

# Performance Improvement for Wind Turbine Systems

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**Abstract** - The power quality is a critical customer-focused assess and is significantly affected by procedure of an allocation as well as transmission system. Wind turbine constructs a nonstop variable output power and these power variations are mostly caused by consequence of turbulence, wind shear, as well as tower-shadow and of control system in power system. The concerns of power quality are viewed regarding wind generation; transmission as well as distribution network on the other hand the wind generator set up disturbances into distribution system. The incorporation of wind energy into existing power scheme presents practical challenges and that necessitate consideration of voltage regulation, constancy, problems of power quality. A STATCOM control system in wind energy generation scheme is projected under standard operating condition to permit the appropriate control over the dynamic power production, reaching speed, torque stable state values. The purpose of the STATCOM is to control the voltage rapidly in required range and maintain its dc-link voltage steady. It can improve ability of wind turbine to ride throughout transient instability in the grid. Shunt Flexible AC Transmission System devices, such as Static Synchronous Compensator (STATCOM), have been extensively used to make available high performance stable state and transient voltage control at Point of Common Coupling. STATCOM is employed to manage the machine speed not to attain below certain safe limit by means of injecting current based control expertise has been projected for recovering the power quality which can strictly administers power level associates with industrial wind turbines.

**Keywords:** *Wind energy, Power quality, Flexible AC Transmission System devices, Static Synchronous Compensator, Point of Common Coupling.*

## 1. INTRODUCTION:

There has been an extensive expansion as well as rapid progress in utilization of wind energy in recent times. The requirement to incorporate renewable energy similar to wind energy into power system is to put together to reduce the environmental impact on conventional plant. One of easy methods of running a system of wind generating is to employ induction generator associated directly to grid system. The induction generator has intrinsic benefits of cost efficiency as well as robustness. Induction generators necessitate reactive power in support of magnetization [1]. When generated active power concerning an induction generator is different due to wind, absorbed reactive power as well as terminal voltage of induction generator is considerably affected. Static Synchronous Compensator, have been extensively used to make available high performance stable state and transient voltage control at Point of Common Coupling. The concerns

of power quality are viewed regarding wind generation; transmission as well as distribution network on the other hand the wind generator set up disturbances into distribution system [2][3]. The applications of a STATCOM towards fixed-speed wind turbines provided through induction generators were reported for stable state voltage regulation, and for temporary transient voltage steadiness. It can improve ability of wind turbine to ride throughout transient instability in the grid.

## 2. METHODOLOGY:

The incorporation of wind energy into existing power scheme presents practical challenges and that necessitate consideration of voltage regulation, constancy, problems of power quality [4]. The power quality is a critical customer-focused assess and is significantly affected by procedure of an allocation as well as transmission system. The concern of power quality is of enormous significance towards the wind turbine. In the fixed speed wind turbine process, each and every fluctuation in wind speed are conveyed as fluctuations in mechanical torque, electrical power on grid and guide to huge voltage fluctuations. During the regular operation, wind turbine constructs a nonstop variable output power and these power variations are mostly caused by consequence of turbulence, wind shear, as well as tower-shadow and of control system in power system [5][6]. A STATCOM control system in wind energy generation scheme is projected under standard operating condition to permit the appropriate control over the dynamic power production, reaching speed, torque stable state values. In occurrence of grid disturbances, STATCOM is employed to manage the machine speed not to attain below certain safe limit by means of injecting current based control expertise has been projected for recovering the power quality which can strictly administers power level associates with industrial wind turbines. The projected STATCOM control system in support of grid connected wind energy generation for power quality enhancement has objectives such as unity power factor at source side; reactive power support simply from STATCOM towards wind Generator as well as Load; effortless bang-bang controller in support of STATCOM to attain quick dynamic response.

### 3. AN OVERVIEW OF STATCOM:

Shunt Flexible AC Transmission System devices, such as Static Synchronous Compensator (STATCOM), have been extensively used to make available high performance stable state and transient voltage control at Point of Common Coupling. The applications of a STATCOM towards fixed-speed wind turbines provided through induction generators were reported for stable state voltage regulation, and for temporary transient voltage steadiness. A STATCOM also recognized as a superior static VAR compensator, is a shunt associated FACTS device that produce a set of reasonable three-phase sinusoidal voltages at elementary frequency, with quickly convenient amplitude as well as phase angle. A STATCOM control system in wind energy generation scheme is projected under standard operating condition to permit the appropriate control over the dynamic power production, reaching speed, torque stable state values. The purpose of the STATCOM is to control the voltage rapidly in required range and maintain its dc-link voltage steady. It can improve ability of wind turbine to ride throughout transient instability in the grid. In its most essential form, STATCOM configuration consists of a VSC, a dc device of energy storage; a coupling transformer associated in shunt with ac system, as well as connected control circuits. The fundamental configuration of STATCOM by means of wind turbine driven SCIG associated directly to grid. The VSC converts dc voltage across storage device into a set of three-phase ac output voltages that are in phase as well as coupled with ac system all the way through reactance of the coupling transformer. Appropriate adjustment of the phase as well as magnitude of STATCOM output voltages permit effectual control of active as well as reactive power exchanges among STATCOM and ac system. With a superior controller for STATCOM, there is an alternative for system devoid of using vector control or else direct torque control, to defend the system from surge currents as well as harmonics mitigation as well as flickering issues. Settling time in support of speed of rotor, electromagnetic torque and so on can be reduced. Severe initial currents are controlled and moreover severe inrush currents because of initial or clearing of faults can be totally removed because of such influential controller.

### 4. CONCLUSION:

The induction generator has intrinsic benefits of cost efficiency as well as robustness. Induction generators necessitate reactive power in support of magnetization. The concerns of power quality are viewed regarding wind generation; transmission as well as distribution network on the other hand the wind generator set up disturbances into distribution system. A STATCOM control system in wind energy generation scheme is projected under standard operating condition to permit the appropriate control over the dynamic power production, reaching speed, torque stable state values. The projected STATCOM control system in support of grid connected wind energy generation for power quality enhancement has objectives such as unity power factor at source side; reactive power support simply from STATCOM towards wind Generator as well as Load; effortless bang-bang controller in support of STATCOM to attain quick dynamic response. Appropriate adjustment of the phase as well as magnitude of STATCOM output voltages permit effectual control of active as well as reactive power exchanges among STATCOM and ac system. A STATCOM also recognized as a superior static VAR compensator, is a shunt associated FACTS device that produce a set of reasonable three-phase sinusoidal voltages at elementary frequency, with quickly convenient amplitude as well as phase angle. STATCOM is employed to manage the machine speed not to attain below certain safe limit by means of injecting current based control expertise has been projected for recovering the power quality which can strictly administers power level associates with industrial wind turbines. The applications of a STATCOM towards fixed-speed wind turbines provided through induction generators were reported for stable state voltage regulation, and for temporary transient voltage steadiness. With a superior controller for STATCOM, there is an alternative for system devoid of using vector control or else direct torque control, to defend the system from surge currents as well as harmonics mitigation as well as flickering issues.

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