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Electric Vehical and Renewable Energy Based Management of Microgrid

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A B S T R A C T

- . An intelligent micro grid is designed that present combination of electrical vehicle, Diesel Generator, Photovoltaic system and wind energy to satisfy energy demands of linear and non-linear load. A photovoltaic system is designed with MPPT controller provide DC to DC conversion to improve voltage matching in between battery storage or utility grid. A system is designed to ensure uninterruptable supply to load.

Keywords: Micro Grid, Renewable Energy, Energy Management, Uninterruptable Supply.

1. Introduction

Due to excessive usage of fuels and over-exploitation of resources like petrol, diesel cause carbon emission, which further leads to global warming. Nowadays, each and every vehicle depends upon the combustion of hydrocarbon fuels for the energy, which is further used for propulsion. Combustion is a reaction between air and fuel that generates heat as well as combustion products. Further, the generated heat was converted into mechanical energy by the mechanical system and the combustion product was further extracted into the surroundings. Except carbon dioxide and the water, some of the combustion products are also extracted into the environment, which contains some amount of nitrogen oxides (NOx), carbon monoxides (CO), and unburned hydrocarbons (HC), all of which are toxic to human health leads to a development of Various types of vehicles such as Battery operated vehicles, hybrid-electric vehicles and plug-in hybrid electric vehicles. An intelligent, fast responsive, reliable system can be designed using electric vehicle technology to ensure continuous supply to load by micro grid. A system is designed with 3 different type of sources: A. Renewable energy sources: Wind Energy and Photovoltaic Energy. B. Backup Source: Diesel Generator. C. Electric Vehicle as a source. The high usage of non-renewable energy resources and drastic increase in pollution has sifted focus on concepts like Micro grid, Renewable energy and outcomes has not only sifted focus on energy resources like solar energy, wind energy but also on geothermal energy, biomass energy. Demand of electricity is increasing day by day that has increased load on grid. To provide continuous demand and maximize potential of electricity generation India has started construction of renewable energy based solar parks, wind energy system on hills. Research paper focus on designing a micro grid system that can provide continuous supply to load weather it is linear or non-linear. System is designed by taking consideration of demand and renewable energy supply. A backup energy source used are Diesel generator and electric vehicle. When load demand is more than the total energy produced by wind energy and Solar energy, supply is obtained from DG set as well as Battery storage. Sometimes time is taken by DG to operate in that case EV battery is used to satisfy load demand.

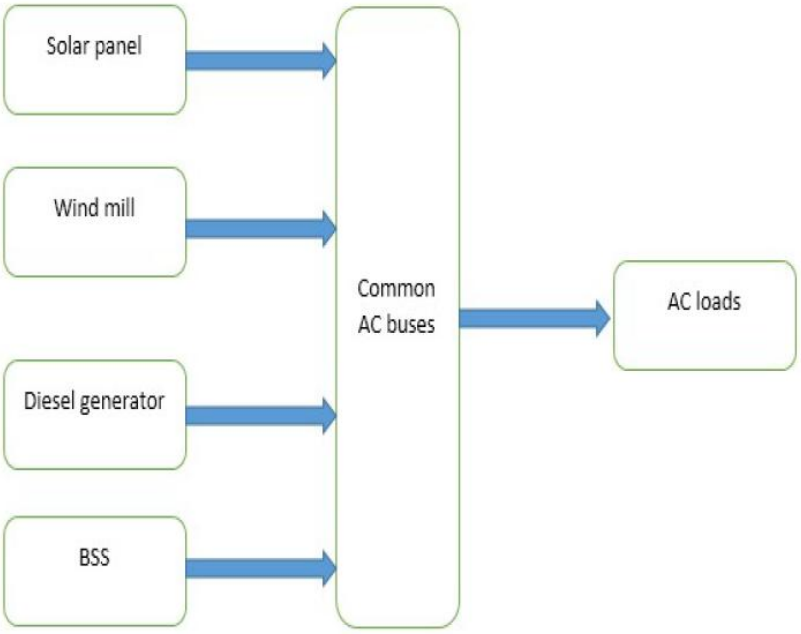

Figure 1 Block Diagram

2. Micro Grid

Micro grid is collection of distributed energy sources and loads that can used in synchronization with grid and as a discrete source of energy. It offers great opportunity to provide energy demand of rural areas. An effective integration of system include integration of different energy resources. Switchgear and protection selection is a challenge in designing micro grid as all equipment should be in micro grid.

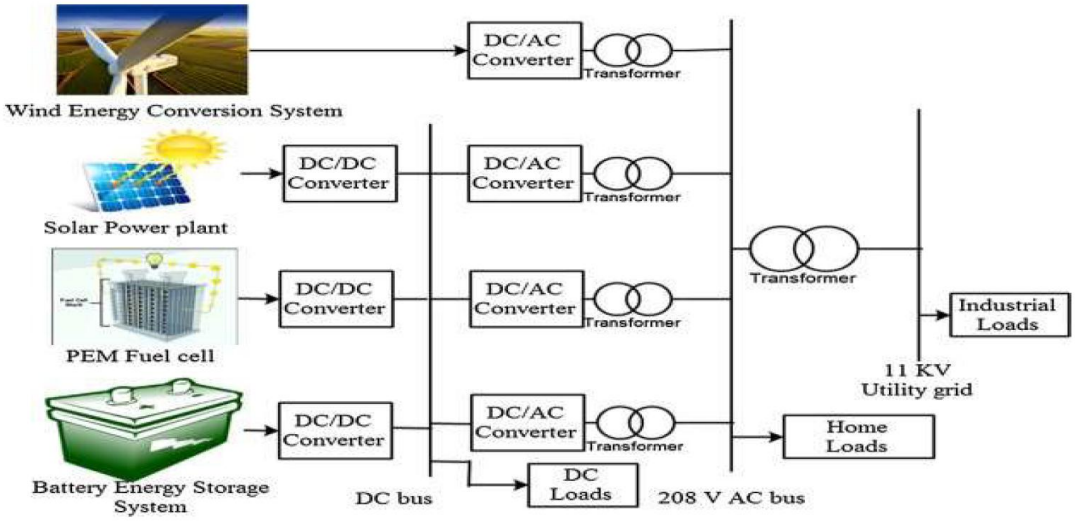

Figure 2 Block Diagram of Micro grid

3. Implementation

Figure 4 show the Single line diagram of designed system. System is designed using MAtlab 2015a. The elected system consist of Renewable energy

block, DG Set as a source of backup power, Battery energy storage system followed by Filter, an AC bus followed by distribution transformer to step up and step down voltage. Two system with linear and non-linear are configured where continuous supply is ensured. The system is executed, it is found to be responsive with continuous supply to the load.

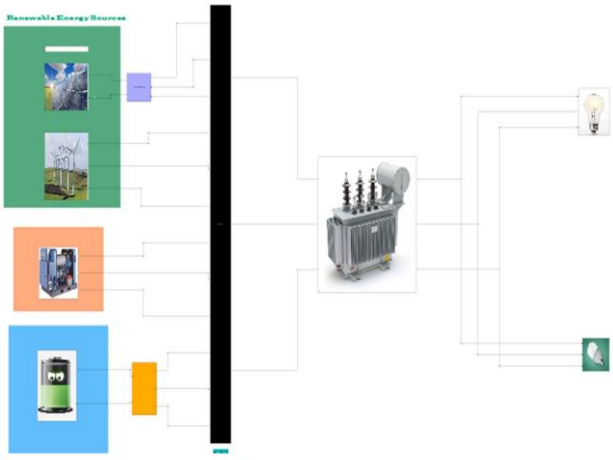

Figure 4 Single Line Diagram

3.1. Solar system

A solar system is designed by calculating solar irradiance at required geographical location at different point of time. The solar irradiance produces a major impact on system. The power used by PV cells reaches the maximum at these points. The short-wavelength is measured by short-circuiting the output channels and measuring the terminal end. PV cells are made of semiconductor material, with crystals and thin film as the main material. In terms of cost and efficiency, most future thin materials may exceed PV silicon cells, which can be divided into the following categories: crystalline, thin-film, amorphous, multi-junction, organic or photochemical. The PV properties are shown in Figure 4.8, and the current Vs volts are based on the XY configuration. The solar cell produces a maximum power of 230 power at its current point, of which the products V and I are the largest, as shown.

Table-1 SIMULATION OUTPUT PV

PV BLOCK	VALUE
Voltage (V)	44
Current (A)	7.5
Power(Pv)	240
Vdc(Boost Converter)	380

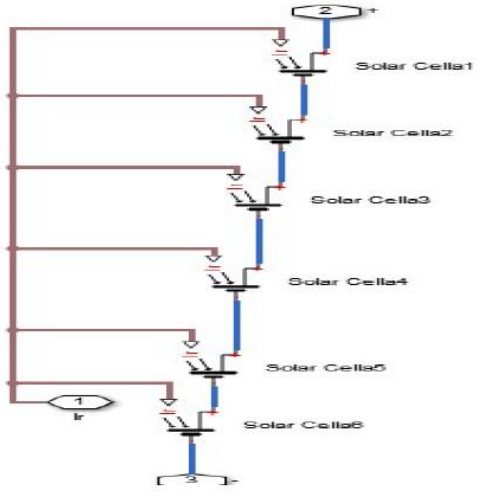

Figure 5 Solar System

3.2 Final Result

Implements a three-phase parallel RLC load. Nominal phase-to-phase voltage 400Vn (Vrms Nominal frequency fn (Hz):50 Inductive reactive Power QL (positive var): Implements a three-phase circuit breaker. When the external switching time mode is selected, a Simulink logical signal is used to control the breaker operation. Switching times (s): [4/60 10/60] Breaker resistance Ron (Ohm) 0.001.

Table 2 Simulation output of the linear and nonlinear load

Load	Value
Linear load (v)	1500
Non liner load(v)	1500

A direct voltage control is adapted to regulate the ac load voltage. This complete energy system design is analyzed and simulated under different hybrid energy sources.

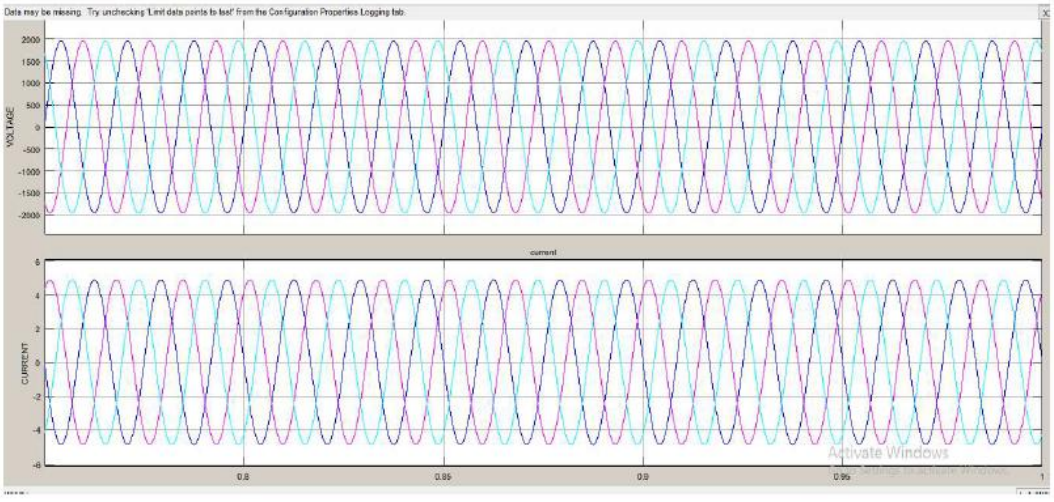

Figure 6 Output Waveform

4. Conclusions

The development of the vehicle for the last few years has become an emerging and moving towards eco-friendly technologies and the usage of the energy and storage sources has been improving over the years. The research has focused on the storage system and controlling system of the vehicle. For this research study, a specifically rated ultra capacitor and battery have been selected as sources, and different converters like a buck, boost, and full-bridge buck-boost converters have been simulated. It also involves the design of three-level inverter using MATLAB Simulink Concerning EV batteries being distributed in smart environments, there are technical issues that need to be addressed: energy management strategies and control of the integration of EVs into tablets is the key to using EVs as shared storage, which needs to be carefully examined. People putting electric cars on plates, we need to understand the problem of control and management. Before starting charging, the EV battery needs to be connected to the device needed to determine if there is any residue in the system to start charging the battery, so we need a competent inverter.

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