a more and more important role in energy production. Energy resources in this way are utilized as a part of huge sum as they are effortlessly accessible and taken a toll free. Be that as it may, these energies in independent structures have hindrances, for example, flightiness, accessibility in unsurpassed and so forth which can be overwhelmed by Hybrid energy system. It was 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, with the help of proper design, advanced fast response, good optimization and control feasibility. This paper provides review of hybrid solar and wind energy system. 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.

Keywords :- Solar Energy, Wind Energy.

I. INTRODUCTION

Solar photovoltaic panels or little wind turbines rely on upon climatic states should work Furthermore prepare electrical energy. Thus, The point when working alone, they need aid poor control wellsprings. Solar power in India is a fast developing industry. As of September 2017 the country solar grid had cumulative capacity of 16.20GW. India initiative to produce 100GW from solar energy by 2022, with the help of international solar alliance. Wind power generation capacity in India has significantly increased in this years. As of the end of July 2017 the total installed wind power capacity is 32.56GW. The national institute of wind energy has announced as estimation of the potential wind resource in India the range of 49,130MW to 302,000MW assessed at 100m hub height. In 2015, the MNRE set the target for wind power generation capacity by the year 2022 at 60,000MW. World of weak economic growth and waning support for global institutions, within which countries encourage more self-sufficient policies. In the LAC region there is a more protectionist response, with regional growth of 1.4% per year to 2060. Countries develop a broad range of internally focussed policies with limited regional cooperation. In this Frameworks that blend sources, wind Furthermore sun, are more viable for electric energy processing. These frameworks would known as “hybrid systems” figure1. They could supply remain solitary frameworks (isolated electric frameworks that are not associated with those control grid) or grid-connected frameworks (systems associated with the force grid). Considerably with mixture frameworks there need maintain periods of duration of the time. The point when not of the

sources produces vitality. In standalone frameworks vitality capacity is needed on succeed this circumstance also furnish energy throughout such periods. A combination framework of wind turbine and photovoltaic sunlight. Their outputs would optimized by using appropriate controllers. The extracted energy is used to charge a batteries bank or to supply energy to an inverter. The inverter is connected to the consumer loads and, when it is present, to the electrical power grid [13].



Fig 1:- Examples of small hybrid systems[13]

A. Enabling Solar Policies [21]

Governments around the globe are creating sustainable power source strategies to help more extensive national objectives, such as, differentiating vitality supply, improving vitality security, extending vitality get to, encouraging advancement, and tending to worldwide environmental change. While these strategies share key outline components crosswise over sustainable power source advances, the great practices and contemplations depicted in this area can bolster arrangements custom fitted to grow sun based organization inside the setting of nation particular difficulties and opportunities [21].

➤ Government policy Direction

- Need for large-scale investments in energy infrastructure [22].
- Great scope for regional integration [22].
- Importance of Government leadership [22].

II. LITERATURE REVIEW

Sungwoo Bae, Alexis Kwasinski, “Dynamic Modeling and Operation Strategy for a Microgrid with Wind and Photovoltaic Resources”, IEEE, 2012, In this paper [1] presents a dynamic displaying and control procedure for an economical microgrid fundamentally fueled by wind and sun oriented vitality. A present source-interface various information DC-DC converter is utilized to coordinate the sustainable power sources to the fundamental DC transport. Potential reasonable applications run from a correspondence site or a local location. A direct-determined lasting magnet synchronous breeze generator is utilized with a variable speed control technique whose procedure is to catch the most extreme breeze vitality beneath the evaluated wind speed. This study considers both

wind energy and solar irradiance changes in combination with load power variations.

B. Ai, H. Yang, H. Shen, X. Liao, Computer-aided design of PV/wind hybrid system, Elsevier, 2003, In this paper [2] combining with hourly measured meteorologic data and load data, the performance of a PV/wind hybrid system is determined on a hourly basis; by fixing the capacity of wind generators, the whole year's LPSP (loss of power supply probability) values of PV/wind hybrid systems with different capacity of PV array and battery bank are calculated, then the trade-off curve between battery bank and PV array capacity is drawn for the given LPSP value; the optimum configuration which can meet the energy demand with the minimum cost can be found by drawing a tangent to the substitution curve with the slope representing the relationship between cost of PV module and that of the battery. According to this match calculation method, a set of match calculation programs for optimum sizing of PV/wind hybrid systems have been developed.

Qingxin Shi, Hantao Cui, Fangxing Li, Yilu Liu, Wenyun Ju, Yonghui Sun, A Hybrid Dynamic Demand Control Strategy for Power System Frequency Regulation, IEEE, 2017, In this paper [3] As a rule, expansive scale wind and sun based power joining dependably purpose here and now befuddle amongst age and load request in light of their irregular nature. The conventional method for managing this issue is to build the turning save, which is very exorbitant. As of late, it has been suggested that piece of the heap can be controlled progressively for recurrence direction with little effect on clients' living solace. This paper proposes a cross breed dynamic request control (DDC) procedure for the essential and optional recurrence direction. Specifically, the heaps can capture the sudden recurrence drop, as well as convey the recurrence nearer to the ostensible esteem.

Aditya R. Gautam, O.P. Mahela, Suresh Singh, Ram Niwash Mahia, A Double Input SMV Controlled DC/DC Buck-Boost Converter for Solar PV /Wind Energy Sources, IEEE, 2014, In this paper [4] input converter is suitable to maintain output voltage constant at DC bus, irrespective of interruption in availability of solar/wind sources individually or simultaneously both due to climatic conditions rather than individual converter for each source. Controller used is PID-type-PWM based SMVC which is one of the robust controllers and suitable for wind/solar power applications.

A. Bilodeau, K. Agbossou, Control analysis of renewable energy system with hydrogen storage for residential applications, Elsevier, 2006, In this paper [5] issue identified with this framework is the control of the hydrogen circle (electrolyzer, tank, power module). Various control calculations were created to choose when to deliver hydrogen and when to change over it back to power, the vast majority of them expecting that the electrolyzer and the energy unit run then again to give ostensible power (full power). This paper displays an entire model of a remain solitary sustainable power source framework with hydrogen stockpiling controlled by a dynamic fluffly rationale controller (FLC). In this framework, batteries are utilized as vitality supports and for brief time stockpiling. To ponder the conduct of such a framework, an

entire model is produced by coordinating the individual sub-models of the energy unit, the electrolyzer, the power molding units, the hydrogen stockpiling framework, and the batteries. An examination of the exhibitions of the dynamic fluffly rationale controller is then displayed. This model is helpful for building productive pinnacle control.

Neethi R Nair, Mabel Ebenezer, Operation and Control of Grid Connected Wind – PV Hybrid System, IEEE, 2014, In this paper [6] This paper deals with the operation and control of a hybrid power system powered by wind and photovoltaic sources. A utility grid connection is provided in order to replenish energy levels in case of power shortage from the renewable energy sources. The hybrid system is a combination of two sources via a common DC bus. The renewable energy sources are connected to the main DC bus using a Multiple Input Ćuk converter. A Permanent Magnet Synchronous Generator (PMSG) is used to drive the wind turbine. Variations in wind power and solar irradiance are considered. The MI Ćuk converter tracks the maximum power point for each of the sources individually.

Duy C. Huynh, Nirmal Nair, Chaos PSO Algorithm Based Economic Dispatch of Hybrid Power Systems Including Solar and Wind Energy Sources, IEEE, 2015, In this paper [7] This paper proposes a novel application of a chaos particle swarm optimization (PSO) algorithm for economic dispatch (ED) of a hybrid power system including the solar and wind energy sources. The algorithm is seeking to minimize total operating costs of the hybrid power system. The proposed chaos PSO algorithm is one of the standard PSO algorithm variants which has been used a logistic map for initializing random values of generators, as well as the inertia weight in the velocity update equation of the standard PSO algorithm. This results in the best convergence capability and search performance during the evolution process of the algorithm.

Bhubaneswari Parida, S. Iniyana, Ranko Goic, Renewable and Sustainable Energy Reviews, Elsevier, 2011, In this paper [8] Solar energy is the most abundant, inexhaustible and clean of all the sustainable power source assets till date. The power from sun captured by the earth is around 1.8×10^{11} MW, which is commonly bigger than the present rate of all the vitality utilization. Photovoltaic innovation is one of the finest approaches to saddle the sunlight based power. This paper audits the photovoltaic innovation, its energy producing ability, the diverse existing light engrossing materials utilized, its natural perspective combined with an assortment of its applications. The distinctive existing execution and unwavering quality assessment models, estimating and control, framework association and circulation have additionally been examined.

Vankadara Sampath kumar, Dr. A. Srinivasa rao, Simulation of generalized hybrid model for solar and wind power generation, IJERA, 2015, In this paper [17] all energies electrical energy is playing a major role in developed as well as developing countries. The energy is mostly produced by fossil fuels which are developing day his is to by day .they also produce lot of pollutants which totally damage the environment the alternative to this is to encourage renewable energy source. Now days the energy production at domestic level is becoming popular with the help of solar and wind energies.

Gaurav Mishra , Ruchi Mishra, Control Strategy For Wind Energy And Hybrid Generating Systems Based On The Concept Of Power Electronics, IJECES, 2012, In this paper[18] discusses role of modern power electronics in small size wind energy and hybrid generating systems. A new and simple control method for maximum power tracking by employing a step-up dc-dc boost converter in a variable speed wind turbine system, using permanent magnet machine as its generator, is introduced. Output voltage of the generator is connected to a fixed dc-link voltage through a three-phase diode rectifier and the dc-dc boost converter. A maximum power-tracking algorithm calculates the reference speed, corresponds to maximum output power of the turbine, as the control signal for the dc-dc converter.

Ming-Shun Lu, Chung-Liang Chang, Wei-Jen Lee, Combining the Wind Power Generation System With Energy Storage Equipment, IEEE, 2009, In this paper[19] Recently, a few extensive scale wind age ventures have been executed everywhere throughout the world. It is financially gainful to coordinate a lot of twist limit in control frameworks. Not at all like other customary age offices, utilizing wind turbines presents specialized difficulties in delivering consistent and controllable electric power. An unmistakable element of wind vitality is its inclination of being "irregular." Since it is hard to foresee and control the yield of wind age, its potential effects on the electric network are not quite the same as the conventional vitality sources. At a high penetration level, an extrafast response reserve capacity is needed to cover the shortfall of generation when a sudden deficit of wind takes place. To enable a proper management of the uncertainty, wind power become a more reliable source on both energy and capacity by using energy storage devices. Combining the wind power generation system with energy storage will reduce fluctuation of wind power. Since it requires capital investment for the storage system, it is important to estimate the reasonable storage capacities for the desired applications.

Ashish S. Ingole, Prof. Bhushan S. Rakhonde, Hybrid Power Generation System Using Wind Energy and Solar Energy, IJSRP, 2015, In this paper [20] the combination of two vitality assets is happens i.e. wind and sunlight based vitality. This procedure castigates the reasonable vitality assets without harming the nature. We can give continuous power by utilizing mixture vitality framework. Fundamentally this framework includes the coordination of two vitality framework that will give ceaseless power. Sun powered boards are utilized for changing over sunlight based vitality and wind turbines are utilized for changing over breeze vitality into power. This electrical power can use for different reason. Age of power will be happens at reasonable cost.

III. SOLAR POWER

The process of converting sun energy into electricity which can be done by following two ways

- 1) By using photovoltaic (PV)
- 2) By using concentrated solar power

i.e. focusing at intensity of sun thereby using lenses, mirrors and tracking systems. Solar power systems mainly consist of solar panel made up of PV cells (semi-conductors) which emits

electrons on absorption of heat and converts solar energy to electrical energy, batteries which store the power generated. The movement of electron produces the electric current [9].

Advantages of Solar power

- Solar energy is a clean and renewable energy source.
- Once a solar panel is installed, solar energy can be produced free of charge.
- Solar energy causes no pollution.
- Solar cells make absolutely no noise at all. On the other hand, the giant machines utilized for pumping oil are extremely noisy and therefore very impractical.
- Very little maintenance is needed to keep solar cells running. There are no moving parts in a solar cell which makes it impossible to really damage them.

Disadvantages of Solar power

- Electricity generation depends entirely on a countries exposure to sunlight; this could be limited by a countries climate.
- Solar power stations do not match the power output of similar sized conventional power stations; they can also be very expensive to build.
- Solar power is used to charge batteries so that solar powered devices can be used at night. The batteries can often be large and heavy, taking up space and needing to be replaced from time to time.

IV. Maximum Power Point Tracking (MPPT)

Maximum power point tracking (MPPT) is a procedure utilized with wind turbines and photovoltaic (PV) universes to expand control yield. PV universes exist in a few distinct designs. The most essential adaptation sends control from gatherer boards specifically to the DC-AC sun based inverter, and from that point straightforwardly to the electrical lattice. A moment rendition, called a half and half inverter, may part the power at the inverter, where a level of the power goes to the lattice and the rest of to a battery bank. The third version is not connected at all to the grid but employs a dedicated PV inverter that features the MPPT [15]. There are many MPPT methods available in the literature; the most widely-used techniques are described in the following sections, starting with the simplest method. MPPT is various types of method like:

- Constant Voltage Method
- Short-Current Pulse Method
- Open Voltage Method
- Perturb and Observe Methods
- Incremental Conductance method
- Temperature Methods.

V. WIND POWER

Wind power is the utilization of wind current through breeze turbines to mechanically control generators for power where speed and heading of wind is essential factor. Wind powerl gives variable power which is exceptionally steady from year to year however which has critical variety over shorter time scales. It is consequently utilized as a part of conjunction with other electric power sources to give a

dependable supply. Wind farms consist of individual turbines connected to electric power transmission network which produces plentiful, renewable, widely distributed, clean and inexpensive [9].

Data required for Wind System [14]:

- Mean Annual Hourly Wind Speed (m/sec)
- Wind Power that can be generated from the wind turbine

Advantage of wind power

- Wind power is cost-effective.
- It's a clean fuel source.
- Wind is a domestic source of energy.
- It's sustainable.

Disadvantage of wind power

- Good wind sites are often located in remote locations, far from cities where the electricity is needed.
- Turbines might cause noise and aesthetic pollution.
- Turbine blades could damage local wildlife.

VI. HYBRID ENERGY SYSTEM

Hybrid systems are the ones that use more than one energy resources. Integration of systems(wind and solar) has more influence in terms of electric power production. Such systems are called as “hybrid systems”. Hybrid solar-wind applications are implemented in the field, where all-year energy is to be consumed without any chance for an interrupt. It is possible to have any combination of energy resources to supply the energy demand in the hybrid systems, such as oil, solar and wind[16].A combination of different but complementary energy generation systems based on renewable energies or mixed is known as a hybrid power system [12].Hybrid energy system is made up of two or more energy resources such as sources at a time like wind, solar, biomass, etc. Wind and solar hybrid combination is concerned to be best module because it is abundant and environmental friendly [9].

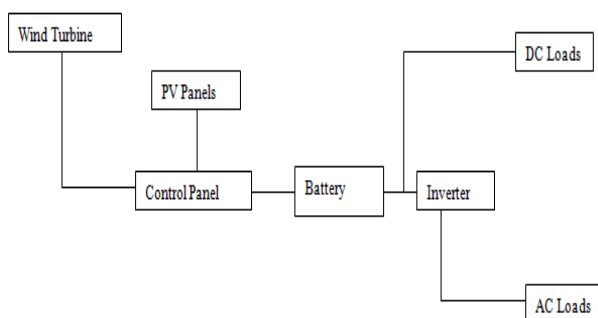


Fig 2:- Solar-Wind Hybrid Power Generation System [9]

When planning a hybrid system it is critical to pick a decent blend of segments, their measurements and to decide a decent technique to deal with the framework that would be solid and practical for quite a while. Countless will bring about substantial speculation costs, while a framework with few

segments can bring about the interference of power supply in the power framework. Climatic conditions may influence the decision of sustainable power sources. For example, PV hybrid systems are ideal in areas with warm climates and in areas where there is more number of sunny hours [12].

Advantage

- System maintains is remarkably reduced and becomes easy. Renewable energy sources like, sun, wind.
- Producing clean, friendly to environment, renewable energy.
- Once the system is designed and developed or manufactured, the installation of system is easy.

Disadvantage

- The first time installation cost is huge in terms of finance.
- The circuit designing complexity is more as there in no micro-computer for controlling action.

VI. CONCLUSIONS

In this searching review papers, dialog about Hybrid power age framework is great and compelling answer for control age than traditional vitality assets. It has more prominent effectiveness. It can give to remote spots where government can't reach. With the goal that the power can be use where it created so it will lessen the transmission misfortunes and cost .

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