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Power Quality Enhancement Using MPPT, Wind and Solar PV

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Abstract *– The control strategy is simple and is based on injecting voltages in-phase with the system voltage and is easier to implement when the system has the ability to provide active power. In Proposed work describes super capacitor-based energy storage integration into the system for the distribution grid is proposed is ideally suited for applications which need active power support in seconds timescale. Therefore, system is ideal, as the normal duration of momentary voltage sags and swells is in seconds range have higher number of charge/discharge cycles when compared to batteries.*

Keywords*: DC–DC converter, d–q control, DSP, dynamic voltage restorer (DVR), energy storage integration, phase locked loop (PLL), sag/swell, Ultracapacitor (UCAP),*

I. Introduction

In recent years, power engineers are progressively involved over the standard of the electrical power. In trendy industries, load instrumentality uses electronic controllers that are sensitive to poor voltage quality and can shut down if the availability voltage is depressed and will mal-operate in different ways that if harmonic distortion of the availability voltage is excessive. Abundant of this modern load instrumentation it uses electronic switch devices that then will contribute to poor network voltage quality. The introduction of competition into voltage provides has created larger commercial awareness of the problems of power quality whereas instrumentation is now readily on the market to live the standard of the voltage wave form and then quantify the problem.

Along with advance technology, the organization of the worldwide economy has evolved towards globalization and also the profit margins of the many activities tend to decrease. The increased sensitivity of the vast majority of processes like (industrial, services and even residential) to PQ issues turns the supply of electrical power with quality an important issue for competitiveness in each activity sector. The continuous method industry and also the data technology services are most critical space. Because of disturbance, a large quantity of financial losses might happen, with the resultant loss of productivity and competitiveness.

The purpose of power system is to supply electricity or power to client. Non linear loads, utility switching and fault clearing produce disturbance that result the quality of this delivered power. Among the current state of affairs, electrical power is viewed as an integral product with explicit characteristics, which could be measured, forecast, certified and improved. The word power quality suggests that varied things to totally different individuals. Power quality suggests that the quality of the normal voltage provided to your facility. It’s supported the extent of diversity of the voltage and current waveform from the perfect clean curved waveforms of fundamental frequency. to enhance the power quality, it's a necessity to know what quite disturbances occurred and quality at first assign to the quality of the service delivered as ‘measured’ by the consumers ability to use the energy delivered among the wish manner. A power quality observation system that is capable to mechanically perceive, characterize and classify disturbance on electrical lines is so needed.

Power Quality delivery among the current distribution system are addressed among the literature, due to the hyperbolic utility of smart and necessary things like conference network, technique industries and formal producing technique. In, the creator propose the usage of the DVR with reversible energy storage at the dc-terminal to satisfy the active power needs of the grid throughout power injection into the grid, creator in addition specify voltage disturbances. Therefore on avoid and minimize the active power injection into the grid, author in addition explained an alternate resolution that is to compensate for the voltage sag by inserting a lagging voltage.

II. Wind Power

Wind power is mainly generated by using wind. It is the energy generation that uses actual form of wind through wind turbines, which rotate and generate electricity. For generating wind power we have many wind power equipment like wind turbines, windmills and water mills. There are many advantages of wind energy such as wind turbine power generation, mechanical power with windmills, pumping water using wind pumps, and so on. An electrical generator is coupled with a wind turbine. Hence it is named as a wind turbine generator. There are various types of wind turbine generators and these wind turbine generators can be directly connected to the power grid or loads or batteries based on different criteria.

II.1. Working Procedure of Wind Power

The generation of the wind power is mainly performed by the force of the wind pulses that strikes against the turbine blades causing them to rotate, and then to create mechanical energy. The spinning blades attached to the hub and group of shaft turn along with the blades. The rotating low-speed shaft is connected to the high-speed shaft – which is connected to the opposite side of the gear box.[12] The high-speed shaft is connected to the electrical generator – which converts the mechanical energy produced from the rotating blades into electrical energy.

DFIG double fed induction generator with 3-phase wound rotor and 3-phase wound stator. An AC current is carried in the rotor windings due to three phase AC signal fed to rotor windings. Because of mechanical force produced from wind energy the rotor starts rotation and produces a magnetic field. The rotor speed and frequency of the AC signal applied to rotor windings are proportional to each other. This constant magnetic flux passing through the stator windings produces AC current in the stator winding. Due to variation of speed in wind speed there is a chance of getting AC signal output with an increasing frequency. But, the AC signal with constant frequency is desired. So, by changing the frequency of the input AC signal given to the rotor windings we can obtain an AC output signal with a constant frequency. Grid side converter can be used for providing regulated DC voltage to charge batteries. Rotor side converter can be used for providing controlled AC voltage to the rotor.[12]

Size of wind turbine: utility turbine range in the size of 100 magha watts to large megawatts. Larger wind turbines are more cost effective and are grouped together into wind farms. These are provided in two bulk electrical power.

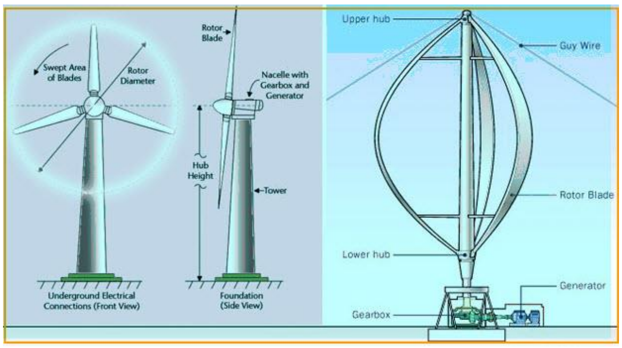

Fig.1 Working Procedure of Wind Power

III. Tables Proposed Methodology

Our proposed model is consists of three different module that is wind, PV and MPPT. This is connected to controller, grid, and load and battery converter.

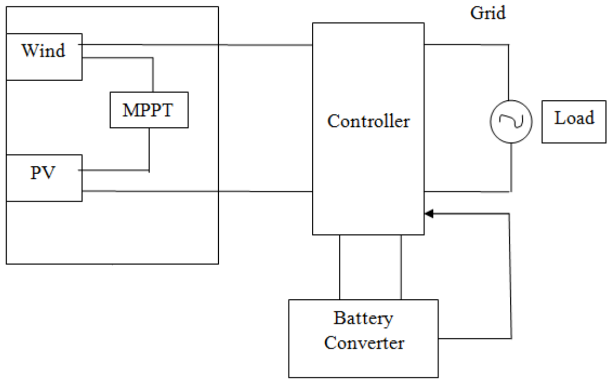

Fig.2 block diagram of proposed system

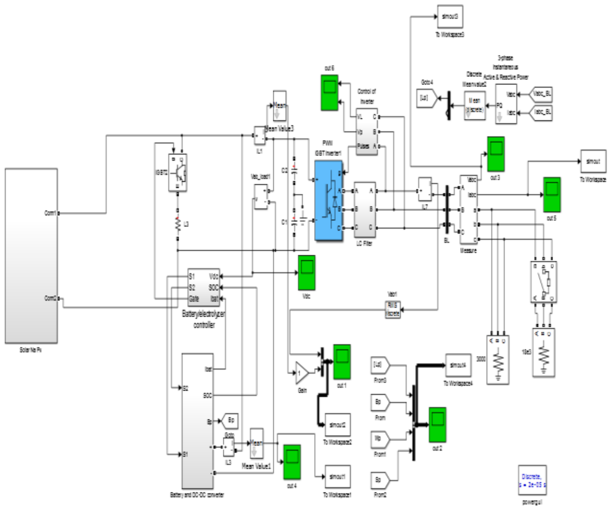

Fig.3 Proposed Model

Proposed model is shown in figure 3 which shows the element or block used for the PV and wind power as an input, which gives two outputs one is PV cell output and another is wind power output which is applied separately on IGBT and current measurement element end in which PV cell Output is used on cathode end of IGBT and

Wind power output is applied on anode end. PWM IGBT inverter is applied for Universal Bridge block allows simulation of converters using both naturally commutated (and line-commutated) power electronic devices (diodes or thyristors) and forced-commutated devices (GTO, IGBT, and MOSFET). The Universal Bridge block is the basic block for building two-level voltage-sourced converters (VSC). A 3 Phase instantaneous Active Power and Reactive Power Output is applied on filters output.

IV. Simulation Results

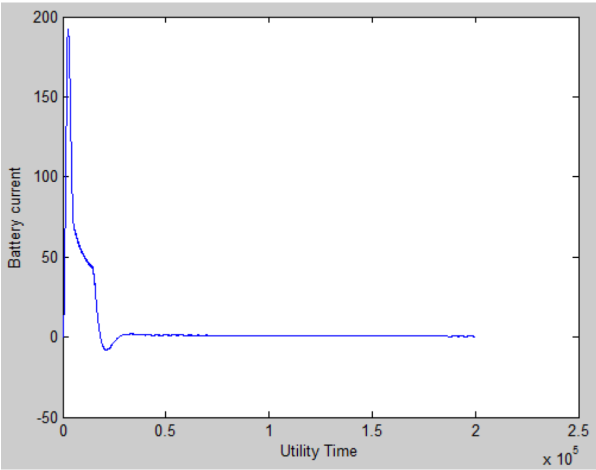

Fig.4 graphical representation of utility time verses battery current (scope 1)

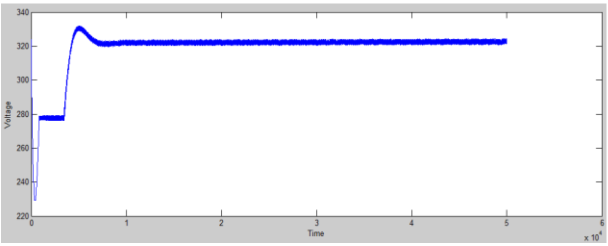

Fig.5 graphical representation of time verses voltage (scope 2)

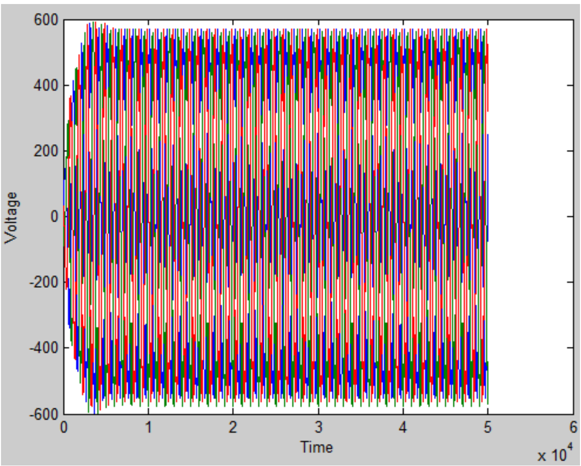

Fig.6 graphical representation of time verse voltage (scope 3)

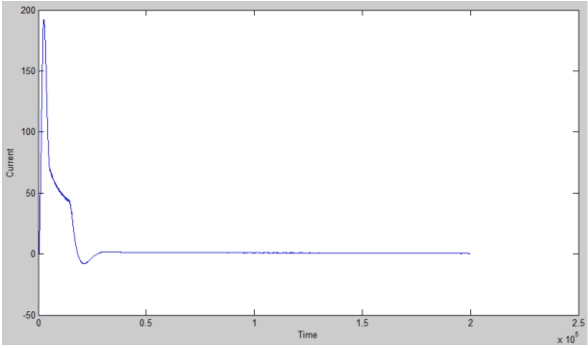

Fig.7 graphical representation of time verses current (scope 4)

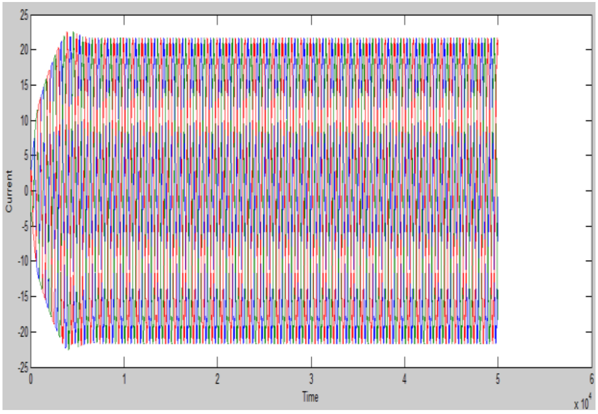

Fig.8 graphical representation of time verses current (scope 5)

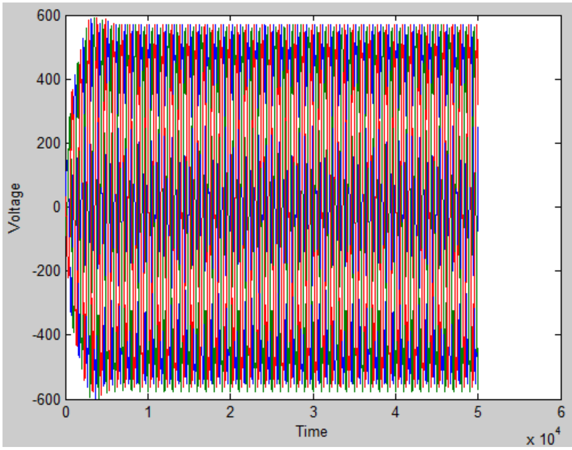

Fig.9 graphical representation of time verses voltage (scope 6)

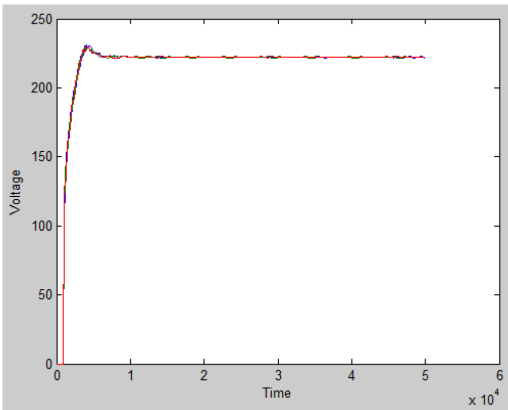

Fig.10 graphical representation of time verses of voltage (scope 6)

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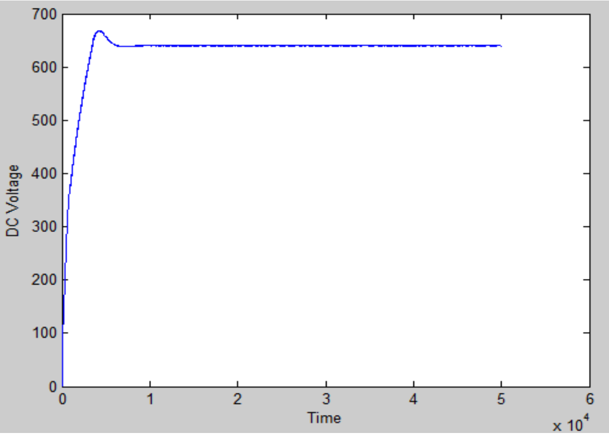

Fig.11 graphical representation of time verses dc voltage (scope V_{dc})

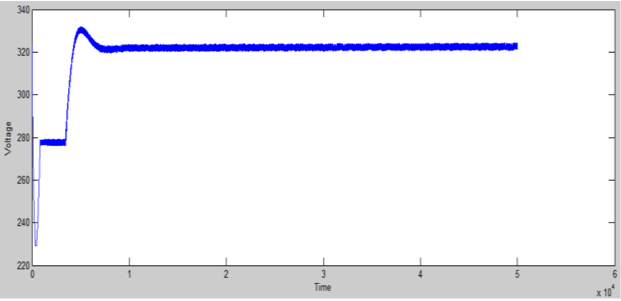

Fig.12 graphical representation of time verses voltage

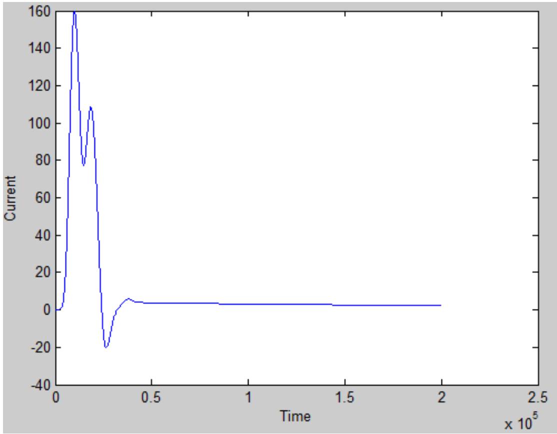

Fig.13 graphical representation of time verses current

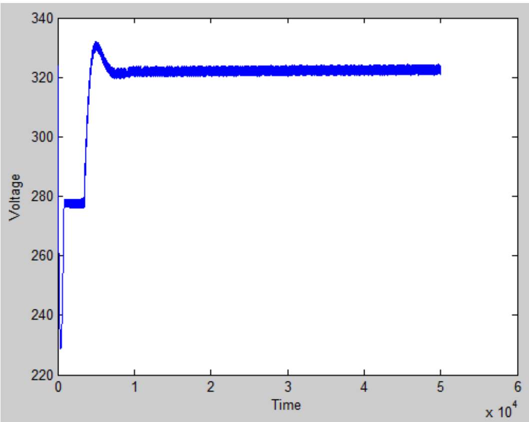

Fig.14 graphical representation of time verses voltage

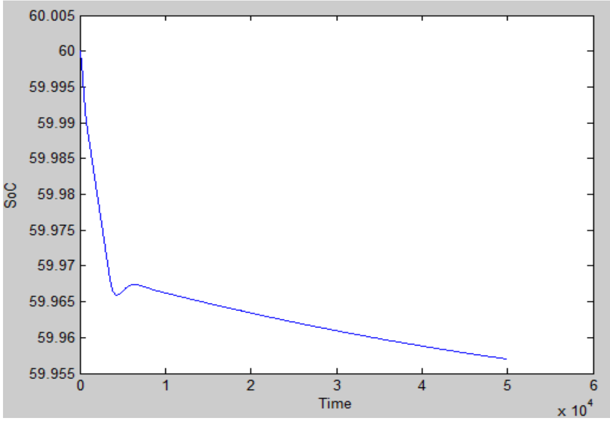

Fig.15 graphical representation of time verses SoC (state of charge)

Table 1 Total harmonic distortion

Parameter	Value
Fundamental frequency	50Hz
Maximum Frequency	4000
Number of cycle	1
THD	27.24%

V. Conclusion

This work presents comprehensive analysis and development of the universal control methodology for hybrid electric vehicle for power quality improvement in distribution networks. Mitigation of power quality issues within the distribution network is achieved by structures named Custom Power Systems (CuPS). During this research, many different methods are used for improved power quality that is MPPT (maximum power point tracking), Wind and Solar PV. Styles of major parts within the power stage of the bi-directional dc-dc device are discussed. Average current mode control is used to manage the output voltage of the dc-dc device as a result of its inherently stable characteristic. Results from simulation and experiment agree well with one another thereby verifying the ideas introduced. Our simulation results are show the power quality is optimized than previous research work.

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