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Hybrid Renewable Energy For Smart Monitoring Of an Urban Microgrid and Emission Reduction Of Co for Energy Management

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***Abstract*—Power to urban and rural areas become cumbersome nowadaysbecause of the scarcity and very poor generation index in power sector. Though in India we have achieved the goal of power generation index 2015, surprisingly the requirement goes to a new height so automatically demand persists. When the demand increases in any country they will concentrate to provide power to cities and industrial belts. Agriculture,rural and urban areas could be given least priority. To overcome the above true issue, we could like to reconfigure the power sector distribution. The power allotted to the urban areas will be synchronized with locally available renewable resource and jointly supports to the power requirements. Electricity board energy, locally generates renewable energy will be connected together on a local micro grid and makes stronger local grid to meet rural and urban demands.The proposed hybrid energy is used to reduce emission of CO_2 from diesel generator.**

***Index Terms*-- Smart grid, micro grid, renewable energy, load, emissions minimization, power planning, energy management.**

I. INTRODUCTION

The Energy in the world basically comes from fossil fuels, hydro sources, thermal sources and renewable sources. Renewable sources available are solar, wind, tidal, hydro, biomass and energy from waste. The energy resources solar and wind are optional, at all times may not be available for wind and solar which causes an interruption in the power flow thus reducing the efficiency and in the power it is consistency. If the two energy sources is integrated as one helps us to increase the output power of the system as a whole. The need to reduce pollutant gas emissions and the liberalization of the electricity market lead to electricity grids with a large ratio of low-carbon electrical production [6].The unpolluted and real renewable energy source forever is solar power. In India, sunlight intensity is very high where solar energy is available at least for 14 hrs a day.Harnessing of solar energy can produce 1600 times more power than the present requirement. In India electricity sector supplies theworld's 6th largest energy consumer.[12]The limited reserves of fuel oils, because of their pollution impact,it is unstable prices have significantly increased the interest in renewable energy sources (RES: wind turbine ,photovoltaic Modules, ,etc.) to produce electricity from power that is an essential factor for the society of human in the development[12].

Wind energy as a renewable energy source of increasing importance.[7]The idea of a "smart-grid" has emerged as the concept for the evolution to a modernized electric grid. The task is to imagine grid architecture to integrate and control synergy interactions of new power components or services andexisting distribution system.

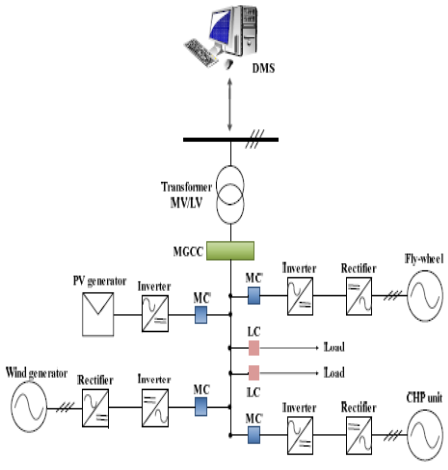

Fig 1: The micro-grid with micro sources, loads, control and management.

The Existing method proved that by using an hybrid energy we are able to reduce emissions and the power needs to large scale may be satisfied by using an both wind and solar energy.

II. STRUCTURE OF THE SOLAR PANEL

An active PV based solar panel is used in this paper .A solar cell is a device that converts the energy of sunlight directly into electricity by the photovoltaic effect. Assemblies of these cells are used to make solar panels, solar modules, or photovoltaic arrays. The energy generated this way is solar energy also known as solar power.

Fig. 2-Solar panel

Solar Panels are a form of active solar power, a term that describes how solar panels make use of the sun's energy: solar panels harvest sunlight and actively convert it to electricity. Solar Cells, or photovoltaic cells, are arranged in a grid-like pattern on the surface of the solar panel. These solar voltaic cells collect sunlight during the daylight hours and covert it into electricity. Solar panels are typically constructed with cystalline silicon, which is used in other industries (such as the microprocessor industry), and the more expensive gallium arsenide, which is produced exclusively for use in photovoltaic (solar) cells.

Other, more efficient solar panels are assembled by depositing amorphous silicon alloy in a continuous roll-to-roll process. The solar cells created from this process are called Amorphous Silicon Solar Cells, or A-si. Solar Panels constructed using amorphous silicon technology are more durable, efficient, and thinner than their crystalline counterparts. For very important solar projects, such as space probes that have to rely on solar energy, very-high efficiency solar cells are constructed from gallium arsenide by a process called molecular beam epitaxy. Solar cells constructed by this process have several p-n junction diodes, each designed to be maximally efficient at absorbing a given part of the solar spectrum. This solar panels are much more efficient than conventional types, but the process and materials involved make them far too expensive for everyday applications. The newest solar panels function on the molecular or quantum level, and represent an exciting new technology coming into play. These solar panels are created by implanting carbon nanotubes or quantum dots into a treated plastic. Unlike silicon-based solar panels, these solar panels do not have to be constructed in a clean room, and therefore production costs are somewhat dimished.

III STRUCTURE OF THE STUDIED MICROGRID

The studied microgrid integrates residential loads, two30kW micro gas turbines (CHP), a 60kW gas turbine and twelve 3kW PV based active generators [7].

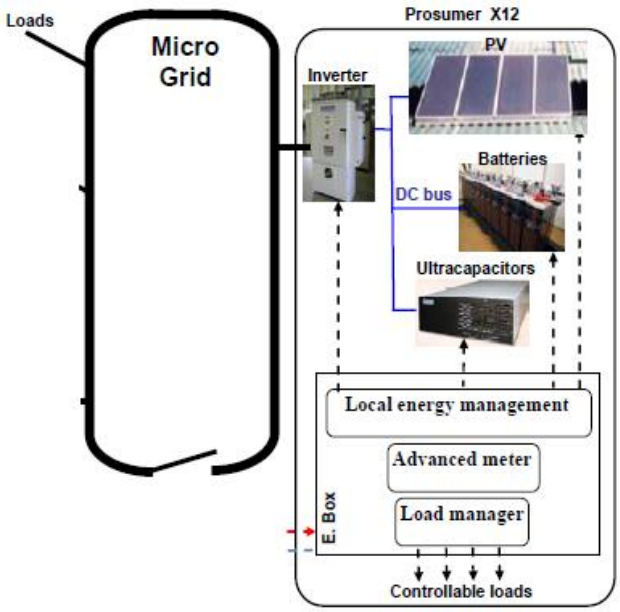

Fig. 3- Microgrid integration of an active generator, gas turbines and central energy management

In existing method they use an E-Box and **MCEMS**(Microgrid Central Energy Managements system). In advanced E-boxes with onboard intelligence that receives signals from the microgrid central controller. and may reduce home demand or may increase power production in a certain margin for matching the total power production with the demand in an optimal way[7].

A microgrid is a small-scale electrical system that generates and distributes power locally. Microgrids can be connected to large electrical grids, but they can also function independently. In this way, they are used to back up power systems in the event of an outage. However, they can also be used as a sole power source, whether for

a large facility like a jail or a specific community trying to achieve energy independence.

A microgrid can be described as a cluster of micro-sources, energy storage systems (ESS) and loads that is perceived by the main grid as a single element that can respond to centralized control signals.[8].

IV. LOCALIZING POWER PRODUCTION OF MICROGRID

According to the U.S. Department of Energy, microgrids can be powered by generators, batteries and renewable resources, such as solar panels. They can help cut costs associated with larger grids and also help communities or businesses become more self-reliant. Microgrids are important for environmental reasons as well. The Galvin Electricity Initiative, for instance, touts microgrids as a way for users to diversify renewable energy sources and reduce carbon emissions. Instead of relying on large, coal-fired power plants, communities can design and build more environmentally friendly microgrids to meet specific energy demands.

V.PROPOSED SYSTEMS

The proposed stage is to reduce carbon monooxide and other emission which is liberating from the diesel generator by generating renewable energy resources. A whole new concept on wind energy is created in this proposed project. The wind turbine is kept along with roads to acquire wind energy from Moving Vehicles. The mechanical model will be constructed to have real time implementation. We are going to construct scale down model to prove the proposed concept.

In our project we would like to propose Wind energy and Solar energy will be generated using real mechanical model. The generated power will be hybrided together and fed to the localized grids

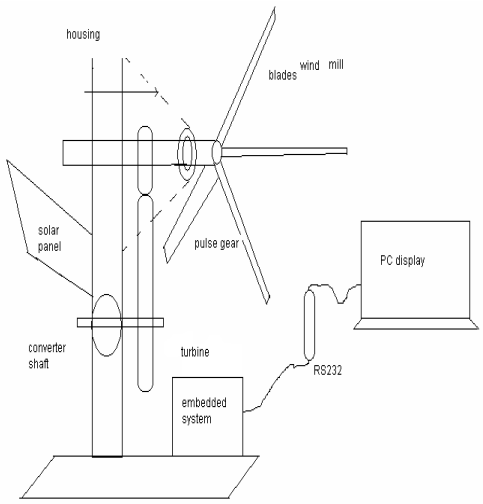

Fig 4-Proposed Model

In this paper here it is able to monitor the emissions and display in PC.Both solar and wind is hybrid together r.The Embedded system is connected.The PC and Embedded system is interfaced with RS232 cable.

The advantages of proposed stage ,two energy sources such as wind and solar used together provides an increase in the systems efficiency as well as greater balance in energy supplies. The systems are complementary. Greater output can be obtained from the wind turbine during the winters and during the summers the solar panels would produce their peak outputs .Hybrid energy systems feature lower fossil fuel emissions and produces continuous power generation at all times thus being environmental friendly and reducing pollution. It improves the quality and availability of power. The required generating capacity of the basic solar and wind energy conversion units can be reduced since the total load is shared. Easy to operate and maintain.

VI. STRUCTURE OF THE MULTISOURCE POWER STATION

The photovoltaic panels, the batteries and the ultracapacitorsare connected to a common DC voltage bus through their dedicated DC/DC chopper (Fig. 4). The grid connection is performed by a three-phase inverter. The 3 kW peak power photovoltaic power station is made up of 18 BP Solar 3160 panels. The 10 kWh energy lead-acid batteries hold a 144 V voltage (12 cells in series). In comparison with the batteries, the ultracapacitors have a lower capacity of energy storage but a higher density of peak power. The main application of the ultracapacitors is to use them as fast dynamic energy buffers. The use ofultracapacitors requires power electronic converters in order to offer an efficient management ofthe storage level[5].This power station may also used for this concept to reduce the power demand.

VII. SMART MICRO GRID CONCEPT

The potential economy and environmental of smart grid include technology investment that result in job creation, reduction in carbon dioxide emissions level, workforce development and the smart grid as an economic development toolSmart micro-grid is an advanced framework based on the service-oriented architectures forintegrating micro-grid modeling, monitoring and control, as shown in Fig. 1.[7].In addition, the lack of sufficient energy resources, the increase of public awareness in reducing pollutant gas emission and also the liberalization of electricity market have given rise to the use of DG.

VIII.CONTROL AND MANAGEMENT OF PV INTEGRATED …

Several cases with different combinations of PV, PEV, V2H (Vehicle to Home i.e. discharge of PEV) and

various charging schemes were analyzed. Case 1 describes a residential facility without PV and PEV.

Case 2 describes a residential facility integrated with rooftop PV system without PEV. Therefore, these 2 cases analyze the effects of using PV while using gasoline vehicles instead of PEVs. Case3 represents a residential facility with PV and PEV without V2H capabilities. Cases 4–6 have all the facilities (i.e. PV, PEV and V2H capabilities) but their charge discharge schemes are different. As shown in Fig. 5the local consumption rate of PV output increased by 1.7 %

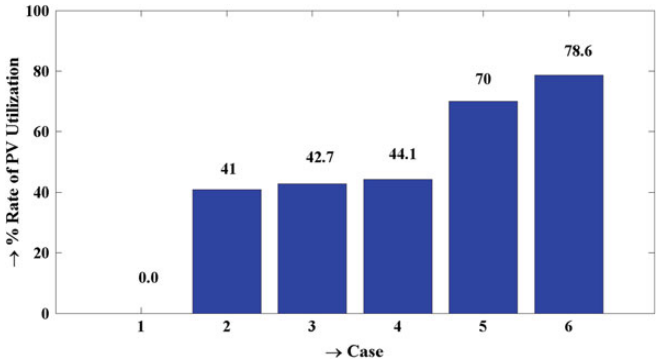

Fig 5- The rate of PV utilization

IX. OPTIMIZATION FOR REDUCING CO2 THE EMISSIONS

The MCEMS calculates a day-ahead plan with the power References for the active generator and the three gas turbines. A multi objective optimization algorithm is implemented, in order to calculate power references for the gas turbines so that the pollutant emissions are at their minimum.[7]The fuel consumption represents the energy efficiency goal. In economic terms, it also corresponds to the minimization of the system's operating costs [7]. In addition, as the three gas turbines in the studied system use the same fuel (natural gas), the fuel consumption minimization approximately corresponds to CO2 emissions minimization, according to [7]. The relevant aspect here is that costs and CO2 are not conflicting objectives under the considered hypotheses in this study.

The calculation of the power references for the micro gas turbines implies the use of multi-objective optimization.

X.SOLAR PHOTOVOLTAIC SYSTEMS

Though the output of a PV panel depends on the solar intensity and cloud cover, PQ Problems not only depends on irradiation but also are based on the overall performance of solar voltaic systems including PV modules, inverters, batteries,filters controlling mechanisms etc [5]. The micro-grid studies and smart grid papers studied by the extensive research is necessary in order to implement evolutionary smart distribution networks for flexible and intelligent operation and network control. Consortium for Electric Reliability Technology Solutions (CERTS) was established in the US for power system reliability of emerging technological, economic, regulatory-institutional, and environmental influences [9].shows fig 7.

XI. STRUCTURE OF THE WIND MILL

Wind Power is very popular nowadays, because of the high power that can be achieved in a efficient way. The Wind is identified as a key natural energy resource, which contributes to reducing undesirable emissions due to fossil fuel power plant. Worldwide installed wind power capacity has reached 120GW at the end of 2008 with a 36% increase in comparison to the previous year. However, with the increase of wind power penetration, the technical and operational challenges associated with wind energy have also become more apparent. These challenges include the elimination of power fluctuations, improving power quality, connection of wind farms to weak grids, prediction of wind power and changes in operating strategies of conventional power plants .Irregular variations of the wind power are the root cause of the first challenge, and more or less partial cause of the others.

Wind turbines are used to convert the wind power into electric power. Electric generator inside the turbine converts the mechanical power [12].Wind turbine systems are available ranging from 50w to 2-3 MW.

Fig 6-Wind mill

Mechanical output of turbine of wind generatoris dependent on the speed of turbine. For small turbines, wind speed is about 3.5m/s. Large wind power plants require wind speed of 6m/s. but wind speeds higher than this are available in many locations [12].

XII. HYBRID ELECTRIC SYSTEMS

A hybrid Electric system combines wind and solar photovoltaic technologies offering several advantages over either single system. Wind speeds are low in summer when the sun shines the brightest and longest. The wind is strong in winter when less sunlight is available. Because the peak operating times for wind and solar systems [12].

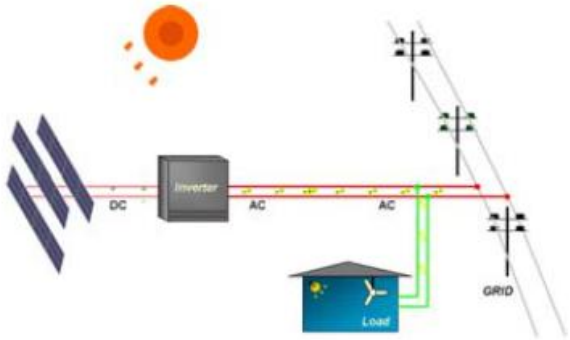

Fig7-General structure of grid-connected pv systems

The hybrid unit contains two complete generating plants, a solar plant and a wind system. The two sources are connected in parallel, the power is connected to a DC to AC inverter and is then supplied from the inverters output to a single phase load[12].The output of solar cell depends on the angle of incidence and intensity of sunlight.

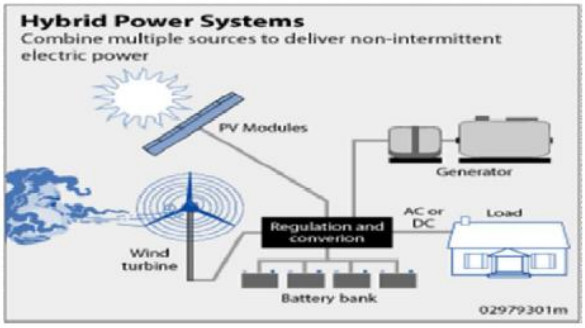

Fig 8-Hybrid power systems solar and wind

By using an wind and solar energy both are generates the required power to rural and urban areas. It is also used for supplying unused power to various sectors, by using a microgrid.The hybrid unit contains two complete generating plants, a solar plant and a wind system. The two sources are connected in parallel, the power is connected to a DC to AC inverter and is then supplied from the inverters output to a single phase load[2].

This may also used to avoid the usage of Diesel generators and reduce the emission of $CO_2$by renewable energy. The total amount of equivalent CO_2 gazes emitted by thesystem without using the active generator and the optimization is 646 kg of equivalent CO_2.[7].If we using the active generator andthe optimization proposed in this study, the total amount is 587 kg of equivalent CO_2, which means an economy of 9.17% of equivalent CO_2shows fig 9.If improving grid operation by contributing to ancillary services, increasing the energy reserve, and reducing CO_2 emissions. Solar cell generates power from sun and the wind generates power from air. Both may generates power and combine so its called as hybrid energy system.

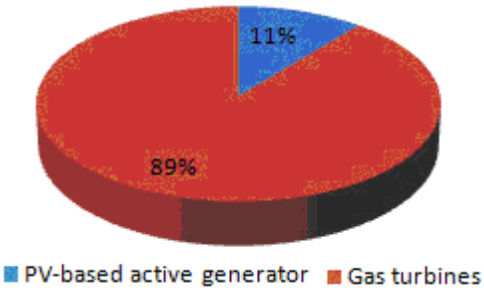

Fig 9-Energy from the micro turbines and energy from the active generator

XIII.CONCLUSION

This proposed concept reduces the usage of diesel generators in the rural and urban areas to reduce emission to keep the green environment .The Power management software will be developed based on electric board power and renewable energy.

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