

IMPROVEMENT IN MICROGRID DUE TO RENEWABLE ENERGY SOURCES IN DISTRIBUTED GENERATOR NETWORK

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ABSTRACT

The non conventional sources are important now days because the raw material required is less and power demand is more to compensate with the increasing demand of power, so renewable energy sources are important Micro grid which resembles a power system consisting of several distributed generators connected together and this micro grid operates in connecting mode which is connected to the main grid. Distributed economic dispatch for a micro grid with renewable energy penetration to enhance performance in grid connected and isolated condition. This paper presents study of different parameters under the effect of wind and solar penetration form. To understand and analyze proper effect of renewable energy sources in micro grid a fixed speed wind turbine equipped with squirrel cage induction generator and solar system with maximum power tracker are used. The simulations are performed in MATLAB/SIMULINK environment.

Keywords: *Micro Grid, Renewable Energy, Voltage Variation, Wind Penetration.*

I. INTRODUCTION

Environmental quality is contingent on economic growth and at the same time economic growth may be constrained by environmental quality. Currently India in a state of transition from traditional to modern energy sources that will require major structure change to the economy and energy system.

That's why we use the possible combinations of hybrid system along with micro hydro systems such as solar PV, wind energy system. Electricity generated from power house is transmitted with the help of transmission line to final consumers. But the main problem is faced with transmission line is losses and voltage instability due to overloading which ultimately supplies poor voltage till it reaches the consumers. So it becomes necessary to reduce the load of transmission line at distribution level with the help of new technique such as inserting renewable resources at distribution level often called as distributed generation. This DG includes different advantages such as power reduction, voltage support thus increasing overall efficiency. Here distributed generation which refers to small scale (1kw-50kw) electric power generators which produce electricity at close to consumers site and in general they include micro turbines ,induction generators which is now replaced by renewable energy sources such as solar, wind

etc. Micro grid is nothing but group of interconnected load with specifically defined boundaries with respect to grid connection and disconnection in order to enable in both grid connected and disconnected mode .this micro grid occupies a significant position in distribution system which is nothing but auxiliary part of whole distribution system.

1.1. Advantage of Micro grid System

- A major advantage of a micro grid and its ability, during utility grid disturbance, to separate, isolate itself from utility seamlessly with little or no disruption to the loads within the micro grid
- In peak load it prevents utility grid failure by reducing the load on the grid.
- Significant environmental benefits made possible by the use of low or zero emission generators.
- The use of electricity and heat permitted by the close proximity of the generator to the user there by increasing the overall energy effectiveness.

1.2. Renewable energy sources

These resources are naturally occurred in universe and are abundant and long lasting

Which can be harnessed by special means to satisfy our increasing demand of energy .this may include solar energy, wind energy, biogas and tidal energy etc.

1.2.1. Solar energy

Solar energy is available in abundance and considered the easiest and cleanest means of tapping non-conventional energy. For direct conversion of solar radiation into usable form the routes are solar thermal and solar photovoltaic, solar architecture .these solar cells converts sun's energy into electricity and some solar system includes large solar collectors to convert into electricity having longer life and silent operation, positive environmental impact with applications in space program, remote location where grid is difficult to get, lighting road sign and road light.

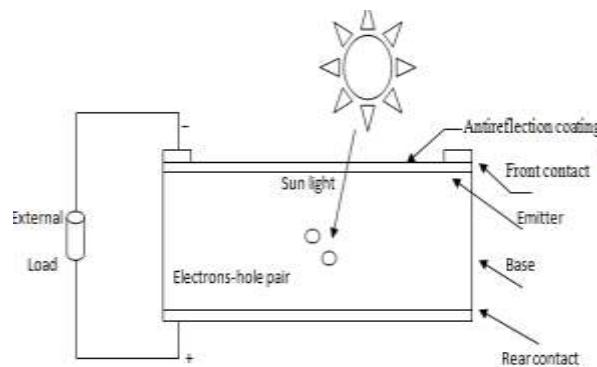


Fig. 1: Cross section of a solar cell

The basic steps in the operation of a solar cell are:

- Generation of the light-generated carriers;
- The collection of light-generated carries to generate current;
- Generation of the large voltage across the solar cell; and
- Dissipation of the power in load and in parasitic resistances.

1.2.2. Wind energy

Wind turbine converts wind energy into electrical energy using the wind energy conversion systems (WECSs). Wind energy has been popular. Usually induction generators are used in the WECSs. The main part of wind turbine is tower, rotor, and nacelle. Nacelle accommodates the mechanical transmission and the generator. Wind turbine captures kinetic energy of the wind flow through rotor blades and transfers energy to induction generator through gearbox. Generator shaft is driven by wind turbine to the generate electric power. The Wind turbines may have horizontal axis or vertical axis configuration of the system. Average of the commercial turbine size was 300 kW until the mid 1990s, but recently machines of the larger capacity, up to the 5 MW and more, have been developed and installed.

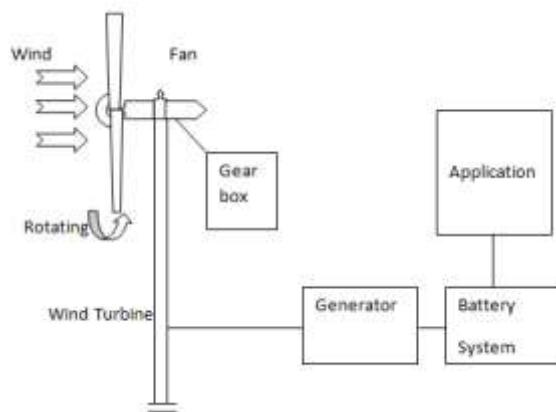


Fig. 2: Wind Generator

II. OVERVIEW OF PROPOSED WORK

Renewable energy sources, wind or hybrid penetration on micro grid is very important to study for the characteristics performances so as to cope with modern trends of power sectors so that, its effect can be studied for improvement of grid characteristics which is facing the problem of overloading, voltage instability, reliability and efficiency. Thus it becomes necessary to introduce various sources to overcome the problem. The supply demand balance can be maintained and the system dynamic performance can be improved. Simulation results demonstrate the effectiveness of the proposed control solution. However, when a micro grid operates in islanded mode of operation, the supply-demand must be balanced therefore; each of the components in the micro grid should be cooperated to achieve this goal. The present paper deals with study of parameters, that can be evaluated for subsystems performances like the effect of changes in generation on the system voltage due to solar penetration. The

impact of nature of wind penetration, on dynamic performance of the system. The impact of amount of power generation into the system through solar penetration. Disturbances due to cloud cover in PV system on the grid performances. Impact of loss of generation or load on frequency response. These changes due penetration of high wind and solar energy in micro grid are observed for the improvement and performance enhancement to reduced load on transmission line and prevent power loss.

2.1 Working Principle

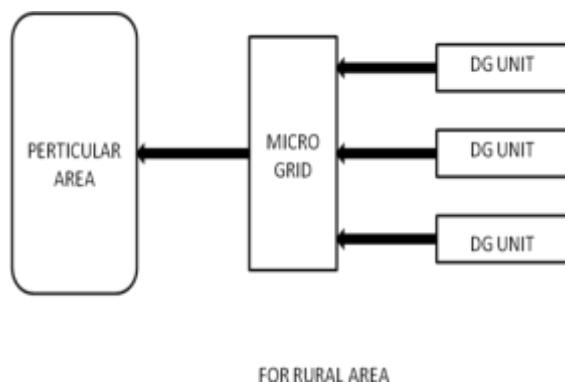


Fig .3: For the Rural Area

This basic system considers rural area with available wind and solar power. The first block of DG unit includes solar power defined as DG1 and can be considered as zone1. Second block includes wind power defined as DG2 as zone2. Third block as combined solar and wind generation defined as DG3 as zone3. Here solar and wind power is used as base power. Micro grid is a part of system but its characteristics are different from main distribution system. To generate power from wind a fixed speed wind turbine is equipped with squirrel cage induction generator and photovoltaic cell is equipped with MPPT and is connected to grid. The area where grid is not connected to grid system in that case we generate electricity from renewable energy like solar, wind etc. From that renewable sources we generate electricity to provide to different users.

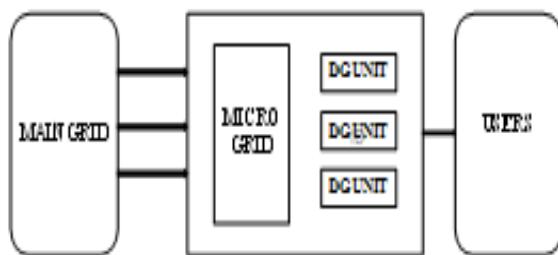


Fig. 4: For urban Area

From fig we observe that different blocks of system are connected to each other. It consists of micro grid consisting of different DG set like solar, wind, and biogas. On the main grid transmission load is very high due to which voltage stability decreases with low efficiency thus giving problem to users at distributed end. So to maintain the voltage signal and to give constant voltage stability to users without any disturbances set of micro grid consisting of DG set like solar, wind .with the help of these sources it helps to users to get a stable supply.

III. MODELING OF SIMULATION

3.1 Objectives of Simulation

To analyze performance of micro grid on, it should be studied thoroughly. In the present work, micro grid is formed with suitable assumptions using Simulink showing feasibility of grid connected and standalone mode of operation. The main objective of this section is to study the feasibility of the proposed model analysis under grid connected mode and islanded mode. MPPT techniques are needed to maintain the PV array's operating at its MPPT. Many MPPT techniques have been proposed in the literature; example is the Perturb and Observe (P&O) methods Incremental Conductance (IC) Methods, Fuzzy Logic Method, etc. In this paper most popular of MPPT technique (Perturb and Observe (P&O) method converter) will involve in comparative Study. Few comparisons such as voltage, current and Power output for each different combination have been recorded. Multi changes in duty cycle, irradiance, temperature by keeping voltage and current as main sensed parameter been done in the simulation. The MPPT techniques will be compared, by using MATLAB tool Simulink, considering the variant of circuit combination.

IV. SIMULATION RESULTS

Irradiance=928



Fig.5: Current and Voltage

(Irradiance=928)



Fig.6: Power

The result shows the amount of power generation through solar penetration.

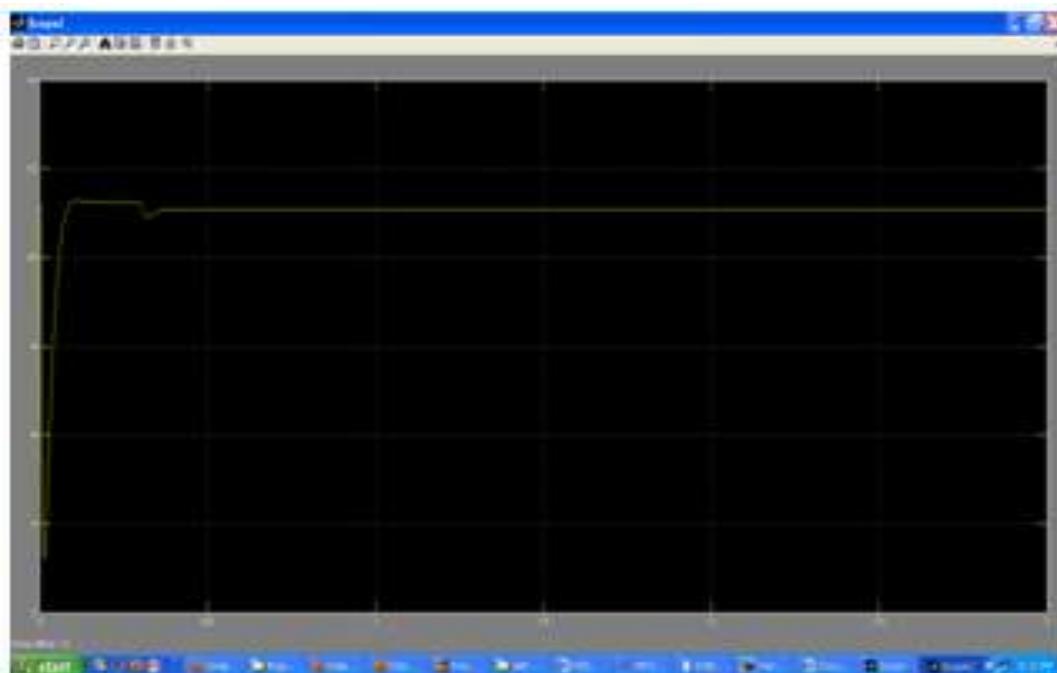


Fig.7: Output voltage changes on solar penetration.

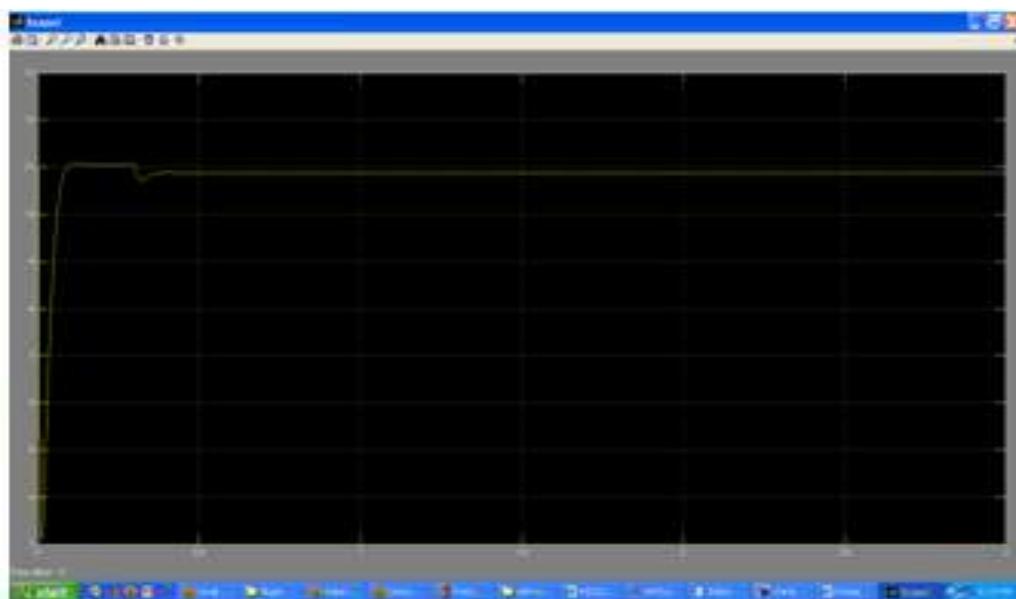


Fig.8: Current and voltage

(Irradiance=902)



Fig.9: Power

Result shows the amount of power generation on solar penetration.**Fig.10: Change of output voltage on solar penetration.****V. CONCLUSION AND FUTURE SCOPE**

Thus the impact of various parameters like voltage stability, amount of power generation into the system, disturbance due to cloud cover, in grid connected as well as in islanded operation by inserting wind and solar as base power individually as well as coupled is observed which is different in nature. Where as in faulted condition the penetration of RES in both grid and islanded operation is adversely affected but it is more in islanded form. Many research work have been in past and much work has yet to be accomplished with tidal, biogas. Much area of interest have to done to fulfill demand of energy

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