



VOLTAGE SAG AND SWELL MITIGATION USING D-STATCOM IN RENEWABLE ENERGY BASED DISTRIBUTED GENERATION SYSTEMS

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ABSTRACT

This paper proposes the distribution level voltage control scheme and compensation of the voltage sag and swell actions by using D-STATCOM compensator. Actually the renewable energy distributed system is one of convenient solution to give energy to nearer the customers on that condition Supplies the voltage without variation is very much. So on that condition we connect one of the main FACTS device named as D-STATCOM compensator. At the point of common coupling to solve the voltage problems, for sensitive loads, even the slightest voltage sag for short duration can cause serious problems. An energy storage battery has been installed at the DC side of the compensator that gives the possibility to control the voltage at the PCC and exchange the active and reactive power with the grid. By using MATLAB the circuit models and simulation results are presented.

Key words: FACTS, D-STATCOM, Sensitive loads.

1. INTRODUCTION

The power quality is the major issue around the world. The distributed generation offers the possibility to supply consumers with electricity in country side without investing more money. Generally, the renewable energy sources such as wind, biomass, solar and hydropower. Then several types of renewable sources can be interconnected together forming a microgrid. Then by connecting the distribution generation to loads on that condition the voltage may be varies in terms of sag and swell and these problems will be solved by connecting the D-STATCOM at the point of common coupling. D-STATCOM means distribution static synchronous compensator and it can be used as flexible alternative current transmission systems in voltage distribution network. Usually, D-STATCOM consists of a three-phase voltage source inverter, connected to the grid at the PCC between the end users and the distributed generator. It gives the possibility to mitigate voltage sag and swell, to improve power factor, and total harmonic distortion. D-STATCOM can be used to improve the power quality. It's a power electronics device designed for low and medium grid voltage. In this work, the compensator consists of three phase wires voltage source converter inserted in shunt with the grid and linked to a battery by its DC bus. The energy storage system allows it to control both of active and reactive power flow in the grid. The main applications of the D-STATCOM are; Distribution STATCOM exhibits high speed control of the reactive power to provide voltage stabilization and other type of system control. The D-STATCOM protects the utility transmission or distribution system from voltage sag and/or flicker caused by rapidly varying reactive current demand.

2. METHODOLOGY

2.1 BLOCK DIAGRAM

When the distributed power generation plants supply an voltage to load on that time first the voltage comes to PCC (point of common coupling) the sensitive loads and heavy loads and D-STATCOM all are connect to PCC then from that point the voltage will be divided to loads. And the sensitive loads

nothing but hospitals, colleges and hotels etc. and heavy loads is nothing but industries on that time the voltages will be varying depending upon the loads when the voltage will be decreases from prescribed limit that condition will be called as voltage sag and increasing the voltage level from prescribed limit is called voltage swell. On that conditions the load side connected equipment may get damage so avoid these problems we connect the D-STATCOM compensator.

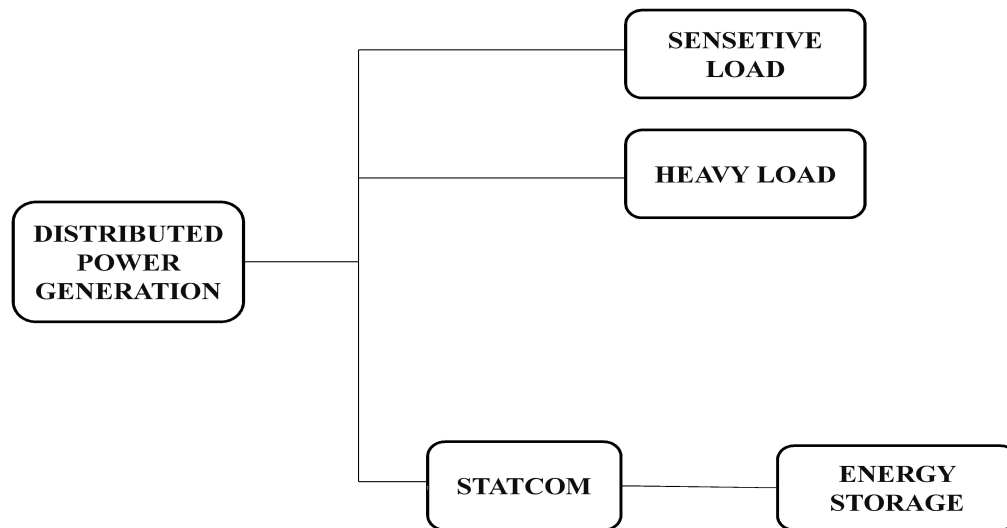


Fig. 1: Proposed power system

2.2 D- STATCOM CONFIGURATION

D-STATCOM can be used to improve the power quality. It's a power electronics device designed for low and medium grid voltage. In this work, the compensator consists of three phase three wires voltage source converter inserted in shunt with the grid and linked to a battery by its DC bus. The energy storage system allows it to control both of active and reactive power flow in the grid.

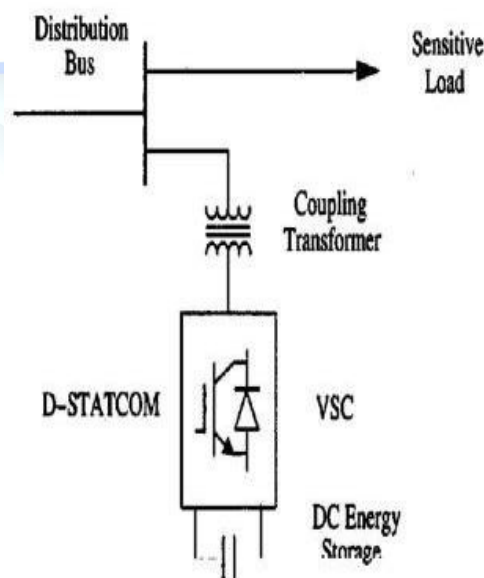


Fig2.D-statcom compensator

The D-STATCOM compensator generates a voltage in the same phase as the grid voltage, but not with the same magnitude. In fact, the compensation mechanism depends considers the grid as an inductive load then, it injects the reactive power, Otherwise (pcc higher than vco), the compensator absorbs the surplus of reactive power, the compensator operates until achieving an acceptable network operating condition where the D-STATCOM output voltage and grid voltages become on the same phase and have the same magnitude.

3. RESULT

The following waveforms will be the outcome result of the voltage sag and swell mitigation by using D-STATCOM compensator in MATLAB Simulation.

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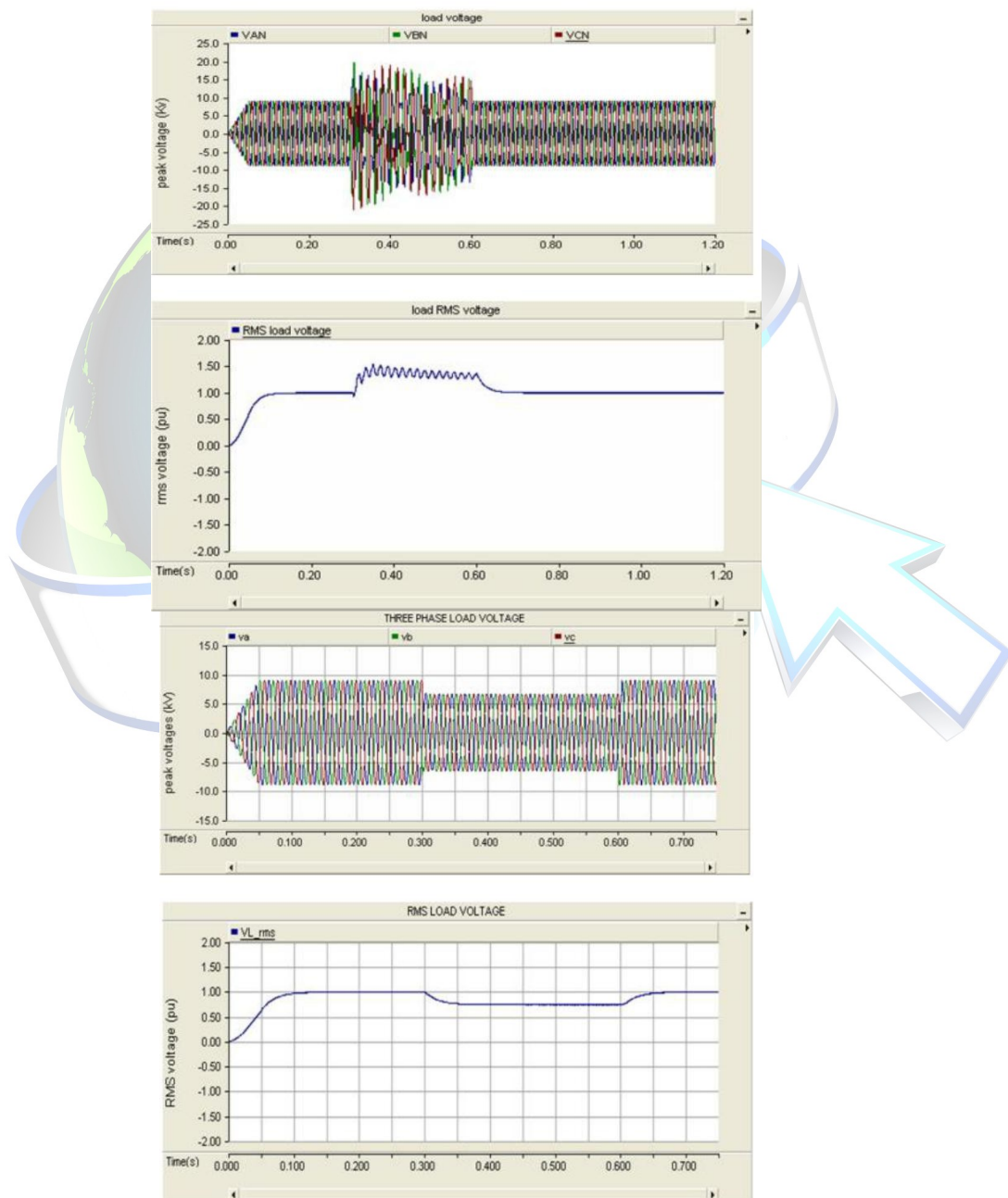


Fig. Voltage Sag and swell waveforms without DSTATCOM

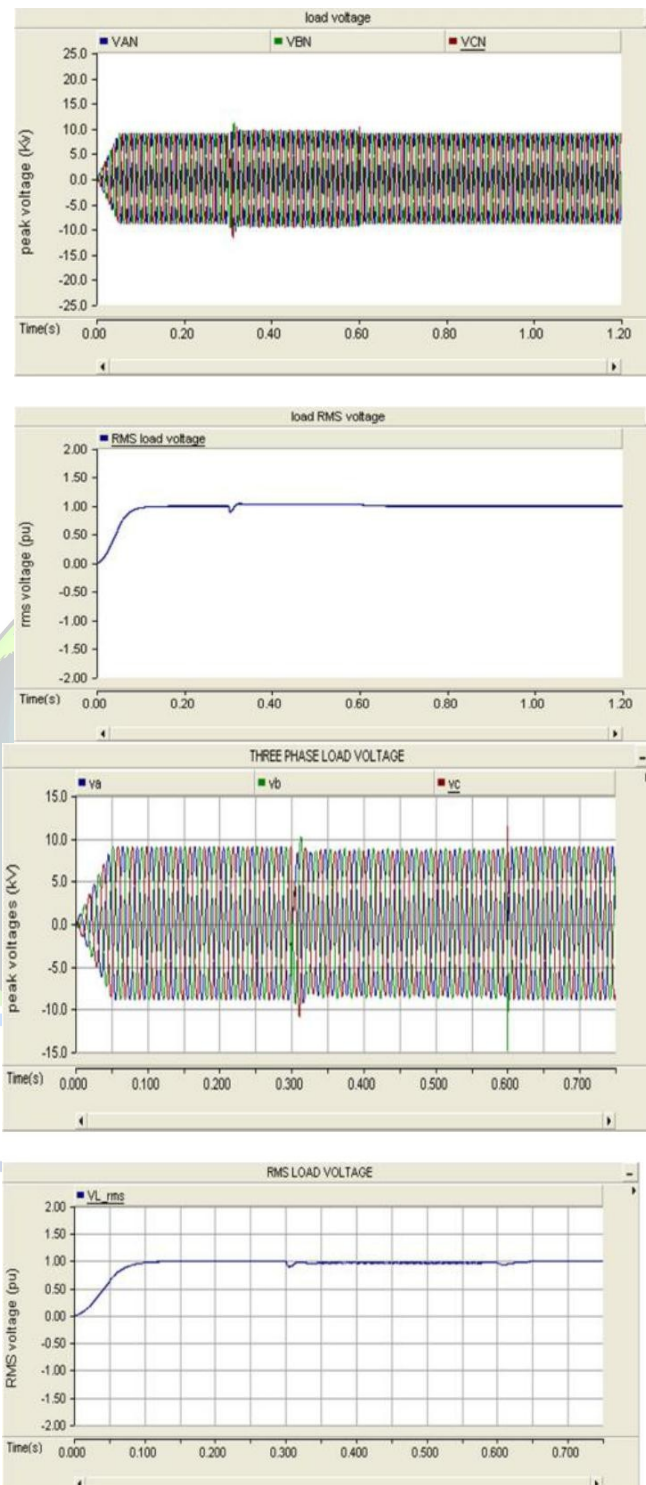


Fig. voltage sag and swell waveforms with DSTATCOM

4. CONCLUSION

In this paper, performance of D-STATCOM compensator in mitigating the voltage sag and swell is demonstrated with the help of MATLAB. The voltage sag and swell are the major issues in now a days so eliminating those disturbances and give constant voltage supply to loads can be done by using D-STATCOM compensator so this is the very much easiest and advantageous method to mitigate the voltage disturbance.



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