IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
PP 41-47

Study on DC Micro grid For Wind and Solar Electric System Power Integration

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Abstract: *This paper portrays the incorporation of wind control and sunlight based power by interconnecting it to the Microgrid that stores and changes DC control. These days, sustainable power source is often utilized. Conveyed vitality sources, for example, wind control, sun powered power, etc that can be worked in parallel with a more extensive utility. These days, a large portion of people groups intrigued to utilize sustainable power sources, for example, tidal vitality, sun oriented vitality, wind vitality, geothermal vitality, wave vitality, etc. Age of DC control is finished by a small scale framework. This paper outlines the capacity and use of DC control by utilizing a small scale matrix. These all sustainable power source creates DC control. By producing these DC control we are using by Microgrid.*

Keywords: *Microgrid, vitality, sun, wind, tidal, geothermal.*

I. Introduction

In this paper, it audits some correspondence innovations accessible for matrix reconciliation of sustainable power source assets. Since most sustainable power sources are discontinuous in nature, it is a vital undertaking to incorporate a critical part of sustainable power source assets into the power matrix foundation essentially the power stream happens one way from the unified plants to customers.

At the point when contrasted with vast power plants, a sustainable power source plant is having less limit. Be that as it may, as developing assets sustainable power source ought to be considered. By accomplishing the reconciliation as appeared in Fig.1 we can improve observing systems, assurance, streamlining and the task. And furthermore two route stream of power can be utilized.

II.

The possibility of lattice combination associated Wind Turbine Generation Systems have been created in the most recent decades to MW estimate control age units with cutting edge control .The power yield isn't just founded on the approaching breeze speed yet additionally dependent on framework necessities. Interestingly with the past, the WTGS mechanical improvements empower wind ranches to be worked by the Virtual Power Plant (VPP) idea, along these lines giving vital help to the essential exercises.

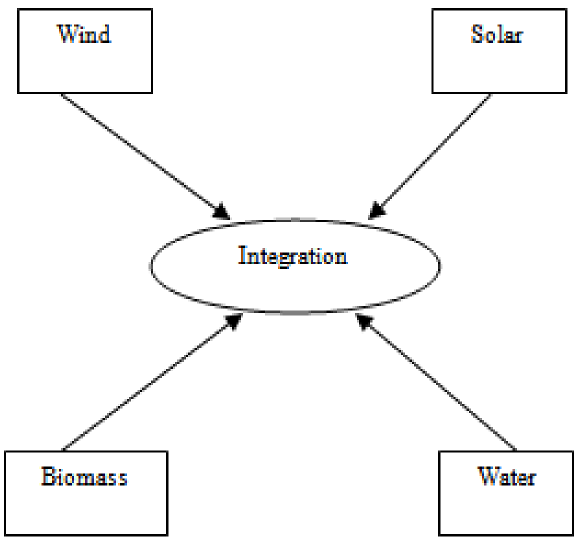

Fig. 1. Renewable energy integration

Wind vitality has turned into an inexorably critical part of the age blend. Substantial scale wind ranches are ordinarily coordinated into power transmission organizes with the goal that the created electric power can be conveyed to stack focuses in remote areas while the Small scales wind homesteads can be incorporated into power dissemination systems to satisfy neighborhood needs.

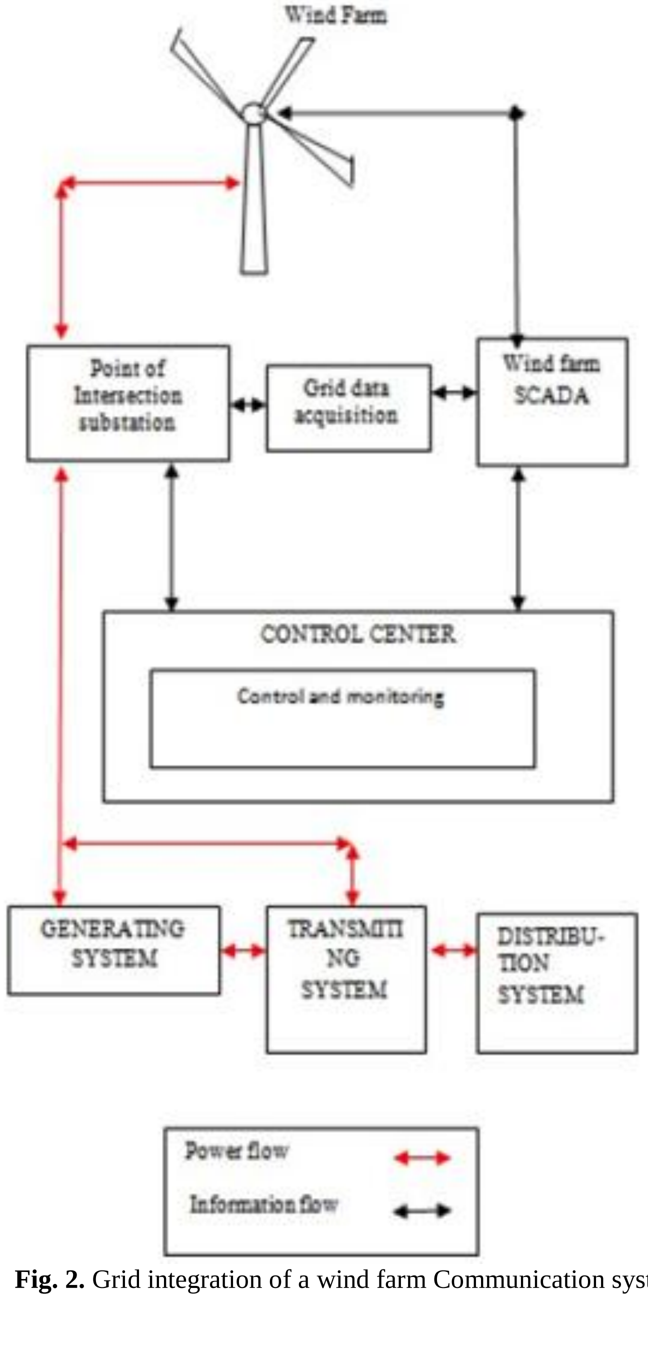

Fig. 2. Grid integration of a wind farm Communication system

Fig. 2 shows that the basic tool which transmits the measured information and control signals between wind farms and power systems. A Proper communication system can explore the wind potentials and facilitate farm controls, helps in peak load and providing voltage support for power systems. Fig. 2 shows the grid integration of the wind farm. It can be seen that a modern power system is composed of communication networks. Energy flows through the power grid to meet customer demand, while information flows through the communication system to monitor the system status, control the dynamic energy flows presented in the grid, and transfer the information collected from an internet of smart devices for sensing and control across the power grid. From the wind farm the data are given to control center through the SCADA communication where the control, monitoring, operation is done and connected to transmission system.

III. Grid Codes Of Wind Integration

Grid operators, both in transmission and distribution, have developed grid codes for connecting WTGS and the wind turbine manufacturers have responded to these requirements by developing advanced functionalities in the field of WTGS control and electrical system design Essential grid code requirements are discussed below

A. Frequency control

Several grid codes require the participation of wind farms in primary and secondary frequency control, including frequency response capability and limitation of both ramp rates and active power output. The requirements are expected to become stricter at higher wind power integration levels in order to avoid exceed power gradients of conventional power plants responsible for primary and secondary frequency control. Some operators also require that WTGS should stay connected and in operation at a wider frequency band in order to contribute to frequency restoration and stable power systems operation.

B. Voltage control

The individual WTGS have to control their own terminal voltage to a constant value by means of an automatic voltage regulator, allowing that modern wind farms have capability to control the voltage at the Point of Common Coupling (PCC) to a pre- defined set-point of grid voltage. Expanded reactive power capabilities can bring advantages for system operators because it offers the possibility of better balancing the reactive power demand.

C. Fault Ride-Through capability

WTGS must remain connected during and after severe grid disturbances, ensuring fast restoration of active power to pre-fault levels as soon as the fault is cleared and inject reactive current in order to support the grid voltage during disturbances and to provide fast voltage recovery after fault clearing.

IV. Solar Energy Integration

The first application of photovoltaic power was as a power source for space satellites. Mostly the photovoltaic modules are used for utility-interactive power generation. Grid connected solar systems are typically classified as three categories: residential, commercial, and utility scales. Residential scale is the smallest type of installation and refers to all installations less than 10kW usually found on private properties.

The commercial capacity ranges from 10kW to 100kW, which are commonly found on the roof of a commercial building. Utility scale is designed to the installations above 100kW, which are traditionally ground-based installations on fields. In this technique using integrate communication systems [4] - the photovoltaic panel, voltage, current and temperature of each module was collected and the information is sent to the monitoring interface.

The solar power monitoring can be classified as three categories: system level, string-level, and module-level. Fig.3 shows the three-level monitoring based on wireless communication systems. The system will monitor the status of solar modules, solar strings, and solar inverters based on the IEEE 802.15.4-2003 Zig Bee standard. Either star or mesh topology can be used. With this wireless monitoring capability, each solar module status is visible.

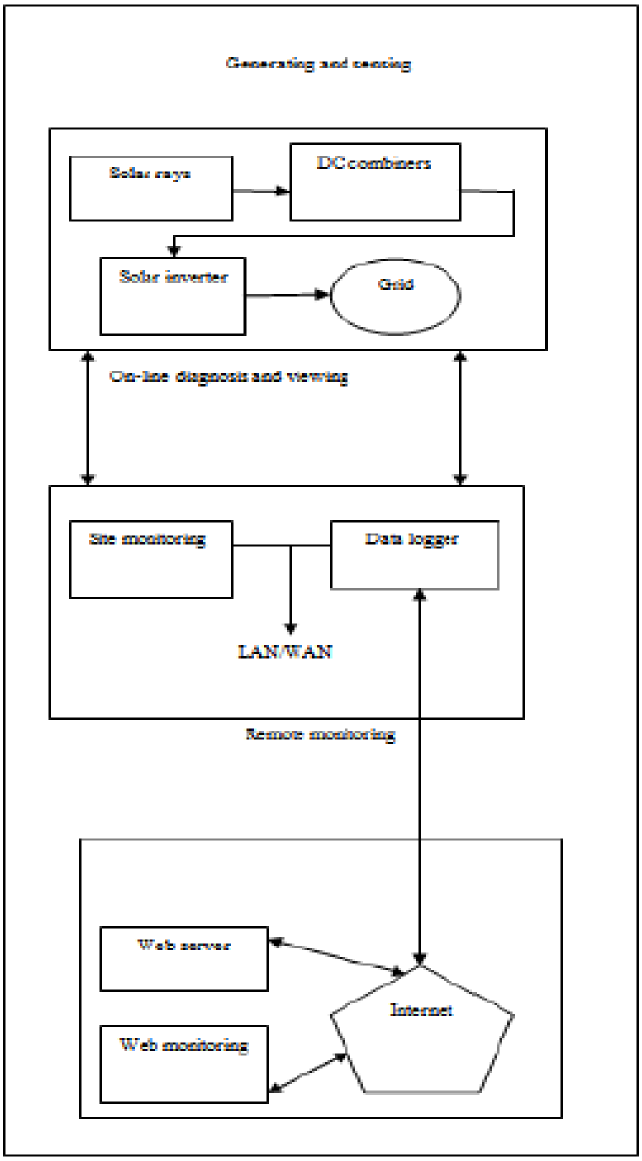

Fig. 3. Three-level monitoring of photovoltaic Power systems based on wireless communication

V. Wind And Solar Energy Intergration

The mix of wind and sun based vitality prompts decreased neighborhood stockpiling prerequisites. The mix of corresponding and staggered vitality stockpiling advances, where a super capacitor or flywheel gives reserve control to repay to quick power vacillations and to smoothen the homeless people experienced by a battery with higher vitality limit.

Miniaturized scale frameworks or half and half vitality frameworks have been appeared to be a powerful structure for nearby interconnection of circulated sustainable age, burdens, and capacity. Late research has considered the improvement of the task on one hand and the utilization of dc to interface the assets on the other .A schematic of the dc miniaturized scale network with the traditions utilized for power is given in Fig. 4.

The DC transport associates wind vitality change framework (WECS), PV boards, staggered vitality stockpiling including battery vitality stockpiling framework (BESS) and super capacitor. The WECS is associated with the dc transport by means of an AC-DC converter. PV boards are associated with the dc transport by means of a DC-DC converter. The BESS can be acknowledged through stream battery innovation associated with the dc transport by means of a DC-DC converter. It is associated near the LV– MV transformer to lessen misfortunes and voltage drop and it is associated with principle network.

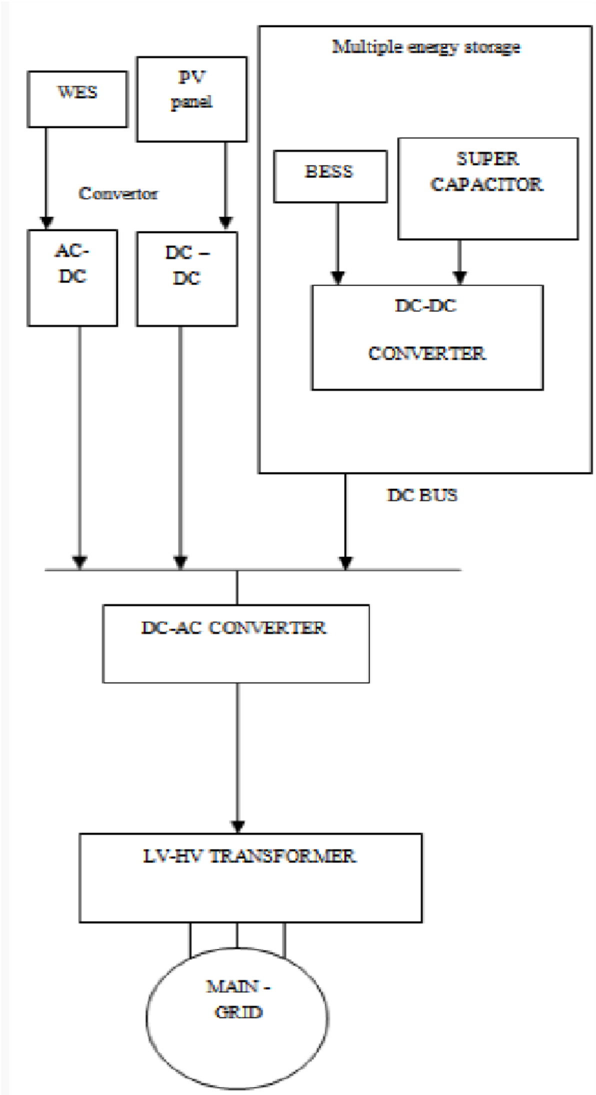

Fig. 4. Wind and Solar Integration

VI. Advantage Of Wind And Solar – Hybrid System

The major advantage of the system is that it meets the basic power requirements of non-electrified remote areas, where grid power has not yet reached. The power created from both breeze and sunlight based segments is put away in a battery bank for use at whatever point required. A half and half sustainable power source framework uses at least two vitality creation strategies, generally sun oriented and wind control. The real preferred standpoint of sunlight based/wind cross breed framework is that when sun oriented and wind control creations are utilized together, the dependability of the framework is upgraded.

Moreover, the extent of battery stockpiling can be decreased marginally as there is less dependence on one strategy for power creation. Wind speeds are frequently low in periods (summer, in the long run) when the sun assets are getting it done. Then again, the breeze is frequently more grounded in seasons when there are less sun assets. Notwithstanding amid that day, in numerous locales worldwide or in certain times of the year, there are extraordinary and inverse examples as far as wind and sunlight based assets. Also, those distinctive examples can make the crossover frameworks the best alternative. A hybrid wind-solar electric system requests a higher beginning speculation than single bigger frameworks: vast breeze and sun based PV frameworks are less expensive than littler frameworks. In any case, the half and half arrangement is the best alternative at whatever point there is a critical improvement regarding yield and execution - which happens when the sun and the breeze assets have inverse cycles and powers amid the equivalent day or in certain seasons.

VII. Grid Congestion

Power grid congestion is a situation where in the existing transmission and/or distribution lines are unable to accommodate all required load during periods of high demand or during emergency load conditions, such as when an adjacent line is taken out of service or damaged by a storm, it also reflects a decrease in efficiency.

Under high load conditions, line losses escalate exponentially. If lines are congested and operating at or near their thermal limits, they would also be exhibiting significant line losses during high load conditions.

There have been cases when wind farms are forced to shut down even when the wind is blowing because there is no capacity available in the lines for the electricity they create. Without adequate transmission to transport power from "renewable" rich areas (like Arizona) to densely populated areas, it is only cost effective to use renewable sources in certain areas of the country. While building new infrastructure would certainly help, smart grid technologies can also help utilities alleviate grid congestion and maximize the potential of our current infrastructure.

Smart grid technologies can help provide real-time readings of the power line, enabling utilities to maximize flow through those lines and help alleviate congestion. As smart grid technologies become more widespread, the electrical grid will be made more efficient, helping reduce issues of congestion. Sensors and controls will help intelligently reroute power to other lines when necessary, accommodating energy from renewable sources, so that power can be transported greater distances, exactly where it's needed. Relieving grid congestion can be achieved in several ways:

- By adding new transmission lines
- By building new electric generating capacity near load centers
- By reducing the demand for electricity in congested areas through greater use of energy efficiency and conservation

VIII. Conclusion

Two-way correspondences are the essential foundation that empowers the convenience of disseminated sustainable power source age. In this paper, we audited correspondence advances accessible for the lattice combination of sustainable power source assets. The idea of wind and sun powered mix is been examined, which gives better yield, lessen the misfortunes and gives better checking, control and task is accomplished with assistance of influence gadgets like converters and furthermore with correspondence advances. Unmistakable attributes in reconciliation of sustainable power source assets present new difficulties to the correspondence frameworks, which merit further research.

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