TO STUDY RENEWABLE ENERGY SOURCES SYSTEM WITH MICROGRID PENETRATION AND THEIR IMPACT

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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 individually as well as coupled 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: wind penetration, voltage variation, micro grid, renewable energy.

1. 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 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, tidal energy etc.

1.2 SOLAR ENERGY

Solar energy is available in abundance and considered the easiest and cleanest means of tapping renewable energy. For direct conversion of solar radiation into usable form the routes are solar thermal, solar photovoltaic and solar architecture .these solar cells converts sun's energy into electricity and some solar system includes large solar collectors to convert into electricity.

1.3 WIND ENERGY

A wind turbine generator produces electricity with mechanical system of rotation which is connected to

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electrical generator whose axis is joined to driving system.

2. Related Work

Much significant work has been done in the field of renewable energy sources penetration in grid as well as islanded operation including solar and wind as base power. Paper written by Yu Zhang, Nikolaos Gatsis, Georgios B.Giannakis they used the principle of distributed generation and distributed storage. DG refers to small power generators like diesel generators, fuel cells and RES.DS relates batteries, fly back and pumped storage. Here distributed economic dispatch for a micro grid with high penetration of RES and DSM (demand side management) operated in grid connected mode is considered). It involves renewable energy and energy traded with main grid for the maintenance of balance between supply and demand. A typical configuration is shown in fig. the micro grid energy manager (MGEM) co-ordinates DER (distributed energy resources) and controllable load. Each of DER &load has local controller which co-ordinates MGEM the scheduling of resources through communications infrastructure.
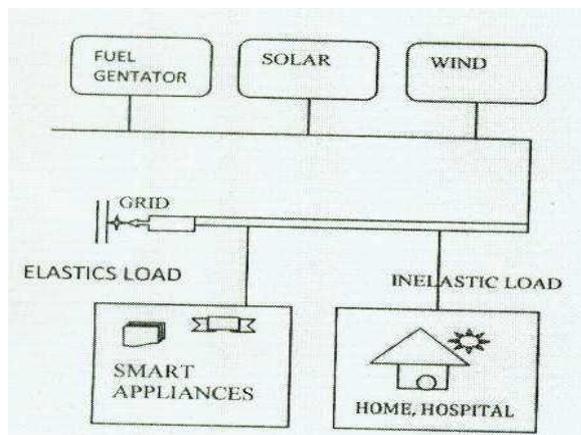

Fig.1: Distributed control and computation architecture of a micro grid [13].

It deals with the use of stochastic programming to solve the variability of RES it is formulated to minimize the overall cost of electricity and natural gas for a building[14]. For uncertainties of demand profiles and PV generation this program is formulated[15]. Also work has been done to explore energy scheduling with DSM & RES using centralized algorithms[16]. Along with energy source control and DS planning problem for micro grid is solved and formulated using model predictive control[17]. Recently worst case transaction cost

based energy scheduling scheme has been proposed. A robust formulation accounting for worst-case amount of harvested RES is developed [18].

The present paper deals with optimal energy management for supply &demand of a grid connected micro grid incorporating RES. Objective is to minimize the micro grid net cost for conventional DG cost, penalized cost of DS and a worst-case transaction cost also a novel model is included in order to maintain supply-demand balance arising from fluctuated RES.A separate structure and strong duality of problem are leveraged to develop a low overhead distributed algorithm which is based on dual decomposition is efficient to communication attacks. For faster convergence bundle method of proximity is employed for non-smooth sub problem handled by LC of RES[13].Finally the paper is studied in three parts 1) A detailed model for DS is included and different design choices for storage cost functions are given. 2)with the envisioned tide of RES high penetration multiple wind farms are considered along two pertinent uncertainty models.3) finally a new class of controllable load is also added with each load having a total energy requirement over scheduling horizon as in case of plug in hybrid electric vehicles[13].

3. 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 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. Reactive power consumption due to wind penetration and voltage variation due to solar penetration. 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.

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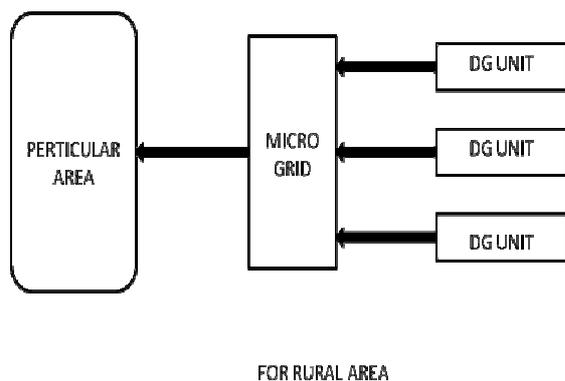
3.1 Testing system

FOR RURAL AREA

Fig.2: For 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 considered as zone1Second block include 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 buts it's characteristics is 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.

4. Conclusion

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.

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