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Smart Grid System to Monitor and Control Renewable Energy Source

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Abstract - This paper presents a short view on network Integration and power quality related with the mix of environmentally friendly power sources frameworks in to matrix and Role of force electronic gadgets and Flexible AC Transmission Systems connected with these Issues. In this task, late examples in power devices for the coordination of wind and daylight based power generators are presented. Discussion about typical and future examples in daylight based and wind energy structures taking into account unfaltering quality and advancement of each development are presented. Utilization of various strategies as applied to assuage the special Power Quality issues is in like manner presented for thought. Power Electronics interface not simply plays a crucial occupation in capable coordination of Wind and Solar energy system yet notwithstanding its effects on the power-age structure movement especially where the maintainable power source expect an interesting place of the full scale structure limit.

Key Words: Solar, wind, Renewable Energy System, MSEB Power, Power Load, Change over Switch, Controlling Unit.

1. INTRODUCTION

The interest for power has expanded dramatically throughout the last century. One road through which the present energy issues can be tended to is through the decrease of energy use in families. This has expanded the accentuation on the requirement for exact and financial strategies for power estimation. It is a high-level metering innovation including setting wise meters to peruse, cycle and critique the information to clients. It estimates energy utilization, remotely changes the stockpile to clients, and remotely controls the greatest power utilization. The shrewd metering framework utilizes the high-level metering foundation framework innovation for better execution.

It is an undeniable level of metering advancement including setting adroit meters to scrutinize, associate and info the data to clients. It gauges energy usage, from a good way changes the stock to clients and remotely controls the most outrageous power use. The splendid metering system uses the significant level metering establishment structure development for better execution. These are prepared for conveying in the two headings. They can send the data to the utilities like energy usage, limit values, alerts, etc, and moreover can get information from utilities, for instance, customized meter getting system, reconnect/separate rules, upgrading of meter programs, and other huge messages. These meters decrease the need to visit while taking or examining the month-to-month bills. Modems are used in these shrewd meters to work with correspondence structures, for instance, telephone, remote, fiber connect, and power line exchanges. Another advantage of wise metering is done in the form of adjusting of energy meter where there is the degree of including power in an unlawful way.

Three principle factors are affecting the future electric frameworks of the world; government strategies, the effectiveness need of the shopper, and the presentation of new keen PC and equipment innovations. Ecological concerns have made the legislative approaches all over the planet, including at the government and state levels, which on stream the whole energy framework to proficiency, preservation, and inexhaustible wellsprings of power. These variables are the primary drivers that are extending the utilization of a wide range of new environmentally friendly power and capacity advances on one hand and new energy proficiency and protection procedures again.

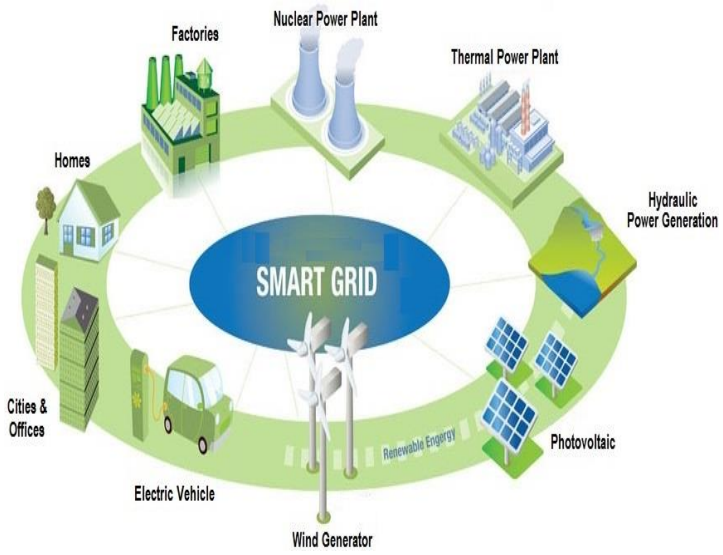

Figure (1): Model of Smart Grid through Renewable Energy Sources

For instance, daylight-based, wind, and hydrogen. The canny cross-section interfaces an arrangement of scattered energy resource assets for the power organization. By using the Internet of Things (IoT) to accumulate data on the canny lattice, utilities can quickly recognize, what's more, resolve organizational issues through the predictable self-evaluations. Since utilities at absolutely no point in the future need to depend upon clients to report power outages, this self-recovering capacity is a fundamental piece of the splendid grid.

Purchasers are ending up being more proactive and are being empowered to take part in the energy use decisions affecting their regular daily existences. At the same time, they are developing their energy needs. Model is customer interest will finally join wide use of electric vehicles (the two vehicles and trucks), the regulator of in-home contraptions to propel energy assurance, obligation regarding conveyed age from generally supportable power sources, and the leading body of force amassing to match supply to that interest locally.

The accessibility of new innovations, for example, more mindful about SCADA sensors, secure 2-way interchanges, incorporated information the executives, and wise, independent regulators has open up valuable open doors that didn't exist even 10 years.

"Grid" is utilized for power age, transmission, conveyance, activity, and control. Regular networks are generally utilized to move energy from restricted wellsprings of electrical energy to numerous shoppers. The traditional power framework is a one-way sort of age. At the producing house, the power is created fully supported by generators.

The delivered power is shipped off the transmission line fully supported by a move forward transformer, while the communicated power is shipped off the dissemination line with the assistance of a stage down transformer. An illustration of a traditional sort matrix framework is displayed in Fig(2) When contrasted with a traditional matrix, a brilliant lattice gives an adaptable, solid, and reliable stockpile.

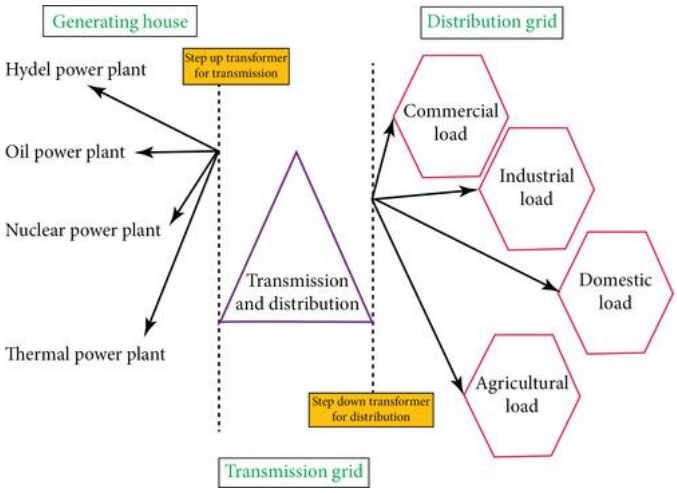

Figure (1.2): Model of Conventional Power Grid

2. Literature Review

H. Gharavi and R. Ghafurian[1] says that "A smart grid (SG), also called next generation power grid, is generally defined as the aggregation of emerging technologies, hardware, software and practice that make the existing infrastructure of power grid more reliable, accommodating, secure, resilient and ultimately more beneficial for consumers".

A. Thomas[2] says that "In conventional power grid a large number of customers are generally fed from a few central generators while in the smart grid bi-directional transfer of power and information occurs that makes the delivery network distributed and automated. The recent development in the power system allows the seamless integration of alternate form of energy production sources into the existing power grid".

X.P. Zhang [3] said that "However, the alternating and discrete characteristics of these sources is the major barrier in integration to the smart grids that can be handled by the deployment and effective use of control modes. This not only cause the improvement in performance but also the operational hours of these sources will be increased". The most exploited renewable energy sources are hydel energy, wind and photovoltaic source.

The share of the renewable energy production to global electricity demand is Increasing continuously and it was about 20% at the end of 2011. However, these sources vary in requirements for their abstract in main streamline. Issues such as the efficiency, reliability and security in power system forces the operators to exploit widely distributed renewable energy sources and deploy them rapidly into grid.

These sources are helpful to environment and also to human health due to less pollution generated. Risk associated with others plants such as disruptions in fuel supply due to international conflicts, problems in transportation and unavailability of unit can also be overcome by the onsite small scale renewable generations. Renewable energy resources can be used for power generation as isolated system but their benefits are significantly enhanced when they are integrated into electric utility system. With greater use of smart grid enabling technologies, higher degrees and rates of penetration can be accommodated. Integration of variable natural renewable energy resources require a huge modification in existing network operation which may in due time lead to increase in electricity cost. In ref. U. Helman said that [4] "problems are mentioned related to intermittent nature of RER" and "these problems are clearly demonstrated in ref. [5] said by S. Kiliccote".

Cameron W. Potter [6] also describes "the variation aspect of RERs in the integrated power system that is named as daily, monthly and yearly variability. For the ability and stability of modern grid, the understanding of this variability is vital".

Manageable power sources moreover called green power sources consolidate the breeze, hydro, sun situated, biomass, ocean and streaming energy sources. These resources have a promising future on account of their present situation pleasant nature and wide availability.

In ref. [16] a scheme for demand side management is proposed. It allows customers in proactively controlling their very demands. It also allows load shifting from peak loads to low demands. It is also proposed how to utilize available energy by using EVs. The results indicate the potential of the scheme to achieve energy savings and release capacity to accommodate renewable energy and electrical vehicle technologies.

The paper at ref. [17] presents a general overview of present power electronics technologies to be used in renewable energy resources for integration in smart grid. A network of this type is essential in order to deploy electric vehicles. These are applicable where utility companies and consumers are working together to attain sustainable energy consumption, by increased use of renewable energy sources, bringing generation closer to customers and making a commitment to rational and efficient consumption.

In ref. [18] an energy management system (EMS) is suggested to optimize operation of smart grid. It behaves as a sort of aggregator of distributed energy resources allowing the SG to participate in the open market. Integration of demand side management (DSM) and active management schemes (AMS) gives a better exploitation of renewable energy sources. The effectiveness of the proposed EMS was verified on a 23-bus 11-kV distribution network. Results proved that the combined operations of RES and Price Responsive Demand mitigate network constraints while satisfying higher demand levels and reducing the energy costs.

2.1 Wind Power

Wind energy is considered one of the most solid and potential substitute energy assets because of its unfathomable and clean

nature. The motor energy of wind is changed over into mechanical energy with the assistance of a wind turbine that is connected with the rotor edges. The rotor is additionally coupled to the generator (all-around doubly managed affirmation generator) for the difference in mechanical energy into electrical energy. The power got from the breeze turbine at the express area for the most part relies upon the breeze speed, tower tallness, and turbine speed credits.

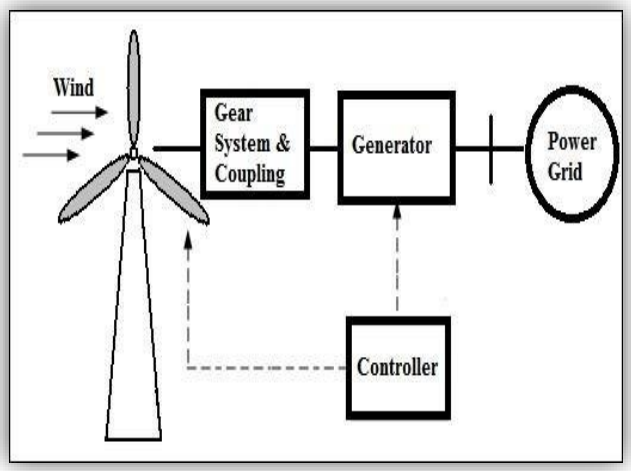

Figure (2.1): Model of Wind Power

The absolute ability of turbine and generator despite the way that making no unsafe difference and power Creation at the reasonable expense from wind energy there are correspondingly sure burdens, for example, the shortcoming of receptiveness, uncontrolled power yield, and so forth Because of its haphazardness and stochastic lead, likelihood-based showing frameworks are required and its ideal errand can be watched out by the use of weighty assessments.
Coordination of wind energy to the grid as far as expanding productivity can improve the power result of the Smart Grid Technology. There is a square outline of incorporating wind into the lattice has been given in the figure. We can isolate the entire framework into three significant parts. Close to the breeze turbine, there are:
1. Turbine and Speed Control Box
2. Wind Interfacing Box
3. Framework Connectivity and Transmission to the AC Grid
Turbine and Speed Control Box comprises Power and Speed Control gadgets, for example, gearboxes and so forth, generators, turbine control units and organization switches.
Wind Interfacing Box comprises of AC to DC rectifier as the power created from the breeze turbine is AC. This corrected DC power is communicated through the DC transmission line and then, at that point, feed into Battery Bank as the holding framework for additional utilization of power. Then, at that point, the DC transmission line is coordinated to the DC to AC inverter for the change of AC power. There is correspondence control that is finished the motivation behind controlling the battery charging and forestalling the cheating issue of battery which influences the battery duration range .and furthermore the charging limit. These sorts of correspondence are finished by the optical strands Grid Connectivity unit is fundamentally serving the reversed AC power coordinating to the three-stage power line and channels. This is the means by which the AC power created from the wind turbine is associated with the grid.

2.2 Solar Power

Smart Grid is a digitalized framework that comprises checking, controlling, and investigating in bidirectional power streams among a wide range of creating units like Thermal power stations, hydropower age, sun-oriented power plants, thermal energy plants, and so on and end-use shoppers. It is utilized to screen and control the power stream consequently, through an expert station with the assistance of innovation. Brilliant matrix innovation empowers the controlling of parts of the power framework in age, transmission, and conveyance framework. It empowers checking and controlling the power utilization at purchasers' premises by the computerization framework and gives appropriate control in the circulation framework. It additionally examines the power utilization so it gives appropriate control in the age framework and transmission naturally.
Sunshine-based energy generally flows over the area and it very well may be dealt with by the utilization of different truly driving advances for example sun-filled warm power, Solar photovoltaic (PV) that are mentioned considering their instrument of getting the sun energized radiations and its change into electrical energy. Sun arranged nuclear energy station is a circuitous system for moving sun controlled energy into electrical energy, in which nuclear energy is made by gathering the daylight radiations additionally, sometime later steam is made that drives the turbine generator as in case of standard thermal power stations.

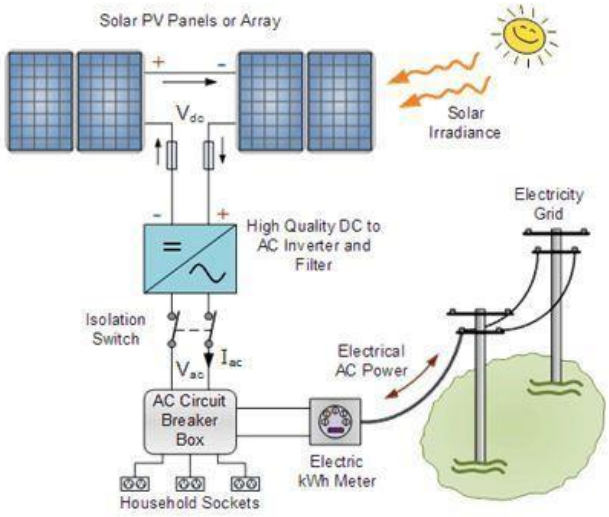

Figure (2.2): Model of Solar Power

3. Proposed System

In this undertaking, we produce power through different manageable resources like a breeze and sun-situated power. The working of the structure is with the ultimate objective that when the MSEB Power is off the power load, therefore, turned on the Solar Power or on the Wind Power. For that normally trading of Power Load, we use Change over Switch Circuit. In this task, we moreover use the snubber circuit to the show improvement of the system. A snubber is a circuit that is used in semiconductor contraptions for protection and

execution overhauls. They have different purposes, to be explicit the decline of power spread in power electronic trading organizations.

A snubber circuit limit or quit the trading voltage abundancy and its speed of rising, henceforth decreasing power dispersal. In its most un-complex construction, a snubber circuit basically includes a resistor and capacitor related across the thyristor. They can do various things, including:

- Decreasing or taking out voltage and additionally current Spikes.
- Restricting dl/dt or dV/dt .
- molding the heap line to keep it inside the safe Working region.
- Decreasing absolute exchanging misfortunes.
- Decreasing EMI by damping voltage; and
- Moving power dissemination from the change to a resistor (or a helpful burden).

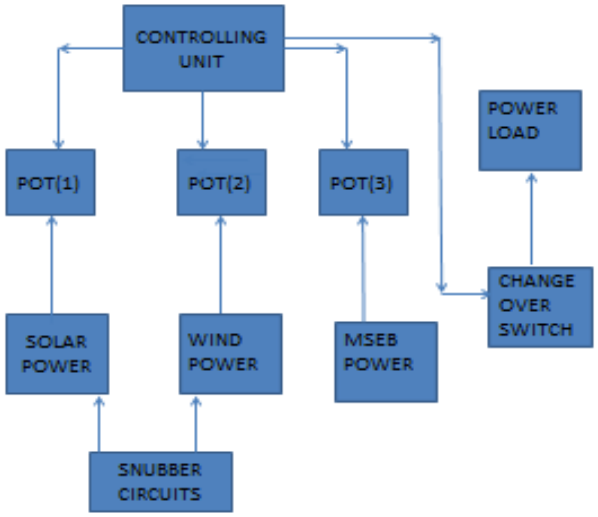

Figure (3): Proposed System

4. SYSTEM DEVEPLOMENT

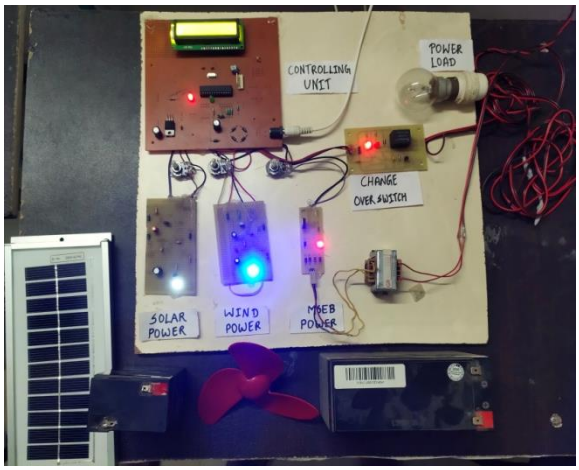

Figure (4.1) Stable Condition of System

Figure (4.2) when System is working on MSEB Load

Figure (4.3) when System is working on Wind Power

Figure (4.4) when System is working on Solar Power

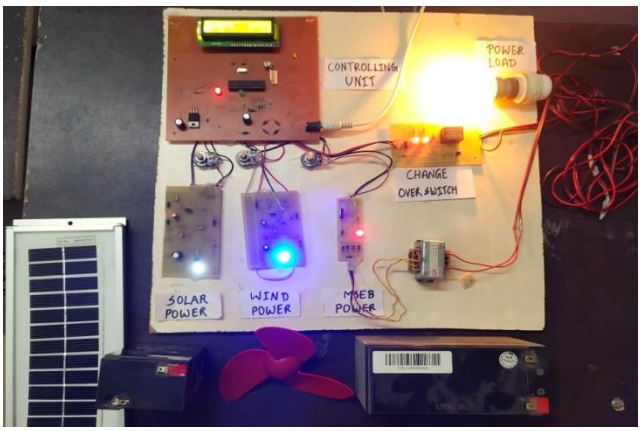

Figure (4.5) Working Condition of System

Here are the overall working conditions of system in different working modes .When we turn on the system the power is supplied through the MSEB load but when the MSEB load is

off the system is switched over the Solar Power or Wind Power according to the condition.

5. CONCLUSION

Savvy framework innovation is a drawn-out type of simple innovation that has likewise been presented for controlling the utilization of apparatuses by utilizing two-way correspondence. Notwithstanding, the pervasiveness of Internet access in many homes has made the shrewd framework all the more for all intents and purposes solid to execute. Savvy network gadgets communicate data so that empowers customary clients, administrators, and mechanized gadgets to rapidly answer changes in brilliant lattice condition framework. Fitting execution, steadfastness, and robustness of power being consumed and made ought to be ensured. Likewise, it is vital to check, test, and separate the power used to each piece of power system for its show and lead, under average as well as crazy working conditions.

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