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A Review To Improvement Power Quality To Grid Connectedwindenergy System by Statcom

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Abstract **- This paper a review of power quality improvement of wind energy system by using of STATCOM to the grid system. It shows how power electronic devices and Flexible AC Transmission Systems play a role to mitigate the power quality problems. But in the transmission system of wind energy system is affected voltage variation, flicker, harmonics and switching operation .Hence the power system losses stability and lagging power factor to connect the load. In this paper researched by using of static compensator (STATCOM) with using the battery stored system (BESS) at the common point coupling to power factor improvement and minimize total harmonic distortion of the grid system. To improve power quality by using STATCOM to connect the grid of wind energy system of a scheme of simulated of the power system of block set. The required power system maintain voltage stability and phase difference is zero, minimize distortion, harmonics to power system according to the guidelines specified in IEC-61400 standard (International Electro-technical Commission) provides some norms and measurement parameter.**

Keywords- **BESS, STATCOM, FACT, GTO, PWM, THD.**

I. INTRODUCTION

The power quality is an essential customer-focused measure and is greatly affected by the operation of a distribution and transmission network. The issue of power quality is of great importance to the wind turbine. A STATCOM based control technology has been proposed for improving the power quality which can technically manage the power level associates with the commercial wind turbines. The proposed STATCOM control scheme for grid connected wind energy generation for power quality improvement has following objectives.

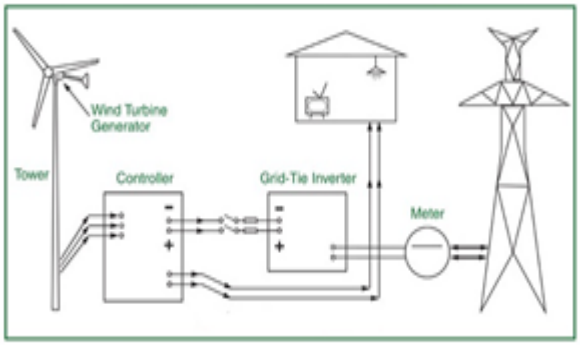

Fig.1.Grid Tie Wind Turbine System.

1. The power factor is improvement about unity on the source side.
2. STATCOM is supported only reactive power to wind Generator and Load.
3. Simple bang-bang controller for STATCOM to achieve a fast dynamic response.

II. STATCOM

Flexible Alternating Current Transmission Systems (FACTS) devices, namely Static Synchronous Compensator (STATCOM), Static Synchronous Series Compensator (SSSC) and Unified Power Flow Controller (UPFC), are used to control the power flow through an electrical transmission line connecting various generators and loads at its sending and receiving end.

1. The STATCOM is compensate the voltage variations across the AC transmission Line
2. When due to transient condition it has increased the stability of transmission line (i.e., during sudden changes in the load at the receiver end of the AC transmission line), STATCOM gives quick response of transmission line.

1. Grid Connected System Configuration

The STATCOM is injects the current from the grid in such a way free from the harmonics and their phase angle is needed to the desired value. This injects current is cancel out reactive part and 3rd and 5th harmonics of the load and current of induction generator, improve power factor and power quality. The improvement power quality of the grid connected system is implemented at points of common coupling (PCC), Consists of wind

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energy generation system and battery energy storage system with STATCOM Main Title.

2. Wind Energy Generating System-

Wind energy generating station is working on a constant speed method with pitch control turbine. The induction generator is field circuit, it can accept constant and variable loads, and has natural protection against short circuit. The available power of wind energy system is presented as under in P wind=1/2ρAV3wind …….(4.6)

Where ρ (kg/m3) is the air density and A (m2) is the area swept out by turbine blade wind is the wind speed in m/s. It is not possible to extract all kinetic energy of wind, thus it extracts a fraction of the power in wind, called the power coefficient Cp of the wind turbine, and is given in

$P_{mech}=C_pP_{wind}$ …….. (4.7)

Where Cp is the power coefficient, depends on type and operating conditions of wind turbine. This coefficient can be expressed as a function of tip speed ratio λ and pitch angle θ. The mechanical power produce by a wind turbine is given in (4.6)

Pmech= 1/2 ρΠAV3windCp

Where R is the radius of the blade (m)

III. BESS-STATCOM

The voltage regulation depends upon the energy storage element like (BESS) the battery energy storage system. The will normally keep up DC capacitor voltage steady and is most appropriate in STATCOM since it quickly infuses or ingested responsive energy to balance out the matrix framework. The distribution and transmission system is controlled very fast rate. The BESS can be used charging and discharging operation due to power fluctuation. The battery is connected in parallel to the DC capacitor of STATCOM

1. Statcom Current Control:

1.1 Control Strategy

The control scheme approach is based on injecting the currents into the grid using "Direct Control. The direct current control uses track PWM technology on the current instantaneous value for feedback control. Basically an indirect current is respectively simple, the quality is not high slow speed, the current control way is fast and quality is high, it can get control method respectively simplein the detection method load current Ia, Ib, Ic of three phase instantaneous reactive and harmonic current detection method, in which Ia, Ib, Ic is a three-phase load currents, Udcrefis DC side voltage reference value.

IV. MATLAB SIMULATION

The Simulink model library includes the model of Conventional Source, Asynchronous Generator, STATCOM, Non-Linear Load, Inverter, Grid Voltage, Battery, Line Series Inductance and others that has been constructed for simulation. The simulation parameter values for the given system are given main paper.

V. RESULTSAND DISCUSSION

Simulation of wind energy system connected to the grid is carried out in MATLAB/Simulink environment. Following two cases are analyzed as follows:

1. Wind connected to grid without STATCOM

In this case, simulation of defined system is carried out without using STATCOM and waveforms are analyzed. The current and voltage waveform shown in the graph fig. 6.1 in this graph wind power generation station is connect to grid, we can observed discontinuous waveforms due to integration of voltage and current are not in same phase, it is seen that the total harmonics distortion(THD) without use of STATCOM with FET analysis for grid connected system wind energy system of current is found to be 11.30%.

Fig.2. Source Voltage and Current of Phase A (without STATCOM).

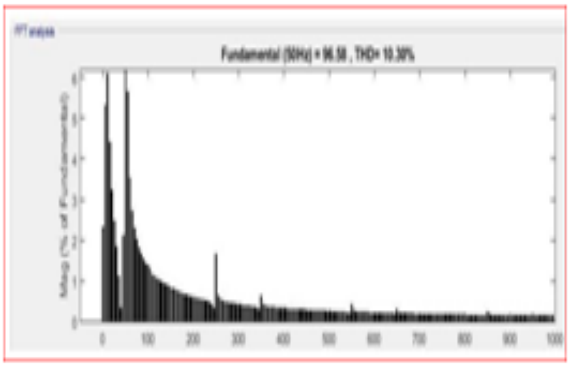

Fig.3. FFT analysis of source current.

2. Wind connected to the grid with STATCOM

In this case, simulation is carried out using the STATCOM control to analyses effect of this on the system. The current and voltage waveform of phase shown in the figure6.3 it is observed that the source

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current waveform is in phase with the source voltage after connection of STATCOM. Fig 5.4 in the presents the wind energy system is connected to the grid with STATCOM fed from FET analysis for the source current waveform with STATCOM is 1.57%.

VI. CONCLUSION

The control of VSI based Direct Current controls carried out using MATLAB/Simulink. Results depict THD, active and reactive power of grid connected wind energy system dynamic performance.

1. Conclusions

- The DC current control scheme for power quality improvement to grid connected wind energy system with linear or nonlinear load.
- thus the waveform of voltage and current are distorted on both sides in wind energy system in source current on the grid is affected due to the effects of nonlinear load and wind generator,
- STATCOM-BESS based SIMULINK MODEL for grid connected wind energy system is
- Proposed. The harmonic part of load current is canceled out.
- It maintains the source voltage and current in phase and supports the reactive power Demand for the wind generator and load at PCC in the grid system.
- It is demonstrated that the THD after using STACOM has been improved considerably and is within the norms of the IEC standards.
- The proposed scheme has not only power quality improvement feature, but it also has Sustain capability to support the load with the energy storage through the batteries.

2. Suggestions for future work

STATCOM-BESS based control has the capability of improving power quality as demonstrated already. However, work can be done to make the switching period of STATCOM faster and reliable. Also, improving quality of the battery is one of the major areas which can further improve performance of proposed controller.

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